MALARIA RISK IN THE LUBOMBO SPATIAL DEVELOPMENT INITIATIVE AREA: A PERCEPTUAL ANALYSIS AND REPRESENTATION USING GEOGRAPHICAL INFORMATION SYSYTEMS

By

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Preface

This study represents the original work of the author and has not been submitted in any form to another University. Where the author used the work of authors it has been duly acknowledged in the text.

The study described in this thesis was carried out in northern-eastern KwaZulu-Natal, southern Mozambique and eastern Swaziland, the Medical Research Council MRC (Durban) and the University of Natal, under supervision of C.G Oelofse (School of Life and Environmental Sciences, University of Natal, Durban) and Dr. B.L Sharp (Medical Research Council: National Malaria Research Programme, Durban).

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Francois Maartens.

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Fillipense 4:13 - "*Ek is tot alles in staat deur Hom wat my krag gee*"

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Abstract

Tourism is the world's largest earner of foreign currency. It brings an estimated R20 billion a year into the South African economy, second only to the manufacturing and mining industry in its contribution to the Gross Domestic Product (GDP). An estimated 1.7 million overseas and African tourists visited South Africa in 1999. Of the 1.7 million approximately 500 000 or 30% of these tourists visited KwaZulu-Natal. Forty seven percent of the foreign tourists visited the Zululand and Maputaland area, which falls within a malaria transmission zone. An estimated 8 million domestic tourists from outside or within this province travelled to one or more destinations within KwaZulu-Natal on an annual basis.

The Lubombo Spatial Development Initiative is a tri-lateral initiative between the governments of Swaziland, Mozambique and South Africa to develop the Lubombo region into a globally competitive economic zone. The geographical area targeted by this initiative is broadly defined as eastern Swaziland, southern Mozambique and north-eastern KwaZulu-Natal. Accelerated development with regards to agriculture and tourism is the main objective of the Lubombo Spatial Development Initiative (LSDI).

The Lubombo corridor has the potential to develop into an international tourist destination but malaria is hampering the growth and development of the region. Perceived malaria risk by tourists is believed to be an important factor that has a negative influence on the tourism industry in the study area. The risk factor, as defined in this study, is the possibility of contracting malaria whilst visiting a tourism facility in the area. It is therefore essential to understand perceptions relating to malaria and malaria risk in the LSDI area. Malaria control plays a pivotal role in the Lubombo Spatial Development Initiative (LSDI). The objective of the malaria control component of the LSDI is to put in place a malaria control programme that will protect the economic interest of the Lubombo Spatial Development Initiative (LSDI) and stimulate development.

Malaria control activities have been taking place in the three countries since 1999. Residual house spraying is the method used to control malaria in the Lubombo

corridor. Major reductions in both malaria cases and parasite prevalence have been recorded. Swaziland's malaria incidence reduced by 64%, South Africa's malaria incidence plummeted by a staggering 76% and Mozambique saw a parasite prevalence reduction of 40% in the first year of residual house spraying in 1999.

This study focuses on the scientific study of malaria incidence and distribution as well as on both tourists and tourism operator's perceptions of malaria risk. It considers the factors that drive people's perceptions of risk and investigates how tourists and tourism operators respond to malaria risk. It draws conclusions about how malaria impacts on tourism in the LSDI and recommends how malaria control can play a positive role in tourism development in the area.

Contents

List of Abbreviations:

BC – Before Christ

ECO – Ecological

DDT – Dichlorodiphenyltrichloroethane

DOH – Department Of Health

DRPF – Drug Resistant Plasmodium Falciparum

GDP - Gross Domestic Product

GIS – Geographical Information System

GPS – Global Positioning System

HIS – Health Information System

HIV – Human Immunodeficiency Virus

KAP – Knowledge, Aptitude and Practices

KZN – KwaZulu-Natal

LSDI – Lubombo Spatial Development Initiative

LIM – Limpopo

MAG – Malaria Advisory Group

MIS – Malaria Information System

MPU – Mpumalanga

MRC - Medical Research Council

NGO – Non-Governmental Organisation

NU – Natal University

P.Falciparum – Plasmodium Falciparum

POP's – Prohibited organic pollutants

SADC – Southern African Development Community

SP – Sulfadoxine Pyrimetamine

SATOUR – South African Tourism Board

UK – United Kingdom

USA – United States of America

USSR – Union of Soviet Socialist Republics

WHO – World Health Organisation

WTO – World Tourism Organisation

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Chapter 1: Introduction

The Lubombo Spatial Development Initiative is a tri-lateral agreement between the governments of Mozambique, Swaziland and South Africa to develop the Lubombo corridor into a globally competitive economic zone. In July 1999, President Mbeki of South Africa, President Chissano of Mozambique and his Majesty King Mswati 3rd of Swaziland signed the general protocol for the Lubombo Spatial Development Initiative (LSDI).

The protocol laid the foundation for regional collaboration and delivery between the three countries. The geographical area targeted by this initiative is broadly defined as eastern Swaziland, southern Mozambique and north- eastern KwaZulu-Natal. Malaria control forms part of the (LSDI) project. The aim is to accelerate development in relation to agriculture and tourism, and to protect communities and economic investment in the area spanning the three countries.

1.1 Rationale for the study

The subtropical plains and coastline that surround the Lubombo mountains which run through an area of South-East Africa that includes parts of Swaziland, Mozambique and South Africa create a place with a unique combination of natural riches and cultural wealth.

This stretch of land, better known as the Lubombo corridor, has the potential to develop into an international tourist destination, but malaria is hampering the development and growth of the region. By implementing regional malaria control measures between South Africa, Mozambique and Swaziland the Lubombo corridor has the potential to become a world-renowned tourist destination.

The perception of risk amongst tourists is an important factor that determines if people will visit an area. By assessing the current perceptions of risk of malaria amongst local and international tourists that visit this area and by giving correct and updated malaria information, the relationship between malaria and tourism can be explored and more clearly understood.

Development of tourism in the area will generate much needed local and foreign revenue. This will boost the local economy and the broader development of the entire region will be supported.

1.2 Aim

The aim of this study is to determine the influence of malaria on tourism and to establish the perceived and mapped risk associated with malaria within the Lubombo Spatial Development Initiative (LSDI) area.

1.3 Objectives

The objectives of this research are to:

- Determine the geographical distribution of all existing and new tourist facilities within the LSDI area.

- Explore tourist facility owners/managers knowledge and perceptions about tourism and malaria within the LSDI area.

- Determine local and international tourist's perceptions of the risk of malaria in the region.

- Determine the spatial relationship between the geographical spread of tourist facilities and the malaria distribution in the LSDI area.

- Undertake comparative studies to determine the effects of malaria control in the region.

1.4 Study area

The study area for this research consists of eastern Swaziland, southern Mozambique and north-eastern KwaZulu-Natal.

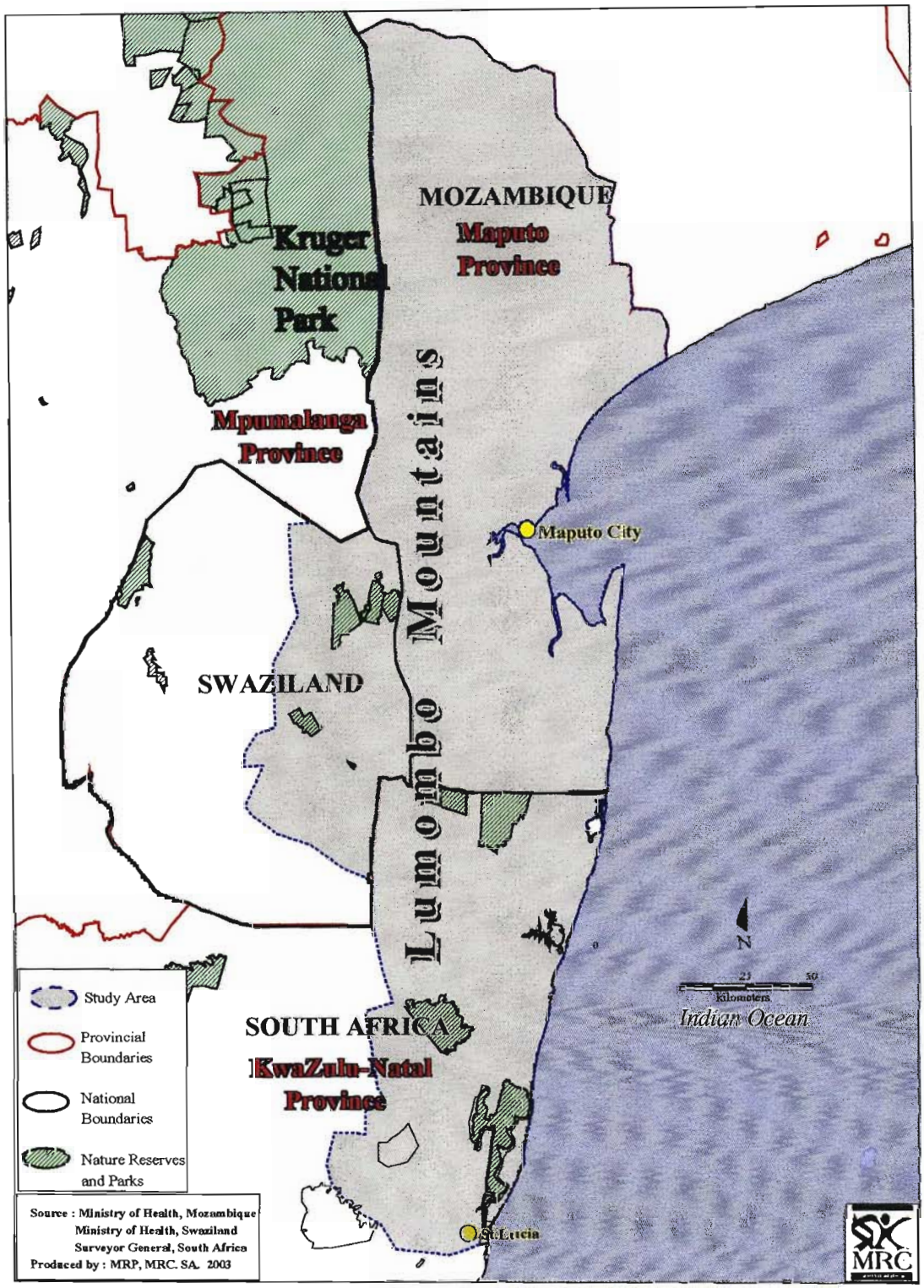


Figure 1: Study area

(Source: Malaria Lead Programme, Medical Research Council, 2003)

1.5 Study outline

This dissertation is divided into six chapters. The first chapter provides the introduction to the study and outlines the rationale, aims and objectives of the study.

The second chapter presents the theoretical framework for the study and introduces the concept of risk. Emphasis is placed on risk perception and how it is formed and shaped. People's perceptions of risk determine their behavior and how they respond to risk. Several factors that contribute to the development of people's risk perception are discussed in this chapter. Reference is made to risk taking and tourism in the latter part of the chapter.

Chapter three provides background information for the study, and includes two main themes, namely malaria and tourism. The malaria theme starts off with a historical perspective on this ancient disease. The geographical distribution of malaria is discussed. The section describes the global distribution, sub-Saharan distribution and southern Africa distribution of malaria and finally narrows down to malaria distribution in the study area, namely north-eastern South-Africa, Swaziland and Mozambique. Several malaria control measures and methods relevant to the southern Africa conditions are discussed. The malaria theme ends by looking at the influence of malaria on development.

The tourism theme within chapter three starts off by investigating global tourism and it's economic impact. A historical perspective on tourism in Africa is given and it narrows down to the past and current tourism situation in South Africa, Swaziland and Mozambique. Special mention is made of health and travel, thereby linking the two themes within chapter three. The chapter ends with travel and tourism forecasting, placing emphasis on the importance of tourism on the African continent as a whole.

Chapter four describes the methodology employed to collect the relevant data for the study. Both quantitative and qualitative methods were adopted in this research and these are described in this chapter.

Chapter five presents the results, which are analyzed and discussed according to four themes. A description and profile of tourism in the LSDI are first presented, followed

by the analysis of perceptions of risk. The third theme explores the incidence of malaria using scientific mapping techniques. The final theme covers perceptions of and approach to malaria control.

Chapter six concludes the study and includes recommendations.

Chapter 2: Conceptualising risk: social and cultural interpretations

2.1 Introduction

Every day people take chances as they go about their daily lives. Virtually every activity in life involves some level of risk, whether people are on vacation, travelling to work, operating electrical equipment or simply taking a stroll in the park; humans are constantly faced with the possibility of injury or death. Risk can be defined as, "the potential that an event or activity in the environment will have a negative impact on those exposed to it" (World Health Organisation, 2002).

People all over the world are exposed to an almost limitless array of risks in the form of communicable and non-communicable diseases, injury, violence or natural catastrophe. Whole populations might be at risk to some diseases, such as the people in Mozambique who are exposed to high levels of malaria infections each year. This study adopts a health lens in characterising malaria risk. Other risks might only involve individuals, such as crime in cities or motor vehicle accidents. Most risks cluster themselves around the poor due to socio-economic factors that make them more vulnerable to injury or disease (The World Health Report, 2002).

Humans have been subjected to risk since the beginning of time. In hunter-gatherer societies risks ranged from wild animals to determining which fruits and berries in the environment were fit for consumption. The introduction of agriculture exposed humans to different risks varying from infectious diseases carried by humans and domesticated animals to insects and fungi that have the capability of destroying crops. The industrial revolution brought further risks, and exposed humans to air pollution, water pollution and injury from mechanical accidents (Hunter, 2001).

The pace and scope of change of the modern world has been accompanied by a belief that humans are creating the potential for total global catastrophe. In the 1950's it was the threat of global atomic war that raised concern. In the 1960's it was environmental disaster, with the use of DDT in the limelight. The focus of debate in the 1970's was the theory of total depletion of vital resources like oil, water and coal. The 1980's were the predictions of nuclear winters. The 1990's have been the decade of concern about global warming (Hunter, 2001). Some of humankind's most spectacular

achievements have been associated with the voluntary acceptance of significant risk. The exploration of the planet by early navigators in a quest for knowledge of their surroundings and human's early space exploration is a good example of voluntary risk taken by humans. In assessing the risk of a certain activity it is necessary to distinguish between voluntary and imposed risk.

2.2 Risk perception

Risk perceptions are based on a diverse array of information that is processed on risk factors, hazards and technologies. People tend to receive information and form their perceptions based on their past experiences, communications from scientific sources, media, family, peers and other familiar groups. This transfer of and learning from experience also occurs within the context of a person's society and culture, including references to beliefs and systems of meaning. The organisation of new and past knowledge enables people to perceive and make sense of their world. Perceptions of risk in relation to health are embedded within different economic, social and cultural environments (The World Health Report, 2002).

Starr conducted one of the pioneering studies in the perception of risk when he tried to weigh the risks from technologies against their perceived benefit (Starr, 1969, cited in the World Health Report, 2002). A major early discovery was a set of mental strategies or rules called heuristics that people use to understand risk. One of the early methods used to study and map people's perception of risk was to ask them to estimate the number of deaths for 40 different hazards and to compare these with known statistical estimates. The above-mentioned experiment revealed that people tend to overestimate the number of deaths from rare and infrequent risks. People tend to underestimate the more common risks like car accidents or cancer. The findings of the above-mentioned experiment had implications for the control strategies of risks to health (Starr, 1969, cited in the World Health Report, 2002).

Another pioneering study that considered perceptions of risk, and which is relevant to the analysis of global risks to health, used psychometric testing to measure perceptions of 90 different hazards using 18 separate qualitative characteristics. The above-mentioned study clearly showed that the most highly uncertain risks are more

dreaded risks, such as nuclear power and pesticides. Risks associated with many health interventions and clinical procedures have more acceptable values and are less dreaded such as childbirth or anesthetics. The higher the dread factor and the higher the perceived unknown risk, the more people demand action to reduce these risks (Slovic, 2000, cited in the World Health Report, 2002).

Humans have the ability to sense and avoid harmful environmental conditions and to learn from previous experiences enabling them to survive on earth. Humans have the ability to change and modify the environment, but this ability to change the environment creates and reduces risk. Most people rely on intuitive risk assessment or risk perception to evaluate hazards and the way people perceive risk determines their behaviour (Slovic, *et. al*, 1980).

Human perceptions of and reactions to risk are shaped by past experiences and by information received from sources such as family, society and governments. It is a learning process that begins in childhood and the process is constantly updated in adulthood. Some risks are beyond human control like disease outbreaks, but others like the unhealthy consumption of food are within a human being's power to either heighten or diminish. The challenge of reducing risk is shared by all people and governments around the world (The World Health Report, 2002).

Social scientists have attempted to answer questions surrounding the nature of perceptions by using a multidisciplinary approach. Geography, sociology, political science, anthropology and psychology have made valuable contributions in understanding risk perception and the processes involved in forming perceptions. Sociology and anthropology have contributed to the field by showing that perception and acceptance of risk have their roots in social and cultural factors (Slovic, *et. al*, 1980).

Psychological research in risk perception focused on probability assessment, utility assessment and the decision making process. A major development in the psychological approach to risk perception arose when a set of mental strategies or heuristics, which people use to make sense of uncertain risk, were discovered. Geography contributed to the risk perception field by understanding human behaviour and natural hazard (Slovic, *et. al*, 1980).

Risk perception research has attempted to develop techniques to assess complex and subtle opinions that people have about risk in their environment. These techniques are used to understand the underlying processes involved when people perceive some activities as risky. It is very important to understand the way in which people think about and respond to risk. Research in this field provides governments, policy makers, emergency services and educational institutions with valuable information that improves communication between them and the public. By understanding the way perceptions are formed, effective risk management strategies can be developed and put in place to address the fears of the public (Slovic, *et. al*, 1980).

2.3 Risk assessment

The assessment and management of health risk is a relatively new area of study that has been rapidly expanding since the 1970's. It began by focusing on developing scientific methods for identifying and describing hazards and for assessing the probability of associated adverse outcome events and their consequences. Risk assessment has its roots in the environmental sector where it was developed as a systematic tool for comparing environmental problems that pose health risks for people. The field of risk assessment has grown rapidly and its focus is to identify, quantify and characterise threats to human health and the environment (Kates and Kasperson, 1983).

Four main elements exist in risk assessment namely:

- Hazard identification – identifies the type of health effect that can be caused, based on toxicological data from laboratories or epidemiological studies. A good example of the above is seen in malaria control where epidemiological data is used to determine the malaria and parasite prevalence in an area.

- Exposure assessment – combines data on the distribution of pollution in the environment with information on behaviour and physiology to estimate the amount of pollutants to which humans are exposed. The knowledge, aptitude and practices (KAP) survey in malaria control gives a good indication of the exposure of a population to possible malaria infection.

- Dose-response assessment – relates the probability of a health effect to the dose of pollutants or amount of exposure. By assessing the malaria prevalence in an area and by determining the population distribution in an area it is possible to make estimations of the dose response of a population to malaria infection.

- Risk characterization – combines the exposure and dose-response assessments to calculate the estimated health risks, such as the number of people predicted to experience a particular disease, for a particular population. The malaria prevalence and distribution in an area will determine the local population's risk of contracting the disease (The World Health Report, 2002).

The relationship between human activities and the environment is complex. Risk assessment attempts to measure the likelihood of a detrimental outcome, when human activities and the environment have an impact on each other. Detrimental outcomes consist of acute risk events such as floods that have a large-scale effect but happen over a short period, or chronic risk events that have a low density but over a much longer period such as the impact of air pollution on people's health or stable malaria transmission (Marsh and Oelofse, 1997).

Cutter and Solecki (1996) identified important questions that need to be addressed in risk assessment. Questions such as who is exposed to risk; at what level is this risk being experienced; is the risk long or short term; and how is the risk spatially distributed need to be explored. It is important to take all other hazards that the public are exposed to into consideration, for these factors may alter the perception or affect of the particular risk under study.

The two main approaches to risk assessment are those measurements determined by objective science, and those explored using the methodologies of subjective science. Both the above-mentioned measures are valid, and they produce quite complementary results, thereby resulting in the need for integration or resolution of differences with regards to risk assessment in an area. These differences arise due to the uncertainty that the event predicted by the risk assessment will actually happen, and the

uncertainty amongst experts and local people about the risk (Lofstedt and Frewer, 1998).

Different approaches exist for assessing risk. The most common approach is to assess the environmental characteristics of an area, taking into account the nature of the risk and the activities that take place in the area. The above-mentioned approach is highly applicable to this study. The environmental condition in the study area is favourable for malaria transmission (hazard) and the major activity in the area is tourism. Assessment that is to be used in decision-making requires levels of measurement that can be verified and derived using quantitative and qualitative data.

Quantitative methods involve the scientific investigation of conditions and elements in the environment that provide data and statistics that can give an indication of the level of risk in that area (Marsh and Oelofse, 1997). Several quantitative methods are used in malaria research and control to determine the level of malaria risk. Mosquito density in an area is calculated by analysing the amount and species composition of mosquitoes caught in window traps. Annual base line surveys are conducted where local inhabitants are tested for malaria. The parasite prevalence for the area is calculated using this method. Several geographical features like standing water bodies and population distribution are mapped and serve as a prediction tool to predict where malaria would occur and spread to when excessive rains fall.

Qualitative methods involve participatory approaches that evaluate the response of those exposed to risk, assessing their perception of risk, which may be based on experience, knowledge of the risk, information gained from other sources and their broader philosophical views of the environment (Marsh and Oelofse, 1997). Qualitative methods are also used in malaria research and control to determine the perceptions of people. A knowledge, attitude and practices (KAP) survey was completed to determine what the local inhabitants know, think and understand about malaria. This study used two questionnaires to gather relevant tourism information from owners/managers of tourist facilities and information about perception of risk from local and international tourists visiting the study area.

In an epidemiological study the outcome measured will be the risk to a population, expressed as a percentage of the population that will develop certain health impacts over time. Health risks are often subtle and the detrimental effects may manifest themselves more slowly (a chronic risk) over a longer period of time (Marsh and Oelofse, 1997). Short-term risks are easier to evaluate and monitor, and can also be dealt with more effectively in the affected population. Long term or cumulative impacts are far more difficult to determine. It is difficult to link health impacts to particular environmental hazards, as there are often numerous other factors, which influence the impact (Marsh and Oelofse, 1997).

Risks to health do not occur in isolation. It is therefore very important to include proximal and distal causes when investigating risk assessment. Proximal factors act directly to cause disease and distal causes are further back in the causal chain and act via a number of intermediary causes. "The factors that lead to someone developing a disease on a particular day are likely to have their roots in a complex chain of environmental events that may have begun years previously, which in turn were shaped by broader socio-economic determinants" (Rose, 1992, p 14, cited in the World Health Report, 2002).

It is essential that the whole causal chain be considered in the assessment of risks to health. It is very important that proximal and distal factors are considered in malaria research and control. A complex chain of events that include meteorological conditions, socio-economic factors, seasonality of the disease, population distribution, age, gender, drug and insecticide resistance are all determinants of malaria distribution and risk to a population.

2.4 Factors influencing perception of risk

There are a number of different factors that influence perceptions of risk. People's perceptions of risk determine their behaviour and how they respond to risk. The following factors discussed below are seen as relevant and applicable to how residents of malaria areas and tourists that visit the area perceive malaria risk.

Acute risk events are associated with disasters. These events take place over a short period but the scale of destruction is large, for example earthquakes, epidemics and

flash floods. Acute risk events receive far more attention in terms of media coverage and emergency funding. Disaster response is usually rapid after an acute risk event and financial resources are distributed accordingly with not much attention paid to preventative measures (Oelofse, 2000). A malaria epidemic can be classified as an acute risk event.

Chronic risk events are events that take place over a long period and at a smaller scale than acute risk events. Chronic risk is subtle risk that humans are exposed to on a day-to-day basis, for example, air pollution or stable malaria transmission. These risk events are long term, and often interact with each other to cause more serious cumulative impacts. Chronic risk events do not attract the same media attention or financial assistance as acute risk events (Oelofse, 2000). It is very important to distinguish between chronic and acute risk when investigating perceptions of risk.

Voluntarism of risk is an important factor that has an influence on the way people perceive risk. Risks that are taken voluntarily, such as those involved in driving on the roads or tourists that visit a known malaria risk area are accepted far more readily than involuntary risks that have been imposed by some outside group (Starr, 1980).

Involuntary risk occurs when people have little or no control over the risk that they are exposed to. Involuntary risk stimulates people to create a negative perception of risk, and is often the result of the spatial distribution of environmental hazards.

Knowledge about risk is a very important aspect that has an influence on how people perceive risk. People that have correct and updated information about risk affecting their lives develop a more comprehensive perception compared to other people. This is clearly visible in perceived malaria risk amongst tourists. Tourists that are knowledgeable and get their malaria information from reputable sources like travel clinics, travel doctors and relevant literature are well-informed tourists and they take the necessary precautions to prevent malaria infection. Misinformed tourists do not have adequate knowledge about the risk and they have a far greater chance of contracting malaria. The way in which the public gains information about environmental hazards and risks in their area will influence their perception of that risk (Oelofse, 2000). The public develops knowledge with regard to the risk

associated with a particular activity from a number of different sources. They often rely on inferences they remember hearing and observing about the risk in question (Slovic, *et. al*, 1980).

Control over risk is another important factor that has an influence on the development of perception of risk. If people have control over risk that is affecting their lives they accept the risk far more readily and form a more balanced perception of risk. Malaria control is a good example of this factor. When people know that malaria is being controlled in an area they are more willing to visit such an area. When people voluntarily visit a malaria area they can still be in control of the risk by taking and using malaria prophylaxis, repellents and bed nets to prevent malaria infection.

Trust relies on competence and credibility. Renn and Levine (1991) have identified five fundamental components that determine people's level of trust: competence, objectivity, fairness, consistency and faith. The basis of all of these is that "trust is based on historical experience. An individual will trust a regulatory body or industry depending on how it has acted in the past" (Lofstedt and Frewer, 1998, p15). Research has shown that "a lack of trust is a critical factor underlying the divisive controversies that surround the management of hazards" (Slovic, 1998, p 182). Trust is a fragile concept; it is built up slowly but can be destroyed in an instant, by a single accident or risk event (Slovic, 1998).

Trust and malaria control is problematic due to the multi-factorial nature of the disease. Malaria can be controlled in an area for years but epidemics can occur due to insecticide resistance or drug failure. Occurrences like malaria outbreaks can negatively effect people's perception of the disease. Building up trust between industry and the public is therefore critical in dealing with the public's perception of the health risk. Dealing with issues of trust, communication and fairness are therefore important in reducing the public's perception of risk associated with a particular activity, as is the creation of objective scientific knowledge that provides the information the public requires to assess levels of risk in their area (Slovic, 1998).

The *newness* of risk in an area plays an important role in risk perception. If a particular risk to people has been a threat for a long period of time, the people that

live in that area most probably would have developed an informed and balanced perception of the risk that influences their lives. When a new risk develops in a previously risk free area, the inhabitants of that area form a rapid perception of the risk and that perception may be either over or under-estimated. The above mentioned happens often when malaria spreads to previously malaria free areas or when malaria is eradicated from an area. People have to constantly adapt to their new situation.

The *vulnerability* of people has an influence on how people perceive certain risks in their environment. The level of hazard is not always determined by an event itself, but is often the result of a combination of factors which have more to do with the social and political context of people affected than the actual risk itself (Marsh and Oelofse, 1997). Individuals and groups are vulnerable as a result of lack of choice, lack of mobility and limited coping mechanisms. Blaikie *et. al*, 1994, p 23 define vulnerability as "the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impacts of hazards".

Levels of vulnerability "change over time as the circumstances of individuals or groups either improve or get worse, as a result of extending and reaching the limit of their coping strategies" (Marsh and Oelofse, 1997, p 4). When assessing vulnerability amongst people and groups, a number of factors need to be taken into consideration: physiological and social resources (such as health status, access to technology, social support networks, physical resources available); economic resources (income); political resources (access to decision-making) and the characteristics of the location that make groups of people more vulnerable.

Poverty and vulnerability go hand in hand, poor people are thus more vulnerable to risk and disease due to their lack of financial resources to move to a safer area or even to buy the required medication when ill. People that live under these circumstances alter their perception of risk due to their living conditions. A good example of this can be seen in the study done in Burkina Faso that investigated risk perceptions in relation to health (Sommerfeld, *et. al*, p38, cited in the World Health Report, 2002). This study is discussed below.

The *severity* of the consequence of the risk is another factor that influences people's risk perception. The more serious the consequences of the risks involved, the more robust the perception. Any risk that can result in death has a rapid and long lasting perception linked to it. Malaria is a very good example of this due to the severity of the disease when contracted. Malaria causes serious illness and can lead to death and the patient will have to undergo treatment that is very expensive.

2.5 Social and cultural interpretation of risk

The cognitive psychological approach has been the preferred method to investigate risk perception. The above mentioned approach has come under mounting scrutiny from some psychologists, anthropologists and sociologists who argue that the cognitive method concentrates too much on individual perceptions and interpretations of risk (Douglas and Wildavsky, 1982, cited in the World Health Report, 2002).

Followers of the new interdisciplinary approach believe that risk can be best understood as a social construct within a particular historical and cultural context and within groups and institutions. They further believe that risks should not be treated independently and separately from the complex social, cultural and political circumstances within which they occur. People that belong to different groups identify different risks and different attributes, depending on the form of social organisations and political cultures to which they belong. It is important that both political and economical situations are analysed at a macro and micro level (Douglas, 1992, cited in the World Health Report, 2002).

It is widely accepted that the political and economical situations at the macro level are good indicators and determinants for many risk factors. Micro level studies can be used to examine how such factors are perceived and interpreted within a given location. Micro level studies are also useful in explaining certain behaviours of people that do not appear to be rational to external public health observers (Davison *et. al*, 1991, cited in the World Health Report, 2002).

An example of the above mentioned behaviour is when the public are aware of risk factors but still have their own rational reasons for not following expert advice on

prevention. As can be seen in Figures 48 and 49 this is common amongst local and international tourists in their malaria prophylaxis usage behaviour. The tourist groups listed different reasons based on their own perceptions for not taking prophylaxis in a known malarious area.

The cultural perspective places emphasis on the type and kind of risk and the ability of the person to cope with that specific risk. The coping mechanism of a person will therefore vary according to the individual's wider context and several variables that play an important role. People's risk perception and its importance therefore varies between developing and developed countries, household income, cultural groups, gender, age, faith, urban populations, rural populations, climate and geographical location. The influence of these variables on risk perception is evident in the responses of local and international tourists to malaria in the Lubombo Spatial Development Initiative area.

An excellent example of the socio-cultural interpretation of risk can be seen in a study done in Burkina Faso. The study investigated risk perceptions in relation to health, health care, economics and climate. Qualitative research methods together with focus group discussions were used to identify 12 important risks to the local population. The perceived severity of the risks together with people's vulnerability was assessed in the study. One of the focus group participants replied that

"*We have two main sources of risk: hunger and illness. In the dry season, November-February, we face soumaya (malaria), which is due to the wind and cold. Cough is due to the Harmattan winds and dust. In the hot season, March-April, we face headache due to the heat. In the rainy season, May-October, we face diarrhoea and stomach-ache due to hunger*"

The study in Burkina Faso revealed that HIV infection was ranked as the most severe risk but it was placed twelfth in terms of personal vulnerability. In terms of perceived severity, the next four risks were

- Lack of rain;
- Becoming mentally ill;

- Being struck by lightening;
- Lack of funds to buy medicine.

Malaria was ranked lowest for severity but first for the chances of contracting the disease in the coming year. After malaria the following four perceived vulnerabilities were

- Lack of medicines;
- Snake bite;
- Becoming ill from tobacco smoking;
- Lack of rain.

The study further revealed that the local population in Burkina Faso had a complex knowledge of risks in a number of domains that were perceived as personal risk. It further showed that health risks could not be seen in isolation from other domains such as the economy, society and climate. These health risks all form part of a larger and wider local discourse on the problems, risks, dangers and difficulties to life on the African continent (Sommerfeld, 2002, cited in the World Health Report, 2002).

2.6 Perceptions of health risks in developing countries

Most models of individual risk perception and behaviour were developed in industrialised countries where the local population has good access to health infrastructure and health information. These models cannot be successfully used in developing countries due to the difference in disease profiles. Many people in developing countries around the world live in areas where illness and death is closely related to infectious diseases, poverty and communicable diseases (Manderson, 2001, cited in the World Health Report, 2002).

Many studies in industrialised countries use the perspectives of applied medical anthropology and sociology. These disciplines have frequently been used to evaluate the effectiveness of disease control programmes, perceptions of disease and reasons for non-compliance in developing country studies (Manderson, 1997, cited in the World Health Report 2002).

The study of risk to health is a relatively new area of research in developing countries around the world. It is essential to view such risks in their local context when analysing perceptions of risk, since most risk factors are considered alongside life threatening diseases such as HIV/Aids, malaria and tuberculosis. Many families in developing countries face an array of daily threats and risks such as food insecurity, poverty and lack of income to buy medication when ill. Several other external risks that have an influence on people's risk perception exist, such as political instability, war, natural disasters and violence. More research is needed that includes an anthropological point of view when assessing and investigating perceptions of health risks in developing countries (Pelto, *et. al*, 1997, cited in the World Health Report 2002).

2.7 Risk Perception and the media

Risk is a concept that is an inherent part of human life so people have always spent a great deal of time communicating about risk. In the past people used to receive most of their information orally as cultural information was transferred to the next generation. "Times have changed and we no longer get the main part of our knowledge from traditional sources (people) in traditional ways (orally). Today we receive a lot of information about various things from the media" (Wahlberg and Sjoberg, 2000, p 31).

In the information age the majority of people on earth can be reached in one way or other using an array of sources and channels. The way in which the public gains information about environmental hazards and risk in their area will influence their perception of that risk (Oelofse, 2000). The public develops knowledge with regard to the risk associated with a particular activity from a number of different sources. They often rely on inferences they remember hearing and observing about the risk in question (Slovic, *et. al*, 1980).

Media content has an influence on people's risk perceptions and the prevailing notion amongst researchers is that the media exaggerates some risks and ignores others, sacrificing objectivity for sensation. "Considerable evidence exists that the media engages in selective and biased reporting that emphasizes drama, wrongdoing and conflict. Media reports tend to concentrate on rare but dramatic hazards, and often fail

to report more common but serious risks, such as motor vehicle accidents" (Johnson & Covello, 1987, 179-181).

The explanation of difficult concepts and terminology in media reports creates misunderstanding and confusion amongst the public. The media tends to report about different hazards without putting them into context or perspective allowing the public to form their own perception about the risk. "Another problem concerning media reporting is the "personalization" of reports where the media transmits emotionally arousing information without enough facts to alleviate the possible fears associated with the reported risks" (Wahlberg and Sjoberg, 2000, p 34).

Risk numbers are the numerical representation of risk in the form of statistics, numbers or percentages that are used in media reports to place emphasis on a problem. A good example of this would be a media report on malaria prevalence in an area. The use of risk numbers in mass media helps people to understand the controversy surrounding media reports and how the reported risk affects them. Risk numbers and the explanation of them show the readers or viewers how the controversy is shaped by politics, science or economics. Most controversial risks and associated risk numbers are complex and some reporters fail to paint the whole picture for the public, causing people to form the wrong perception about the risk in question. Other media constraints like limited airtime and limited reporting space prevent reporters from publishing the full story, adding to the confusion of the reader. Many reporters that report on risk events do not have much statistical, mathematical or scientific training and are uncomfortable with numbers (Friedman, 1999).

The amount of coverage that environmental risk receives in the media is often unrelated to the seriousness of the health risk. Journalists focus more on big controversies than on big health risks. Seriousness, timeliness, proximity, prominence, human interest, drama and visual appeal are all factors that determine if a story is newsworthy. Much of the focus within risk stories is on blame, fear, anger and outrage and not on the hazard itself. Reporters tend to avoid technical information on environmental risk due to the inaccessibility of technical sources and their fear of technical detail known as "techno-phobia". It is easier and more productive for the

media to report on environmental politics than on environmental risk (Sandman, 1989).

The media has a responsibility towards the public to inform them of any risk that might influence their lives. There is however room for improvement in risk reporting and journalists have a responsibility to include more details of the risk they are reporting on. The inclusion and explanation of risk numbers, technical detail and background information on the reported risk should be included in risk reports so that the public can form an informed perception of the reported risk (Friedman, 1999).

2.7.1 Social amplification theory

One of the first large-scale framework for understanding risk perception was proposed by Kasperson *et. al*, (1988). "The main tenet of the social amplification theory is that the consequences of a risk are determined by different amplifier stations, which can be persons, groups or organizations, which transform and disseminate the information about the hazard. In this way the information and its effects 'ripple' through society in some hypothesized key steps, shaped by different societal mechanisms" (Kasperson, *et. al*, 1988).

The framework of the above mentioned theory assumes that the media has an important role in shaping people's risk perception, as the media is the major part of the information source called the 'professional information broker' (Wahlberg and Sjoberg, 2000, p42). The social amplification of risk is based on the idea that risk events interact with psychological, social, institutional, and cultural processes in ways that accentuate or heighten individual and social perceptions of risk (Renn and Levine, 1991).

The roots of the social amplification theory lie in the social experience of risk. People's direct and indirect experience of risk plays an important role in the way people perceive that risk and it contributes to how perceptions of risk are formed. Direct experience with risk heightens the perception of risk but it helps the person to gain insight into the nature of the risk. Direct contact with risk enhances the capability of the person to avoid similar risks in future and it gives perspective on the

manageability of the risk. People experience many risks indirectly when they learn about risks through the media or through other people. Information flow becomes a key issue in the way people perceive indirect risk. The volume of information or the degree to which information is disputed, the extent of dramatization and the symbolic connotations of the information are all factors that may lead to the amplification of indirect risk (Kasperson, *et. al*, 1988).

2.7.2 Cultivation theory

George Gerbner and Associates proposed the cultivation theory in the 1970's. Gerbner asserts in this theory that television is the great common medium. This single channel reaches all in our society sending messages that teach a, "common world view, common roles, and common values" (Severin and Tankard, 1988).

"The cultivation theory in its simplest form, tries to ascertain if those who spend more time watching television are more likely to perceive the real world in ways that reflect the most common and repetitive messages and lessons of the television world, compared with people who watch less television but are otherwise comparable in important demographic characteristics" (Morgan and Signorielli, 1990).

Cultivation theory claims that television shapes and forms the worldview of viewers who watch great amounts of television since it becomes their main source of information and entertainment. People that obtain their information from newspapers, magazines, and personal conversations are likely to have a more balanced world view and they are less likely to share the same attitudes, values, and beliefs with their heavy viewing counterparts (Morgan and Signorielli, 1990).

Cultivation theory is not a simple conditioning model of behaviour. The theory does not hold that unique individual viewing episodes work to change the consciousness of individuals or a nation. Rather, it is the repeated long-term exposure to a consistent message that affects change, shapes views, and builds attitudes. The recurring themes found in television programming create a culture; a very belief system and a reality of the way things are in the world. Thus, heavy viewers see the world differently than do light viewers. Again, this process of cultivation is not achieved in a single

viewing season. These themes work to the culturalization of generations (Morgan and Signorielli, 1990).

The Mozambican floods in 2000 might be a good example of how the cultivation theory can be applied to South African viewers. The Mozambican floods received much more media coverage in South Africa in comparison to European countries due to Mozambique's geographical proximity to South Africa, and due to the South African government's participation in the relief efforts. The South African public automatically viewed repeated broadcasts and news updates of the floods over an extended period and that would have had an influence on their perceptions concerning the floods. This study suggests that the coverage of the Mozambique floods influenced the perceptions of both local and international tourists.

2.8 Risk taking and tourism

Like all activity in life, tourism poses varying degrees of risk to tourists. Several factors determine the risk that tourists are exposed to whilst on vacation. When tourists visit an area or country, they take many of the risks voluntary. A good example of voluntarily risk taking amongst tourists is when people visit a known malarious area or when tourists visit countries that are experiencing political turmoil.

Many of the risks that tourists might encounter while on vacation are involuntary risk. Involuntary risk occurs when people have little or no control over the risk that they are exposed to. Involuntary risk stimulates people to create a negative perception of risk, and is often the result of the spatial distribution of environmental hazards. People perceive involuntary risk as very dangerous due to their lack of knowledge of the risk and therefore they feel vulnerable and unsafe. People accept voluntary risk far more readily than involuntary risk. A good example of involuntary risk to tourists is crime and natural disasters like floods or tropical cyclones.

There are several forms of adventure tourism that pose considerable risk to tourists, but the tourists except the risk voluntarily. Space tourism is a very good example of this and it is considered to be the ultimate risk that a tourist can take.

http://www.space.com/businesstechnology/business/astronaut_perception_000508.html).

There are several other activities that pose considerable risk to tourists such as white water rafting, shark cage diving, bungee jumping, rock climbing and skydiving. All the above-mentioned activities somehow appeal to a large number of tourists and they are happy to take the risks involved if they get the adrenalin rush that they are after (Tyndall, 2002).

Post-disaster tourism is a new and growing form of tourism. Tourists are drawn by disasters due to several reasons. Some tourists are drawn to disaster sites out of curiosity, others grieve the loss of a family member or friend and others use it as therapy to overcome the shock that it has caused in the community or country. The crash sites of the three airplanes that were highjacked on September 11, 2001 in the terrorist attacks on the United States are a recent example of disaster tourism. People from all over the world have been travelling to the Pentagon, Shanksville and the World Trade Centre site to visit these disaster sites. The amount of tourists that visited the observation deck of the twin towers before September 11 was approximately 1.8 million. The ruins of the twin towers after September 11 are expected to bring in approximately 3.6 million tourists a year (Bly, 2001).

2.9 Risk management

The way people think and respond to risk has changed considerably in the last few decades. The nature of risk that people face has changed, and these risks are managed and analyzed differently to in the past. Risk management is based on being able to distinguish between an event that is truly random and an event that is the result of cause and effect. The demand for risk management and risk management professionals has risen dramatically over the past quarter century. These experts specialize in assessing and quantifying the risks involved in numerous activities and are employed by insurance companies, financial companies, environmental companies, and the federal government (Gough and Ward, 1994).

The increased attention to risk management began in the 1970's when the understanding of risk was brought into the modern age. Ross, points to a "mini-revolution" beginning in the 1970's that raised the understanding of risk. This revolution was linked to the emergence of the new science of risk analysis, which in turn arose from a "critical accumulation" of data in health and safety, the introduction of high-speed computers, and the development of sophisticated analytical techniques for making sense of this information. It was a revolution that has affected risk perception.

Emphasis on the preventative and precautionary approaches to decision making denotes a shift towards attempts to manage risks in the environment. Managing risk means finding ways to reduce (proactive) or mitigate (reactive) risk, or of simply learning to live with risk. The way in which risk is managed depends on the acceptability of risk. The public considers some risks as unacceptable and society is prepared to pay a high cost to avoid such risks; other risks are more acceptable. Some of the main factors affecting people's willingness to accept risk are personal involvement with the risk, the unpleasantness of the risk, and the extent to which the risk is incurred voluntarily (Gough and Ward, 1994).

Malaria distribution varies considerably between the developed and developing world with the majority of people living in third world countries being affected by malaria. Malaria is essentially a disease of the poor in many regards and many people in the world have no choice about being exposed to malaria risk.

Risk management can mean the integrated process of risk assessment and risk control or it can simply mean risk control as an optional "add-on," undertaken after assessment has been completed. The management of overall risk provides sustainable solutions to risk management. Several social, cultural and economical factors are taken into consideration when an overall risk approach is used. Risk management provides an umbrella under which information from many different sources can be combined so that a "decision" can be implemented comprehensively. It can be applied at different levels from managing the activities at either a single site or within an organization. Risk management can be applied at a policy level in guiding activities or in prioritizing areas for action that can be taken voluntarily (Gough and Ward, 1994).

Malaria control and research illustrate this. Malaria research is mostly involved at a policy level where research findings on insecticides and drug resistance data influences policy changes in insecticide and drug usage. Malaria control is also involved at a management level where the physical problem (malaria) is addressed by implementing malaria control measures. All contributing factors such as social, economic, environmental and cultural aspects of the people and the area are taken into consideration when malaria risk management activities take place.

2.10 Conclusion

The study of risk is a relatively new field of research but the value of it cannot be underestimated in relation to the quality of life of people, particularly in developing countries. The way people perceive risk in their environment determines to a large extent their behaviour. If people's behaviour towards risk can be understood, measures can be put in place to address their fears and to reduce the impacts of hazards, such as malaria.

This chapter has provided a conceptual framework which is used to analyse tourism operators and tourist's perceptions of risk in relation to malaria. It has considered the ways in which risk is socially constructed and it has reviewed the factors that shape risk perception.

By understanding the construction of risk of tourists that visit the Lubombo corridor measures can be put in place to address their fears and to reduce the impacts of the disease. This will make a significant contribution to the tourism industry in the area.

Chapter 3: Malaria and Tourism

3.1 Introduction to malaria

The general public's knowledge of malaria is often restricted to basic information about the disease. Many people are unaware of the spatial distribution of the disease and its seasonal variation. This is particularly true of residents of malaria free areas in the world. The fact that malaria is one of the biggest killers in Africa with approximately 1.1 million deaths and that there are between 300-500 million clinical cases diagnosed each year with the majority of cases being in sub-Saharan Africa, often surprise people. The majority of people are unaware of the very serious impacts of the disease and of the scale of these impacts (Hamoudi and Sachs, 1999).

People in general are misinformed where it comes to malaria and this must change if humanity wants to significantly reduce the impacts and effects of this deadly and ancient disease. By making people aware of the negative influence the disease has on people's quality of life and the devastating effect it has on the economies of countries, the perception that malaria is a Third World problem will change.

3.2 The History of Malaria

Malaria parasites have been in existence since the dawn of time. The parasite probably originated in Africa (along with humankind) and fossils of mosquitoes up to 30 million years old show that the vector for malaria was present well before the earliest history. The Plasmodium parasite is highly specific, with humans as the only vertebrate host and Anopheles mosquitoes as the vectors. This specificity of the parasites also points towards a long and adaptive relationship with the human (Chwatt, 1988).

Malaria is probably one of the oldest diseases known to mankind. Descriptions of the disease can be found in the ancient Chinese, Indian and Egyptian manuscripts. "Deadly fevers" which is a classic symptom of malaria have been recorded since 5500-6000 B.C. Reference about the "deadly fever" can be found in the Vedic writings of 1600 B.C in India, but Hypocrites was the first to describe the manifestations of the disease and relate them to the time of year some 2500 years ago (Desowitz, 1993).

The early Romans associated the deadly fever with swamps and the bad smell that came from the swamps. The name malaria is a Latin word meaning bad air. A chapter was added to the history of malaria in 2001 when scientists conducted DNA analysis on a child's skeleton buried outside Rome. The DNA analysis revealed that the child died of *Plasmodium falciparum* malaria. Approximately 50 infants skeletons were found in a mass grave while doing excavations at a cemetery in Lagnano in Italy, suggesting a major malaria epidemic in the year 450, just before the fall of the Roman Empire (Carroll, 2001).

Quinine, a toxic plant alkaloid made from the bark of the Cinchona tree in South America was used to treat malaria more than 350 years ago and is considered to be one of the first major therapeutic breakthroughs. Jesuit missionaries in South America heard of the healing properties of the Cinchona tree and introduced it into Europe by the 1630's and into India by 1657 (Chwatt, 1993).

A French army physician working in Algeria made the first true identification of the malaria parasite in 1880. Charles Louis Alphonse Laveran made the historical significant sighting whilst viewing blood slides under a microscope. The medical community rejected Laveran's sighting and the Italian scientists who were the leaders in malaria research at the time only accepted it years later in 1886 (Chwatt, 1988).

In 1897 the British Medical Journal reported that Dr.Ronald Ross discovered malaria cysts in the stomach wall of the Anopholine mosquito that fed on a malaria patient. In 1898, Giovanni Babtista Grassi, an Italian scientist established that malaria was transmitted by the Anopheles mosquito. This discovery was significant and the transmission of the "deadly fever" or malaria was known for the first time. This discovery by Giovanni Babtista Grassi would change the way malaria was studied and the first control measures were put in place to prevent malaria infections (Desowitz, 1993).

Paul Muller discovered the insecticidal properties of the insecticide DDT in 1939, which changed malaria control and malaria distribution worldwide, and still plays an important role in malaria control today. The discovery of DDT led to the eradication of malaria in some countries in Europe and North America and Paul Muller won the Nobel prize for his discovery of DDT (Desowitz, 1993).

3.3 Geographical distribution of malaria

Indigenous malaria has been recorded as far north as 64 degrees north latitude (Archangel in the former USSR) and as far south as 32 degrees latitude (Cordoba in Argentina). It has occurred at the Dead Sea at 400 meters below sea level and at 2600 meters above sea level in Kenya. Within these limits of latitude and altitude there are large areas free from malaria (Figure 1). Malaria transmission depends greatly on local environmental and other conditions (Gilles, 1991).

Malaria is a public health problem in more than 90 countries inhabited by 2 400 million people, 40% of the world's population. Mortality due to malaria is estimated to be over 1 million deaths each year. The vast majority of deaths occur among young children in Africa, especially in remote rural areas with poor access to health services (World Health Organisation, 2002).

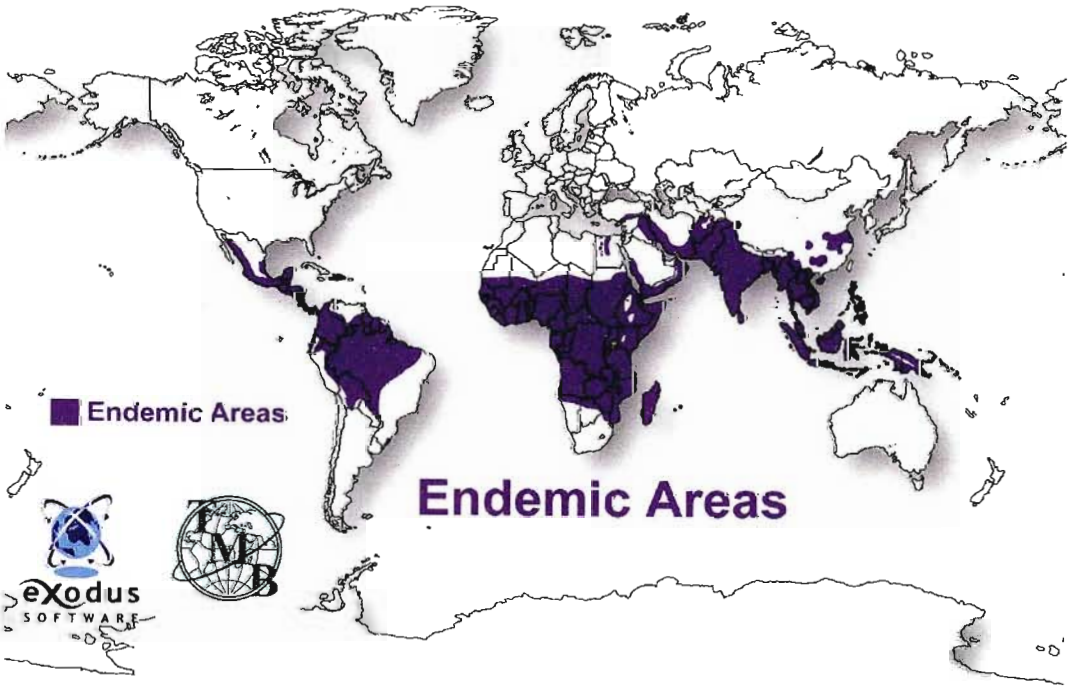


Figure 2: Global distribution of malaria

(Source: http://www.tmb.ie/Diseases/Malaria.htm)

3.3.1 Geographical distribution of malaria in sub-Saharan Africa

Malaria transmission on the African continent ranges from malaria free areas to unstable transmission and stable transmission areas. The establishment of malaria

control efforts in Africa lags far behind the rest of the world. Although consolidated control efforts had been recommended by WHO in Africa as early as 1950, the problem of African malaria was deemed sufficiently intractable to justify the exclusion of the continent from the global malaria eradication program launched in 1958 (Hamoudi and Sachs, 1999).

This neglect of malaria control is visible today on the African continent where malaria occurs in all African countries south of the Sahara desert. Between 12 and 22 million cases were reported on the African continent during 1985 – 1989 and it is estimated that up to 100 million clinical malaria cases occur every year. Ninety percent of all malaria cases worldwide occur in sub-Saharan Africa (Chwatt, 1993).

Malaria transmission in sub-Saharan Africa (Figure 3) varies considerably and is affected by several factors. Onori and Grab (1980) defined four broad epidemiological strata for malaria distribution in sub- Saharan Africa:

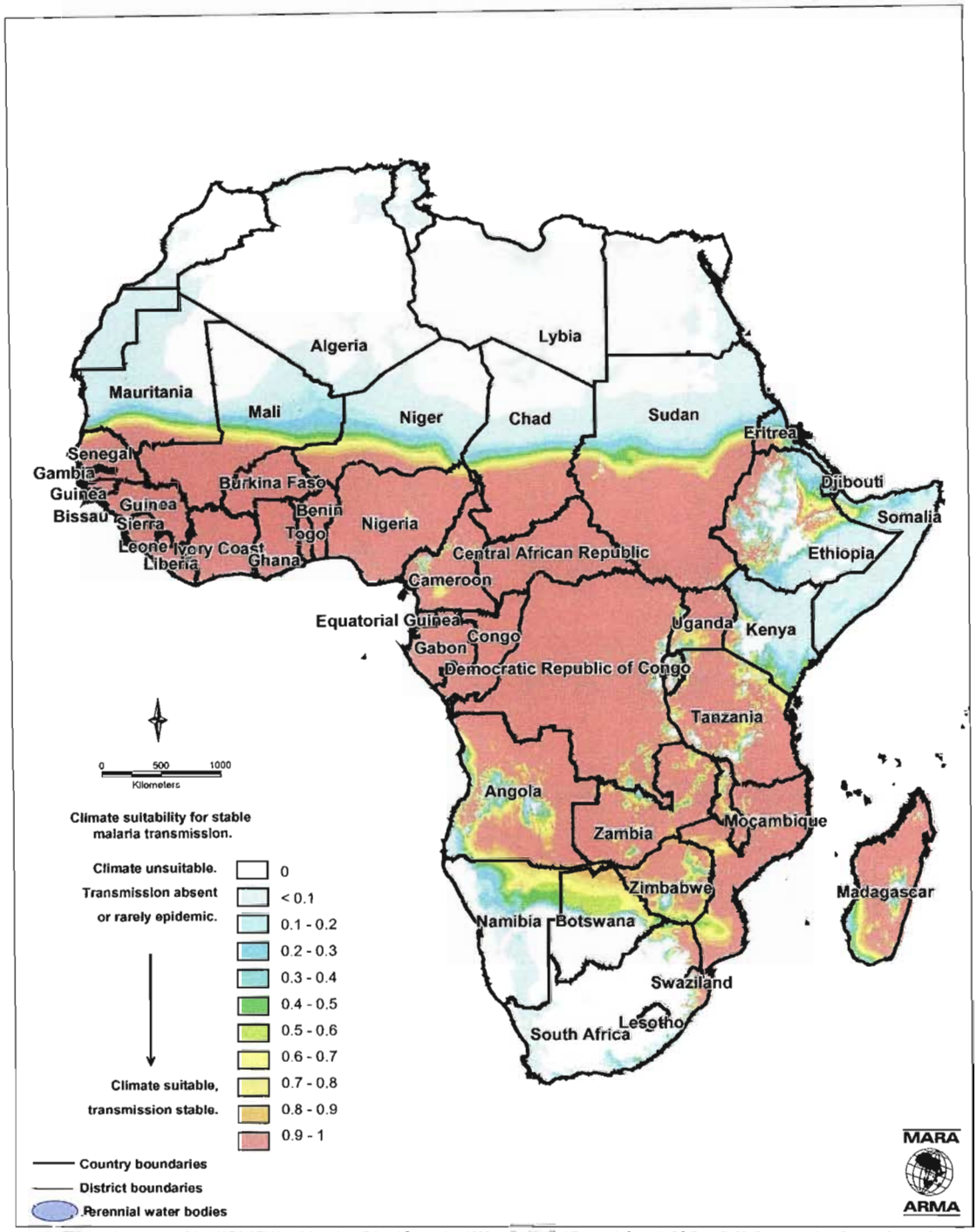
1. Very high endemicity: is found in areas where malaria transmission is intense and perennial with essentially minor seasonal variation due to extremely favourable meteorological conditions, such as rainfall and relative humidity all year round (Chwatt, 1993). The above-mentioned strata can be found in central Africa where equatorial climatic and environmental conditions create perfect conditions for malaria vectors to transmit malaria. Mortality rates in these areas are approximately in the order of 6 per 1000 in infants and 11 per 1000 in children aged 1-4 years, representing 10% and 25% of all deaths in the above-mentioned age groups.

2. High endemicity: areas experience heavy malaria transmission but the transmission is essentially seasonal, reaching its peak during the rainy season and then disappearing or remaining at a very low level during the dry seasons (Chwatt, 1993). The above mentioned seasonal variation in malaria transmission is common in most savannah zones in Southern African countries were malaria is seasonal.

3. Mesoendemic malaria: is usually found in areas where transmission of the disease is of short duration, usually 2 months, corresponding to the rainy season, with an almost complete interruption in the remaining 10 months of the year (Chwatt, 1993). The areas on the African continent that belong to the above mentioned strata experience seasonal epidemics when exceptional meteorological conditions such as heavy rainfall occur. Arid and semi-arid countries on the African continent experience this form of malaria transmission.

4. Low malaria endemicity: is usually found in areas where malaria transmission is absent but in which it may occur following exceptionally favourable meteorological changes. The immunity of the local population is almost non-existent in this strata and when malaria transmission starts it usually develops into epidemics with high mortality amongst different age groups (Chwatt, 1993). This strata occurs in the valleys or high mountains of Central Africa, Kenya and Ethiopia.

The prevalence of malaria in Africa has escalated in the past decade due to several factors. Changing climatic and environmental conditions on the African continent together with drug and insecticide resistance are some of the main factors contributing to the resurgence of malaria in sub-Saharan Africa. Frequent conflict and civil war in many African countries has caused forced migration and millions of people are displaced each year forcing them to settle under difficult conditions in areas of high malaria risk. This political turmoil destabilises and impoverishes governments leaving them with less money to spend on public health. A lack in planning of agricultural and water schemes such as dams and irrigation is exacerbating the malaria problem on the African continent due to the increase in vector breeding sites. The escalating birth rate in Africa is a further cause of concern due to the rapid increase of the susceptible population under 5 years of age (Nchinda, 2000). Other factors contributing to the detrimental effect of malaria on Africa communities is the inadequate malaria reporting system that is currently in use in many African countries. Incidence data in Africa is so under-reported that data is misleading, and therefore often excluded from assessments of the world malaria situation, although on the order 90% of all malaria cases occur on the African continent (Hamoudi and Sachs, 1999).



This map is a product of the MARA/ARMA collaboration. Printed September 1999 at the Medical Research Council, PO Box 17120, Congella, 4013, Durban, South Africa
CORE FUNDERS of MARA/ARMA: International Development Research Centre, Canada (IDRC); The Wellcome Trust UK; South African Medical Research Council (MRC); Multilateral Initiative on Malaria (MIM) of the UNDP/World Bank/WHO Special Programme for Research & Training in Tropical Diseases (TDR),Swiss Tropical Institute.

Figure 3: Distribution of stable malaria transmission in sub-Saharan Africa

(Source: MARA/ARMA collaboration, printed September 1999).

3.3.2 Geographical distribution of malaria in southern Africa

Malaria transmission in southern Africa varies considerably and it ranges from malaria free areas, unstable and stable transmission areas. The unstable areas are prone to epidemics, which usually results in high levels of morbidity and mortality. Countries in southern Africa that have unstable malaria transmission are Botswana, Namibia, South Africa, Swaziland and Zimbabwe. Countries that have stable transmission in southern Africa are Angola, Malawi, Mozambique, Tanzania and Zambia (Figure 4).

An estimated 139 million people live in southern Africa, 63% of these people live in malarious areas. There are an estimated 13,687,000 children under five year old and 3,302,600 pregnant women in the stable transmission countries (Angola, Malawi, Mozambique, Tanzania, Zambia) and they are all at serious risk of contracting severe malaria. There are approximately 12,382,000 people at risk in unstable malaria transmission countries (Botswana, Namibia, South Africa, Swaziland, Zimbabwe) in southern Africa (Southern Africa Malaria Control, 2002).

Malaria is a major cause of morbidity in Southern Africa. Reported malaria cases have increased in southern Africa due to a combination of several factors. Improved coverage of Health Information System (HIS) and the mis-diagnosis of malaria cases due to the increase of HIV in southern Africa have been cited as factors contributing to the resurgence of malaria. Transmission and distribution of vector borne diseases especially malaria is greatly influenced by environmental and climatic factors. Studies are currently under way to determine the influence of climatic change and malaria transmission in Africa. Other factors that have contributed to the resurgence of malaria transmission in southern Africa are drug and insecticide resistance, the breakdown in vector control in some countries, lack in planning of agricultural and water resource schemes and uncontrolled population movement in the region.

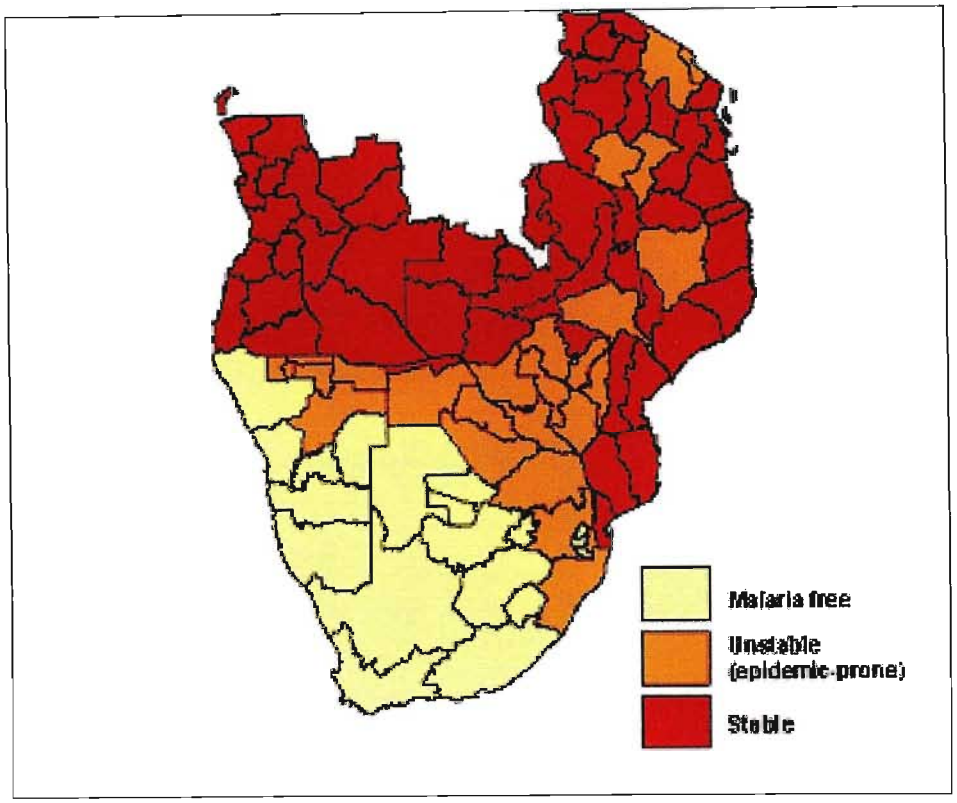


Figure 4: Malaria transmission in southern Africa.

(Source: SADC Malaria Control web site - http://www.malaria.org.zw/)

(Geographical data not added as this map has been downloaded from the web site above, map not editable).

3.4 Geographical distribution of malaria in the study area.

The geographical area targeted by the Lubombo Spatial Development Initiative (LSDI) is broadly defined as Eastern Swaziland, Southern Mozambique and North-Eastern KwaZulu-Natal. The Lubombo Spatial Development Initiative (LSDI) was developed to control malaria in the Lubombo corridor, an area of high potential for tourism development, which however, falls within a historical endemic malaria area.

South Africa, Mozambique and the Kingdom of Swaziland have very different malaria distribution and transmission due to several historical and current factors that are discussed below (See Figure 5). It is therefore important to examine each country's malaria situation separately before a regional viewpoint on malaria can be formed.

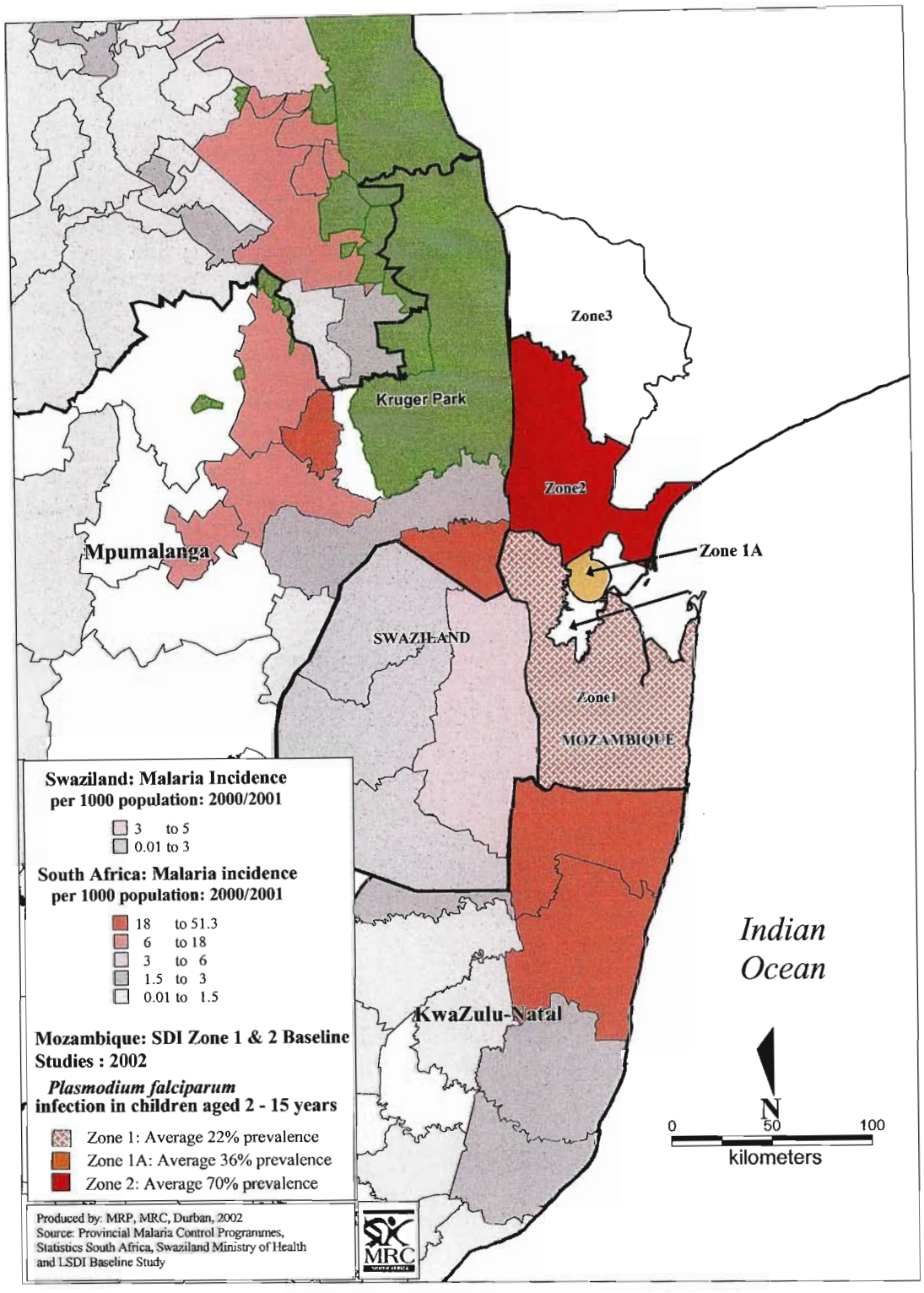


Figure 5: Regional Distribution of Malaria in South Africa, Swaziland and zone 1 & 2 of the LSDI area in southern Mozambique.

(Source: Malaria Lead Programme, Medical Research Council, Durban, 2002).

3.4.1 South Africa

South Africa has a very long and well respected malaria control and research history that started in the 1930's. The distribution of malaria in South Africa today is due to successful malaria control and scientific malaria research. Only three out of the nine provinces in South Africa have unstable malaria transmission problems in the bordering areas with neighboring countries and that is mainly due to cross border human movement from neighboring Zimbabwe and Mozambique. The malaria problems in the areas bordering Mpumalanga, KwaZulu-Natal and the Limpopo province are being addressed and a regional approach is being followed.

Before malaria control started in the 1930's, malaria epidemics were recorded as far south as Durban and in and around Pretoria on the highveld (Figure 6). The severity of these pre-control malaria epidemics in KwaZulu-Natal was reviewed by le Sueur and Sharp (1996). Malaria mortality estimates by magistrates in Natal from November 1931 to June 1932 totaled 22 132 (Population at risk = 985 000), an exceptionally high rate of 2.2% .In 1932 all the districts of Natal province reported cases of malaria (Sharp and le Sueur, 1996).

According to 1998 figures, it is estimated that only 10% or 4 429,500(1998) of the total South African population live in malarious areas. Out of the above-mentioned people, 5 94 300 are children under 5 years of age and 131 100 are pregnant woman. There is an estimated 450 - 690 malaria deaths per annum in South Africa and the reported malaria incidence per 1000 population per annum is 0.7.The estimated malaria incidence per 1000 population at risk per annum is 6.7. The estimated malaria prevalence in children between 2 and 9 years of age is between 0 and 5 % (Southern Africa Malaria Control, 2002).

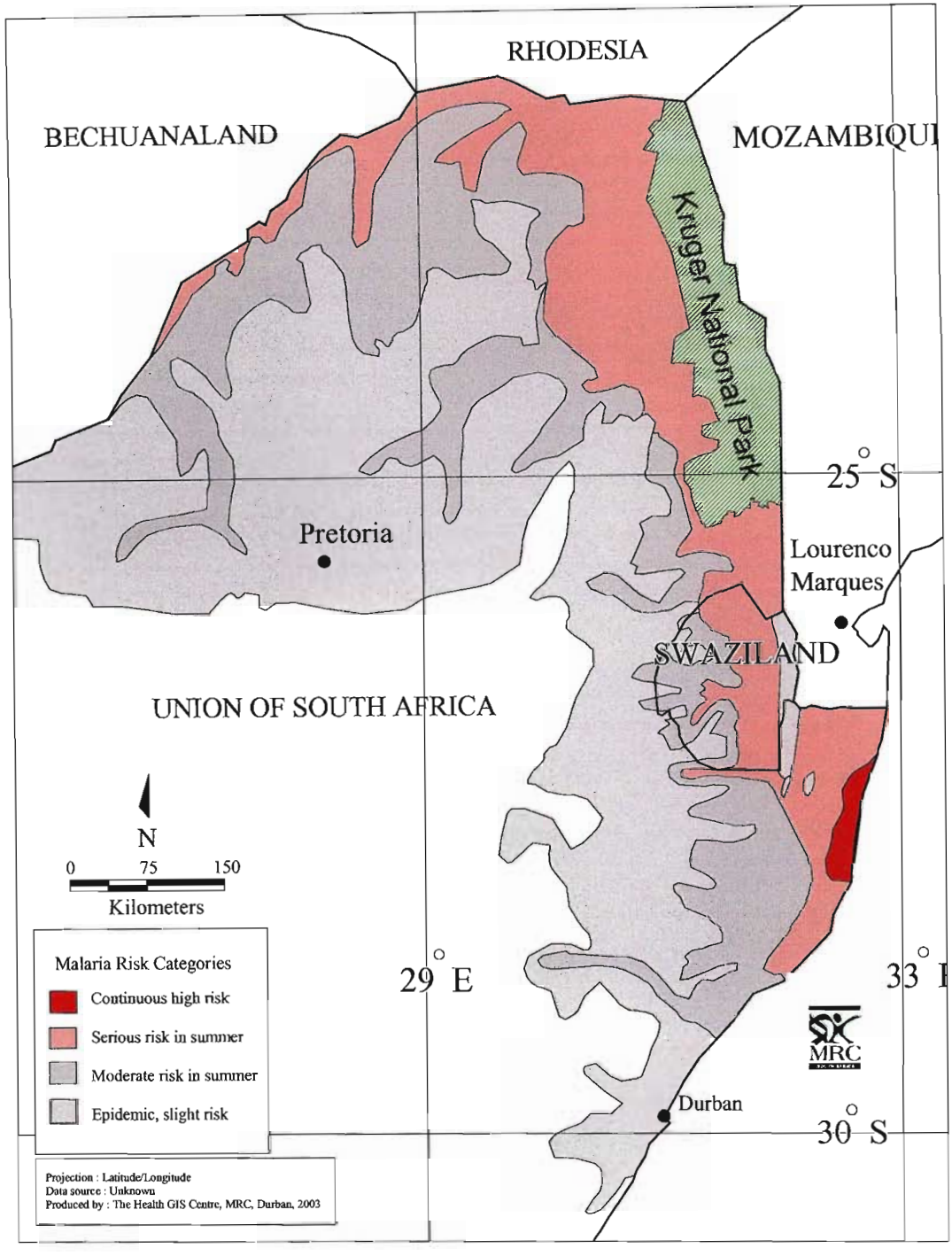


Figure 6: Malaria risk in South Africa in 1938 prior to the introduction of disease control.

(Source: Malaria Lead Programme, Medical Research Council, Durban, 1997).

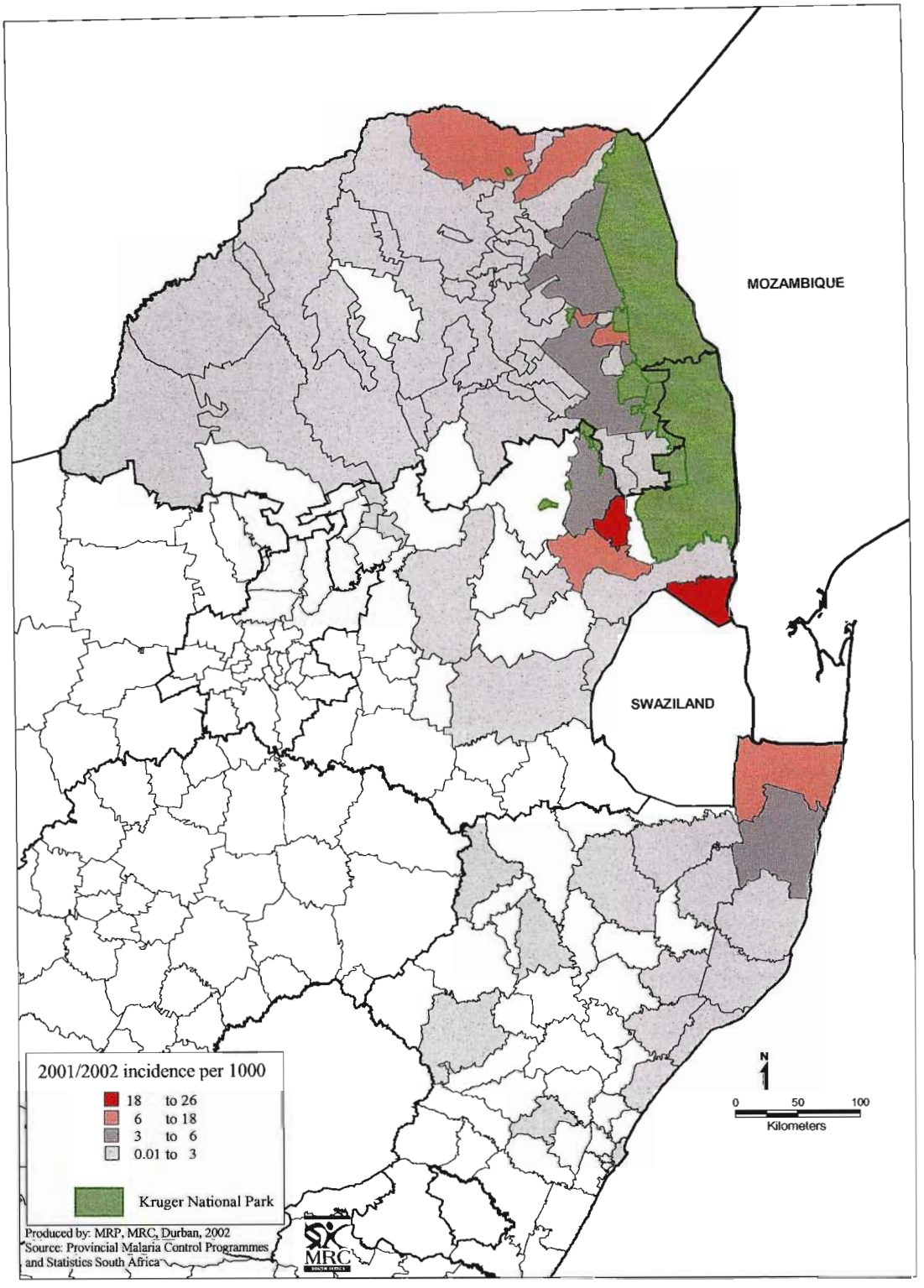


Figure 7: Total malaria case incidence per thousand population: 2001/2002

(Source: Malaria Lead Programme, Medical Research Council, Durban, 2002).

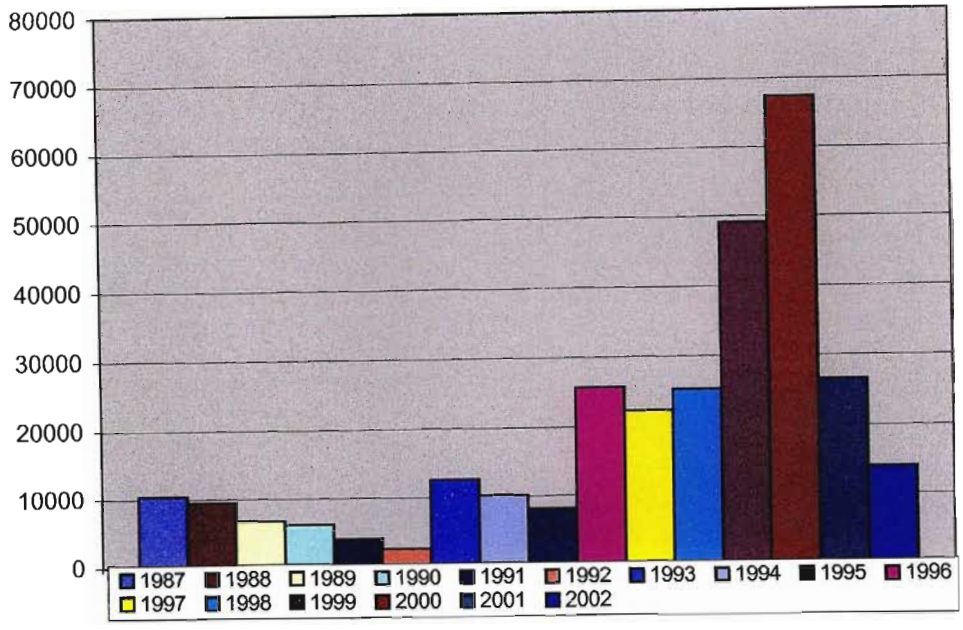


Figure 8: South African malaria totals from 1987 to 2002.

(Source: Malaria Information System (MIS), Malaria Lead Programme, Medical Research Council, 2002).

As can be seen in Figure 8, the malaria cases in South Africa vary from year to year with several factors such as rainfall, insecticide and drug resistance playing an important role. The malaria epidemic in 2000 is clearly visible with 67 373 cases. The malaria cases decreased to 13 964 in 2002 due to successful malaria control in South Africa.

The buildup to the 1999/2000 malaria epidemic started in 1996. From then onwards the malaria cases in South Africa increased dramatically due to a combination of drug (Brendenkamp *et. al*, 2001) and insecticide resistance (Hargreaves *et. al*, 2000) in the country. The effect of regional malaria control measures, the introduction of an effective drug (Atemether-Lumefatrine), and a change in insecticide (DDT) is clearly visible in 2001 when the malaria cases plummeted from 67 373 in 2000 to 13 964 in 2002. The regional approach to malaria control between South Africa, Swaziland and Mozambique had a major influence on malaria cases and malaria parasite prevalence reductions in the Lubombo corridor.

3.4.2 Swaziland

A malaria control programme has been in operation in Swaziland since the 1960's. The malaria control programme in Swaziland is coordinated from Manzini and indoor residual house spraying is used as a first line malaria control measure to control malaria vectors. Chloroquine is used as a first-line treatment for people who report ill to health facilities. The medication is given presumptively at outpatient clinics where no definitive diagnostic facilities are available. Patients admitted to hospitals because of the serious nature of their condition are definitively diagnosed with a blood slide to test for the presence of malaria parasites. Individual case histories are recorded with the address being a town name. These case records are sent from the different public, private and mission hospitals to the Ministry of Health where they are recorded into the MIS (Malaria Information System).

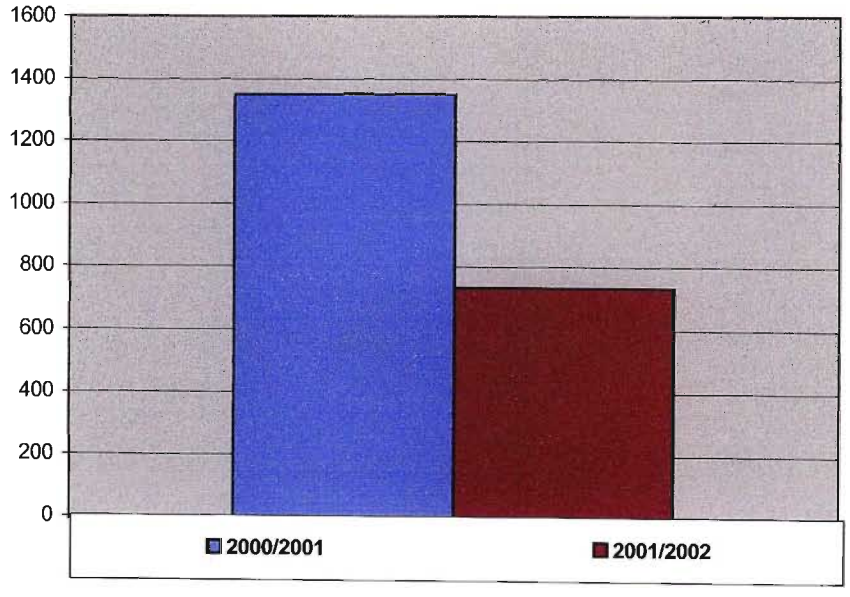


Figure 9: Swaziland malaria cases by malaria season.

(Source: Malaria Information System (MIS), Malaria Lead Programme, Medical Research Council, 2002).

There was no change in the insecticide and drug policy in Swaziland between 2000 and 2002. The reduction of malaria cases is believed to be a direct result of the LSDI malaria control measures in neighboring Mozambique. Swaziland has a very effective

and efficient malaria control programme and major reductions between the 2000/2001 and 2001/2002 malaria seasons are visible in Figure 9.

The reductions achieved by Swaziland are due to a combination of factors. The use of an effective insecticide and effective drugs laid the foundation for the malaria case reductions in Swaziland. The regional approach to malaria control by the LSDI programme, and the well-managed malaria control programme contributed to the malaria reductions in the Kingdom of Swaziland.

Unstable malaria transmission mainly occurs in Swaziland with large areas being malaria free. The 1998 figures estimated that approximately 30% or 279 300 of the population in Swaziland live in malarious areas. Of these 45 000 are children under five years of age and 10 200 are pregnant woman. There are an estimated 165 - 250 malaria deaths per annum and the estimated malaria incidence per 1000 population per annum is 6. The estimated malaria incidence per 1000 population at risk per annum is 21, and the estimated malaria prevalence in children between 2 - 9 is between 0-5% (Southern Africa Malaria Control, 2002).

3.4.3 Mozambique

The Portuguese had successful malaria control programmes in parts of Mozambique but when the war broke out in 1964 the Mozambican health infrastructure collapsed in the country for several years. During the wars fought between 1964-1992, some 85% of health facilities in Mozambique were destroyed, abandoned or could not be maintained. By 1993, only 30% of the rural population had access to health services and there were approximately 435 medical doctors in the country and one nurse for every 4500 people (Slaughter, 2000).

The start of the Lubombo Spatial Development Initiative (LSDI) in 1999, marked the start of malaria control in Southern Mozambique for the first time in 35 years. Major malaria case reductions and parasite prevalence reductions have been achieved in the study area due to a successful malaria control programme. Due to logistical reasons, malaria case data in Mozambique is collected as in-patient data, confirmed in-patient (Hospital) data and unconfirmed monthly summaries at clinics and health posts.

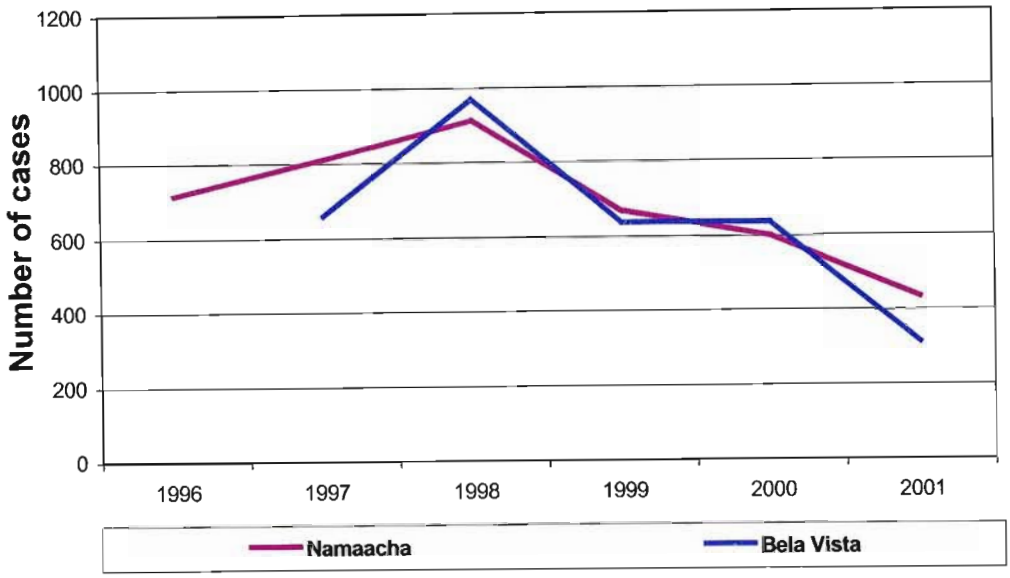


Figure 9: In-patient malaria case data for Namaacha and Bela-Vista, southern Mozambique 1996-2001.

(Source: Malaria Information System (MIS), Malaria Lead Programme, Medical Research Council 2002).

Malaria is endemic in Mozambique and malaria control is the responsibility of the Department of Epidemiology and Endemic Diseases within the Ministry of Health. Outpatients are treated presumptively while those admitted to hospitals, due to the nature of their condition, are tested and treated accordingly. Malaria has been a notifiable disease in Mozambique since July 1998.

Malaria transmission is stable and intense in most parts of Mozambique. It is estimated that 16 118 000 or 100% of the population is at risk of contracting malaria. According to 1998 figures, there are 2 836 000 children under five years of age and 682 000 pregnant women at risk of contracting malaria. A high percentage, 24% or 44 250 - 67 000 deaths in Mozambique are attributed to malaria each year and the estimated malaria incidence per 1000 population per annum is 121. The estimated malaria prevalence in children aged 2 - 9 is between 40% and 60% (Southern Africa Malaria Control, 2002).

3.4.4 Summary

It is clear that there are distinct differences in malaria transmission between South Africa, Swaziland and Mozambique. The differences in malaria transmission have been briefly reviewed and the focus will shift to malaria control measures.

3.5 Malaria control measures and methods.

Malaria control measures were only formally put in place after it was determined that the Anopheles mosquito was the vector that transmitted malaria in 1897. Malaria control measures and methods vary a great deal and the epidemiological prototypes related to ecological and socio-economical factors and conditions determine to a large extent the malaria control method used in countries.

3.5.1 Environmental manipulation

It is important to note that there are several environmental manipulation methods used in malaria control throughout the world like changing water levels, stream flushing, change in water salinity, shading of stream banks and stream sluicing. Only the methods used and relevant to southern African malaria control will be discussed below.

Drainage is one of the oldest forms of environmental manipulation. The association of fever with stagnant water led the Romans and Greeks to use drainage as the first recorded environmental manipulation method as far back as the sixth century BC in an effort to prevent "Roman fever". By draining stagnant water the breeding sites of the Anopheles mosquitoes were destroyed.

This control method proved to be reasonably successful and millions of dollars were spent on this method in Europe. In 1928 the Greek government began major drainage programs to address the malaria problem in the county. Marshy plains and even lakes were drained in an effort to control malaria transmission by drying up possible breeding sites of the mosquitoes (Balfour, 1936).

Drainage is a very effective method of reducing the mosquito breeding sites in an area. Small scale drainage schemes (Plate 1) can be developed by less experienced

people due to the small volume of water involved, that would most probably evaporate once the water is drained. Planning and construction of major drainage schemes involve specialists in the field due to the complex nature of topographical features and water flow (Chwatt, 1993). Drainage as a malaria control measure is still used in southern Africa today, but it is not seen as the first line of defense against malaria transmission due to ecological destruction of drained areas, the cost involved in draining operations and the fact that the *Anopheles arabeinsis* mosquitoes, prefer to breed in small indentations filled with water like cattle hoof prints as apposed to larger water bodies (le Sueur and Sharp, 1988).

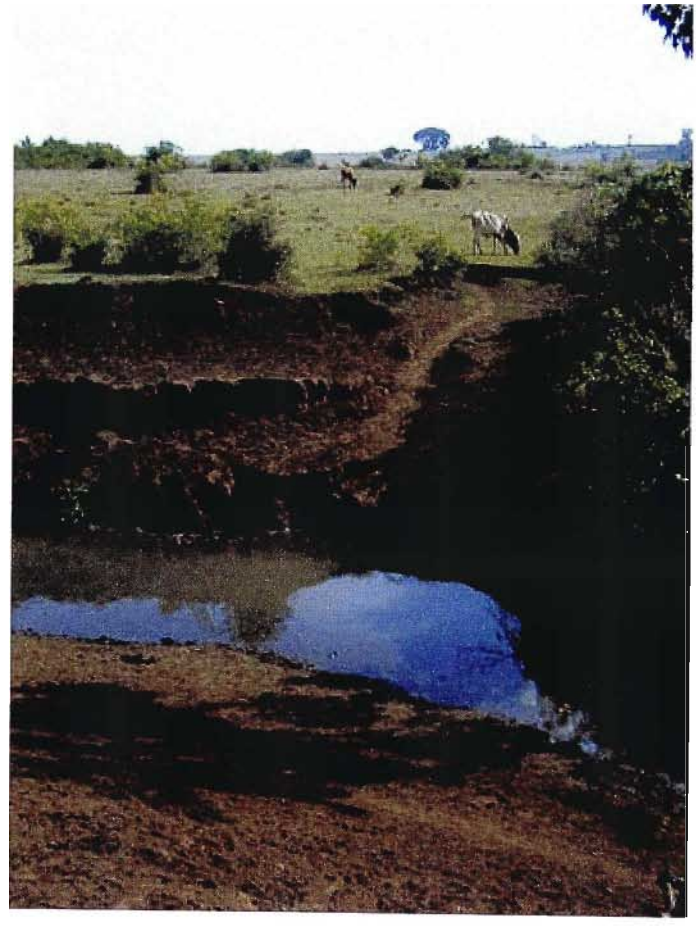


Plate 1 - The construction of a wetland drainage system for the control of malaria.

(Source: http://www.ark3.lth.se/research/ggrp/Webpages/Time/Indent/Drainage.htm#)

Clearing of vegetation has been used with success to control mosquitoes and the method is still used today. The clearing of vegetation removes the shelter that mosquitoes use in the daytime. The clearing of vegetation promotes the evaporation

of standing water which mosquito's use for breeding sites (Plate 2) and it discloses any other possible breeding sites. Although the clearing of vegetation as a malaria control method has been successful the danger that it might suit the breeding habits of other mosquito species still exists (Chwatt, 1993).

Plate 2 – Vegetation clearance in the Amazon for malaria control purposes.

(Source: http://www.des.ucdavis.edu/esp133/amaztour.htm)

Planting of curtain vegetation like eucalyptus and other trees has been used to dry up stagnant water to get rid of potential mosquito breeding sites. The form of environmental manipulation strategy works well and is used throughout Africa as a malaria control method. Other plants such as muskgrass (*Chara*), floating leaf (*Brasenia*) and bladerworth (*Utricularia*) are known to prevent mosquito breeding and can be planted as an environmental manipulation strategy to get rid of surface water or to avoid mosquitoes breeding in stagnant water bodies (Chwatt, 1993).

3.5.2 Larvaciding

Larvaciding has been used as a malaria control method since the start of the century to kill mosquito larvae before they reach the adult stage. Liquid larvacide compounds such as petroleum oils; paraffin and other hydrocarbons have played a very important role in the development of larvaciding as a malaria control method. The oils produce a continuous thin film on the surface of the water smothering and poisoning mosquito larvae.

The substances used in larvaciding are very effective and the application to water bodies did not require any special machinery. The disadvantages associated with petroleum oils and other hydrocarbons are the ecological damage the oils have on aquatic systems and the rising cost of mineral oils (Chwatt, 1993).

Plate 3 – Spray operator's larvaciding a water body near Ndumo, northern KwaZulu-Natal, 2001.

Larvacidal dust in the form of paris green or copper aceto-arcenite was first used in 1921 as a mosquito larvae side. Paris-greening operations were undertaken all over

Europe in an effort to control the spread of malaria. This technique was very successful and it was introduced in other parts of the world. Major successes in the control of malaria and yellow fever in Cuba and Panama were achieved and the concept of naturalistic control based on the knowledge of the breeding habits of the mosquito was used to control the spread of malaria (Chwatt, 1993).

Larvaciding with paris green was very effective due to the low cost and high toxicity to Anopheles larvae. The wind portability and the suitability of the water for human and animal consumption after treatment made paris green a revolutionary larvacide. The negative aspects associated with paris green was the fact that special apparatus was needed for distribution and constant supervision was essential during the mixing of the substance. The development of organophosphates and other larvacide compounds like synthetic pyrethroids saw the decrease in use of paris green as a larvae side (Plate 3).

3.5.3 Bed nets

The Chinese first used mosquito nets made of silk over 1000 years ago. Bed nets have been used since very early times and are still considered one of the most important personal protection measures a person can take against malaria infection. Russian, German and US armies first used malarial bed nets treated or impregnated with DDT in the Second World War in an effort to prevent malaria infection.

The impregnation of bed nets with an insecticide was an important development in malaria control. The insecticide has a repelling effect on mosquitoes and mosquitoes die if they come in close contact with the impregnated net. Mosquitoes are attracted by the carbon dioxide and body odors emitted by the sleeper (Plate 4). Pyrethroids are the preferred insecticide for bed net impregnation due to the insecticide's repelling effect on insects and it is relatively safe for humans to come into close contact with the repellants (Curtis and Mnzava, 2000).

The importance of bed nets as a malaria control measure was highlighted with mounting pressure against the use of insecticides such as DDT in residual house spraying. Synthetic pyrethroids were developed in the 1970's and are widely used in the impregnation of bed nets in an effort to replace DDT due to the negative

environmental effect of the insecticide on the environment. The World Health Organization's (WHO) interest in mosquito nets began in the 1980's and the organization approved the use of pyrethroids with specific reference to permethrin for the treatment of bed nets.

Bed net research is an ongoing process and the effectiveness and quality of bed nets have changed considerably in the last few years. The durability of bed nets has improved and the expected lifespan of the new polyester bed nets are approximately 5 years. Research is underway to manufacture bed nets with polyethylene, which should last for approximately 20 years if handled correctly. More than 20 studies of insecticide treated nets have been conducted around the world where malaria is endemic. Most of these studies have shown a reduction in malaria disease rates between 20% and 63% following the introduction of insecticide treated nets (Curtis, 2000).

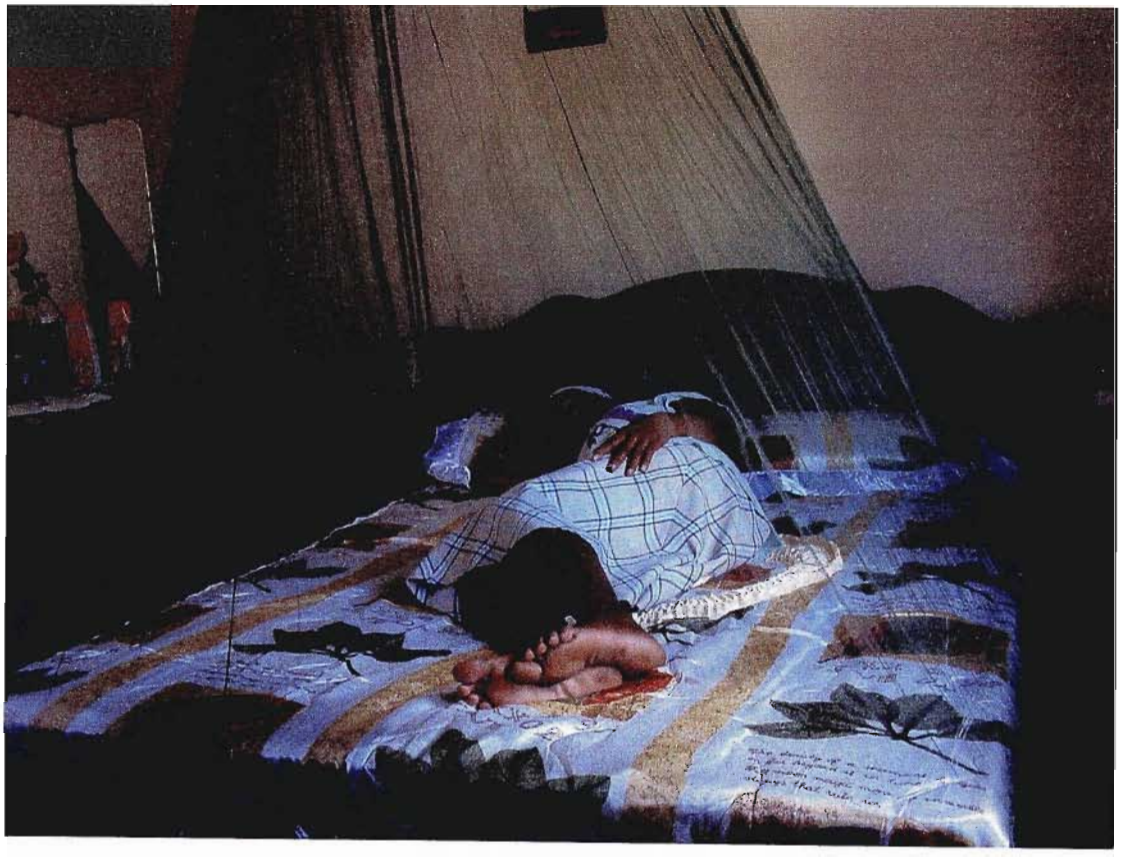


Plate 4 – Woman sleeping under a mosquito net near Jozini, northern KwaZulu-Natal, 2000.

3.5.4 Residual house spraying

The first trials of residual house spraying were done in South Africa by senior health inspector Hamilton under the supervision of Park Ross in 1932 (le Sueur et. al, 1993). Residual house spraying using pyrethrum was seen as the main method of controlling the adult mosquito. Trained spray operators, equipped with hand held pumps, spray the surface of the walls and roof with a residual insecticide to target mosquitoes that fly into a house. The intention of house spraying is that mosquitoes, especially the Anopheles mosquito, will rest on the long lasting residual insecticide deposit before or after biting a person and that the mosquito will remain long enough to pick up a lethal dose of insecticide. Residual house spraying (Plate 5) was very successful as a malaria control method and the technique was soon used across the globe (Curtis, 1997).

Plate 5 – Residual spray training in Namaacha, southern Mozambique, 2001

Pyrethrum is the preferred insecticide used in residual house spraying since 1932. The insecticide's immediate toxicity to insects and its ability to decompose in the

environment made it the most suitable insecticide for residual house spraying. Pyrethrum is derived from the *chrysanthemum cinerariaefolium* plant, which is commercially grown in Kenya, Zaire, Japan and South America. Pyrethrum mixed with kerosene or petroleum was used in the first large scale attack against the Anopheles mosquito by launching a wide spread residual house spaying operation. The "knock down" effect together with the insecticide's toxicity made it the perfect residual insecticide for malaria control and it is still widely used today due to very low resistance levels of mosquitoes to the insecticide.

Dichloro-diphenyl-trichloroethane or DDT was originally synthesized in 1854 under the name of discophane®. The discovery of DDT was the most revolutionary discovery in pest control history and it had a massive influence on public health worldwide. DDT was first used successfully dealing with human body lice and ending the typhus epidemic in Naples between 1939 and 1944.

The first malaria control trials using DDT took place in Italy in 1944 and the results were so encouraging that malaria eradication seemed possible. Missiroli initiated a massive residual house spraying campaign in 1945 to eliminate malaria in Italy. Spraying only started on the fifth of March 1946 and the effect of DDT could clearly be seen after the first round of spraying by looking at the mosquito numbers caught in the capturing stations. Before the start of the residual house spraying up to 50 000 mosquitoes were caught compared to 200 three months after the commencement of residual house spraying with DDT. In 1948 no deaths were reported due to malaria and by 1949 the age-old disease that used to cause havoc in ancient Rome was almost non-existent. Other malaria control operations around the world soon followed and DDT was extensively used in residual house spraying in Venezuela, Greece, Guyana, and the USA. All the above-mentioned residual spray programmes showed excellent results using DDT (Mellanby, 1992).

The result of Residual house spraying with DDT was so encouraging that the World Health Organization (WHO) adopted the principal of malaria eradication in 1955. A global campaign was launched to eradicate malaria and excellent successes were achieved in non-tropical countries between 1955 and 1970. Europe saw the eradication of endemic malaria in Romania, Yugoslavia, the Netherlands, Italy,

Bulgaria, Spain, Portugal, Poland and Hungary while North America, Australia, the former USSR and some parts of Asia achieved similar successes in their respective countries (Chwatt, 1993).

Tropical countries around the world experienced disappointing results due to a combination of drug and insecticide resistance, uncontrolled urbanization, unplanned agricultural activities, political instability in certain countries and a lack of funds due to the cost of malaria control. The World Health Organization officially revised the global eradication campaign in 1969, and that marked the end of the large-scale malaria eradication campaigns throughout the world and the start of mounting environmental pressure towards the use of DDT (Chwatt, 1993).

Although the effectiveness of DDT in malaria control has been proven since the first trials in Italy in 1944 mounting environmental pressure towards DDT arose. The publishing of the book "Silent Spring" by Rachel Carson in 1962 caused an emotional public reaction and several environmental movements against the use of DDT were started. DDT was banned in the United States in 1973 and this is still considered to be the first major victory for the environmentalist movements in the US. Most of the environmental pressure groups turned their attention towards creating international pressure against the use of DDT (Mellanby, 1992).

The effect of the ban on DDT could clearly be seen in Sri Lanka. The number of malaria cases dropped from 2.8 million in 1948 to 17 in 1963 after DDT was used in residual house spraying. After spraying with DDT was stopped in 1964, the malaria cases began to rise again and reached 2.5 million in 1969. The same phenomenon could be seen in many other tropical and impoverished countries around the world.

The United Nations Environmental Programme (UNEP) is negotiating a legally binding agreement for global elimination of DDT together with other organic pollutants "POP's". The Stockholm treaty on Persistent Organic Pollutants (POP's) is an initiative to ban an entire class of chemicals due to its direct effects on human health and its environmental implications. The treaty was sighed in May 2001 by over 100 countries and it is expected to be fully implemented by 2004. The treaty has been hailed as "a public health treaty", one that will "protect public health both from DDT and malaria (Porta and Zumeta, 2002, p 651)

The substances covered by the treaty are eight pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene), two industrial chemicals (hexachlorobenzene (HCB) and polychlorinated biphenyls (PSB's), and two POP by-products (dioxins and furans)). The first 10 compounds except DDT are all included in Annex A: (elimination) and the long-term aim for these compounds are to cease production, use and trade, annex B: (restriction) deals with DDT. Its use is accepted for the purpose of disease vector control, and as intermediate in the production of dicofol; countries that have requested to do so are allowed to continue using DDT against malaria, until effective and affordable alternatives available. There remains considerable controversy and debate over the use of DDT. This study focuses on the controlled and small-scale use of DDT for the purpose of reducing malaria in Southern Africa (Porta and Zumeta, 2002, p 651)

DDT is still being successfully used today in malaria control programmes due to its cost per unit weight, its durability as a residual insecticide and the lack of insecticide resistance. DDT's residual effect on walls allows low income countries to apply the insecticide once a year compared to two spray rounds with other, more expensive insecticides like pyrethroids or organophosphates (Curtis, 1997).

Another example of the effectiveness of residual house spraying can be seen in South Africa, Swaziland and Mozambique. The Lubombo Spatial Development Initiative (LSDI) has been using residual house spraying as a malaria control method since 1999. Major reductions in both malaria cases and parasite prevalence have been recorded in the Lubombo corridor.

Swaziland and South Africa have been using DDT in residual house spraying operations since 1999 due to insecticide resistance (Plate 6). Swaziland's malaria incidence was reduced by 64% and South Africa's malaria incidence plummeted by a staggering 76%. Mozambique have been using carbamates due to political reasons and saw a parasite prevalence reduction of 40% in the first year (1999) of residual house spraying.

Plate 6 – A spray operator applies DDT to the eave of a house in Mbazwana, northern KwaZulu-Natal, 2002.

The "DDT War" rages on with first world countries calling for the global elimination and banning of DDT use while the impoverished third world countries with serious malaria epidemics, call for the controlled use of DDT in public health, especially in malaria control.

3.5.5 Treatment

Plasmodium falciparum accounts for more than 90% of all malaria cases in sub-Saharan Africa. The majority of the South African population is non-immune, including residents of seasonally endemic malaria areas, and are therefore at risk of contracting severe or complicated malaria. The choice of chemotherapeutic agents is crucial and will depend on the severity of the illness and the possible geographical drug resistance in the area where the disease was contracted.

Quinine, a toxic plant alkaloid made from the bark of the Cinchona tree in South America was used to treat malaria more than 350 years ago and is considered to be one of the first major therapeutic breakthroughs. For more than three centuries chinchona and its alkaloids, especially quinine, were the only drugs available that were effective against the malaria parasites. Resistance to quinine has recently developed in limited geographical areas in the world but the drug is still widely used in the treatment of severe falciparum malaria. The synthesis of chloroquine in 1934 as an anti-malarial drug saw the widespread use of the drug due to its effectiveness to treat all types of malarial infections. Parasite control by means of chloroquine chemotherapy has been the single most widely used and effective measure against malaria until the development and spread of drug resistant *Plasmodium falciparum* (DRPf) malaria (Chwatt, 1993).

There are only a limited number of effective drugs available, which can be used to treat or prevent malaria. The most widely used drug for complicated malaria is quinine. Chloroquine and antifolate drugs are widely used for the treatment of uncomplicated malaria. Malaria treatment is a very effective malaria control method and it controls and rids the patient of the malaria parasite that causes the disease. Anti-malarial drugs have a selective action on the different phases of the parasite life cycle. These can be divided into prophylactic drugs, which prevent parasite development in the liver, and schizontocidal drugs that attack the malaria parasite in the red blood cell preventing a clinical malaria attack. The ideal malaria treatment should be effective in a single dose due to the inadequate health services in third world countries and the drug should have activity on all stages of the parasite life cycle (Chwatt, 1993).

It is important to distinguish between complicated and severe malaria cases before treatment commences. Patients with uncomplicated malaria are those with mild symptoms that show no evidence of organ dysfunction when tested clinically or on laboratory tests. Patients with uncomplicated malaria generally have a parasite count lower than 5%. It is however very important that a patient with uncomplicated malaria receive prompt treatment with the most effective regimes available. A patient in KwaZulu-Natal with uncomplicated malaria is treated with artemether plus lumefantrine (Coartem®). The alternative treatment for patients with uncomplicated

malaria is quinine combined with either doxicycline or clindamycin. Mpumalanga and Limpopo province uses sulfadoxine-pyrimethamine (SP) as the first line treatment. A combination therapy using artemisinin derivatives will be introduced in the near future and it will replace all SP monotherapy (Directorate: Communicable Disease Control, Augustus 2002).

Clinical features of patients with complicated malaria are impaired consciousness, respiratory distress, jaundice, bleeding and shock. Patients with complicated malaria have a parasite count or parasitemia of 5%, or 3+ with haemoglobin <6 g/l or haematocrit <20%. These patients should be treated with the highest level of care available. Unless patients with *P. falciparum* malaria are treated rapidly, the clinical symptoms deteriorate with the possibility of mortality increasing. The treatment of complicated malaria must include specific anti-malarial chemotherapy and management of complications. Quinine is the preferred treatment of complicated malaria in South Africa and it is administered intravenously to patients with complicated malaria symptoms. Where intravenous quinine administration is not feasible, intramuscular administration will be given. When quinine resistance is suspected an artemisinin derivative is used to treat complicated malaria. The only parenteral artemisinin currently available in South Africa is Arteether® (Directorate: Communicable Disease Control, Augustus 2002).

Only 5-10% of malaria cases on sub-Saharan Africa are due to one of the other Plasmodium species namely *P.vivax, P. ovale, and P. malariae*. Infections should be treated with chloroquine monotherapy and P.vivax and P.ovale should be treated with chloroquine followed up with primaquine. Patients with suspected or diagnosed mixed plasmodium infections should be treated with the standard therapy for uncomplicated or severe *P.falciparum* malaria. Pregnant woman are classified as a high-risk group and the most effective treatment must be administered to them when ill. The consequences of contracting malaria while pregnant are very serious and it could cause mortality, abortion, premature birth or low birth weight (Directorate: Communicable Disease Control, Augustus 2002).

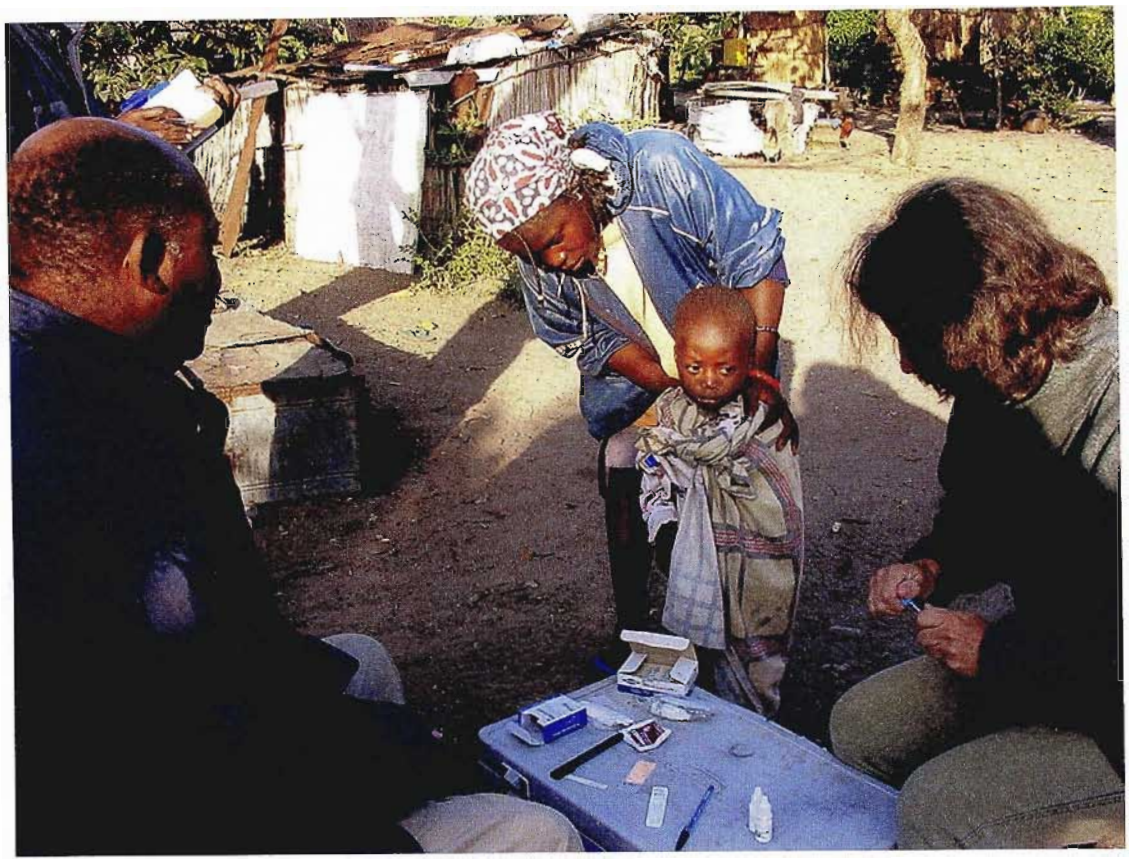


Plate 7 – A child being tested and treated for malaria in Bella-Vista, southern Mozambique, 2002.

3.5.6 Drug resistance

Anti-malarial drug resistance has been defined as the "ability of a strain to survive and/or multiply despite the administration and absorption of a drug given in doses, equal to or higher than those usually recommended but within tolerance of the subject" (Bloland, 2001,p12.). The above-mentioned definition has been modified to specify that the drug in question must "gain access to the parasite or the infected red blood cell for the duration of the time necessary for its normal action" (Bloland, 2001).

Drug resistance to malaria treatment is one of the biggest obstacles in malaria control measures across the world. Drug resistance in *P.falciparum* is not a new occurrence and was documented as early as 1910 in Brazil when patients did not respond to quinine administered to them in a dosage that should have cured them. The first cases of chloroquine resistance occurred in South America and South East Asia in the

1950's and spread rapidly across the world. Chloroquine resistance in Africa was first reported in Kenya and Tanzania in 1979 and now occurs in all southern African countries including Angola, Mozambique, Botswana, Namibia, Zimbabwe, Zambia and Swaziland. Chloroquine resistance in South Africa was first detected in 1985 in varying degrees in malarious areas in South Africa (Sharp and Freese, 1995).

The first line malaria treatment was changed in KwaZulu-Natal from chloroquine to sulfadoxine-primethamine (SP) due to wide spread malaria parasite resistance to chloroquine in 1988 (Durrheim *et. al*, 2001). The increase of malaria cases in South Africa from 364 cases in 1971 to 51 433 cases in 1999, caused great concern in the public health sector. The dramatic increase of patients in KwaZulu-Natal returning to clinics with the recurrence of classical malaria symptoms after treatment with sulfadoxine-primethamine (SP) raised the fear that the province might have a high grade of malaria parasite resistance to sulfadoxine-primethamine or SP (Sharp *et. al*, 2000).

An in vivo study was done in 1996 to determine if there was drug resistance to *sulfadoxine-primethamine* (SP) to patients attending the malaria clinic at Ndumo, KwaZulu-Natal. Patients were treated with SP and followed up daily for 3 days and thereafter at 7, 14, 21, 28 and 42 days post-treatment. At least 79 out of the 129 (61.2%) enrolled patients failed the in vivo test indicating malaria parasite drug resistance to sulfadoxine-primethamine (SP) in KwaZulu-Natal. Artemisinin as a combination therapy for malaria treatment in KwaZulu-Natal was introduced in 2000 (Bredenkamp, *et. al*, 2001).

Mpumalanga and the Northern Province have been using chloroquine as a first line malaria treatment for years but an increase in positive follow up smears after chloroquine therapy in Mpumalanga from 1.7% in 1990 to 16.7% in 1995 suggested resistance to chloroquine in the two provinces. An in vivo study was conducted in 1997 to determine the drug resistance to chloroquine and a parasitological failure of 17.9% and a clinical failure of 24% were documented in Mpumalanga. Similar patterns of drug resistance were found in the Northern Province to chloroquine and these results resulted in a national policy change for the two provinces introducing sulfadoxine-primethamine (SP) as the first line malaria treatment in 1997 (Durrheim *et. al*, 2001).

Swaziland uses chloroquine as a first line treatment for people that come to clinics or hospitals for treatment. If a patient returns after treatment with chloroquine, sulfadoxine-primethamine (SP) is used as a second line treatment. If a patient returns after treatment with sulfadoxine-primethamine (SP), quinine is used as a third line treatment. The treatments that are used in Swaziland are used in many countries on the African continent. Mozambique uses chloroquine as a first line treatment and fansidar® as a second line treatment if the patient returns after chloroquine treatment failed. Quinine is administered as a third line treatment when patients do not respond to the treatment with chloroquine or fansidar®.

Several factors contribute to the spread of malaria drug resistance in the world but their relative contribution is unknown. Factors that have been associated with drug resistance are human behaviour to treatment, human migratory patterns, vector and parasite biology, economics and pharmacokinetics. Several interventions are currently underway to prevent drug resistance by reducing overall drug pressure, improving the way drugs are used and the use of combination therapy (Bloland, 2001).

3.5.7 Chemoprophylaxis

The use of Chemoprophylaxis is a very effective way to prevent malaria infection but the expansion of drug resistance to anti-malarial drugs, an increased awareness of side effects of prophylactic drugs and controversies in drug recommendations have caused problems for doctors, chemists and travelers around the world. Chloroquine has for years been seen as the most effective and safest anti-malarial prophylaxis but wide spread chloroquine resistant falciparum malaria has occurred around the world. Many alternative drugs have been patented with some having poor safety profiles and debatable effectiveness (The Director-General, Department of National Health and Population Development, 1993).

Recommendations for chemoprophylaxis should be individualized according to the person's health status, malaria risk of the area where the person is travelling to (see Figure 11), the length of the trip to the malarious area, known drug resistance to drugs in the area, possible adverse drug effects and the age of the person. It is very important to avoid blanket drug recommendations due to the varying health status of people and the fact that blanket recommendations might enhance low levels of drug

resistance in areas. The non-compliance of people taking prophylaxis by either not taking them or not completing the recommended dosage is another problem associated with chemoprophylaxis and it contributes to the development of drug resistance to prophylaxis (Goldman, 2002).

Malaria risk areas can broadly be defined into chloroquine resistant and chloroquine sensitive areas. Chloroquine is the recommended prophylaxis for people traveling to chloroquine sensitive areas. People traveling to known chloroquine resistant areas should ether take chloroquine plus proguanil or mefloquine. People that cannot take the above mentioned prophylaxis due to medical reasons or conditions should take doxycycline. There are areas that have multi-drug resistance against both chloroquine and mefloquine and doxycycline should be used in multi-drug resistant areas as prophylaxis (Department of National Health and Population Development, 1993).

Malaria prophylaxis should be taken before malarious areas are entered to ascertain how well the drug is tolerated and to establish the prophylactic routine. It is very important to make people aware that malaria prophylaxis is not 100% effective and that other self protection measures such as repellants, bed nets and protective clothing should be used in addition to prophylaxis. People that visit malaria areas should be advised to consult their medical practitioners when any malaria symptoms develop. The patient must inform the medical practitioner that a malarious area has been visited so that timeous diagnosis and treatment can be prescribed (Department of National Health and Population Development, 1993).

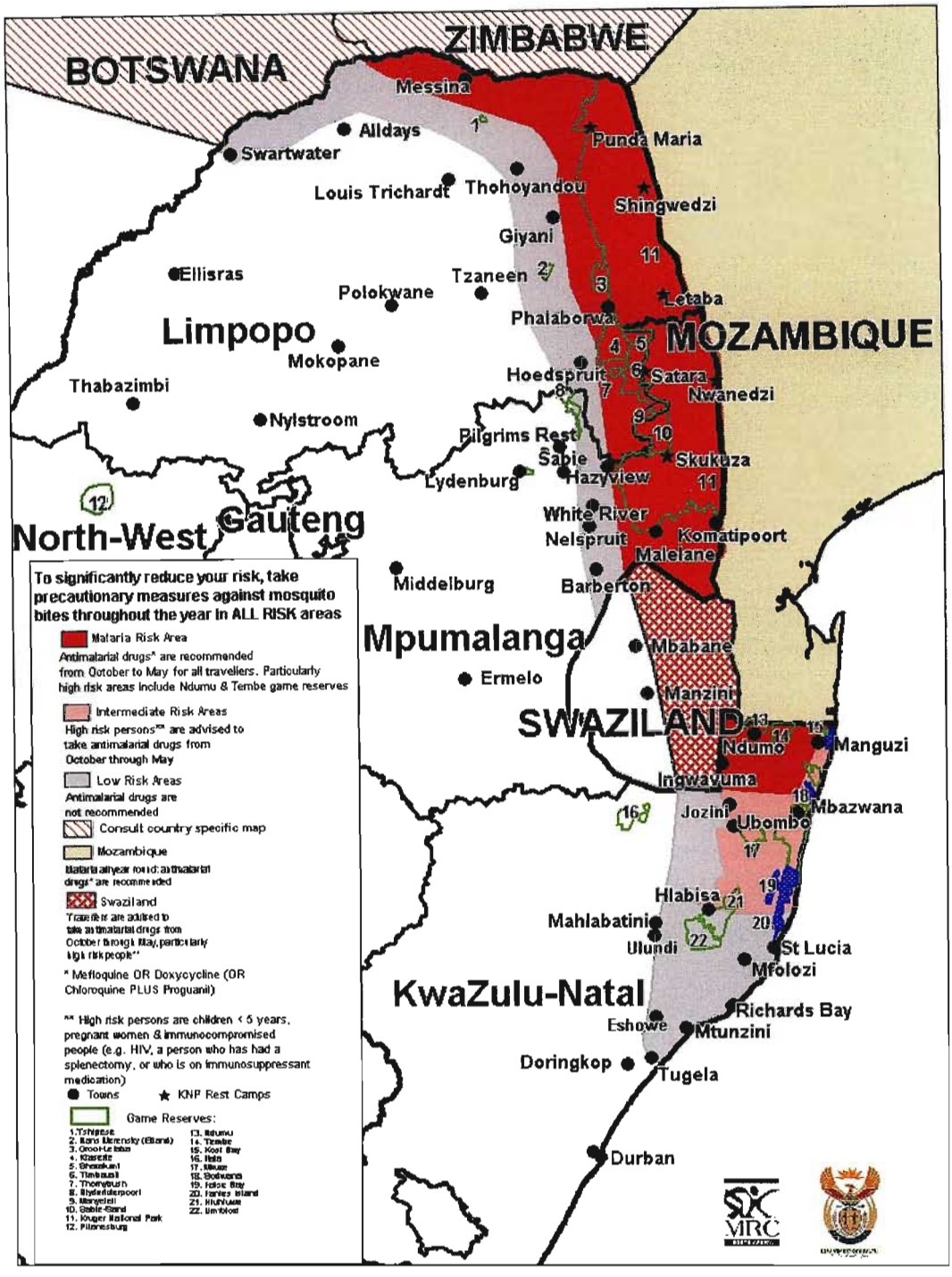


Figure 11 – South African malaria risk map 2002 for prophylaxis guidelines.

(Source: Malaria Lead Programme, Medical Research Council, Durban, 2002).

3.6 Malaria control methods in the study area

The focus of malaria control in the LSDI area is vector control through residual house spraying before the transmission season starts and the use of effective treatment to cure the local population of the malaria parasite. Governmental support has been given for this control method as can be seen in Plate 8. Vector control by house spraying has proved to be extremely effective in South Africa and Swaziland, with large areas of previous high risk, being free or relatively free from disease transmission and the negative effects thereof on communities and development.

South Africa and Swaziland have reintroduced DDT in their residual house spraying operations due to mosquito insecticide resistance to other insecticides. Pyrethroids and carbamates are mainly used in Mozambique in residual house spraying operations. Larvaciding and the use of impregnated bed nets are the other secondary malaria control methods used in the LSDI area. These malaria control methods are used in conjunction with residual house spraying by the Departments of Health in South Africa, Swaziland and Mozambique.

Plate 8 – President Thabo Mbeki supporting the malaria control efforts in St.Lucia, northern KwaZulu-Natal.
(Source: SABC library, 2000).

3.7 Malaria and development

Malaria risk is very geographical with severe malaria confined to the tropical and sub-tropical zones. Countries situated in high malaria risk areas are almost all poor with some exceptions such as Oman and Gabon, which owe their wealth to oil. According to Sachs and Gallup, 1998, forty-four of the 150 countries with populations of over one million have severe malaria. Thirty-five of these fourty-four are in Africa with the average purchasing power parity GDP per capita in 1995 for malarious countries being $1,526 compared to $8,268 for countries without malaria. Of the 119 poorest countries in the world, all but twelve have some incidence of malaria. The 31 countries with the highest wealth are malaria free (Gallup and Sachs, 1999).

"Cross-country regressions for the 1965-1990 period confirm the relationship between malaria and economic growth. Taking into account initial poverty, economic policy, tropical location and life expectancy among other factors, countries with severe malaria grew 1.3% lower per year, and a 10% reduction in malaria was associated with 0.3% higher growth per year" (Gallup and Sachs, 1998, p 4).

Malaria is the world's most serious tropical disease and it imposes significant socio-economic cost on the poorest of the poor. Malaria impacts on the economy at different levels including household level, community level, private sector, government and macro level. Malaria has been cited as one of the main factors that cause poverty in malarious countries across the globe and several direct and indirect costs have been identified (Southern Africa Malaria Control, 2002).

Direct costs include the cost to individuals when they contract malaria and the cost to the health services of treating and preventing malaria. "Direct costs are made up of medical personnel, cost of drugs to treat malaria victims and the cost of testing for malaria. Every malaria case is different and will require different amount of attention from medical personnel and different quantities of drug to treat the disease" (Tren, 2001). Direct costs to countries due to malaria are enormous and this impacts heavily on the economy.

Indirect costs are the costs to the economy of lost productivity due to malaria, the cost of lost future earnings in the case of death and the cost incurred through days lost in

education. "Indirect economic costs of malaria are those that do not entail an immediate cash cost to an organization, such as the Department of Health. Indirect costs are those costs incurred on the wider economy through, for example, productivity losses through the inability to work. Indirect costs are more difficult to estimate than direct costs, as assumptions have to be made about productivity of malaria victims. Estimates have to be made of mortality costs as well as morbidity costs, which involves estimating the present cost of lost future earnings" (Tren, 2001).

3.8 Conclusion

Malaria is an ancient scourge that still affects millions of people across the globe. Sub- Saharan African countries are bearing the brunt of this devastating disease and it affects African communities at all levels. Political instability on the African continent, lack of funds, drug and insecticide resistance and uncontrolled population movement are some of the factors contributing to the malaria problem on the African continent. Sustained malaria research and control is essential if the African continent wants to win the war against malaria. Cross border collaborations between neighboring countries is fundamental to address the malaria problem at a regional level.

3.9 Introduction to tourism.

A massive increase in global tourism took place in the 1960's due to technological advances in aviation and the growing affluence of the middle classes in Northern industrial nations. The Third World countries attracted western tourists due to their fauna and flora, sunny climates, sandy beaches and exotic cultures. The early emphasis of tourism was on growth and promotion and not much planning went into the management and control of the industry. Tourism was seen as a renewable resource and early warning signs of environmental and social degradation were largely ignored (Murphy, 1985).

Today, travel and tourism is the world's largest earner of foreign currency. The World Travel and Tourism Council estimates that tourism directly and indirectly contributes more than 10% of the gross world product. In 1995, the direct and indirect gross world product related to travel and tourism totaled $US 3.4 trillion, supporting 212 million jobs worldwide and generating $US 655 billion in taxes (Frechtling, 1996).

3.10 Global tourism

Global tourism is on the increase and the strong global economy during the early 1990's, together with special events held worldwide to commemorate the new millennium resulted in a 7.4% growth in world tourism in 2000. This growth in tourism is the highest in nearly a decade and almost double the increase experienced in 1999. According to the World Tourism Organization (WTO) the total number of international arrivals reached a record 699 million in 2000. Europe, which constitutes 58% of international tourist arrivals, grew by 6.1% to 403 million arrivals, which is 25 million more trips than in 1999. All regions in the world experienced varying increases in tourism in 2000 with East Asia and the Pacific having the biggest growth rate of 14.7% (World Tourism Organization, 2001).

The tourism sector is very sensitive and world events influence it negatively. The terrorist attacks on the United States of America on 11 September 2001 had a negative effect on world tourism. The World Tourism Organization (WTO) estimates that during the first eight months of 2001, from January to August, arrivals grew by only 3%, more than one point lower than the average annual gain of 4.3% in tourism arrivals in the past 10 years. The last four months of 2001 saw an 11% drop in arrivals

worldwide after the terrorist attacks. Other factors that contributed to the decrease in world tourism in 2001 were the foot and mouth outbreak in the United Kingdom, the strengthening US dollar, the political instability in the Middle East and the economic crisis in Argentina (World Tourism Organization, 2002).

3.11 Tourism in Africa

Some of the activities associated with tourism in Africa go back centuries to the Roman occupation of Egypt. Modern tourism as it is known today formally emerged in the 19th century when wealthy European explorers started visiting scenic wonders like Mount Kenya, Mount Kilimanjaro, Victoria Falls and the Nile River. Hunting became a big tourist attraction with Europeans visiting Africa on hunting safaris for big game trophies like Lion, Elephant and Buffalo. Although tourism in Africa escalated, basic tourism infrastructure like transport, hotels and guide services remained under developed. The period after World War II saw the first mass tourism to the African continent due to inexpensive trans-oceanic travel and the construction of luxury accommodation around Africa's prime attractions (Fay, 2001).

Tourism is a major source of jobs and foreign currency in many African countries today. It is also often stated as the economic "hope" of Africa. The benefit of tourism is visible in many African countries. It encourages governments to protect historically significant sites and indigenous fauna and flora. There is cause for concern due to exploitation by major foreign travel agencies in Africa. Researchers are trying to assess how much the African economies, ecosystems and people benefit directly from the tourism operations in their area. The amount of money that goes to foreign airlines, hotel chains and tour operators is enormous and is commonly known as "leakage". Studies in Gambia and Kenya show that leakage in their tourism industry can be as high as 70% of tourism revenue in their respective countries (Fay, 2001).

The tourism industry in Africa has had other negative effects on the environment and on the local people that live in close proximity to tourism facilities. Social problems like prostitution, smuggling of art objects and the displacement of people due to land distribution towards creating parks have happened in many African countries (Fay, 2001).

Examples of serious environmental degradation due to tourism activities in ecological sensitive areas are visible throughout the African continent. Regardless of these negative effects of tourism in Africa, many African countries look towards tourism as a source of economic growth for the future (Fay, 2001).

Tourism in Africa can be divided into four forms namely cultural tourism, wildlife tourism, coastal resort tourism and eco-tourism. Cultural tourism is one of the oldest forms of tourism on the African continent. Egypt was well known for it's cultural tourism due to the country's ancient civilization, spectacular monuments and ancient artifacts. Since the 1970's, cultural tourism has expanded to many other west African countries that attracts a large number of African-Americans due to its numerous historic sites related to slave trade with America. Cultural tourism has spread to Southern Africa were visitors can spend time with Zulu or Xhosa families, where tourists can experience the local people's culture first hand. Cultural tourism is a growing market today and it generates substantial foreign revenue for local people and communities.

Wildlife tourism is one of the oldest and most popular forms of tourism in Africa due to the wide variety of animals on the continent. Safaris are very popular and foreign tourists spend large sums of money to see the "Big Five" and other wild animals in game reserves across the African continent. The revenue generated through safaris is used in most cases to expand conservation efforts in countries and to protect endangered species that have great value. It is estimated that a single lion in Kenya is worth $7000 per year in tourism income and a herd of elephant approximately $610 000 annually. Wildlife tourism is a growing industry and the creation of new parks and the joining of existing parks on the African continent create new opportunities for wildlife tourism to expand (Fay, 2001).

Coastal resort tourism is a very popular form of tourism in Africa and the sunny beaches attract thousands of international tourists to the continent. The beaches of Kenya, Togo, South Africa, Mauritius, Seychelles and Gambia are very popular amongst European travelers that escape the cold winters in Europe. Coastal resort tourism generates millions in foreign revenue each year and it is a growing form of tourism on the African continent. Coastal resort tourism has created strong local

economies by stimulating local people to sell hand made crafts and fresh produce to the sector.

Eco-tourism is a rapidly expanding form of tourism due to the increased cultural and environmental awareness globally. Eco-tourism can be defined as a form of tourism that is environmentally and culturally sensitive, educational and locally controlled with a large percentage of the profit going to the local community.

Many examples of successful eco-tourism projects exist on the African continent and they are well supported by environmentally and culturally aware tourists and organizations. Non-governmental organizations (NGOs) such as Earth Watch, fund scientific research projects to encourage eco-tourism in Africa. Eco-tourism is very important and it is suggested that it is the only sustainable form of tourism that will preserve the environment and ancient cultures of the African continent (Fay, 2001).

3.11.1 Tourism in South Africa

In 1999/2000 tourism brought an estimated R20 billion Rand a year into the South African economy, second only to the manufacturing and mining industry in its contribution to the Gross Domestic Product (GDP). South Africa attracts only 0.2% of the estimated 300 million tourists in the world. South Africa is ranked 25th in the world's top tourism destinations which is 55% higher than its ranking in 1990 by the World Tourism Organization (Department of Environmental Affairs and Tourism, Annual report, 1999/2000).

South Africa has a well developed tourism sector that offers a wide variety of activities to local and international tourists in the cultural, wildlife, coastal resort and eco-tourism sectors (See Plate 9). South Africa is seen as one of the leading tourism countries on the African continent and it contributes more than 8.2% to the South African Gross Domestic Product (GDP). Foreign tourists stay an average of 16,9 days on average in South Africa and they spend R852 a day. It is estimated that for every eight tourists that visit South Africa, one new job is created (KwaZulu-Natal Tourism Authority, 1999).

South African tourism potential and infrastructure varies across the country with the Western Cape, KwaZulu-Natal and Eastern Cape receiving the bulk of international tourists due to successful marketing, fauna and flora, appealing geographical features and established game reserves.

The Western Cape is currently receiving the majority of international tourists of all the South African provinces. Approximately 770 000 international tourists visited the Western Cape in 2000. This figure constitutes 51% of all international tourists that visited South Africa in 2000. The estimated number of overseas tourist nights spent in the Western Cape for the year 2000 was 9,9 million. Approximately 4,4 million domestic tourists visited the Western Cape in 2000 (South African Tourism and Statistics South Africa, 2002).

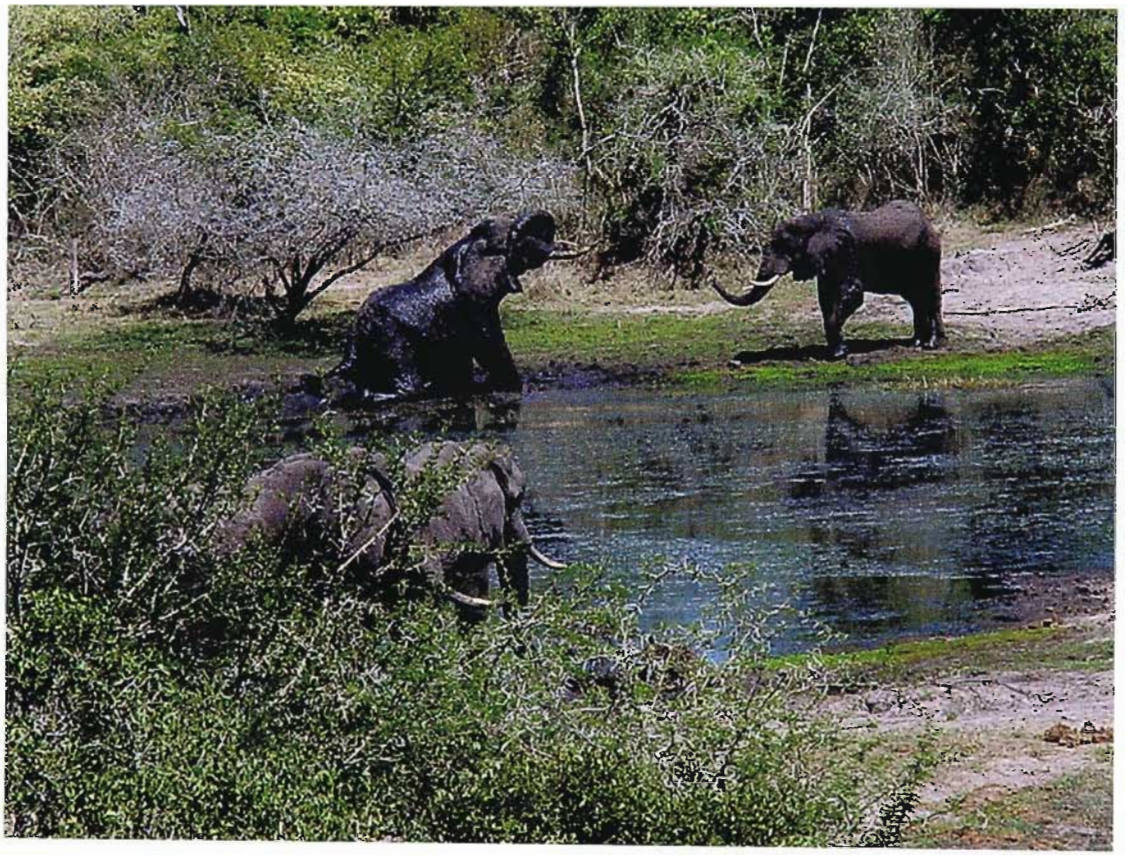


Plate 9 – Elephant wallowing at a water hole in Tembe Game Reserve, northern KwaZulu-Natal, 2002.

An estimated 1.7 million overseas and African tourists visited South Africa in 1999. Out of the 1.7 million approximately 500 000 or 30% of these tourists visited

KwaZulu-Natal. Forty seven percent of these 500 000 foreign tourists visited the Zululand and Maputaland area, which falls within a malaria transmission zone. An estimated 8 million domestic tourists from outside or within this province travel annually to one or more destinations within KwaZulu-Natal. KwaZulu-Natal's total tourism industry was thus worth in excess of R8 Billion in terms of consumer expenditure in 1999. Its contribution to the Gross Domestic Product (GDP) is estimated to be in order of 10% and the industry employs approximately 200 000 people (KwaZulu-Natal Tourism Authority, 1999). The Eastern Cape is the third largest receiver of international tourists and receives approximately 19 % of international tourist that visit South Africa.

3.11.2 Tourism in Swaziland

The Kingdom of Swaziland is a small land-locked country between the Republic of South Africa and Mozambique. The 1998 figures suggest that Swaziland has a population growth of 3% per annum and a population of approximately 932 000. Swaziland is predominantly agricultural with approximately 80% of the population living in rural areas. Two thirds of Swaziland's export earnings come from the exportation of sugar, paper pulp and fertilizer. The government and the crown have increasingly invested in partnerships with Sun International over the past couple of years to develop Swaziland's tourism sector (Harrison, 1992).

Although Swaziland is a small country of only 17,364 square kilometers the country has considerable tourism potential with a wide variety of geographical and climatic features. Approximately 89 015 tourists visited Swaziland in 1972 of whom 61% were on holiday and 20% were on business. By 1989 this number has risen to 257 997 with the number of tourists on vacation rising to 63% and people on business to 22%. A large number of South Africans used to visit Swaziland before 1994 due to sanctions on South Africa that prohibited sporting, musical and television events in South Africa (Harrison, 1992).

The Central Bank reported that the tourism sector experienced negative growth in 2001. The number of bed nights sold at Swazi hotels and game parks declined 5,5%. Tourism receipts were up 3,8%, to R192m from R188, 7m in 2000, but the gain was largely illusory, a reflection of the declining currency, the Lilgangeni, which is linked

to the Rand. A cholera outbreak was blamed for lower visitor numbers together with the decline in travel worldwide and a proliferation of casinos in the Mpumalanga Province of South Africa that drew gamblers away from Swaziland's older gambling spots. Fewer Americans visited Swaziland last year, replaced by more Europeans, particularly from France and the Netherlands. The majority (80%) of Swaziland's visitors continue to come from South Africa (Southern African Tourism Update, 2002).

Wildlife tourism is a very popular form of tourism in the Kingdom of Swaziland. Swaziland has placed a great deal of emphasis on the preservation and expansion of nature and game reserves in the past and rewards are being reaped due these conservation efforts. Swaziland boasts with four well-managed nature reserves and three big game parks that tourism authorities consider to be a growing tourism sector with potential for the future.

Swaziland offers excellent cultural tourism to tourists that visit the Kingdom. The Swazi people are very proud of their culture and traditions (Plate 10) and cultural tourism in Swaziland is growing exponentially. Several back packer hostels and Swazi cultural villages offer tourists a cultural experience. Emphasis is placed on preserving the Swazi culture and using it to market the country as an international tourist destination.

Eco-tourism is a very popular and rapidly expanding form of tourism in Swaziland due to the increased cultural and environmental awareness of tourists and people in general. Emphasis is placed on sustainable environmental development and cultural preservation in Swaziland.

His Majesty King Subhuza II said "We do not inherit the earth from our forefathers, we borrow it from our children" - An ancient Indian Proverb – [Accessed from, Big Game Parks, http://www.biggame.co.sz/).

The above-mentioned word of His Majesty King Subhuza II is a good summary of the way Swaziland manages its wildlife and eco-tourism sector.

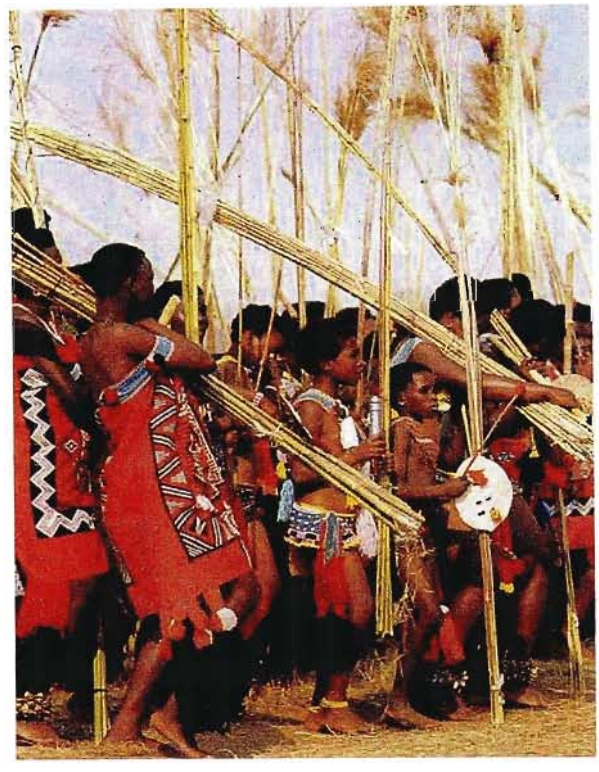


Plate 10 – Traditionally dressed Swazi people participating in the annual reed dance, Manzini, Swaziland. (Source: Swaziland Tourism Web site http://www.swazi.com/tourism).

3.11.3 Tourism in Mozambique

Mozambique's tourism sector is not as organised and developed as South Africa and Swaziland's tourism sectors due to the effects of the civil war in the country and economic hardship. Mozambique has tremendous tourism potential but the tourism sector together with most of the other Mozambique infrastructure broke down when the devastating war broke out in 1964. Mozambique is currently busy working on a national policy and strategy for its tourism industry so that the abundant tourism potential in the country can be developed and marketed to the world (Mahumane, 2002).

Cultural tourism is a relatively new form of tourism in Mozambique and it has tremendous potential due to the country's fascinating history. Mozambique's distinct local culture consists of a vibrant blend of African, Arab and Portuguese influences and provides a refreshing contrast to the other countries in the Southern Africa region.

Mozambique boasts a number of conservation areas and national parks such as the Maputo Elephant Park, Gorongosa National Park and the Marromeu Buffalo Reserve. The civil war and extensive poaching led to severe degradation of the reserves and national parks in Mozambique. Efforts are currently underway to restore the reserves and parks so that the wildlife tourism potential of the country can be restored. Several initiatives have been established to promote trans-border natural areas with neighboring countries to create ecological corridors and to enhance regional wildlife tourism (Mahumane, 2002).

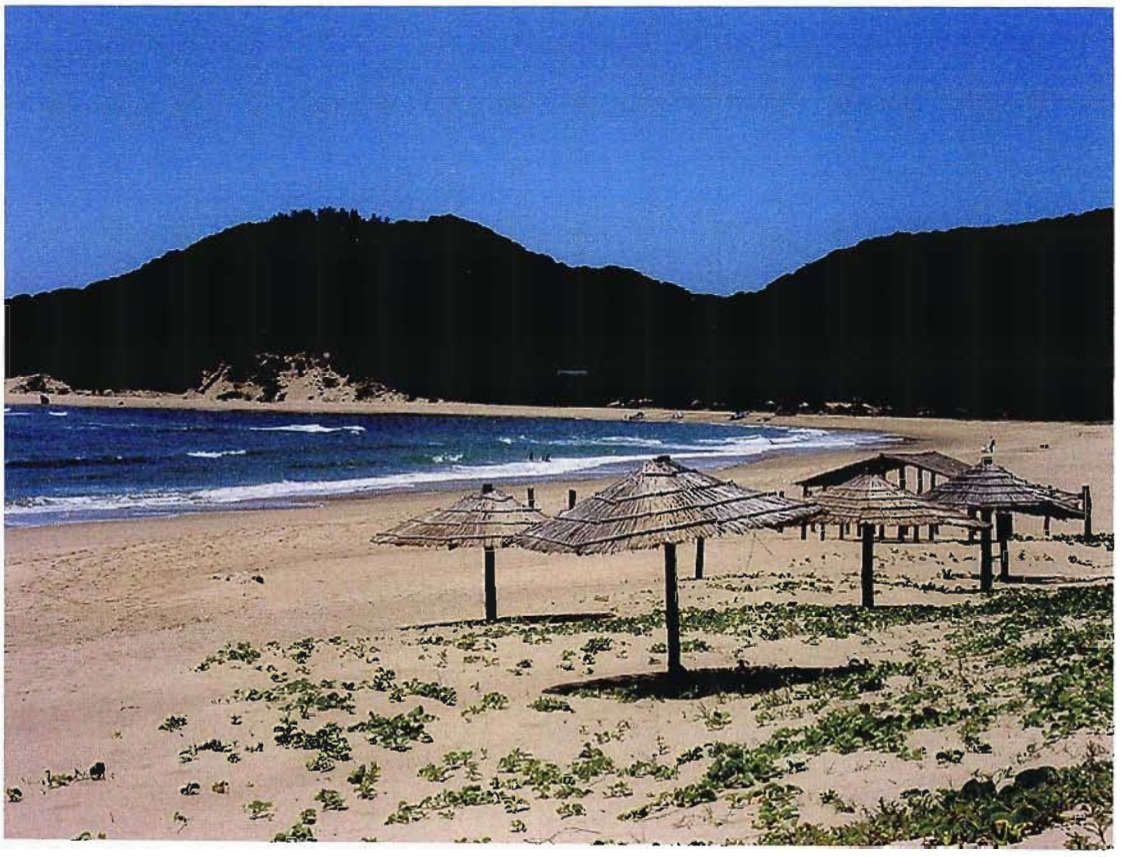


Plate 11 – Ponta do Ouro beach, southern Mozambique, 2002.

Because of its location, Mozambique has a coastline of over 2470 km offering tourists endless coral reefs, tropical islands and beaches making Mozambique a mecca for scuba and snorkel divers. The warm tropical climate together with the warm Indian Ocean water gives Mozambique the potential to become an international coastal resort tourist destination (Plate 11). The coastal resort tourism potential in Mozambique has been recognized locally and internationally and the sector is developing rapidly. International tourism groups are spending millions of dollars in places such as the

Bazaruto Archipelago and southern Mozambique to develop the abundant tourism potential of the area.

Eco-tourism is still in the early development stages in Mozambique for historical reasons. The development of eco-tourism in Mozambique is seen as a priority by the government and Mozambique has adopted a policy for promoting sustainable tourism development in the country. Community involvement is a very important component of eco-tourism and extensive training programmes are underway to ensure that local communities can benefit from the tourism development in their area through job creation and the sales of arts and crafts (Mahumane, 2002).

3.12 Economic impact of tourism

It is well known that tourism in general has a positive influence on both local and national economies if the sector is managed correctly. It is however very difficult to correctly estimate the exact economic impact of tourism in a country or area due to its cross cutting influence on other sectors.

Michelle Demessine, the French Secretary for Tourism said, "Tourism is an activity that cuts across numerous areas of the economy, such as transportation, construction and public works, as well as culture, leisure and most sectors of consumption. Its complexity makes it difficult to appreciate the true impact on the economy and difficult to obtain the means needed to fully exploit its positive effects. "

3.12.1 Foreign exchange

Tourism is a major export-oriented industry and the economies of many countries are dependent on tourism. At international level, it is the second largest manpower employment industry in the world after the oil industry. In some countries like France, Italy and Spain, the revenue earned from tourism has even surpassed the profits from big industries. Western countries have taken keen interest in the promotion of tourism and they have done everything possible to promote tourism in their countries. In many countries around the world the development of tourism leads to further economic development (Memon, 1998).

Many African countries have recognized the fact that tourism can be a viable source of foreign revenue and exchange earnings as well as an industry that attracts substantial foreign investment when the sector is well managed and planned. These countries are reaping the rewards of tourism development and the foreign exchange generated through the tourism sector is encouraging other African countries to invest in tourism thereby creating employment for many people (Brown, 1999).

Being a source of foreign exchange earning and employment, tourism has been a source of rapid development in many countries around the world. In some areas, due to an increase in visitor traffic, local residents enjoy higher standards of public transport facilities. Tourism also provides infrastructure, which in turn forms the base and the stimulus for diversification of the economy and for the development of other industries. In comparison to other forms of economic development, an improvement in living standards may be generated through tourist traffic relatively quickly (Memon, 1998).

3.12.2 Employment

The employment generated by tourism varies from country to country. Tourism expenditure creates direct and indirect investment related employment in the tourism sector. Direct employment in the industry is created in businesses that sell goods and services directly to tourists such as hotels, restaurants, shops and transport operators. A study in Tunisia and Malta showed that around 0.4 persons were employed per bed in the tourism industry and around 0.8 persons per bed in hotels in east Africa. The amount of employment generated by hotels varies according to the facility's size, location, standard of service, price category, and country specific regulations regarding wage rates and policies on wage payments (de Kadt, 1979).

Indirect employment is stimulated and created by tourist expenditure that supply goods and services to the tourism business, and considerable employment can be generated in the agriculture, handcrafts and food processing industries. A study in Tunisia showed that for each hotel employee there are three to four persons employed in the agriculture, handcraft, manufacturing and distribution sectors. It is difficult to assess the amount of employment opportunities in the indirect employment sector and as it varies from country to country (de Kadt, 1979).

Investment related employment in the tourism industry is mainly created in the construction and capital goods industries. It is estimated that for each new hotel bed a total of 2.7 man-years of employment are needed for construction and investment items such as furniture. The expansion of the tourism sector creates various opportunities for small-scale enterprises in the construction and capital goods sector (de Kadt, 1979).

Tourism demand as an important income and employment generator, directly and indirectly, affects many different branches and services. The most important are hotels, restaurants, retail trade, transport, sports, entertainment, culture, travel agents, tour operators, guides, and several personal services. These need input from other branches such as the construction industry, agriculture, food and beverage, clothing and machinery industry. In the European Union the average share of tourism in total employment amounts to 6%. Tourism is a labor-intensive activity with low rationalization possibilities, requiring a wide range of skills (de Kadt, 1979).

3.13 Travel and tourism forecasting

The Tourism 2020 vision is the World Tourism Organization's (WTO) long term forecasting assessment of the development of tourism up to the first 20 years of the new millennium. The quantitative tourism forecasting covers a 25-year period beginning in 1995 and forecasting for the year 2000, 2010 and 2020. According to the above-mentioned forecasting, international arrivals are expected to reach over 1.56 billion by the year 2020. Of these arrivals, 1.18 billion will be inter-regional and 377 million will be long hall travellers. The total tourist arrivals by region show that by 2020 the top three regions will be Europe (717 million tourists), East Asia (397 million tourists), and the Americas (282 million tourists). East Asia and the Pacific, South Asia, the Middle East and Africa are forecasted to record growth rates over 5 % per year compared to a world average of 4.1%.

According to the World Tourism Organization (WTO 2001), Africa should be able to triple the size of its tourism industry by 2020 if proper efforts are made to ensure the safety and security of visitors. The number of tourist arrivals in the continent is forecast to reach 77.3 million in 2020, up from 27.8 million in 2001; according to the

new report Tourism 2020 Vision: Africa published by the World Tourism Organization (World Tourism Organisation, 2001).

"Greater co-operation among countries and between the public and private sectors are already helping to boost tourism, bringing greater coverage of Africa in tour operators brochures" says WTO Chief of Market Intelligence and Promotion, Augusto Huéscar. "Africa possesses natural and cultural resources in abundance, but civil unrest and perceived personal danger may prevent many nations from reaching their full tourism potential," says Mr. Huéscar (World Tourism Organisation, 2001, p 54).

Southern Africa is forecast to see an average 10.4 per cent annual rise in tourist arrivals to 36 million by 2020, up from 7.9 million in 2000, overtaking the North Africa region, which will manage only a 3.5 per cent increase to 19 million from 9.4 million last year. East Africa will be the other main growth region, up 6 per cent annually to 17 million compared with 5.9 million in 2000. Meanwhile, intra-regional travel will rise by an annual average 6.5 per cent from 42 per cent of the market in 1995 to 53 per cent or 41.3 million tourists in 2020.

South Africa will be the prime beneficiary of tourism growth in Africa, with its four main long-haul markets - the United Kingdom, Germany, the United States and France-expected to grow by more than 10 per cent a year, boosting arrivals from 6 million in 2000 to 30.5 million by 2020. In outbound tourism, southern Africa will also dominate, growing by more than 8 per cent a year to represent 30 million of the estimated 62 million African outbound travelers in 2020. South Africa will be the biggest source of outbound tourists, with trips to Zambia growing by 20 per cent annually, and the long-haul destinations of Germany and Australia both enjoying growth rates of more than 10 per cent in South African arrivals (World Tourism Organisation, 2001).

3.14 Health and travel

International travel and tourism have increased dramatically. People travel for professional, social, recreational and humanitarian purposes. More people travel greater distances and at greater speed than ever before, and this upward trend is set to

continue. Large numbers of travellers move far beyond the customary leisure and business centres, both for professional purposes and for pleasure, and there are now more elderly, infants and young children that travel, some of whom have pre-existing health problems.

The massive growth of international tourism has exposed an ever-increasing number of people to health risks across the globe. Most of these health risks can be minimized if suitable precautions are taken. The medical profession is playing an increasingly important role in addressing the health risks associated with the different types of travel. Travel and health advice is very important not only for personal protection but for the control of infectious diseases in the world Vaccination Requirements and (World Health Organisation, 1991).

The health implications of travel and tourism are far reaching. Health impacts affect the travelling public, travel and tourism industry, health professionals and politicians involved in managing escalating health care costs. As the volume of international travel expands, so do the health risks associated with such movement, particularly by western travellers to less developed regions. The education of travellers to inform them about the potential risk and the different antibiotics and prophylactic drugs available to prevent disease is a very important aspect of international health and travel (International Travel and Health, 1991).

People in their local environment live in a state of equilibrium with the locally occurring strains of micro-organisms, altitude and climatic conditions of the area. When people travel or go on vacation they encounter new environmental conditions that can disturb the equilibrium. The sudden exposure to significant changes in temperature, altitude, humidity, microbial flora, stress and fatigue may result in people becoming ill. The risks associated with international travel and tourism are influenced by the characteristics of the traveller. The health status, sex and age of the traveller are all factors that determine to what extent the traveller is at risk. The characteristics of the travel destination, reason for visiting the destination and length of stay are all factors that determine the risk associated with the trip (International Travel and Health, 1991).

Travellers may be exposed to a number of infectious diseases. The risk of becoming infected varies and factors such as the purpose of the trip, itinerary within the area, standards of accommodation, hygiene, sanitation and the behaviour of the traveller play an important role. Some infectious diseases can be prevented by vaccination, but there are some infectious diseases for which no vaccines exist. General precautions can greatly reduce the risk of exposure to infectious agents and should always be taken for visits to any destination where there is a significant risk of exposure. These precautions should be taken regardless of whether any vaccinations or medication has been administered. Forward planning, appropriate preventive measures and careful precautions can substantially reduce the risks of adverse health consequences (International Travel and Health, 1991).

3.14 Conclusion

The African continent has abundant tourism potential and it can contribute to the growth and development of many African countries if the tourism sector is developed and managed in a sustainable manner. African countries need to realize the enormous economic potential of tourism and rigorous international marketing campaigns need to be launched to promote tourism in Africa.

The forecast by the World Tourism Organization (WTO) for southern African countries is encouraging with a forecast of 10.4 per cent annual rise in tourist arrivals in the region. Countries in the southern African region need to market, develop and expand their tourism sectors so that the above-mentioned influx of tourist can be accommodated and that the maximum foreign revenue can be generated.

Chapter 4: Methodology

4.1 Introduction

This chapter discusses the methodology used to gather the relevant data for the study. Both quantitative and qualitative methods were used in this study. This project is part of the Malaria Lead Programme within the Medical Research Council based in Durban, South Africa. Dr Brian Sharp, Director of the Malaria Lead programme was approached by the Lubombo Spatial Development Initiative to conduct malaria research in the Lubombo corridor. I have been employed by the Malaria Lead Programme since 1999. I am a scientist working in the Geographical Information Systems (GIS) laboratory.

4.2 Qualitative data

Qualitative data were obtained through the use of questionnaires that had different target populations. The first questionnaire was directed at tourist facility owners/managers to obtain relevant tourism information. The tourism information gathered for the study served as a measure to determine the effect of malaria on the tourism industry in the area. Valuable information such as occupancy rates and number of cancellations due to malaria were captured using the above-mentioned questionnaire.

The second questionnaire was directed at both local and international tourists that visited the area to obtain perceived malaria and malaria risk information. The data obtained from the tourist questionnaire shed more light on the differences in perceptions that exist amongst local and international tourists that visit the area.

All the data retrieved from questionnaires was collated by entering the data into an Access database for further analysis. Each questionnaire's data was analysed separately due to the different focus and target populations interviewed. By analysing the tourism questionnaire data, the impact of malaria on tourism could be assessed in the study area. By analysing the tourist questionnaire perceived malaria risk

information from both local and international tourists that visited the study area could be assessed.

The Tourism KwaZulu-Natal database was used to gather contact details of the tourist facilities situated in the study area. The Tourism KwaZulu-Natal database provided the necessary contact details of tourist facilities so that the self-administered survey technique could be used for the tourism and tourist questionnaires. Tourist facilities were posted and faxed with tourism and tourist questionnaires to gather relevant information for the study.

The KwaZulu-Natal Nature Conservation database was used to derive an estimate the number and geographical spread of tourist facilities in the area. It was essential to get a rough estimation of the geographical spread of tourist facilities in the area so that a sample size for the tourism questionnaires could be calculated. This data assisted in calculating a sample size and targeting the target population for the tourist questionnaire.

4.3 Quantitative data

Quantitative data was collected and analysed using Geographical Information Systems (GIS).

MIS (Malaria Information System) data was used to link present and past malaria case data to the small-scale malaria risk maps of the study area. By linking this data, updated small-scale malaria risk maps could be produced for distribution to tourist facilities in the area.

Ward and tribal authority boundary data was obtained from the Utungulu Regional Council and was used in the mapping of the former KwaZulu areas. The ward and tribal authority data were used in the small-scale malaria risk mapping of the area. The data was overlaid onto new geo-referenced areas and new polygons were formed to create small-scale malaria risk maps of the area.

Historical data were obtained from the Department of Local Government and Housing and was used in the mapping of the former KwaZulu areas. The data was overlaid onto ward and tribal authority data to create small-scale malaria risk maps.

The sample size and sample method was decided on after discussion with a statistician at the Medical Research Council. A convenience sample technique was adopted for tourist facilities due to the uneven distribution of facilities in the study area and the high percentage to be sampled. The purposive sample technique was used for the local and international tourists that visited the study area. A pilot study was undertaken in the St.Lucia area to field test the questionnaire and to determine its value, applicability and relevance for the study.

4.4 Data collection techniques

An extensive literature review on data collection techniques was undertaken to investigate all the data collection techniques available for questionnaires. All the advantages and disadvantages of each data collection technique were taken into consideration and subsequently the self-administered survey technique was decided on for both questionnaires (Robinson, 1998).

Self-administered survey techniques were used for both questionnaires but the desired results were not achieved with this technique for several reasons that will be discussed later in the chapter. The self-administered survey technique was first used in June 2000.

Personal direct communication interviews were then undertaken to gather the data from both tourist facilities and local and international tourists that visited the study area. The personal direct communication technique proved to be very successful and the desired sample size was attained using this technique. The personal direct communication interviews took place from July 2000 to June 2001.

Global positioning system technology (GPS) was used to geo-locate all existing and new tourist facilities in the study area. The geo location of these facilities took place in conjunction with the personal direct communication interviews at tourist facilities.

4.4.1 Self-administered survey technique

The self-administered survey technique was initially used for both questionnaires. The first questionnaire was directed at tourist facility owners/managers to obtain general tourism information. Tourist facilities were identified in the study area and questionnaires were e-mailed and posted to the owners/managers together with a covering letter explaining what the study objectives were. The owners/managers of the facilities were asked to complete the questionnaires and to please return them. The self-administered survey technique did not work. Less than 10% of the facilities returned the questionnaires using the above mentioned data collection technique for the tourism questionnaire.

The second questionnaire was directed at both local and international tourists that visited the study area to gather perceived malaria risk information from tourists. Tourist facility owners/managers were asked to distribute and retrieve the tourist questionnaire from both local and international tourists that visited their facility. Ten questionnaires per facility together with a covering letter explaining the aims and objectives of the study were handed out to facility owners/managers of tourist facilities in the area. A very small percentage were completed using the self-administered survey technique for the tourist questionnaire.

The self-administered survey technique was initially decided on due to the advantages of this data collection technique. The mail survey technique is very cost effective and all the contact details of the target population were known. Mail surveys allow the respondent to answer at their leisure, rather than at the often inconvenient moment they are contacted for a telephonic or personal interview.

The disadvantages of the self-administered survey technique outweighed the advantages. A very small percentage of the tourism questionnaires were retrieved using this data collection technique. Tourist facility owners/managers were concerned about the confidentiality of information obtained in the tourism questionnaire. Tourist facility owners/managers were asked about their occupancy rates, number of people employed, and number of beds. The above-mentioned information was seen as

'sensitive' information by the owners/managers of tourist facilities and the questionnaires were subsequently not returned.

A very small percentage of the tourist questionnaires were retrieved using the self-administered survey technique. The questionnaires were distributed to local and international tourists that visited the tourist facilities in the area. Tourist facility owners/managers were asked to distribute and retrieve the tourist questionnaire. The self-administered survey technique did not work for the tourist questionnaire due to tourists not wanting to do "paper work" on vacation and tourist facility owners/managers not wanting to place emphasis on malaria in their areas to tourists.

The self-administered survey technique was therefore abandoned and the personal direct communication technique was incorporated as the data collection technique for the study.

4.4.2 Personal direct communication interview technique

Personal direct communication interviews were undertaken with the tourist facility owners/managers in the study area to gather relevant information. This data collection technique was very time consuming but the advantages of the personal direct communication technique outweighed the disadvantages and the desired sample size was obtained using this technique (Robinson, 1998).

Tourist facility owners/managers co-operated using this technique as the study aims and objectives could be explained to them in person. The confidentiality issue was addressed and the owners/managers were assured that any information obtained through the questionnaires would be kept confidential at all times.

The personal direct communication interview technique was also used for the tourist questionnaire to gather perceived malaria risk information from tourists. Both local and international tourists were interviewed at tourist facilities in the area. This data collection technique worked well and the target population for the questionnaire could be accurately targeted. Both local and international tourists cooperated and the desired sample size was obtained for the tourist questionnaire.

The problem encountered with the self-administered survey technique was overcome with the direct communication interview technique. Most of the tourists were more than willing to spend time completing a questionnaire and they were very interested in the study.

4.5 Questionnaire design

Researchers from the Medical Research Council and Natal University were consulted and it was decided that a questionnaire-based study would be the appropriate method for data collection. Two separate questionnaires had to be developed for the study due to the difference in the target population. The first questionnaire's target population was the owners/managers of tourist facilities in the study area and the second questionnaire's, target population was local and international tourists that visited the study area.

4.5.1 Tourism Questionnaire

The tourism questionnaire (See Appendix 1) had to be developed in such a way that relevant tourism and malaria information could be gathered from owners/managers of tourist facilities in the area. The questionnaire was kept as short and user friendly as possible. The questionnaire was designed in such a way that the respondents were encouraged to complete the questionnaire. The first three questions were very general questions asking the respondents about their knowledge of the malaria control project and factors influencing tourism in their area (Robinson, 1998).

The tourism questionnaire design was a combination of open-ended and closed-ended questions (Robinson, 1998). These types of questions added to the accessibility of the tourism questionnaire. Respondents were asked tourism and malaria related questions using the above-mentioned questioning techniques. Likert and agreement scales proved to be very successful in gathering relevant information for the study (Robinson, 1998).

Researchers from the South African Medical Research Council (MRC) reviewed the relevance of malaria related questions in the questionnaires and a staff member of the

Geography and Environmental Sciences Department of the University of Natal reviewed the questionnaire design and questions related to people's perceptions of malaria and malaria risk in the area.

The questionnaire was piloted in the St Lucia area and minor modifications were made before the final questionnaire was applied to tourist facilities in the study area.

4.5.2 Tourist questionnaire

The tourist questionnaire (See Appendix 1) had to be designed in such a way that the questions asked were relevant to both local and international tourists. It was challenging due to the fact that different answers were expected from the two tourist groups.

It was very important to keep this specific questionnaire as short and user friendly as possible due to the target population, being tourists. Tourists tend to avoid any paper work whilst on vacation so a long questionnaire would be problematic. As with the tourism questionnaire, the tourist questionnaire design was a combination of open-ended and close-ended questions. Rating scales and agreement scales were also successfully used in the questionnaire.

The questionnaire asked the respondent to indicate their location when they completed the questionnaire and to indicate if they were local or international tourists. The tourist questionnaire captured malaria and perceived malaria risk information from tourists. Open-ended and close-ended questions were used extensively in capturing perceived malaria risk information from tourists.

Open-ended and close-ended questions in combination with rating scales and agreement scales kept the tourist questionnaire short, and only the relevant malaria and perceived malaria risk information was captured. Preliminary questionnaires were developed and distributed for review to researchers from the South African Medical Research Council (MRC) and staff members from the Geography and Environmental Sciences Department of the University of Natal.

After review by the above-mentioned institutions the tourist questionnaire was piloted in the St.Lucia area. Minor modifications and adjustments were made to the questionnaire before it was applied to local and international tourists that visited the area.

4.6 Sampling

A literature review was undertaken to investigate sampling in research (Salant and Dillman, 1994). After determining the target population for the study and the possible sample size for the questionnaires both researchers from the Medical Research Council and Natal University were approached for input. After careful consideration and discussion with these institutions two methods of sampling were decided on for the two questionnaires that were used in the study.

The purposive sampling technique (Patton, 1990) was decided on and used for the tourism questionnaire due to the uneven distribution of tourist facilities in the study area. Most facilities are clustered in the Hlabisa district in the south of the study area. The perposive sampling technique allowed flexibility with regards to targeting relevant tourist facilities for the study. Hotels, motels, backpackers, caravan parks, camping facilities, guesthouses, bed and breakfast and lodges were targeted to gather relevant tourism information.

The Tourism KwaZulu-Natal database was used to calculate the number of relevant tourist facilities in the study area. A sample size for each of the three districts, Swaziland and Mozambique was calculated using this data. A total of 86 tourist facilities were visited in Hlabisa, Ubombo, Ingwavuma, Swaziland and Mozambique. Due to the uneven distribution of tourist facilities the sample sizes varied accordingly. Owners and managers of 49 tourist facilities in Hlabisa were interviewed, 16 in Ubombo, 8 in Ingwavuma, 6 in southern Mozambique and 7 in Swaziland.

The purposive sample technique was used for the tourist questionnaire. The geographical spread of tourist facilities and the seasonality of tourism in the area made it difficult to obtain the sample size for the above-mentioned questionnaire. A total of 35 tourists were interviewed in each district in northern KwaZulu-Natal

(Hlabisa, Ubombo, Ingwavuma). A further 35 tourists were interviewed in Mozambique to get the total of 140 interviewed tourists.

Both local and international tourists that visited the study area formed the target population for the questionnaire. A total of 140 tourists were interviewed in the study area. Eighty-two of the 140 interviewed tourists (59%) were South African and the other fifty-eight tourists (41%) were international tourists visiting the study area.

4.7 Pilot study

The geographical area targeted by the Lubombo Spatial Development Initiative (LSDI) is broadly defined as eastern Swaziland, southern Mozambique and north-eastern KwaZulu-Natal. The study area stretches from St.Lucia in the south to Maputo in the north and Manzini in the east. The proximity of St.Lucia to Durban and the tourist facility density of the area made St.Lucia the perfect pilot study location for the study.

Dr. Immo Kleinschmidt, a statistician at the Medical Research Council was consulted about an adequate sample size for the pilot study. A sample size of 20 for each questionnaire was decided on for the pilot study to determine if correct and relevant information was being gathered.

The tourism questionnaire was piloted first. Only selected tourist facilities such as hotels, motels, backpackers, caravan parks, camping facilities, guesthouses, bed & breakfast and lodges were targeted so a representative sample had to be taken during the pilot study. The personal direct communication technique was used during the pilot study. At least two of each of the above mentioned tourist facility types were sampled during the pilot study. After careful consideration and dialogue minor changes were made to the tourism questionnaire.

The tourist questionnaire was aimed at local and international tourists that visited the area. A representative sample of tourists had to be sampled during the pilot study therefore ten local and ten international tourists were interviewed. The personal direct communication technique was also used for the tourist questionnaire pilot study. After

analysing the data retrieved from the tourist questionnaire minor changes were made before the questionnaire was widely distributed to tourists visiting the area.

4.8 Global positioning system (GPS) and mapping

The geo-location of tourist facilities in the study area was of paramount importance for the study due to the fact that small-scale malaria risk maps were non-existent for the area.

The technology to obtain coordinate locations through the use of GPS receivers was developed by the USA Department of Defence using the Navstar satellite system. This consists of over 24 satellites that orbit the earth at a distance of 20 600 km, and allows for global coverage. The atomic clock in the satellites transmit high frequency signals with time-specific patterns that are matched with patterns in the GPS receiver on the ground, thereby determining the time the signal took to travel to earth. The interception of a minimum of three satellite signals allows the receiver to calculate its position on earth with respect to latitude and longitude, a minimum of four being required to include altitude (Longsdon, 1992).

The study area used to be sub-divided into broad generalized malaria risk areas, and varied from low risk to high risk. These risk maps of the past were very generalized and included lower risk areas into high-risk areas and visa versa. One of the goals of this study was to produce small-scale malaria risk maps for the area.

All existing and new tourist facilities were geo-located to capture the co-ordinates of the facilities and to display the geographical spread throughout the area. A total of 86 Tourist facilities were geo-located in the study area. The co-ordinates captured in this way were used in the small-scale variation mapping of malaria risk in the area. The tourist facility co-ordinates were overlaid on top of the small-scale malaria risk map of the area to graphically display the geographical spread of tourist facilities in relation to malaria risk in the region. Magellan 320 handsets were used to capture the tourist facility co-ordinates.

As a result of this research, small-scale variation malaria risk maps are now available for the area (See Figures 37 & 38). MapInfo 5.5 was the Geographical Information System (GIS) package used to create the maps for the study. All the geo- located coordinates were imported into the MapInfo GIS programme and overlaid on top of the existing malaria prevalence data to graphically display the distribution of tourist facilities in the area. This mapping process was possible for Ingwavuma and a section of Ubombo due to the availability of smaller disseminations of the area. The southern or former KwaZulu areas were historically low risk areas and no data was available for these areas.

Malaria surveillance agents from the Department of Health in the Richards Bay office were trained in geo-locating the former KwaZulu malaria surveillance areas so that a small-scale variation map of the whole area could be created. The surveillance agents were trained and sent into the field to capture all the co-ordinates of their respective surveillance areas. All the co-ordinates captured were imported into MapInfo and were overlaid in combination with ward, tribal authority boundary data and 1:50 000 topographic data to create the small-scale malaria risk maps for the area.

4.9 Study limitations

Several study limitations were encountered during the study. One of the major impediments was the vast area targeted by the study. The areas of northeastern KwaZulu-Natal, eastern Swaziland and southern Mozambique cover an area of approximately 36 607 sq. km. The tourism facilities are very unevenly distributed throughout the Lubombo corridor with the biggest concentration being in the Hlabisa district. The data collection phase of the study was therefore very time consuming and also difficult due to the nature of the study.

The data collection techniques posed challenges due to the limitations of each technique. A trail and error approach was used in the pilot study phase to eliminate techniques that were not successful. The self-administered survey technique was initially used for both questionnaires. This technique proved to be unsuccessful due to the small number of respondents who were prepared to complete the questionnaires.

This is a common problem with this method. The mail and facsimile survey technique was then used and an even smaller number of respondents responded to the technique.

The personal direct communication interview technique was then chosen and used due to the effectiveness of this technique. Although the personal direct communication interview technique was effective it was very time consuming and expensive due to the time spent in the field, mileage travelled, visa costs and accommodation costs.

There was initially some resistance from the tourism operators in answering the questions, as they did not want to reveal data about occupancy rates and employment statistics, as this is sensitive information for their business. However, once they were informed of the purpose of the study and trust was established between the researcher and themselves they did provide this data. This data may be biased, as they may not have revealed the correct information.

The tourists needed to be encouraged to participate in the survey as they were on holiday. However, once the researcher explained that it would only take a few minutes and provided the reason for the study they were much more willing to participate.

The LSDI area does not have clear geographical boundaries. It is described as the area that includes southern Mocambique, northeastern KwaZulu-Natal and eastern Swaziland. This has implications for the maps produced in this study as the LSDI area could not be included as a single layer (see Figure 1, 5, 6, 7).

4.10 Conclusion

Primary data obtained through the use of questionnaires laid the foundation for the study. The tourism data was essential for the study and enabled the assessment of the influence of malaria on the tourism sector in the area. The data obtained from the tourist questionnaire enabled the interpretation of tourist perception towards malaria and malaria risk in the area.

The secondary data used in the study played a very important role especially in the mapping component of the study. Without the secondary data, used as backdrop information, the small-scale variation mapping of the area would not have been possible. Both qualitative and quantitative methods were used for this study. The qualitative methods provided insight into tourist's and tourism operators' perceptions of malaria risk. The quantitative methods provided information on the actual levels of malaria risk and it showed the changing patterns and levels of malaria risk in southern Africa.

Chapter 5: Analysis

5.1 Introduction

The data collected in this study is analysed both qualitatively and quantitatively. It is represented in the form of graphs and tables. Four themes have been selected in the interpretation of the data. These are:

- Tourism in the LSDI: General and specific background on tourism in the Lubombo corridor is presented in this section. A profile of the tourism industry in the area is hence presented.

- Perceptions of risk: The factors that influence tourism in the Lubombo corridor are presented in this section. The perceptions of local/international tourists and tourist facility owners/managers where captured and perceptions on malaria and malaria risk where analysed and presented. This section therefore contains mainly qualitative data.

- Incidence of malaria: A scientific representation of malaria risk is discussed in this section. All the small-scale malaria risk maps, together with the discussion and analysis of the maps are presented here. This section details incidence of malaria and therefore provides insight into the "actual" risk of malaria in the Lubombo corridor.

- Control of malaria risk: Both local and international tourists and tourist facility owners/manager's perceptions of malaria control and prevention are presented in this section.

5.2 Tourism in the LSDI

Information on the numbers of tourists that visit an area plays a key role in any health risk assessment. It is also important to know the number of tourists that visited the interviewed tourist facilities in the Lubombo corridor so that the number of people at

risk can be monitored on a yearly basis. This data can also be used to assess the tourism growth in the area.

Table 1: Total number of tourists that visited the interviewed facilities.

Origin of Tourists	Number Visiting the Facility per Year	Percentage
Local Tourists	21 613	39%
International Tourists	34 352	61%
Total	55 965	

The majority of tourists that visited the interviewed tourist facilities per year in the Lubombo corridor were international tourists (34 352) followed by local tourists (21 613) (See Table 1). This is a significant number of people and it supports the need to develop and maintain a malaria control programme in the area. It is also significant that there were more international tourists visiting the area than local tourists. This implies that international tourists and travel agencies need to be targeted with malaria risk and malaria control information.

Table 2: Number of beds at the sampled tourist facilities.

Area	Total number of beds
Hlabisa	3436
Ubombo	334
Ingwavuma	662
southern Mozambique	579
Total	5011

Hlabisa has the most beds at tourist facilities that were included in the study in northern KwaZulu-Natal followed by Ingwavuma and Ubombo. Swaziland has 566 beds at interviewed tourist facilities followed by southern Mozambique 579 (Table 2). The statistics on the number of beds available at the tourist facilities is important information for monitoring an increase in tourism. The number of beds will increase when the numbers of tourists that visit these areas increase in future.

The place of origin of both local and international tourists is considered. This provides information on the profile of tourists that visit the Lubombo corridor and the home place that should be targeted with malaria awareness campaigns.

Profile of South African tourists.

The majority of tourists, 34% that visited the Lubombo corridor came from the Gauteng province followed by KwaZulu-Natal province (30%). The proximity of KwaZulu-Natal and Gauteng to the study area might be one of the reasons why 63% of the interviewed tourists came from these provinces (Figure 12). A large number of local tourists also originated from the Free State province, 13%, and Mpumalanga province, 7%.

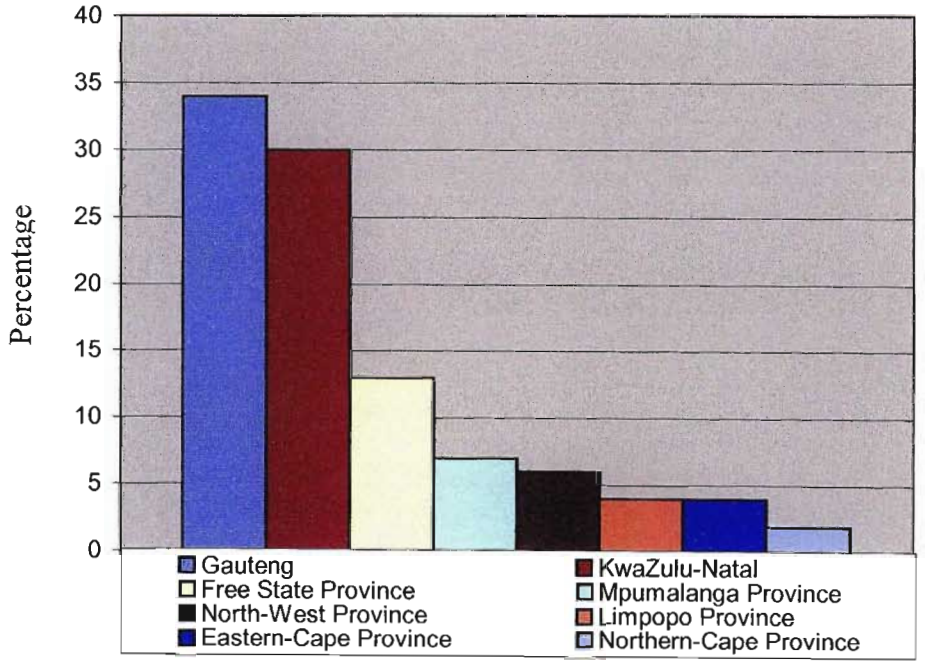


Figure 12: Home province of local tourists visiting the LSDI area.

The majority of South African tourists, 30%, stay an average of 7 days at the tourist facilities followed by 2 days (24%) and 3 days (20%). South African tourists tend to choose a holiday destination and stay at a facility for the duration of their vacation (See Figure 13).

The majority of South African tourists stay a relatively short period at the tourist facilities. Malaria prophylaxis guidelines vary depending on the medication prescribed but most of the prophylaxis treatment must be taken up to six weeks after being in a malarious area. South African tourists obviously attach a great deal of value to the Lubombo corridor if they are willing to complete a six-week malaria prophylaxis course after visiting an area for less than a week. Alternatively they may not be taking prophylaxis and prefer to take the voluntary risk of being infected with malaria for a short period of time.

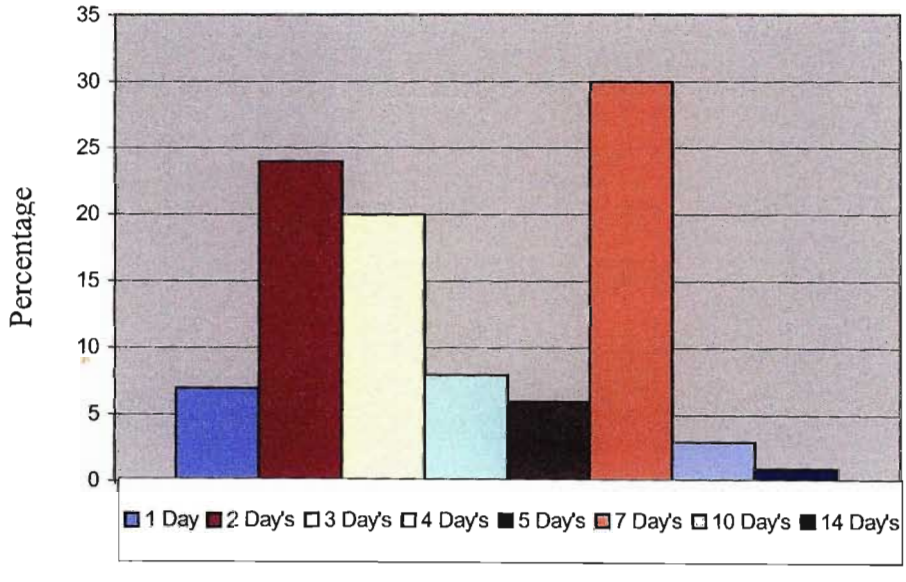


Figure 13: Average stay of South African tourists.

Profile of international tourists.

With respect to the majority of international tourists interviewed, 55% came from Germany, the UK and the USA (Figure 14). The South African Tourism Organisation (SATOUR) has engaged in an aggressive marketing campaign in all three of these countries and this data might be a reflection of the marketing campaign.

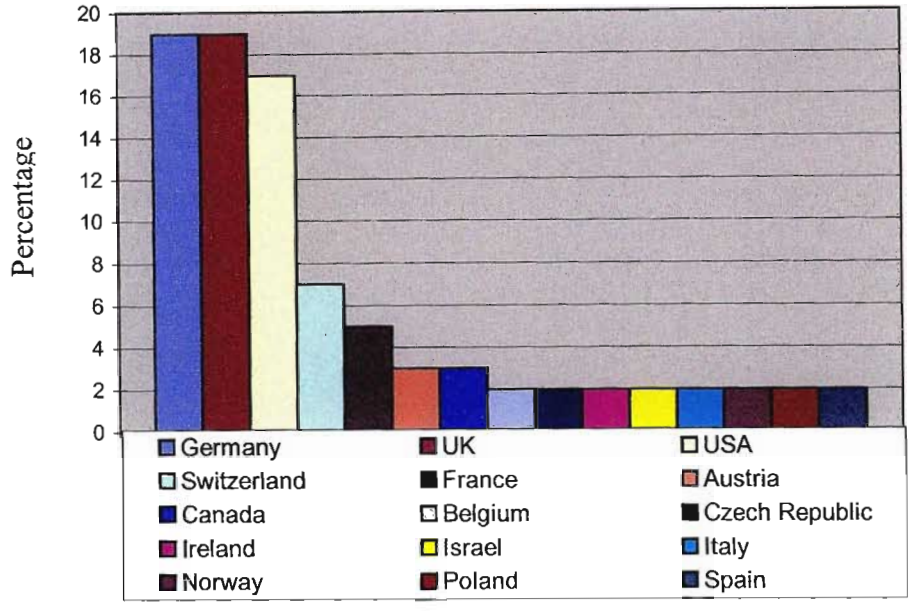


Figure 14: Home country of international tourists visiting the LSDI area.

According to the World Tourism Organisation's (WTO) long term forecasting assessment, South Africa will be the prime beneficiary of tourism growth in Africa. It is estimated that the four main long-haul markets, United Kingdom, Germany, the United States and France are expected to grow by more than 10% a year, boosting arrivals from 6 million in 2000 to 30.5 million by 2020.

The perceptions of international tourists of malaria risk are largely shaped by the information they receive. This data therefore indicates which countries should be targeted in malaria awareness campaigns.

A third of international tourists, 33% stay on average 2 days at tourist facilities in the area followed by 3 days (29%) and 4 days (14%). International tourists tend to stay shorter periods of time due to the fact that they want to see as much as possible in a limited space of time, and so travel and move around more than their local counterparts.

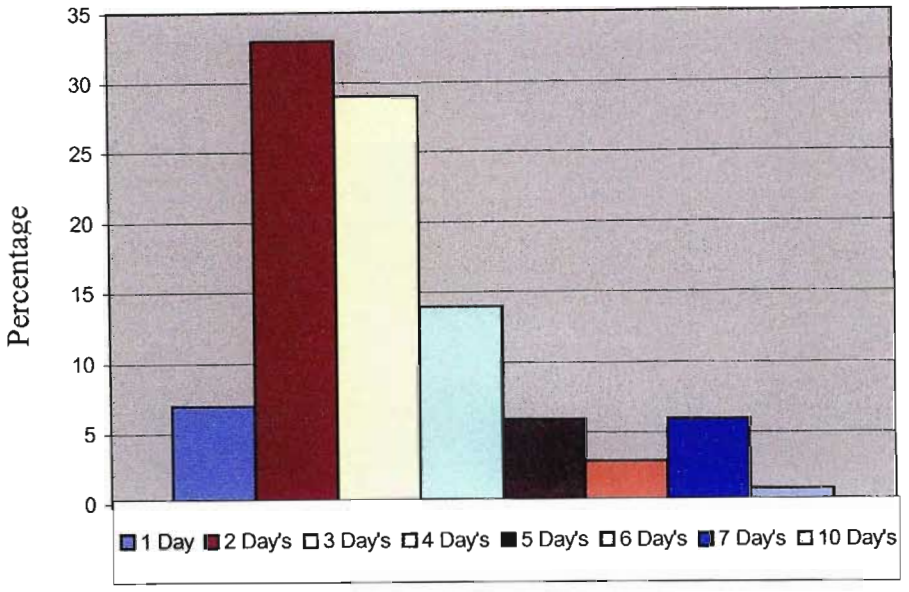


Figure 15: Average stay of international tourists.

The mobility of international tourists whilst on vacation to the area has malaria precaution implications for the tourist. Due to the uneven distribution of malaria in the Lubombo corridor, tourists visiting the area could visit high malaria risk areas to malaria free areas within a week. Many of these tourists stop using the chemoprophylaxis when entering the malaria free areas, increasing their chances of developing malaria if an infected mosquito in the risk areas has bitten them.

Seasonality of tourism.

The majority of tourist facility owners/managers, 81%, perceive tourism to be seasonal. Only 19% perceive tourism to be non-seasonal in the Lubombo corridor (Figure 16). By capturing the seasonality of tourism to the area any changes in the current trend can be monitored by considering when visitors come to the area. It is important to know when the influxes of tourism to the area occur, so that this can be measured against the malaria prevalence and the malaria transmission seasons of that specific area.

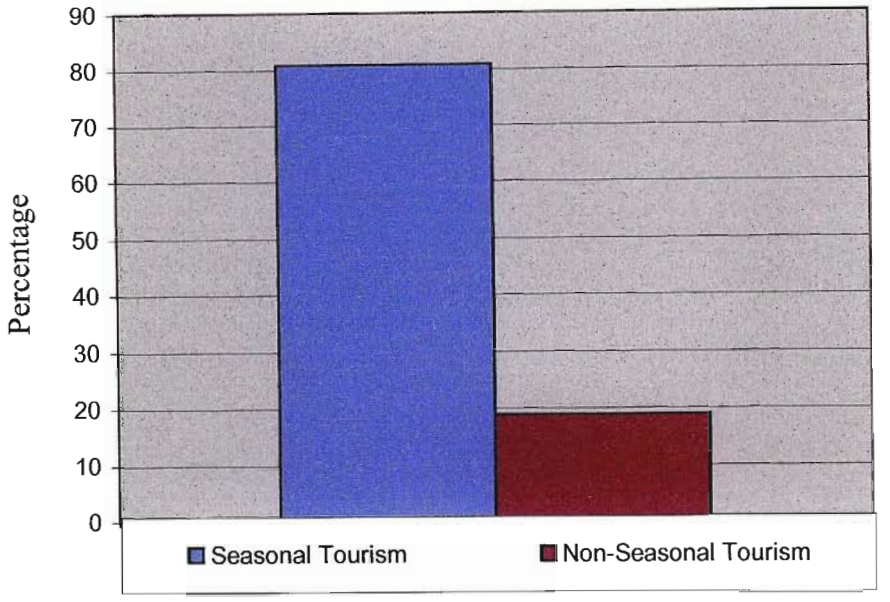


Figure 16: Perceived seasonality of tourism.

Tourist facility owners/managers state that January (56%), February (47%), November (56%) and December (64%) are the peak tourism months in the Lubombo corridor (Figure 17). Many international tourists seek out warmer climates in the European winters and the African summers are very popular amongst these groups. Local tourists have their annual summer holidays during November and February, so that explains the influx of tourists in these months. The majority of tourist facility owners/managers consider the months of May (13%) to be the lowest tourism month of the calendar year in the Lubombo corridor.

By capturing the perceived seasonality of tourism in the Lubombo corridor and comparing it to the peak malaria months it is possible to calculate the amount of tourists that will visit the area in the high malaria transmission months. Malaria awareness campaigns should be launched to make tourists that visit the area in high-risk months aware of malaria and so that they can construct an informed perception of risk.

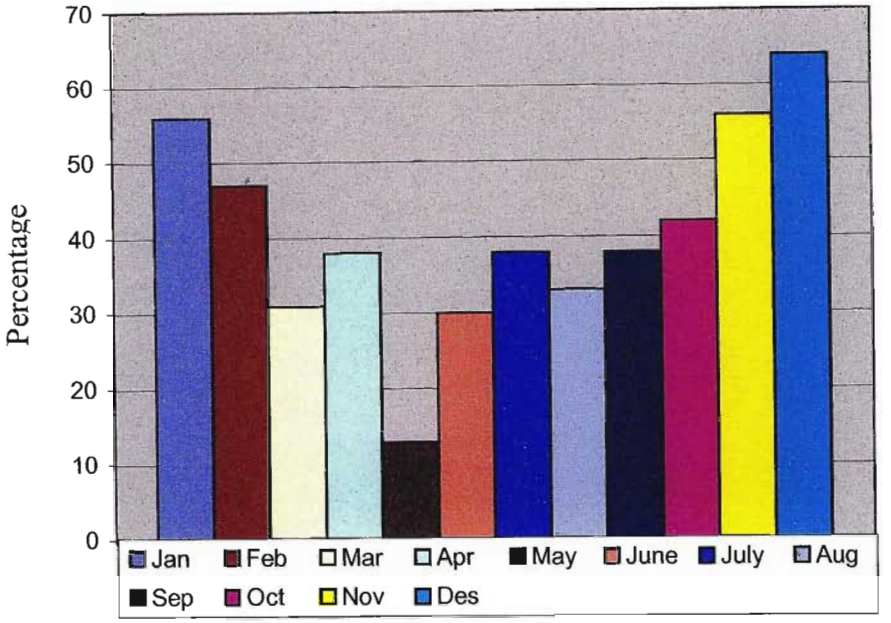


Figure 17: Seasonality trend of tourism in the LSDI area.

All countries in the southern Africa region show a similar seasonal pattern of malaria transmission (le Sueur and Sharp, 1996) with malaria transmission starting no earlier than October, increasing through to March, April, May, declining rapidly in June with very few cases occurring through to October. The onset of the seasonal epidemics varies annually starting between October and February coinciding with the onset of seasonal rainfall and progression of season.

The months of March, April and May are considered to be the peak malaria transmission months in southern Africa. As can be seen in Figures 48 and 49, both local (31%) and international (21%) tourists list travelling in winter months as the reason for not taking prophylaxis. Although tourism peaks between November and February in the Lubombo corridor, the month of April experiences an influx of tourism due to the Easter weekend and several public holidays (Good Friday, Family Day and Freedom Day). Malaria awareness campaigns need to be initiated during this time to inform tourists about malaria and the necessary precautionary measures that exist to prevent malaria infection.

Awareness of the LSDI.

When tourist facility owners/managers were asked if they were aware of the Lubombo Spatial Development Initiative project, a large percentage (71%) were aware of the LSDI project but only 53% of the operators at these facilities could comment on the main activities and objectives of the project (Figure 18). Malaria control is one of the main focus areas of the LSDI project and it is of concern that very few tourist facility operators know about disease control taking place in the area as part of the LSDI. Tourist facilities need to be made aware of the different components, aims and objectives of the project so that they can realise the long-term benefit for tourism in the Lubombo corridor.

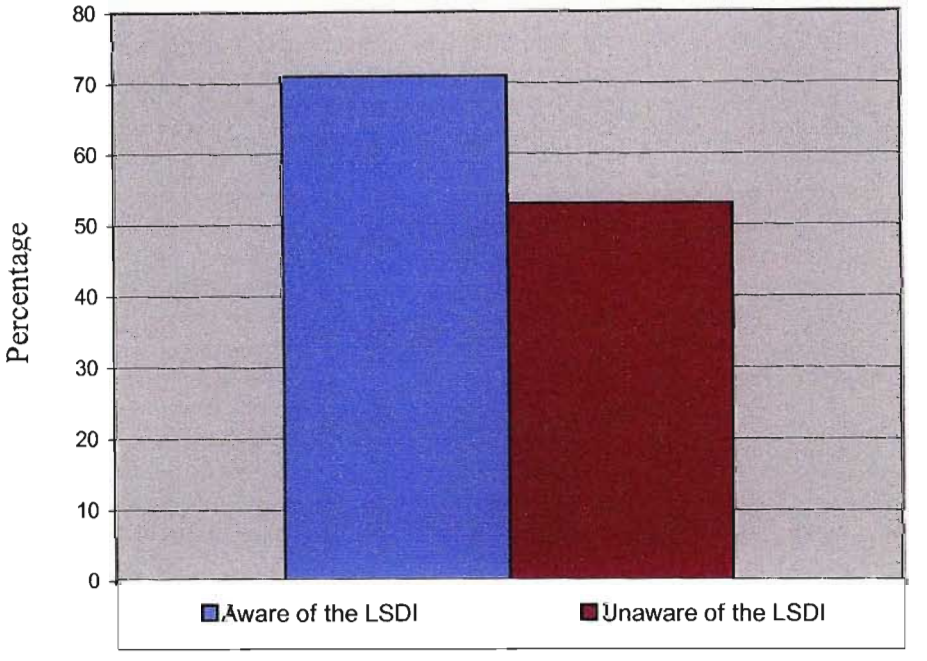


Figure 18: Levels of awareness of the Lubombo Spatial Development Initiative.

The base line data concerning tourist facility owners/managers knowledge about the LSDI project is very important, and it will be collected and assessed on a yearly basis to determine if people's knowledge and perceptions about the project changes with time. It is crucial that tourist facility owners/managers, local and international tourists, businesses and local inhabitants know about the project, especially the positive outcome of disease control in the Lubombo corridor.

Travel concerns.

Local and international tourists were asked if they were hesitant about travelling. The majority of tourists (73%) visiting the area were not hesitant (Table 3). These statistics are interesting since a large percentage of local and international tourists listed major issues of concern before coming on vacation to the area.

Table 3: Local and international tourists hesitation about trip.

Hesitant about coming on trip
Yes – 27%
No – 73%

A large number (140) of local tourists (Figure 26) listed major issues of concern. The major issue of concern amongst local tourists was malaria (37%), followed by cholera (11%) and safety (9%). One hundred and eleven international tourists (Figure 27) listed issues of concern and the major issues of concern amongst international tourists were malaria (28%), followed by crime (15%) and safety (14%).

Awareness of the malaria risk.

A vast majority (94%) of the interviewed tourist facility operators in the LSDI area perceive that they live in a malarious area (Figure 19). The area in question is considered to be a malarious area but the distribution of the disease is non-homogeneous as can be seen in Figure 37 & 38. The perception amongst tourist facility owners/managers regarding malaria prevalence in their immediate area is a good example of how long it takes for people to change their perceptions if they do not receive updated and correct malaria distribution data on a regular basis.

The information flow between tourists and tourism operators is very important. People's knowledge of risk and risk distribution determines how they perceive the risk in question (malaria). It is therefore very important to provide correct and updated malaria information on a yearly basis so that tourists and tourism operators can improve their knowledge about the risk and to help them to construct an informed perception of risk in their area. It is furthermore important to reduce the malaria information lag time so that tourists and tourism operators know what the malaria risk

of an area is before they visit the area. The use of Internet web sites will minimise the lag time and improve the information flow between health authorities and the general public. A good example of such an web site is http://www.malaria.org.za where people can obtain general and specific malaria information on prophylaxis, treatment, case statistics, advice to travellers and risk areas relevant to the southern African context.

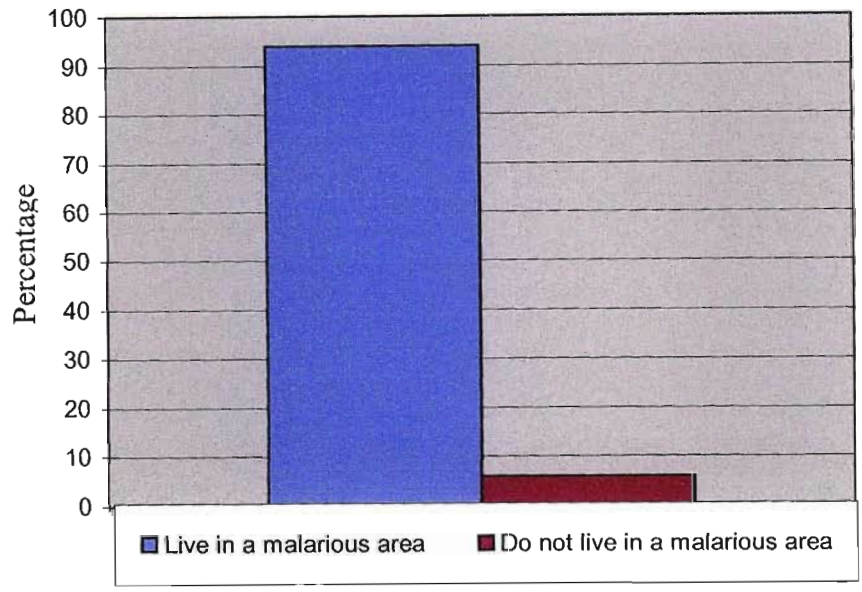


Figure 19: Location of tourist facilities and malaria risk.

The Lubombo spatial development initiative has had major successes in their fight against malaria since the project started in 1999. Tourist facilities and tourists must be made aware of the positive outcome of disease control in the Lubombo corridor.

Availability of malaria information.

A very large percentage 81%, of tourist facility owners/managers supply guests with malaria information while visiting their facility. The malaria information supplied by the tourist facility owners/managers to tourists is mainly informal information 86% (Table 4). Informal malaria information consists of verbal dialog between the tourist and tourist facility owners/managers. Formal information consists of documents obtained from reputable sources concerning malaria risk and precautionary measures to prevent malaria infection.

Table 4: Provision of information on malaria.

Provision of Information	Percentages
Yes	81%
No	5%
No response	14%
Formal information	14%
Informal information	86%

Although the provision of malaria information to tourists is positive, the quality of informal information is unknown and a cause for concern. There is a great need for formal malaria information amongst tourist facility owners/managers as can be seen in Figure 5. The information flow between Health authorities, tourist facilities and the tourists that visit the Lubombo corridor is very important and equips the tourists with updated malaria information when visiting the Lubombo corridor.

Table 5: Request for malaria information by owners/managers of tourism facilities.

Request for malaria information	Percentage
Yes	95%
No	5%

The fact that 95% of the interviewed tourist facility owners/managers require more malaria information is a clear indication that malaria is a main issue of concern amongst owners/managers of tourist facilities (Table 5). Many interviewed tourist facility owners/managers commented on the need for formal malaria information. "All my tourists ask me about malaria and I do not know enough about the disease to give them adequate information. I have found myself in embarrassing situations before " (Respondent 1, 19 April, 2001). A second operator stated, "I am willing to pay for it!" (Respondent 2, 30 May, 2001).

Profile of tourist facilities.

The highest numbers of tourist facilities (30%) in the LSDI area (Figure 20) have been in business between 2 and 5 years followed by more than 10 years (24%) and between 5 and 10 years (22%). By looking at the statistics, it is clear that the majority of tourist facilities are established and stable. These statistics are vital in the future monitoring of tourism growth in the area. The Lubombo corridor is set for massive tourism growth, therefore there should be an increase in new tourism facilities as the tourist numbers increase to the area.

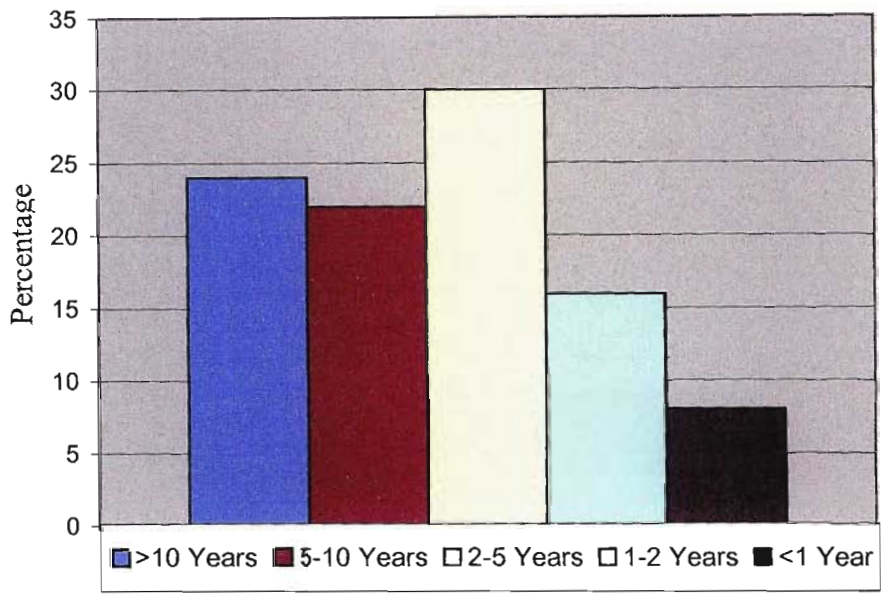


Figure 20: Length of time in business.

The bulk (50%) of tourist facilities (Figure 21) in the Lubombo corridor were classified as lodges followed by guesthouses/Bed and breakfast (29%), hotel/motels (12%), youth hostels/backpackers (5%) and caravan parks/camping facilities (5%).

This data enables monitoring of changes in the facility type as the tourism sector develops in the Lubombo corridor. The large number of lodges in the area is an indication that many tourist facilities cater for the overseas and high-income markets. The facility's pricing structure is a clear indication of their target market. It is quite common for these facilities to charge tourists between R850 – R2000 per person per day.

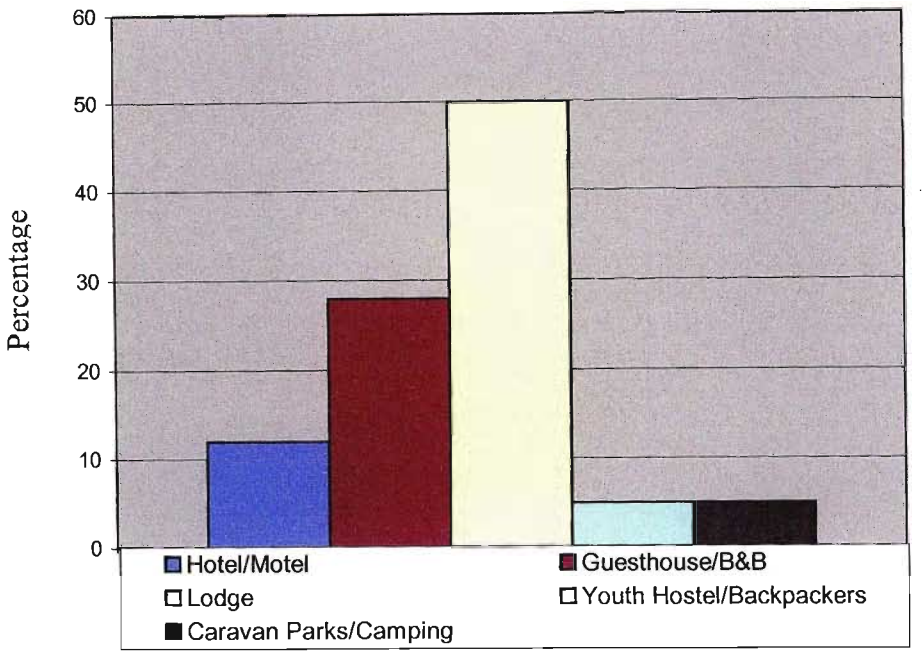


Figure 21: Type of tourist facilities included in the study.

Many other facilities such as bed and breakfasts, guesthouses, self-catering accommodation, camping and caravan parks exist in the Lubombo corridor that cater for the low and medium income groups. These facility's pricing structure vary according to the seasonality of tourism and facility type, but visitors can expect to pay anything from R80 – R500 per person per day at the above-mentioned facilities.

5.3 Perception of risk

The factors that influence tourism in the Lubombo corridor are presented in this section. It is important to analyse both positive and negative factors that influence tourism in the Lubombo corridor. The perceptions of tourism operators toward tourism assets in the study area were examined. Respondents were asked to indicate what resources were most valuable to tourism in the area.

The majority of tourist facility operators in the LSDI area consider the game reserves (14%) and the natural environment (14%) as their biggest tourism assets in the Lubombo corridor. The beaches (12%), wildlife (8%), fishing (7%) and the world heritage (9%) status of the area are all factors that influence tourism positively in the area (Figure 22). Since this was an open ended question tourists generated the

categories and that influences the percentages under each category. For example beaches, game and elephants would also fall under the category of environment.

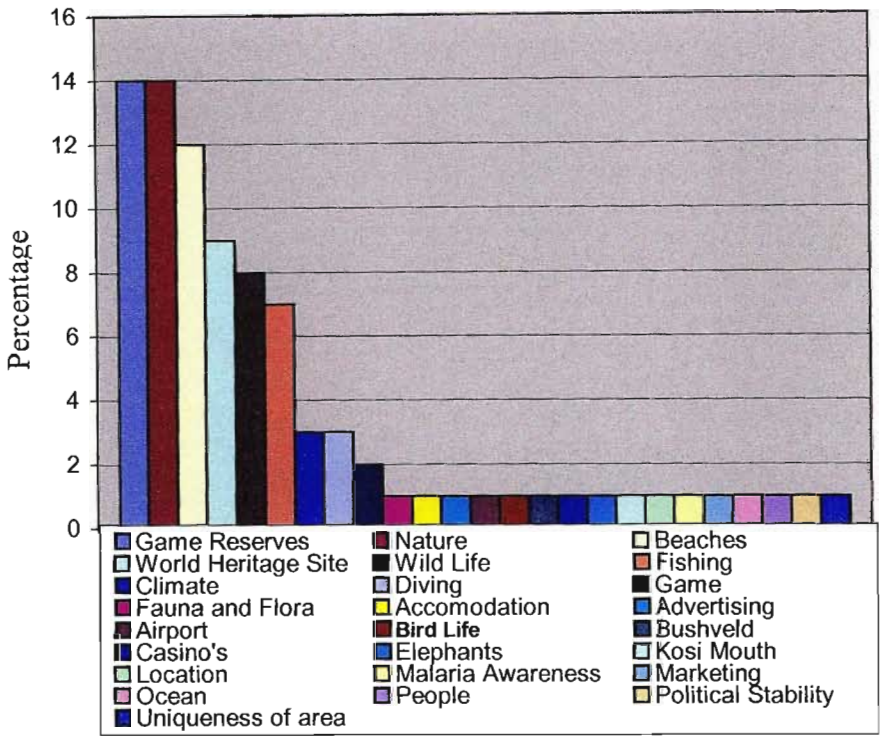


Figure 22: Factors positively influencing tourism in the area.

Both positive (Figure 22) and negative (Figure 23) factors that influence tourism will be monitored on a yearly basis by this study. It is important to assess the change in perception amongst tourist facility owners/managers of malaria risk. Several internal issues such as infrastructure development, craft market development and marketing and external factors such as political instability in neighbouring countries, crime and violence will play an important role in the future development of the Lubombo corridor.

Impact of malaria on tourism.

The majority of the tourist facility operators in the LSDI area, 44%, consider malaria to be the main negative factor influencing the tourism sector followed by crime (19%) and media reports on malaria (12%). The combined percentage of malaria risk and media reports on malaria is 56%, which correlates with the major issue of concern raised by local (Figure 27) and international tourists (Figure 28), namely malaria.

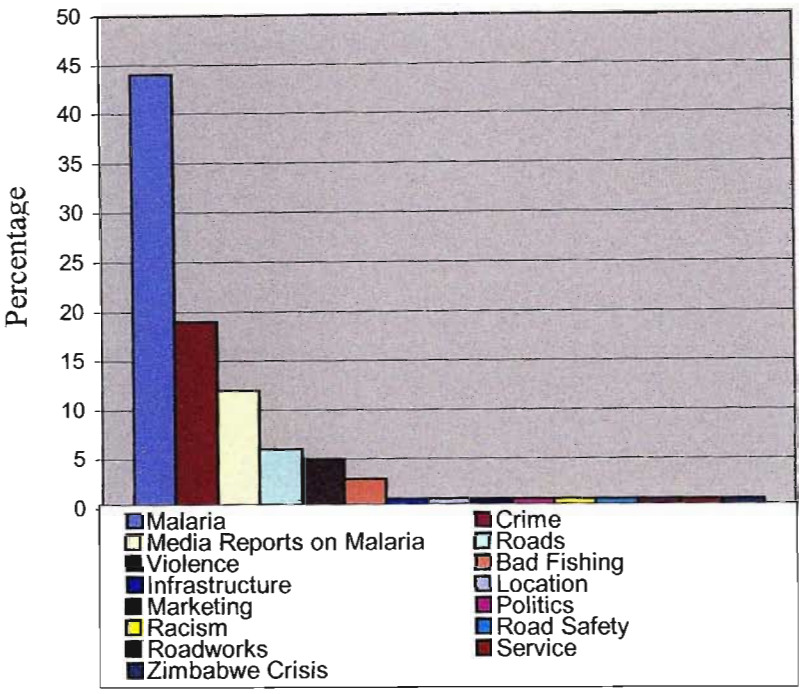


Figure 23: Factors which negatively influence tourism.

When asked if malaria has any influence on tourism (Figure 23) a large percentage of respondents, 66%, strongly agreed that malaria has a negative impact and influence on their businesses. Twenty nine percent of the tourist facility owners/managers agreed that malaria impacts on tourism. In total 95% of respondents either strongly agreed or agreed that malaria has a major influence on the tourism industry in the LSDI area. These statistics will be collected and assessed on a yearly basis by this study to monitor facility owner's/manager's responses. It is suspected that the responses given will change with time due to the positive outcome of malaria control in South Africa, Swaziland and Mozambique.

It will be interesting to note how long it takes for information about the regional malaria reductions to reach tourists and tourism facility operators and to assess what influence it will have on their perception of risk.

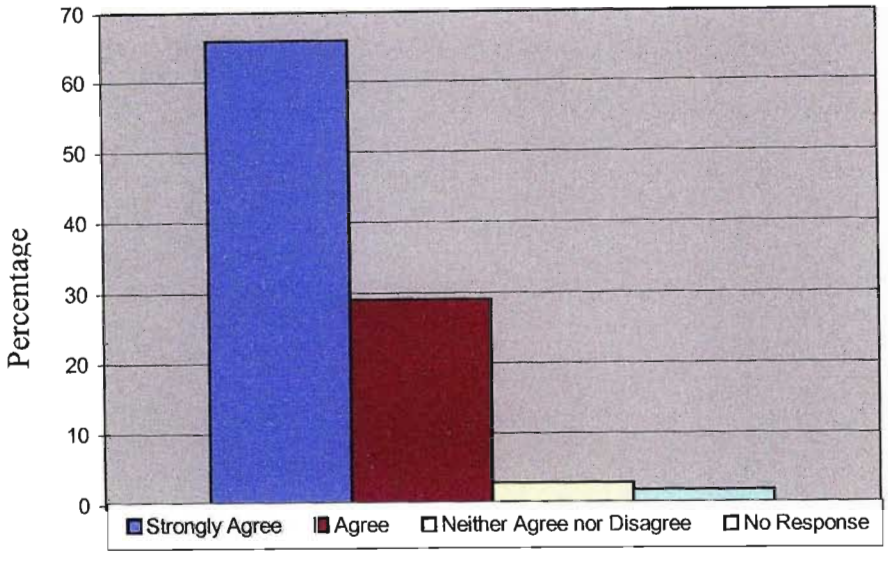


Figure 24: The perceived impact of malaria on tourism.

It is clear that all tourism facility owners/managers (Table 6) in the northern KwaZulu-Natal districts and southern Mozambique perceive that malaria has a very negative influence on tourism in their respective areas.

Table 6: Malaria influence on tourism in Hlabisa, Ubombo, Ingwavuma and southern Mozambique.

Areas	Strongly Agree to Agree	Neutral to Strongly Disagree
Hlabisa	88%	12%
Ubombo	94%	6%
Ingwavuma	88%	12%
Southern Mozambique	100%	0%

Eighty eight percent of tourism facility owners/managers in Hlabisa and Ingwavuma either strongly agreed or agreed that malaria impacts on tourism to the above-mentioned question. An even larger percentage of tourism facility owners/managers in Ubombo (94%) and southern Mozambique (100%) either strongly agreed or agreed that malaria has a detrimental effect on tourism in their immediate areas.

These statistics correlate with the malaria transmission of the different areas. Out of the four mentioned areas, southern Mozambique has the highest malaria prevalence followed by Ubombo, Ingwavuma and Hlabisa (See Figure 4 & 5).

Impact of malaria on South African tourists.

The following graph represents the impact malaria has on local tourists and their willingness to visit the area as perceived by tourism operators.

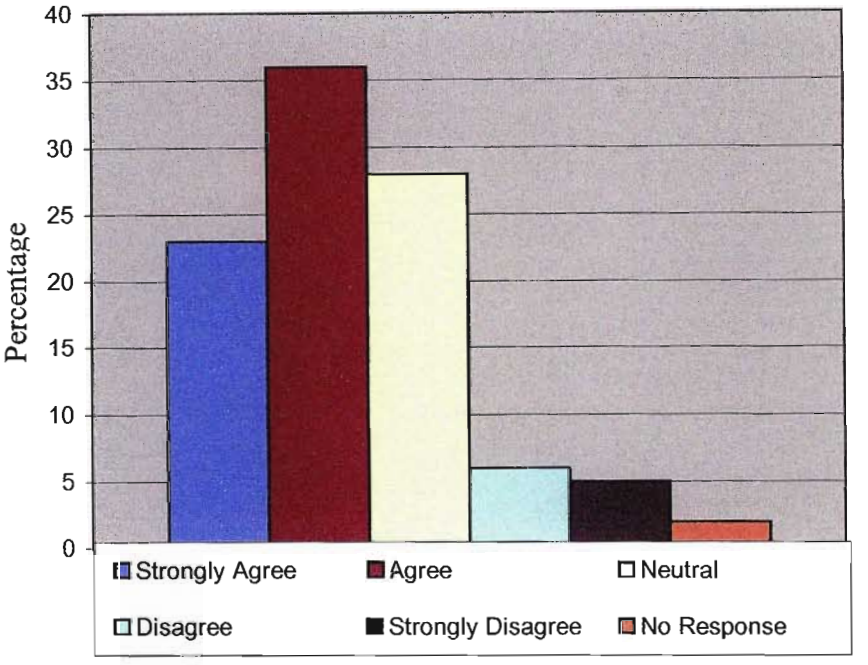


Figure 25: The perceived impact of malaria on South African tourists.

The combined percentage of tourist facility operators that either agreed or strongly agreed that malaria impacts on South African tourists is 59%, indicating that malaria has a definite negative impact on the number of South African tourists that visit the area. Twenty eight percent of the tourist facility operators neither agreed nor disagreed with this question. This study suggests that the perceptions and comments of tourist facility owners/managers will change with time due to the resent regional malaria reductions.

It is clear that tourism facility owners/managers in southern Mozambique (Table 7) perceive that malaria has a significant negative influence on the number of South African tourists that are prepared to visit the area or facilities.

Table 7: Malaria's influence on South-African tourists visiting this area/facility.

Areas	Strongly Agree to Agree	Neutral to Strongly Disagree
Hlabisa	56%	44%
Ubombo	44%	56%
Ingwavuma	50%	50%
Southern Mozambique	100%	0%

Fifty six percent (56%) of tourism facility owners/managers in Hlabisa perceive that malaria has a negative influence on the number of South African tourists that visit the area or facilities followed by Ingwavuma (50%) and Ubombo (44%).

The perception amongst facility owners/managers is that malaria has a greater negative impact on international tourists, 63%, as opposed to South African tourists, 23% (See Figure 26).

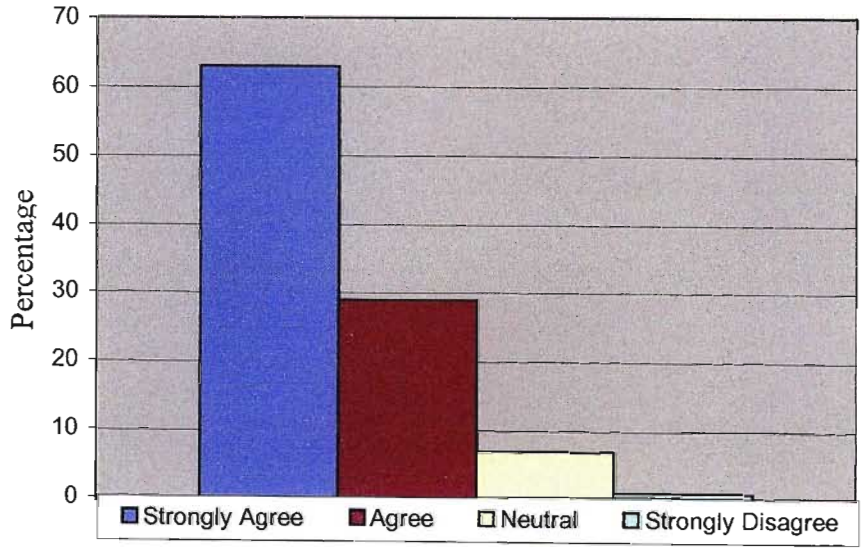


Figure 26: The perceived impact of malaria on foreign tourists as opposed to South African tourists that visit the area.

Tourism operators suggested that the foreign tourist market (93%) was more sensitive to the impacts of malaria than the South African tourist market (59%). International tourists visiting the area perceive that the disease is "uncontrolled" so they feel vulnerable towards the risk in question.

Knowledge of the risk and the control over the risk plays a large part in the construction of risk perception. It is expected that the perception of risk will change with time due to the reduction in malaria and media awareness campaigns.

It is clear that tourism facility owners/managers in southern Mozambique (100%), Ingwavuma (100%) and Ubombo (100%) strongly agree or agree that malaria has a greater negative impact on international tourists in comparison to South African tourists that visit their respective areas and facilities (See Table 8). Tourism facility owners/mangers in Hlabisa (86%) strongly agreed or agreed with this question.

Table 8: Malaria's influence on overseas tourists visiting this area/facility.

Areas	Strongly Agree to Agree	Neutral to Strongly Disagree
Hlabisa	86%	14%
Ubombo	100%	0%
Ingwavuma	100%	0%
Southern Mozambique	100%	0%

It is of concern that such a high percentage of tourist facility owners/managers perceive malaria to have such a negative influence on international tourists given that the bulk of tourists that visited the interviewed facilities are international tourists (Table 1). The tourism facility owners/managers must be made aware of the positive outcome of regional malaria control in the Lubombo corridor so that they can relay the positive news to their guests. A reason for the perception that malaria has a greater negative influence on international tourists as opposed to South African tourists is that international tourists ask the facility owners/managers more about the disease. Local tourists are more knowledgeable on the local distribution of the disease.

Issues of concern for tourists.

Local and international tourists were asked to list issues of concern whilst visiting the area. The question was open-ended and the data in the graphs is reflected in the way that that the tourists have listed them. The data was analysed separately for local and international tourists.

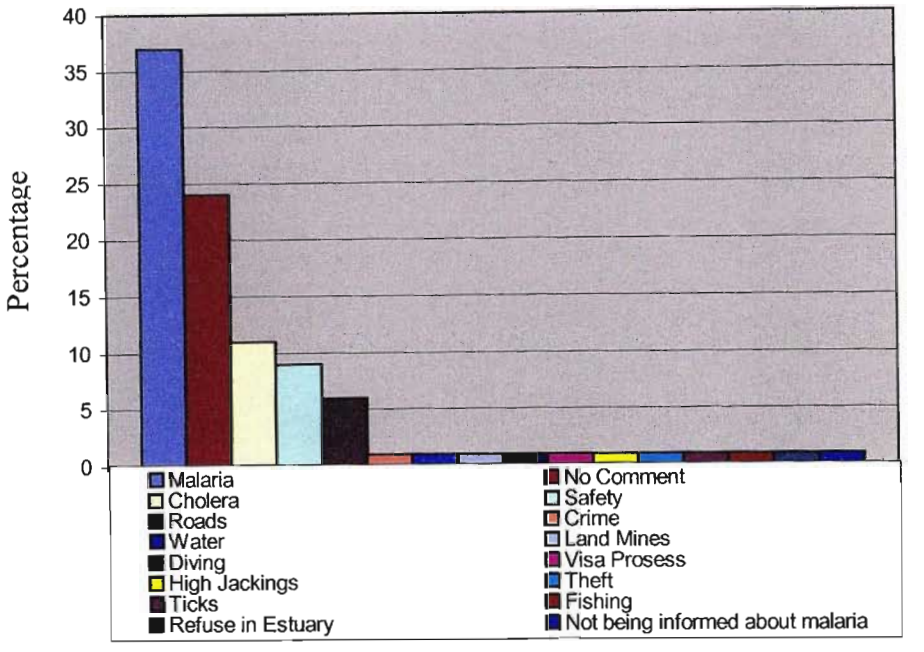


Figure 27: Major issues of concern for local tourists before coming on trip.

The main concern amongst local tourists visiting the LSDI area is the fear of contracting malaria while on vacation (37%), followed by cholera (11%) and safety (9%) as additional concerns (See Figure 27). One of South Africa's worst cholera outbreaks occurred in 2000 and the disease received substantial local media coverage. The tourists were interviewed in 2000 so this may explain the local tourists concern about cholera.

The main concern of international tourists visiting the LSDI area was the fear of contracting malaria (28%) followed by crime (15%) and safety (14%) as additional concerns (See Figure 28).

Clear similarity can be seen between the listed issues of concern amongst local and international tourists. Both groups perceive malaria to be the major issue of concern. The non-respondents in both the local and international categories fall after the major issue of concern (malaria), and that emphasizes the gap between the major issue of concern being malaria and the second issues of concern.

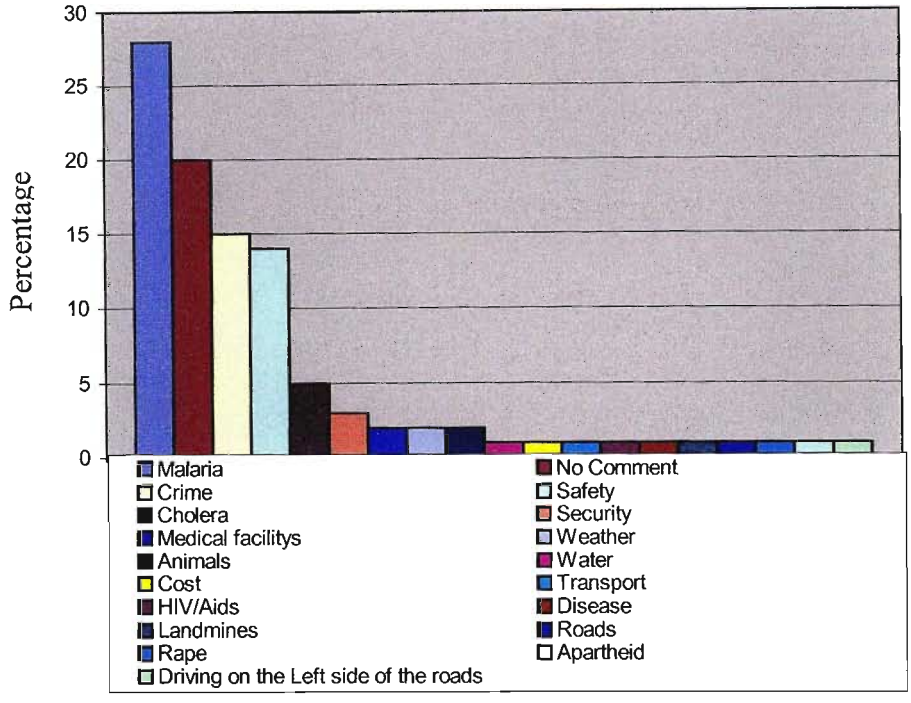


Figure 28: Major issues of concern for international tourists before coming on trip.

Issues of crime and security are dispensed across a number of categories listed by respondents. When these are combined it is evident that security issues for local tourists (12%) and international tourists (32%) are also significant. International tourists are more concerned about security issues than malaria. This is probably related to the negative media coverage internationally of security issues in South Africa.

Tourist perceptions of malaria distribution.

Tourist perception of the geographical distribution of the disease is important with respect to destination choice. When tourists perceive an area as a malarious area, they either avoid going to the area or they visit the area knowing that they are accepting a certain level of risk of contracting the disease.

A large percentage of local tourists used broad descriptions to describe their perception of malaria distribution in southern Africa. Local tourists perceive northern KwaZulu-Natal as a high-risk malaria area (21%) followed by coastal areas (13%) and KwaZulu-Natal (12%). A combined percentage of 46% perceive northern KwaZulu-Natal, KwaZulu-Natal and the coastal areas as malarious areas (Figure 29).

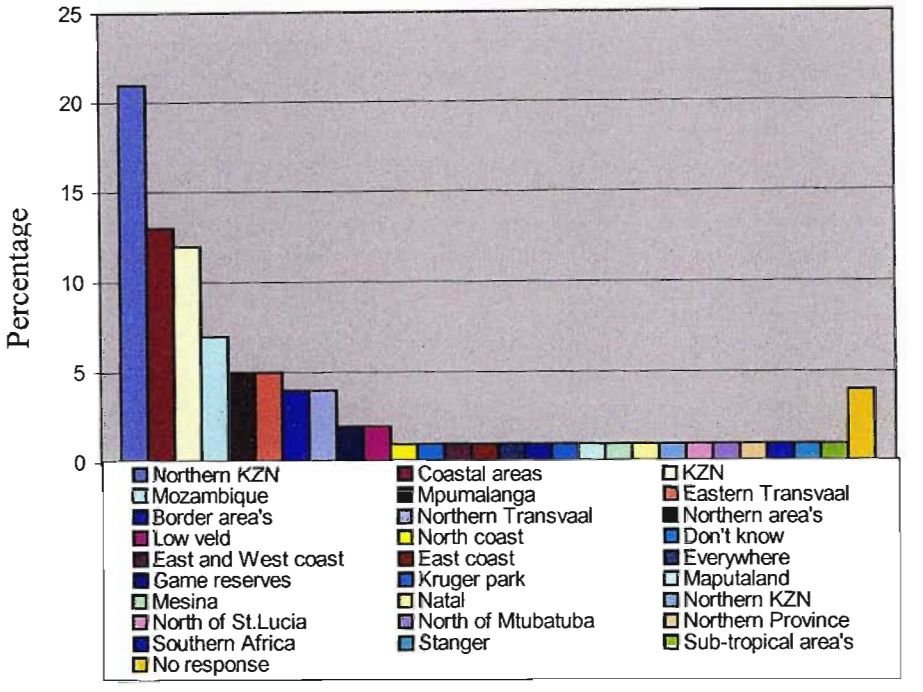


Figure 29: Local tourists response to where malaria occurs in southern Africa.

The above-mentioned broad description of malaria distribution by local tourists points towards the KwaZulu-Natal province as a whole, which may have negative implications for tourism. The perception of malaria distribution amongst local tourists needs to be altered and an intensified media awareness campaign must be launched to make tourists aware of the true malaria distribution in the province (See Figures 37 & 38).

KwaZulu-Natal attracts an estimated 500 000 tourists a year. Forty seven percent of foreign tourists visit the Zululand and Maputaland area, which fall within a malaria transmission zone. An estimated 8 million domestic tourists from outside or within this province travel to one or more destinations within KwaZulu-Natal on an annual basis. KwaZulu-Natal's total tourism industry was thus worth in excess of R8 Billion in terms of consumer expenditure in 1999. Its contribution to the Gross Domestic Product (GDP) is estimated to be in order of 10% and the industry employs approximately 200 000 people (KwaZulu-Natal Tourism Authority, 1999).

The above-mentioned tourism figures are very positive and reflect the role of tourism in creating jobs and contributing to the local economy. It is therefore of national and regional importance to shift tourists perceptions of malaria, malaria risk and malaria

distribution in the province so that the tourism industry can grow to its full potential. This shift in perception is dependent on public awareness of recent malaria incidence and distribution data and the malaria control programme.

The majority of international tourists perceive the Kruger National Park (31%) as a high-risk malaria area (Figure 30). The Kruger National Park is the oldest and best know game reserve in Africa and attracts thousands of local and international tourists. The malaria prevalence cannot be determined for the Kruger National Park due to the small number of people that physically live in the park. Although the Kruger park is a malarious area, the area will soon experience the regional effect of malaria control when the LSDI project extends its operations in southern Mozambique to include the western border of the Kruger Park. International and local tourists must be made aware of the positive outcome of disease control in the Lubombo corridor so that they can construct an informed perception of risk.

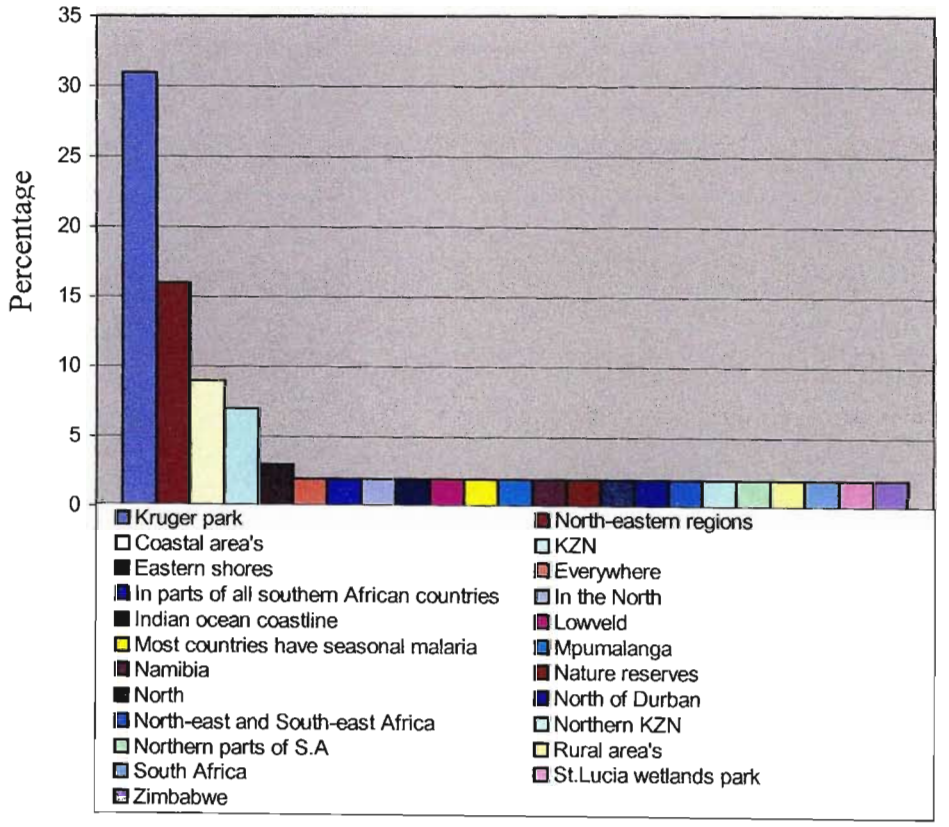


Figure 30: International tourists response to where malaria occurs in southern Africa.

Many of the international tourists that visit the area (16%) perceive the north-eastern regions of South Africa to be malarious and 9% perceive the coastal areas to be a high risk area to travel in. A smaller number of international tourists, 25% perceive either the coastal or north-eastern regions of KwaZulu-Natal to be malarious. It appears that local tourists have a more accurate spatial understanding of malaria distribution. It is important to inform the International tourists about the positive effect of disease control in the Lubombo corridor so that they can construct an informed perception of malaria distribution.

Information on malaria.

The source and quality of malaria information received by tourists plays an important role in risk perception. People that have correct and updated information about risk affecting their lives construct a balanced perception compared to laymen. This is clearly visible in perceived malaria risk amongst tourists. Tourists that are knowledgeable and get their malaria information from reputable sources like travel clinics, travel doctors and relevant literature are well informed tourists and they take the necessary precautions to prevent malaria infection.

Misinformed tourists do not have adequate knowledge about the risk of malaria and they therefore have a far greater chance of contracting the disease. The way in which the public gains information about environmental hazards and risks in their area will influence their perception of that risk (Oelofse, 1994). The public develops knowledge with regard to the risk associated with a particular activity from a number of different sources. They often rely on inferences they remember hearing and observing about the risk in question (Slovic, et al, 1980).

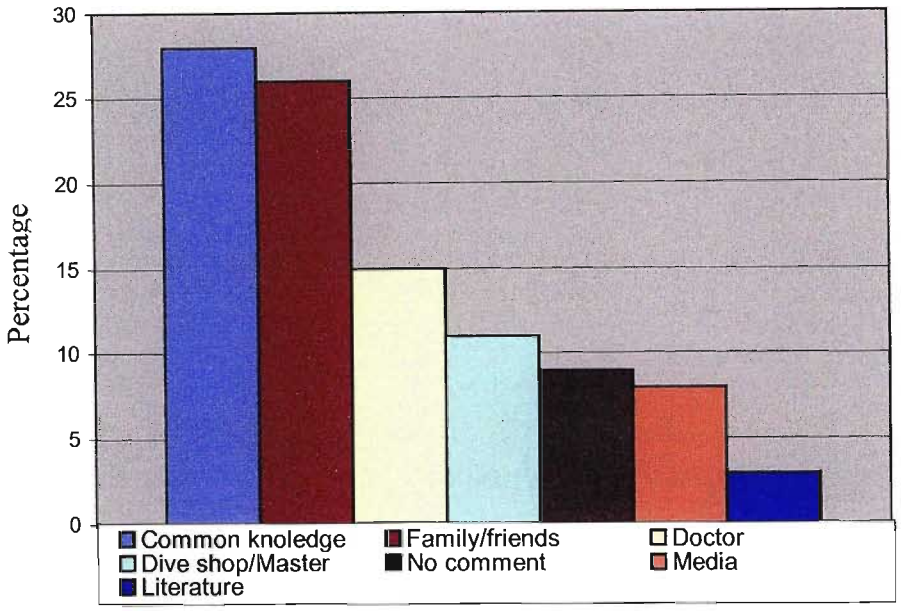


Figure 31: Local tourists source of information pertaining to malaria.

A large percentage of local tourists (28%) were not made aware of malaria by anybody in particular but rather stated that their understanding of malaria was derived through common knowledge. Family and friends (26%) were the second largest source of malaria information to local tourists visiting the area. A combined percentage of 54% were made aware by their own knowledge or family and friends (Figure 31). This influences their malaria risk perception and their behaviour towards preventative measures (See Figure 46). South African tourist's knowledge is thus based on local and experimental knowledge. Although the local knowledge of people concerning malaria is a valuable source of information, it is important to balance local and scientific knowledge.

The source and quality of malaria information received by international tourists (Figure 32) is good and a high percentage (36%) of the interviewed international tourists were made aware of malaria by travel doctors and 17% by relevant malaria literature. A combined percentage of 52% were made aware of malaria by travel doctors and doctors hence their knowledge is based on scientific information.

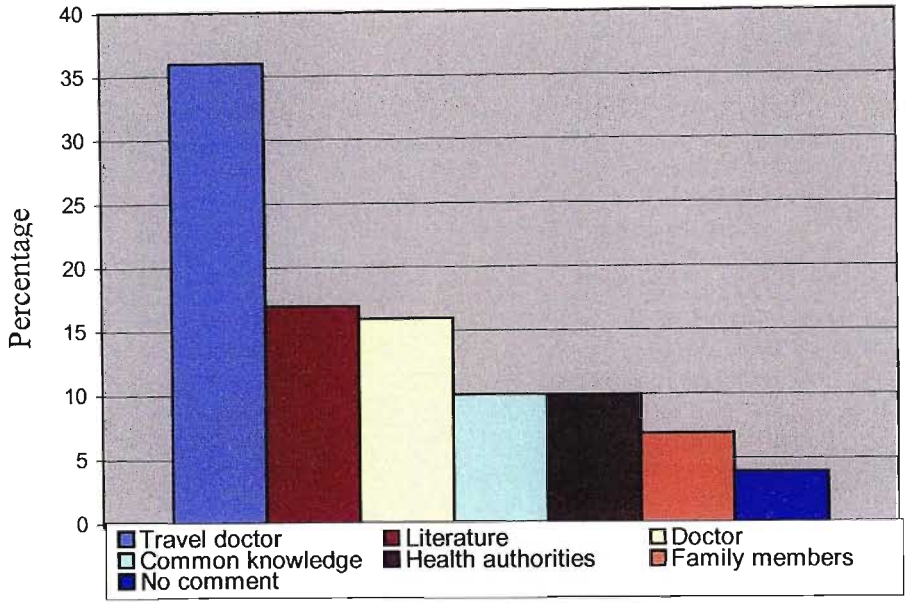


Figure 32: International tourists source of information pertaining to malaria.

The international tourists were mainly made aware of malaria by reputable sources (travel doctors, literature, health authorities) and the quality of information received will have an influence on their perception of malaria risk and their attitude towards preventative measures (See Figure 47).

Media content has an influence on people's risk perceptions and the prevailing understanding amongst researchers is that the media exaggerates some risks and ignores others sacrificing objectivity for sensation. Considerable evidence exists that the media engage in selective and biased reporting that emphasizes drama, wrongdoing and conflict. Media reports tend to concentrate on rare but dramatic hazards, and often fail to report more common but serious risks, such as motor vehicle accidents (Johnson and Covello, 1987).

More than half of the local tourists, 57%, said that the media did not have any influence on their perception concerning malaria in the study area (See Figure 33). Of the local tourists visiting the area, 43% said that media reports had an influence on their perception concerning malaria in the study area and that newspapers, 49%, were the main form of media that caused a change in perception change. Magazines, 26%, and TV & Radio, 11%, were the other forms of media through which local tourists obtained information about malaria.

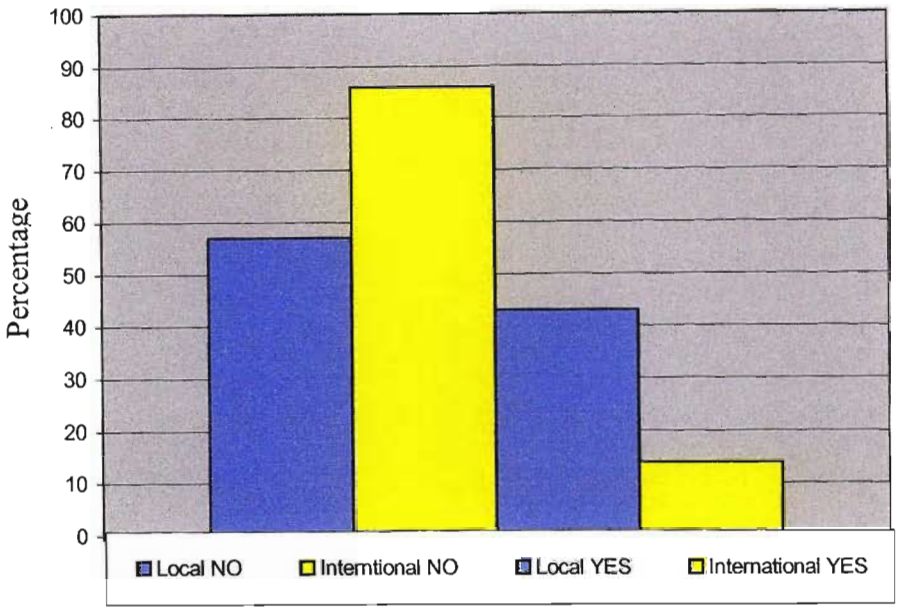


Figure 33: Media influence on tourist malaria perception.

A very high percentage of international tourists, 86% said that the media did not have any influence on their perception concerning malaria in the study area which is to be expected. A very small percentage, 14%, of the international tourists visiting the area said that media reports had an influence on their perception concerning malaria in the study area. A reason for the very low percentage of international tourists affected by media is probably due to the limited media coverage the disease receives in their home countries. All of the countries that the international tourists originate from do not have malaria so the local press does not give much media attention to the disease. The only malaria related press that they would see in their home countries concerning malaria is documentary TV, Africa news and short articles in newspapers on malaria epidemics.

A higher percentage of local tourists were influenced by the media, (43%), probably due to the fact that South Africa has malaria and therefore the disease receives local media coverage.

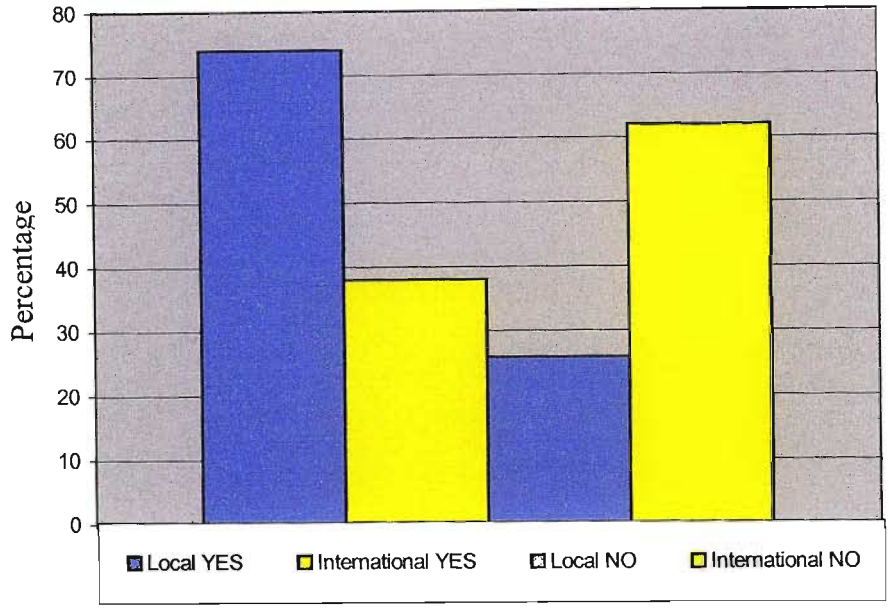


Figure 34: The relationship between the Mozambican flood and risk perception.

A high percentage (74%) of local tourists perceive that the Mozambican floods in 2000 had an influence on malaria levels in South Africa (See Figure 34). Only 26% of local tourists said that the Mozambican floods did not have an influence on malaria levels in South Africa. A high percentage of international tourists, 62%, said that the Mozambican floods did not influence malaria levels in South Africa and only 38% said that the floods did have an influence.

The exposure to risk reporting has an influence on people's risk perception. The local media extensively covered the Mozambican floods in 2000. This might explain the difference in perception amongst local and international tourists regarding the floods in Mozambique, and the influence it had on malaria levels in the region as a whole.
The geographical knowledge of local tourists might have an influence on their perception due to their understanding of the proximity of neighbouring countries to South Africa compared to international tourists.

Understanding of malaria symptoms.

A high percentage of local tourists, 50%, perceive flu like symptoms to be the main symptom of malaria (See Figure 35). Fever (31%), headaches (11%) nausea (5%) and muscle pain (1%) are the other symptoms that the local tourists consider to be typical malaria symptoms.

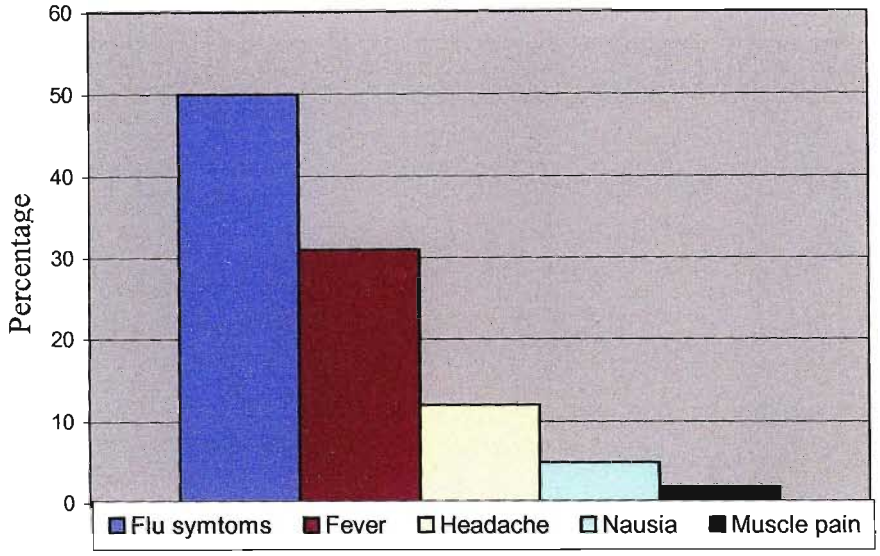


Figure 35: Local tourists knowledge of malaria symptoms.

The malaria symptoms listed by local tourists are correct. The fact that the local tourists know what malaria symptoms are will have an influence on their treatment seeking behaviour when/if they fall ill while on vacation (See Figure 44).

The majority of international tourists perceive fever, 55%, to be the main symptom of malaria (See Figure 36). Flu symptoms (29%), headaches (6%), weakness (4%), muscle pain (2%), nausea (2%) and tiredness (2%) are the other symptoms that the international tourists perceive as typical malaria symptoms.

The symptoms that the international tourists have listed are also correct and the quality and source of malaria information that the international tourists received is clearly good. The fact that international tourists know what the symptoms of malaria are will have an influence on their treatment seeking behaviour when/if they fall ill while in the country (See Figure 45).

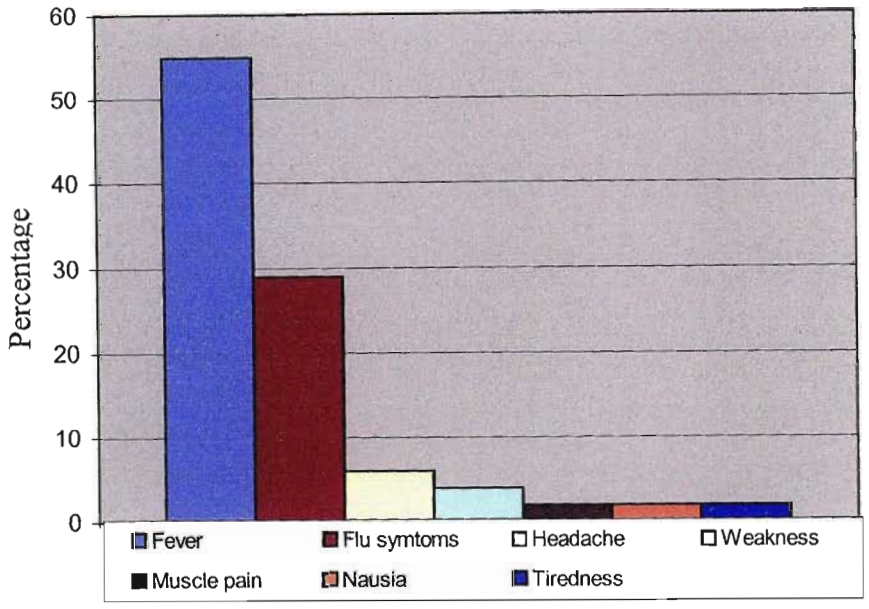


Figure 36: International tourists knowledge of malaria symptoms.

Table 9: Perceived treat-ability of malaria

	Treatable	Not treatable
International Tourists	**91%**	**9%**
Local Tourists	**96%**	**4%**

Both local (96%) and international (91%) tourists know that malaria is a treatable disease (Table 9). This knowledge will have an influence on tourist treatment seeking behaviour and compliance to precautionary measures (See Figures 42, 43, 44, 45, 46 & 47). It also influences their choice of taking the risk of visiting an area since they do not perceive the disease to necessarily be fatal. This is in contrast to peoples travel behaviour as a result of the sever acute respiratory syndrome (SARS). The danger exists that some tourists might not comply with precautionary measures due to the treatable nature of the disease. It is important to make tourists aware of the seriousness of malaria infection. *Plasmodium falciparum* constitutes 90% of all malaria cases in southern Africa, and rapid and correct treatment is of paramount importance. If a person waits for the malaria symptoms to develop his/her chances of recovery become uncertain. Very expensive hospitalisation and treatment will determine the person's fate.

Table 10: Fatality of malaria

	Malaria can cause death	Malaria can not cause death
International Tourists	98%	2%
Local Tourists	98%	2%

Both local (98%) and international (98%) tourists know that malaria can cause death. Although both tourist groups know that malaria can be fatal a surprisingly high percentage of local tourists (See Figure 47) were not taking prophylaxis (43%). A much smaller percentage (24%) of international tourists were not taking prophylaxis (See Figure 48).

Transmission of malaria.

A very high percentage of local (94%) and international (95%) tourists know that mosquitoes transmit the malaria parasite (Table 11). This knowledge will have an influence on the self-protection measures that tourists take to prevent malaria infection. The tsetse fly is perceived to be the culprit by 6% of the local tourists and 5% of the international tourists.

Table 11: Transmission of malaria.

Malaria Vector	Mosquito	Tsetse fly
Local Tourists	94%	6%
International Tourists	95%	5%

Both local and international tourists were asked when malaria was transmitted. Malaria can be transmitted during the day or night but most people get infected at night whilst sleeping due to the mosquitoes being attracted by the carbon dioxide, body heat and odours.

Table12: Time of malaria transmission.

Malaria transmission time	Day	Night	Both
Local Tourists	2%	46%	51%
International Tourists	3%	40%	57%

The majority of local tourists (51%) said that malaria could be transmitted during the day and night. The majority of international tourists said that malaria infection could occur during the day or night (57%).

Several age and gender groups are considered very vulnerable when it comes to malaria infection. Young children, pregnant woman, old people and people with HIV/Aids are considered by medical professionals to be high risk groups that should take all the possible precautionary measures when visiting a malarious area. These groups should avoid going to areas with malaria transmission.

Table 13: Perception of most vulnerable groups.

	Local Tourists		**International Tourists**	
Different Risk Groups	**Yes**	**No**	**Yes**	**No**
	36%	64%	48%	52%
Children	38%		16%	
People with HIV	5%		9%	
Old people	2%		3%	
Poor people	1%		2%	
Outsiders	1%		0%	
Local people	0%		2%	
Pregnant woman	0%		2%	
People that ignore preventative measures	0%		2%	
People without sickle cell anaemia	0%		2%	

The majority of local tourists (64%) believe that everyone has an equal health risk when infected with malaria (Table 13). Only 36% of the local tourists were correct in saying that certain groups are more at risk when infected with malaria. Local tourists perceive children (16%) as the most vulnerable group followed by people with

HIV/Aids (9%) and old people (3%). These groupings are correct, but it is of concern that pregnant woman only feature at the bottom of the list.

The majority of international tourists (52%) perceive that everyone has an equal health risk when infected with malaria. Only 48% recognize that there are certain groups more at risk and they perceive children (38%) to be the most vulnerable followed by people with HIV (5%) and old people (2%). It is very concerning that the international tourists do not recognize pregnant women as a high risk group considering the serious consequences if a woman contracts malaria while pregnant. However it seems that international tourists are better informed about the different risks related to malaria infection.

Incidence of malaria infection amongst tourists.

When asked if they had previously contracted malaria a small percentage (16%)of local tourists confirmed that they had contracted the disease at some point in time (Table 14). A smaller percentage of international tourists (3%) had contracted the disease.

Table14: Malaria infections.

Tourist groups	Yes	No
Local Tourists	16%	84%
International Tourists	3%	97%

The obvious reason for the higher percentage of local tourists that have contracted malaria is that South Africa has unstable malaria transmission. More local tourists would visit these and other malarious areas in neighbouring countries in their lifetime than international tourists, so their exposure to malaria is much greater then international tourists.

Many local tourists (76%) personally know people that have contracted malaria in the past (Table 15). The people mainly contracted the disease in Mozambique (40%) followed by Malawi (4%), Zimbabwe (2%) and Kenya (2%). It is expected that many local tourists would know someone that has contracted malaria due to South African and other African country's malaria status. Many local tourists are exploring

neighbouring African countries for the first time and most of these countries have very high malaria transmission.

Table 15: Knowledge of others that have contracted malaria.

Tourist groups	Yes	No
Local Tourists	76%	24%
International Tourists	67%	33%

A very high proportion of international tourists (67%) know someone who has contracted malaria whilst on vacation. The majority of people contracted the disease in Kenya (19%), followed by Mozambique (7%) and Uganda (7%). The majority of people contracted malaria in sub Saharan-Africa. This network is linked to the fact that many tourists that visit southern Africa probably are here as a result of knowing someone that has been to Africa before.

Travel destinations of tourists to malarious areas.

The majority of local tourists (55%) were travelling to other malarious areas in Africa with the most visited countries being Zimbabwe (17%), followed by Mozambique (16%), and Botswana (9%). A large percentage of international tourists (60%) have visited other malarious areas in Africa (Table 16). The most visited countries amongst international tourists are Zimbabwe (10%) followed by Botswana (10%) and Malawi (7%).

Zimbabwe attracts many South African and international tourists due to its close proximity to South Africa and as a result of its many well-known game reserves such as Hwangwe. The Victoria Falls, Zimbabwe ruins and the Lake Kariba are all attractions that draw many tourists to the country. However the current land reform policy and political unrest in the country have had a detrimental effect on Zimbabwe's tourism industry and many local and international tourists are going elsewhere.

Mozambique offers mainly coastal resort tourism. The country has endless beaches and coral reefs making it a diving and fishing paradise. The Bazaruto archipelago and Inhaca Island are some of the natural wonders that tourists can experience whilst on vacation in Mozambique. The political stability and rapid development of the past few

years has improved tourism in Mozambique tenfold and many South Africans are exploring the country for the first time. Mozambique has great tourism potential and many more local and international tourists will visit the country in the future.

Table 16: African malarious destinations.

	Local Tourists		International Tourists	
Visiting other malaria areas	**Yes**	**No**	**Yes**	**No**
	55%	45%	60%	40%
Zimbabwe	17%		10%	
Mozambique	16%		3%	
Botswana	9%		10%	
Swaziland	1%		7%	
Kenya	2%		5%	
Namibia	2%		3%	
Madagascar	1%		2%	
Tanzania	1%		0%	
Malawi	0%		7%	
Lesotho	0%		2%	
Nigeria	0%		2%	
East Africa	0%		2%	
West Africa	0%		2%	

Botswana offers tourists excellent wildlife and eco-tourism opportunities. The Botswana government has realized their tourism potential by creating many game reserves and placing emphasis on conservation. Botswana's natural riches such as Chobe game reserve and the Okavango Delta attract many local and international tourists.

Malawi (7%) was the third most visited country by international tourists. Malawi's major tourist attraction is Lake Malawi with its several islands where tourist can dive or participate in an array of water sports. Malawi has several mountains like Michiru and Mulanje that attract avid bird watchers and mountaineers.

A very small percentage of local tourists (7%) are travelling to other non-African destinations that have malaria transmission (Table 17). The most popular non-African malarious country is Thailand (4%) followed by Mauritius (2%) and Indonesia (1%). Understandably a much larger percentage (36%) of international tourists are visiting

other non-African malarious countries. The most popular destination amongst international tourists is South East Asia (26%).

Table 17: Non-African malarious destinations.

	Local Tourists		International Tourists	
Non-African malarious destinations	**Yes**	**No**	**Yes**	**No**
	7%	93%	36%	64%
South east Asia	5%		26%	
Mauritius	2%		0%	
India	0%		3%	
South America	0%		2%	
Madagascar	0%		2%	

It is therefore apparent that tourists that visit malarious areas in southern Africa are also prepared to take the risk of visiting malarious areas in other parts of the world. The benefits obtained from visiting these areas therefore seem to outweigh the risk of contracting malaria.

The recent bombing of a nightclub in Bali will have a very negative effect on Indonesia's tourism sector. One of the major reasons for the high percentage of international tourists that travel to other countries in general is their strong economies. Most international countries currencies are very strong and it is therefore very cheap to travel. The geographical location of Europe is very central and most other countries are within 5-10 hours flight time from the continent.

The perceptions of local and international tourists have been considered. The scientific representation of malaria will be explored in the following section.

5.4 Incidence of malaria

This section details incidence of malaria and therefore provides insight into the "actual" risk of malaria in the Lubombo corridor. The collection and representation of

data for small-scale malaria maps has only been completed for South Africa. The collection of data and small scale mapping of fast areas is a very difficult and long process as small-scale risk maps are currently nonexistent for Swaziland and southern Mozambique. The methods used in the small scale mapping is reflected in the methodology chapter.

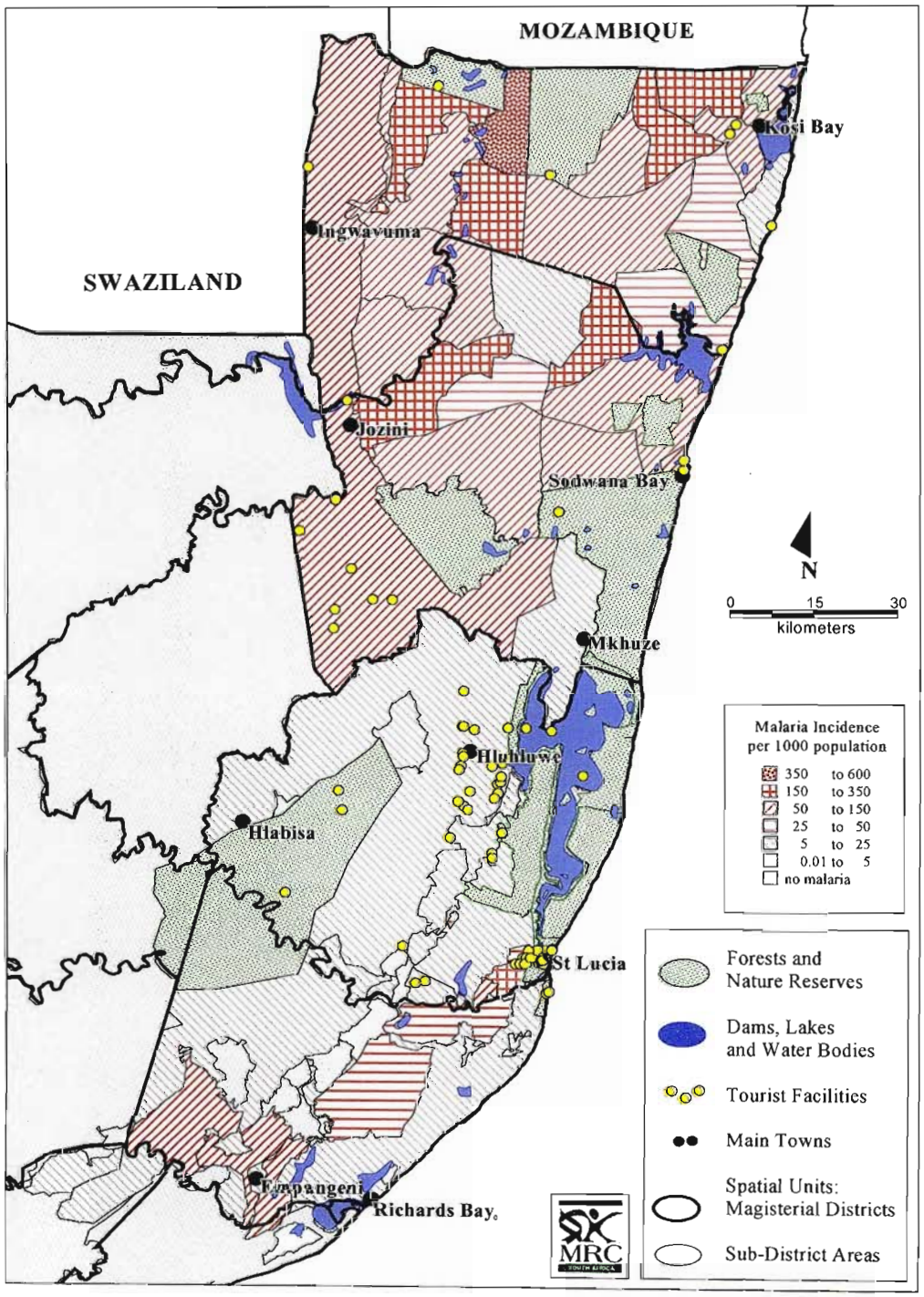


Figure 37: Malaria incidence per thousand population from July 1999 to June 2000.

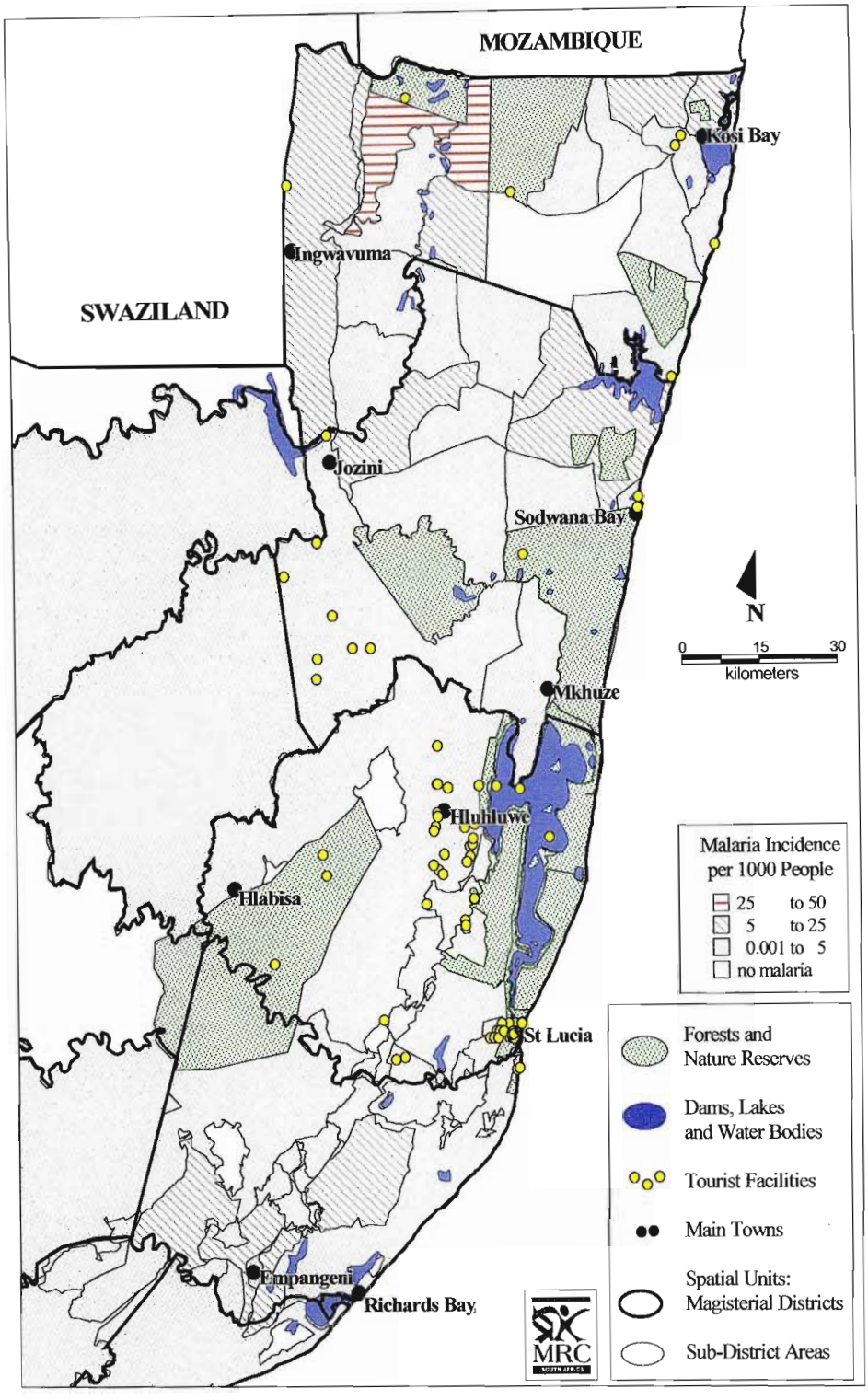


Figure 38: Malaria incidence per thousand population for July 2001 to June 2002.

Figures 37 and 38 indicate the location of the northern KwaZulu-Natal tourist facilities with regard to the small scale variations in malaria incidence, and show the decrease in case incidence from 1999/2000 to 2001/2002. The spatial images presented in these maps show the dramatic change in malaria incidence between 1999 and 2002. In the 1999/2000 malaria season, 57% of tourist facilities were in areas where > 50 malaria cases per 1000 people were recorded, and 42% where in areas were 5-25 malaria cases per 1000 people were recorded.

A major reduction in malaria cases in the 2001/2002 malaria season was achieved as a result of the malaria control measures in the Lubombo corridor. Only 3% of tourist facilities were in areas where 5-25 malaria incidences per 1000 people were recorded and 96% where in areas were the malaria incidence was very low, with 0.001-5 cases per 1000 people being recorded (See Figure 38).

There is a misconception concerning malaria risk amongst owners, managers and tourism facility operators and they need to be informed about the regional malaria case and malaria parasite prevalence reductions in the Lubombo corridor. Clearly the risk of malaria has been socially amplified.

The reductions in the 2001/2002 malaria season indicate the positive effect of the regional approach to malaria control in the Lubombo corridor. It is essential that this information is made available through all mediums to encourage tourists to visit the area. The major malaria case reductions can be attributed to a number of new interventions such as (1) the introduction of an effective drug (Atemether-lumefatrine), and (2) a change in insecticide (DDT).

The regional approach to malaria control between South Africa, Swaziland and Mozambique and the extension of vector control to southern Mozambique also had a major influence on malaria incidence in the Lubombo corridor. It is anticipated that the regional malaria case reductions in Swaziland, South Africa and southern Mozambique will have a positive influence on tourism in the Lubombo corridor.

Three out of the nine South African Provinces have malaria transmission. KwaZulu-Natal, Mpumalanga and the Limpopo Province border neighbouring Swaziland, Zimbabwe and Mozambique. The LSDI malaria control programme covers the whole of north-eastern KwaZulu-Natal including the northern border areas with Mozambique and the eastern border of Mpumalanga Province that borders on Mozambique.

A regional approach to malaria control that extends over international borders is thus fundamental if successful malaria control is to be achieved. Co-operation and collaboration amongst neighbouring countries is thus the key to successful disease control in the future (Sharp and le Sueur, 1997).

KwaZulu-Natal Province has benefited greatly from the LSDI malaria control project and the province has recorded a malaria case reduction of 76%. This major reduction can directly be attributed to the regional effects of malaria control in the Lubombo corridor, the introduction of an effective drug (Coartem®) and an effective insecticide (DDT).

Mpumalanga Province has experienced the positive outcome of regional malaria control and a malaria case reduction has been recorded since the start of the project in 1999. Mpumalanga Province will however experience the true effect of the regional collaboration in Phase 2 of the project when the eastern border of the province that borders Mozambique is residually sprayed.

Limpopo Province has a successful malaria control programme but it does not have cross border malaria control collaboration with neighbouring Zimbabwe. A similar regional approach to malaria control would be a definite advantage to both parties in future and the LSDI model for malaria control should be used.

Ongoing and sustainable cross border malaria control between South Africa, Mozambique, Swaziland and possibly Zimbabwe is essential for effective malaria control in the Lubombo corridor and southern Africa. The governments and private sectors of all countries must take ownership of this project so that funding can be

secured for future malaria research and control. The sustainability of malaria control in the Lubombo corridor and further a field is the key to future agriculture and tourism development.

Swaziland has had an effective and well-managed malaria control programme since the 1960's. Swaziland has had well-established links with the South African malaria research and control community. The regional malaria reduction in the Lubombo corridor has had a very positive effect on the country's malaria cases and it has plummeted by 64% since the start of the LSDI project in 1999. Further and sustained collaboration between Swaziland, Mozambique and South Africa is essential to the project and to the malaria distribution in Swaziland.

Malaria control was abruptly stopped in 1964 when the war broke out in Mozambique. The LSDI project reintroduced malaria control to rural and urban areas in southern Mozambique in 1999. The effect of malaria control in Zone 1 (7000 square kilometres) was instantaneous with a 40% reduction in malaria parasite prevalence in the first year of spraying. Mozambique has had a 70% reduction in malaria parasite prevalence thus far (June 2002). The regional effect of malaria control is evident in Mozambique and it will alleviate the burden on the health infrastructure in future.

As with South Africa and Swaziland the sustainability of the project is of utmost importance. The LSDI project has laid the foundation and infrastructure for further malaria control and research development and expansion into other parts of Mozambique. The LSDI model for malaria control can and must be used in areas where Mozambique borders other countries such as Zimbabwe, Zambia, Malawi and Tanzania.

5.5 Control of malaria risk

Both local and international tourists together with tourist facility owners/managers perceptions on malaria control and prevention are presented in this section. Their perceptions on malaria control and prevention was captured and analysed to determine their knowledge of malaria control.

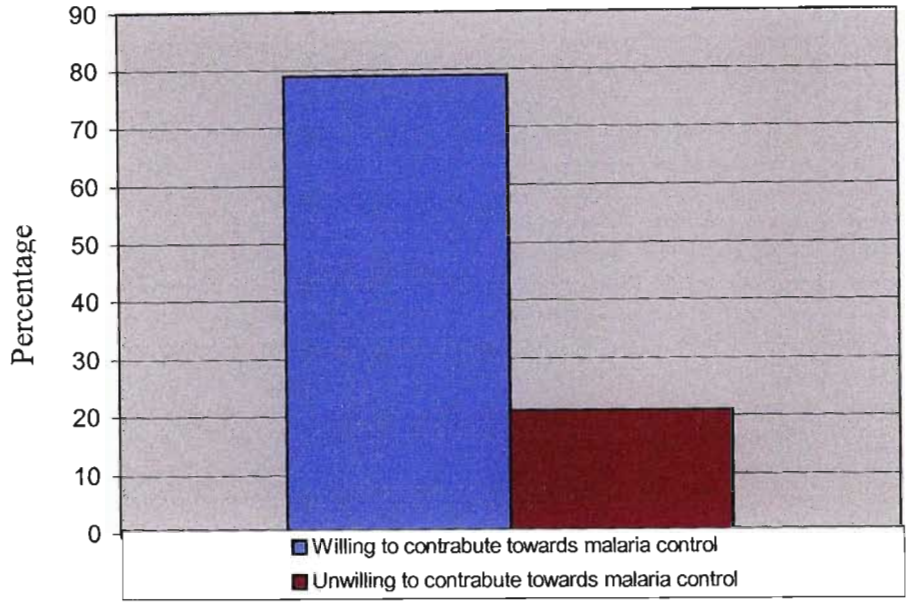


Figure 39: Willingness to contribute towards malaria control.

A very high percentage, 79%, of tourist facility owners/managers (Figure 39) said that they would be willing to contribute towards malaria control in their area if it will reduce malaria. It is a very clear sign that malaria has an enormous negative influence on the tourism industry and that the owners/managers are recognizing the disease as a threat, not only to their lives, but to their livelihoods as well.

Malaria control in South Africa is undertaken by the Department of Health. Beside the fact that the Government does the official malaria control in these areas, a large percentage of facilities (63%) spend their own capital to further prevent the disease. This is a clear indication that malaria is perceived to be an enormous problem and that the disease has a negative influence on tourism businesses (Figure 40).

Out of the 63% tourist facilities that do some kind of malaria control in or around their facility, 32% use insecticides to residually spray the walls of their facilities. The other 31% use repellents that they give out to tourists and staff who stay at their facilities.

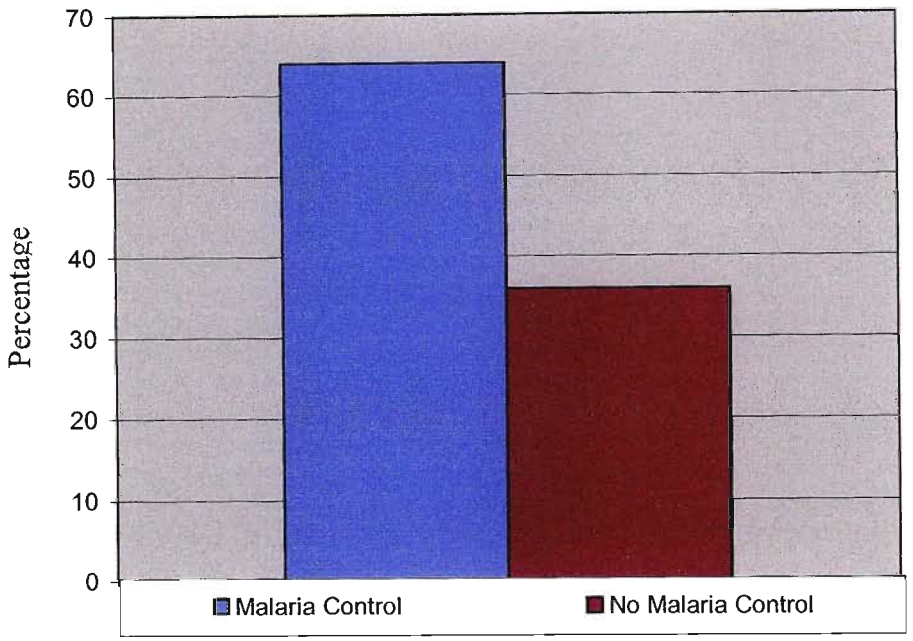


Figure 40: Level of malaria control by tourism facility owners and managers.

One of the most important factors that influence the perception of risk amongst people is control over risk. If people have control over risk that is affecting their lives they accept the risk far more readily and form a balanced perception of risk. Malaria control is a good example of this. When people know that malaria is being controlled in an area they are more willing to visit such an area. When people voluntarily visit a malaria area they can still be in relative control of the risk by taking and using malaria prophylaxis, repellents and bed nets to prevent malaria infection.

When local and international tourists were asked if they were aware of malaria control in the Lubombo corridor a staggering number of international tourists, 82%, did not know of any malaria control measures in the area and a large percentage of local tourists, 70%, were not aware of malaria control in the area (Figure 41).

All these tourists perceive malaria as an uncontrolled disease; therefore they automatically construct a negative perception of the disease. The tourists voluntarily visited the area and hence took the risk of contracting the disease. This study does not determine how many local and international tourists avoided coming to the area or changed their choice of destination as a result of the risk of malaria. Only 17% of the

international tourists and 30% of the local tourists were aware of malaria control in the Lubombo corridor.

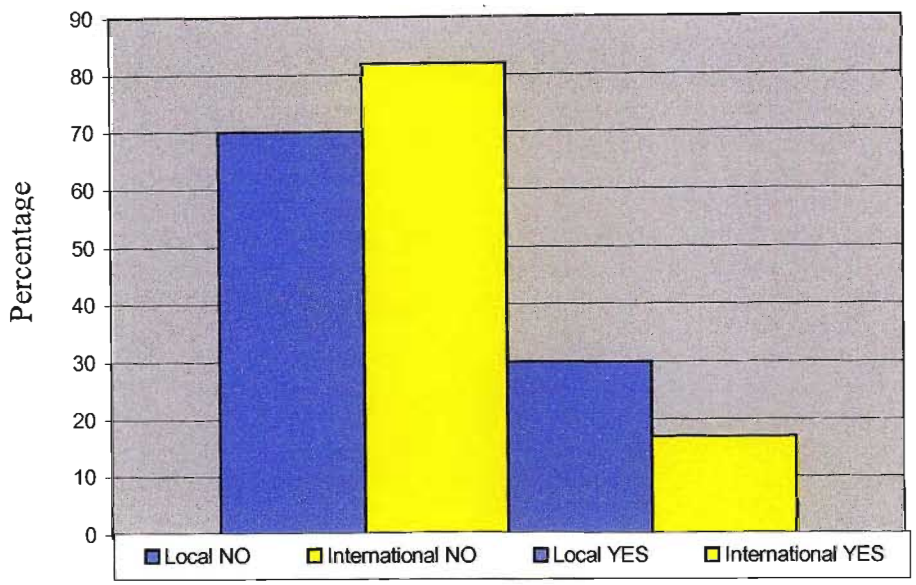


Figure 41: Awareness of malaria control efforts in the area.

Local and international tourists must be made aware of the positive outcome of disease control in the Lubombo corridor so that they can alter their perception of risk. This will increase their feeling of control of the risk (malaria), thereby reducing their fear of contracting the disease while on vacation. Local and international marketing campaigns should be launched to promote the area's unique natural, cultural and wild life assets. Emphasis must be placed on malaria control given that the majority of tourists perceive malaria as a risk and that they are not aware of malaria control in the Lubombo corridor.

The majority of local tourists, 74%, state that they consider prophylaxis to be the best precautionary measure against malaria infection (See Figure 42). This high percentage is surprising considering that only 57% of local tourists were taking prophylaxis while on vacation in the area. Repellents (18%) were perceived to be the second best precautionary measure taken against malaria infection.

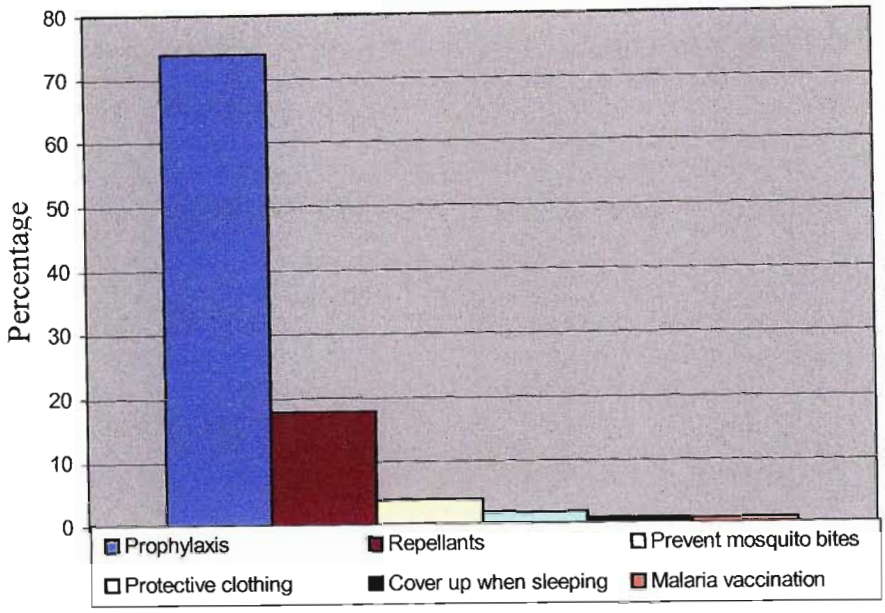


Figure 42: Preferred precautionary measures amongst local tourists.

The data shows that people have knowledge about malaria, but they are still prepared to take the risk of not taking medication, hoping that they will not contract the disease. They may also be aware of the side effects of some prophylactic drugs and therefore weigh the chance of contracting malaria against the negative side effects of some prophylactic drugs.

The majority of international tourists, 60%, perceive prophylaxis to be the best precautionary measure against malaria infection. The prevention of mosquito bites (12%) and the use of protective clothing that includes long sleeved shirts, trousers and light coloured clothing (9%) is seen as the second and third best precautionary measure against malaria infection. It is surprising to note that only 7% of the international tourists consider repellents as a precautionary measure (Figure 43).

The data retrieved from international tourists shows clearly that the two tourist groups (Local & International) are receiving different information about malaria prevention. It is interesting to note that there are misinformed international tourists who have confused malaria transmission with water-borne diseases.

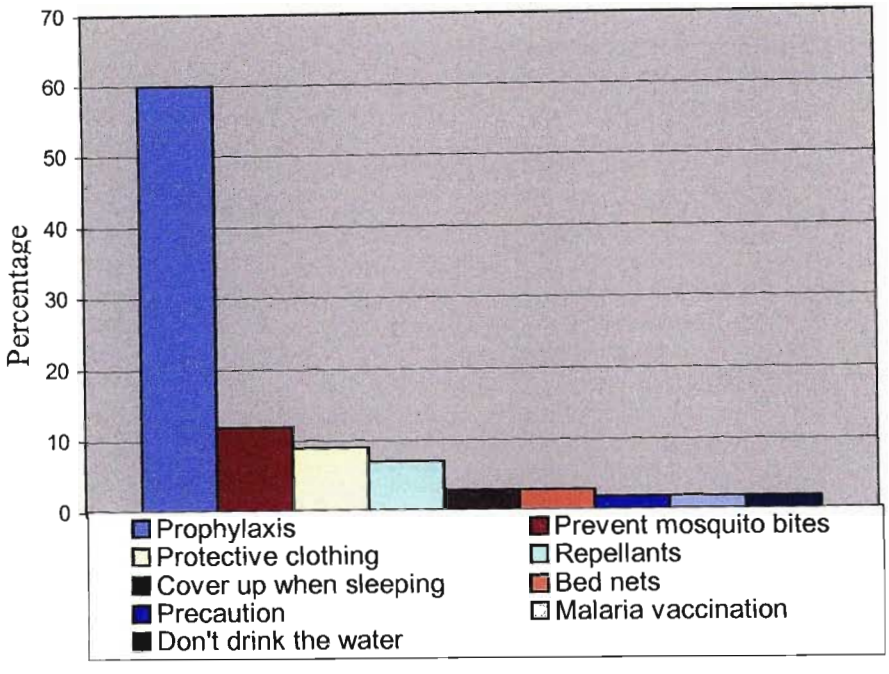


Figure 43: Preferred precautionary measures amongst international tourists.

Response to malaria infection.

The majority of local tourists, 54%, said that they would go to a doctor when/if they fall ill while on vacation (See Figure 44). Many local tourists (34%) said that they would go to a hospital for treatment when ill. The treatment seeking behaviour of local tourists is excellent. It is very important that the tourists notify their doctor or hospital of their visit to a malarious area when seeking treatment. It is interesting to note that local tourists have trust in the medical care that they receive in South Africa as they do not carry their own treatment.

The malaria symptoms take 10-14 days to develop so the chances are quite good that the tourist will have returned home by the time the symptoms develop. Doctors that practice in malarious areas are very familiar with malaria symptoms and will diagnose and treat patients rapidly. Many doctors practice outside malarious areas and mistake the symptoms for flu or other illnesses. This is problematic and reflects on the need to raise awareness of malaria within the medical profession in South Africa.

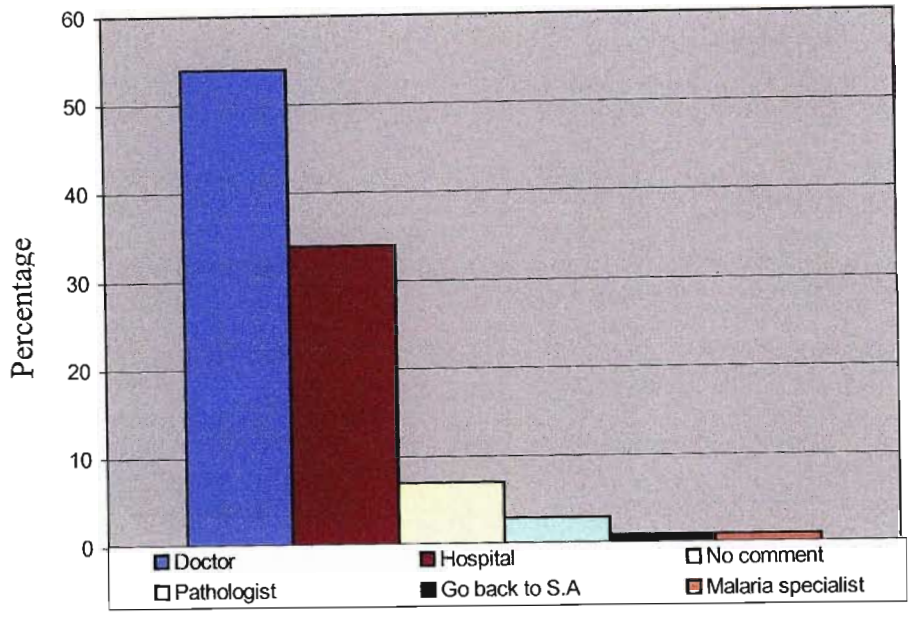


Figure 44: Local tourist's treatment seeking behaviour.

The majority of international tourists, 49%, said that they would seek the help of a doctor if/when they fall ill whilst on vacation (Figure 45). Twenty two percent of international tourists would either go to a hospital or take treatment when ill.

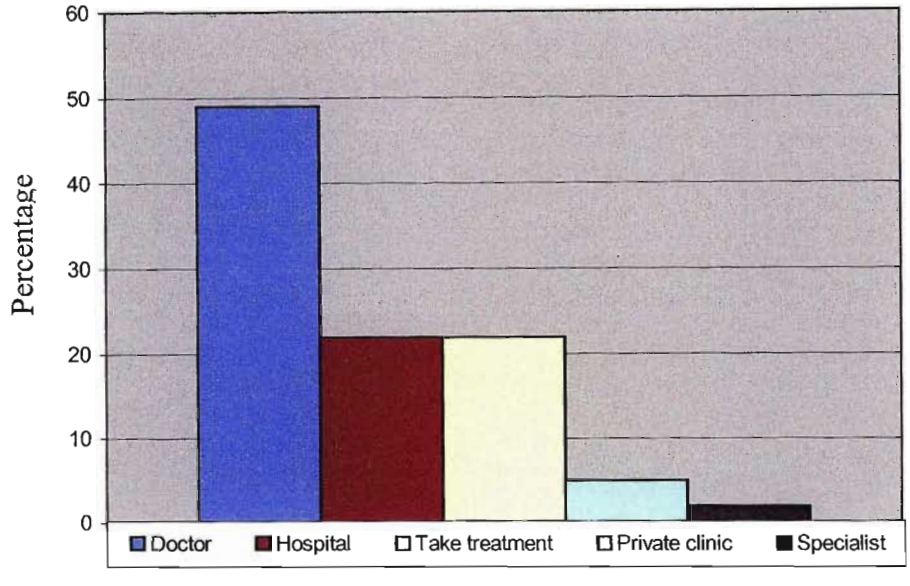


Figure 45: International tourist's treatment seeking behaviour.

The treatment seeking behaviour of international tourists is good and it is interesting to note the high percentage of tourists, 22%, that carry treatment while on vacation to the area. This may reflect their mistrust in the South African health care system since

they are assuming full responsibility for their own care whilst in a malarious area. International tourists need to be made aware of the health care options in South Africa. It is however concerning that these tourists wait for the malaria symptoms to develop before taking treatment. *Plasmodium falsiparum* constitutes 90% of all malaria cases in sub-Saharan Africa and it is deadly, developing into cerebral malaria if not treated swiftly and correctly (Nchinda, 1997).

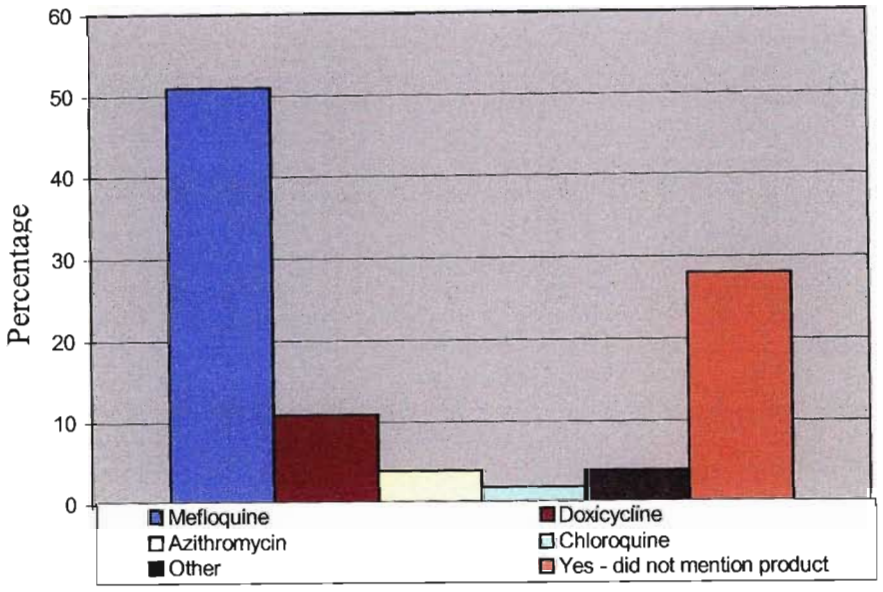


Figure 46: Local tourists taking prophylaxis

A large percentage of local tourists (57%) visiting the area were taking prophylaxis (See Figure 46). The majority was using Mefloquine (53%) followed by Doxicycline (11%) and Azithromycin (4%).

Both Lariam® and Mefliam® are the trade names for Mefloquine. Tourists in general have a bad perception of Lariam® and Mefliam® and comments on the negative side effects were commonplace. "I was sick for the whole trip after taking Lariam" (Respondent 3, 12 January 2001). People complained about headaches, nausea, size and bitterness of the pill and the sleeplessness that Lariam® causes. "I would rather push my luck than take Lariam again" (Respondent 4, 21 March 2001).

The use of these products is an indication of what prophylaxis local doctors prescribe to tourists that visit the area. Knowledge about malaria and the source of malaria information obtained by the tourist will have an influence on prophylaxis usage. A

very high percentage of local tourists claimed that they were made aware of malaria through their own knowledge (28%) or that family and friends (26%) made them aware of the disease.

A combined percentage of 54% obtained their knowledge from common knowledge, family or friends and that explains why only 57% of local tourists compared to 76% of international tourists are using prophylaxis.

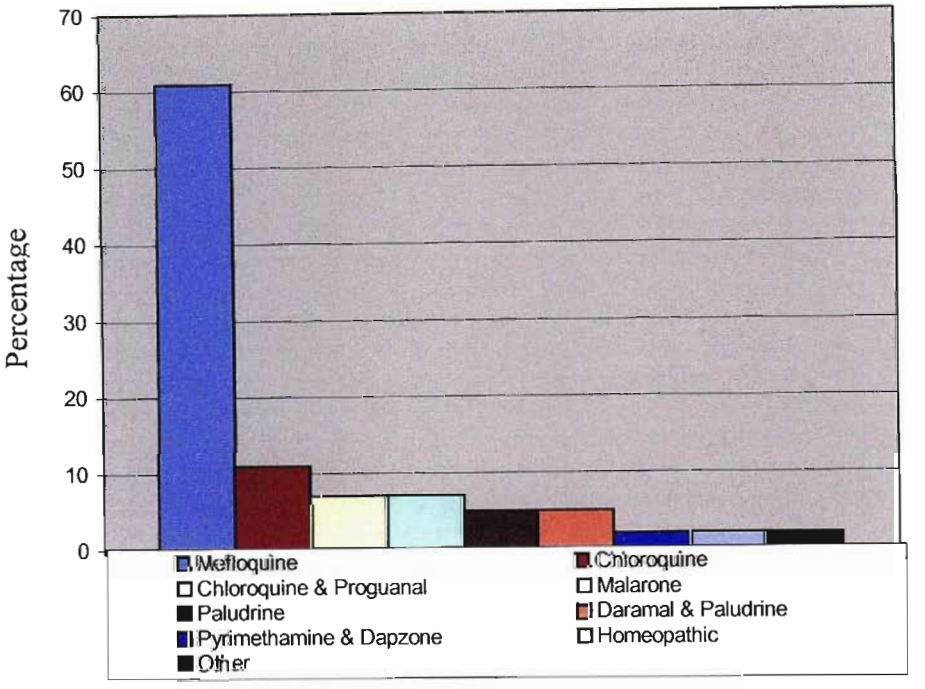


Figure 47: International tourists taking prophylaxis.

High percentages, 76%, of international tourists visiting the study area were taking prophylaxis. As with the local tourists, Mefloquine (61%) was the most used product. Chloroquine (11%) was the second most used product amongst interviewed international tourists. It is surprising that 11% were using Chloroquine, given that wide spread chloroquine resistance exists in the study area and beyond (Figure 46). This shows that the medical profession in foreign countries is giving incorrect advice.

The international tourists were mainly made aware of malaria by reputable sources such as travel doctors, literature or health authorities (79%) and the quality of information received had an influence on their perception of malaria risk and their attitude towards preventative measures.

A high percentage of local tourists (43%) who travelled to the area were not taking prophylaxis and many reasons were given for this (See Figure 48). The main reason listed by local tourists for not taking prophylaxis was that they were traveling in winter months (31%) that coincide with the June school holidays. Tourists in general perceive the winter months to be a low malaria risk time of year to travel. Le Sueur and Sharp (1996) noted that all countries in the southern Africa region show a similar seasonal pattern of malaria transmission. Malaria transmission starts no earlier than October, increasing through to March, April, May, declining rapidly in June with very few cases occurring through to October. Winter months are therefore not as safe as tourists perceive them to be.

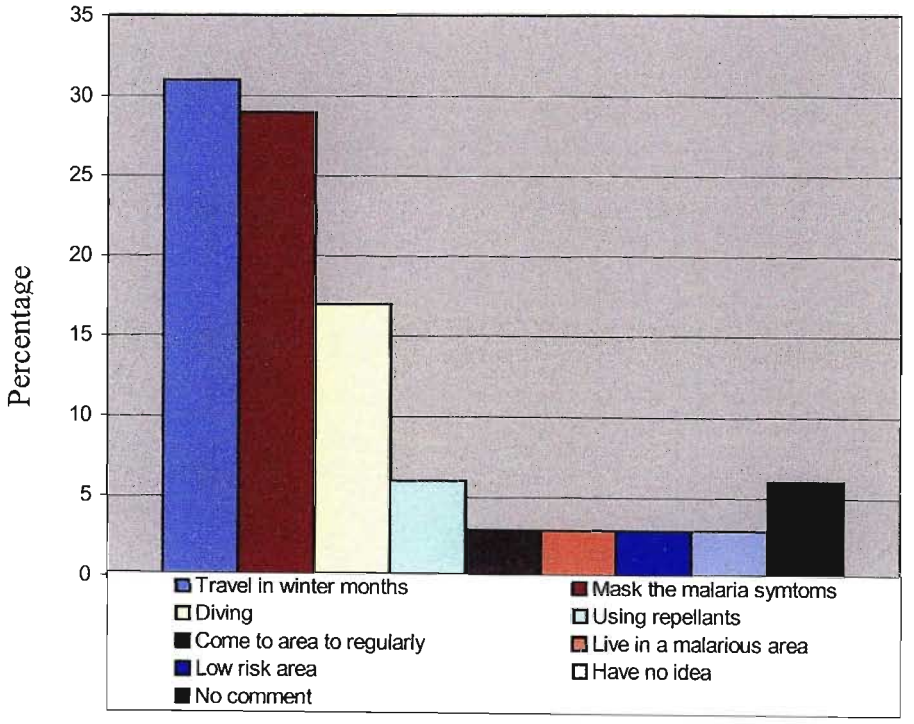


Figure 48: Reasons given by local tourists for not taking prophylaxis.

It is concerning that a high percentage of local tourists (29%) believe that the use of malaria prophylaxis "masks" the malaria symptoms when a person is infected. They further believe that it is better not to take prophylaxis so that the doctor/hospital can identify the malaria symptoms rapidly. This assumption by local tourists regarding prophylaxis is not only false but also very dangerous and it could be fatal. *Plasmodium falsiparum* malaria constitutes over 90% of all malaria cases in sub-

Saharan Africa and if it is not treated rapidly develops into cerebral malaria (Nchinda, 1997).

The third most commonly listed reason for not taking prophylaxis by local tourists whilst visiting the area is that they are visiting coastal areas for scuba diving (17%). People do not take prophylaxis when on a diving vacation and this is related directly to the use of Lariam®/Meflium®. These two products have neurological side effects and are contra-indicated when diving due to water pressure and psychological side effects.

A surprisingly low percentage of local tourists see repellents as an adequate alternative to prophylaxis (6%). There is a wide range of effective mosquito repellants on the market. N,N-diethyl-3-methylbenzamide (DEET) is the most effective, and best studied insect repellent currently on the market. This substance has a remarkable safety profile after 40 years of worldwide use, but toxic reactions can occur (usually when the product is misused). When DEET-based repellents are applied in combination with permethrin-treated clothing, protection against bites of nearly 100% can be achieved. Plant-based repellents are generally less effective than DEET-based products (Fradin, 1998).

A much lower percentage of international tourists (24%) are not taking prophylaxis in comparison to local tourists (Figure 49). The most common reason given by international tourists was that it was not necessary due to the time of year (winter months). As with the local tourists, the international tourists perceive winter months (21%) to be a low malaria risk time of year, which is problematic given that transmission starts no earlier than October, increasing through to March, April, May, declining rapidly in June with very few cases occurring through to October. Unpleasant side effects of prophylaxis (21%) with special mention of Larium® were listed as the second reason for not taking prophylaxis "It is impossible for me to enjoy my vacation when taking prophylaxis" (Respondent 4, 15 September 2000).

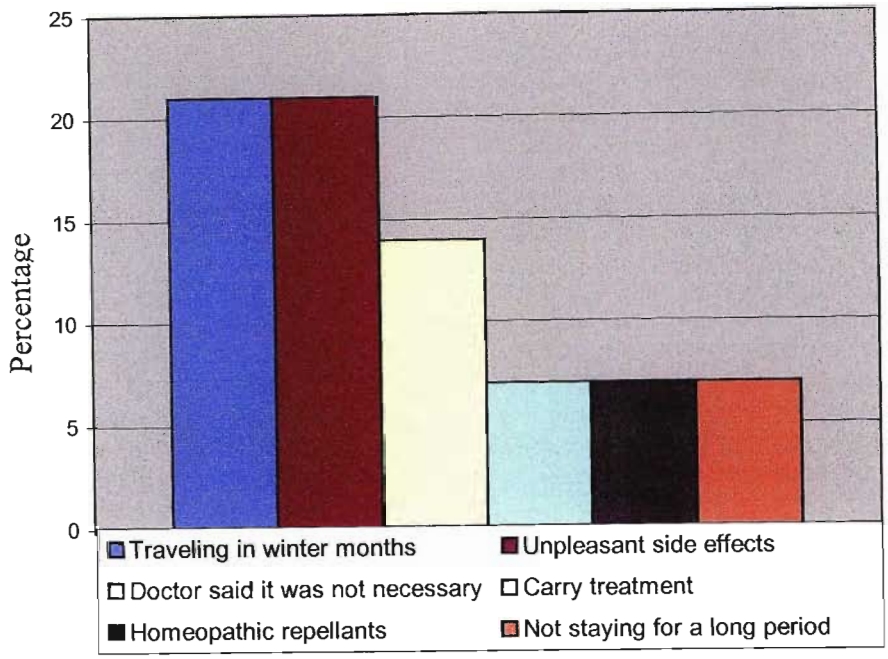


Figure 49: Reasons given by international tourists for not taking prophylaxis.

Only 41% of local tourists use alternative measures to protect themselves from malaria infection whilst on vacation. The most popular alternative measure used by local tourists is repellents (35%) followed by protective clothing (2%) and mosquito nets (1%)(Table 18). It is surprising that only 1% perceive bed nets as an adequate alternative measure given that there is a global shift towards the use of bed nets as a malaria control measure.

Table 18: Other measures taken to prevent malaria infection.

	Local Tourists		**International Tourists**	
Alternative measures	**Yes**	**No**	**Yes**	**No**
	41%	59%	50%	50%
Repellents	35%		34%	
Protective clothing	2%		2%	
Stay inside at night	0%		3%	
Cover up at night	0%		2%	
Minimise exposure	0%		2%	
Prevent bites	0%		2%	
Mosquito nets	1%		0%	
Sex	1%		0%	
Nothing	1%		0%	

Half of the international tourists (50%) use alternative measures to protect themselves from malaria infection. The most popular method amongst international tourists is the use of repellents (34%) followed by mosquito nets (5%) and avoidance tactics (3%). Mosquito nets or bed nets are yet again not very well supported and further investigation needs to be done to determine the reasons for this behaviour.

5.6 Conclusion

This chapter has considered four key themes related to malaria risk. It has profiled tourism in the area, considered risks and travel concerns, focused on the impacts of malaria on tourism and the availability of information on malaria. Tourist's knowledge of malaria transmission patterns and distribution was analysed and assessed and preventative and curative treatment has been evaluated and analysed.

The following chapter draws key conclusions and makes recommendations.

Chapter 6: Conclusion

The Lubombo corridor has the potential to develop into an international tourist destination but malaria is hampering the growth and development of the region. Ongoing and sustainable malaria control is thus essential and will determine the pace of agricultural and tourism development in the area.

The regional effect of malaria control in the Lubombo corridor can clearly be seen in the major malaria case and malaria parasite reductions since the project started in 1999. South Africa recorded an astonishing 76% reduction in malaria cases. Swaziland recorded a reduction of 64% and Mozambique reported a malaria parasite prevalence reduction of 40%.

A number of key findings related to malaria risk perception emerged from this study. It is apparent that malaria is a key concern to both local and international tourists while on vacation. A high percentage of tourists know that malaria is a treatable disease, so it is not perceived by them to be a dreaded disease such as severe acute respiratory syndrome (SARS). Malaria has a greater negative impact on international tourists as opposed to local tourists and international tourists are more concerned about their safety (both in relation to malaria and crime) than their local counterparts.

Local tourists tend to rely on their own knowledge or local knowledge in relation to malaria distribution and risk. International tourists receive their malaria information from scientific sources such as travel clinics or travel doctors and are therefore better informed in terms of scientific knowledge. Although the international tourists are better informed from a medical perspective the importance of correct local knowledge must not be underestimated. International and local tourists obtain information on malaria in different ways and their knowledge and perceptions are different. This implies that malaria information campaigns need to take these differences into account when targeting local and international tourists in future.

From this research it is evident that only a very small percentage of local and international tourists were aware of the malaria control programme in the Lubombo corridor. Many tourists considered it their own responsibility to carry treatment in

case of possible malaria infection. It is good that tourists take responsibility for individual control of the disease but correct information and medical practice is essential if tourists administer their own treatment. Marketing campaigns need to target both tourist groups to inform them about malaria control and the major malaria reductions in the corridor. International tourists need to be informed about the available health facilities in the area so that the apparent mistrust of health care in South Africa can be addressed.

All of the above perceptions need to be considered in relation to the massive reductions in malaria over the past four years. This has been achieved as a result of the malaria control programme discussed in this study.

The theory has provided insight into ways in which people construct risk. The following factors should be targeted in future to change people's perception about malaria and malaria risk in the Lubombo corridor. People need to be informed about the positive outcome and regional effect of disease control in the corridor, so that they can construct an informed and correct perception of risk.

Voluntarism of risk is an important factor that has an influence on the way people construct and perceive risk (Starr, 1980). All the tourists that visit the area that know about malaria transmission visit the area voluntarily but the risk (malaria) is imposed on them involuntarily. Researchers will never know conclusively how many tourists avoid coming to this unique area due to their perception of malaria risk in the area.

Tourists knowledge of risk determines how they perceive the risk in question (malaria), how they construct their perception of risk, their treatment seeking behaviour and the personal protection measures they take to avoid being infected with malaria. It is therefore very important to provide correct and updated malaria information on a yearly basis so that tourists can improve their knowledge on malaria, prophylactic drugs, repellents and treatment.

Control over risk is another important factor that has an influence on how people perceive malaria risk when travelling in the area. It is of paramount importance to make people aware of malaria control in the corridor so that they realise that there is

some control over the risk of malaria. It is furthermore important to improve the use of personal protection measures like prophylactic drugs and repellents so that tourists take responsibility for some control over possible malaria infection.

Trust relies on competence and credibility. Renn and Levine (1991) have noted that historical experience; consistency and competence play an important role in developing trust. It is therefore crucial that malaria control and research is sustained so that malaria reductions continue and malaria epidemics are avoided in the Lubombo corridor.

It is essential to distinguish between chronic and acute risk when evaluating malaria transmission. Many tourists perceive malaria transmission in the Lubombo corridor to be acute due to the perceived lack of malaria control. Acute risk is associated with disasters such as malaria epidemics (Oelofse, 1994). The Lubombo corridor has experienced exceptional reductions in both malaria cases and malaria parasite prevalence. It is essential that the good news of regional malaria reductions reach tourists, so that their perception can change.

The newness of risk plays a role in how people construct their perception of risk. When tourists visit an area, they encounter new risks that are not prevalent in their home environment. It is important to provide tourists with the relevant information on possible risks that they might encounter so that they are aware of the risks and that they can take the necessary precautions against them.

Vulnerability is another important determinant of how people perceive risk. The regional malaria reductions are yet again a positive factor that may change the way people construct their perception of risk if they are made aware of the reductions. If people are aware of malaria control and the significant reductions in the Lubombo corridor they may feel less vulnerable in future and the area may then attract many other tourists that possibly avoided the area due to malaria. Updated malaria risk information in therefore very important so that tourists can reassess their level of vulnerability.

One of the most concerning misconceptions amongst tourists that visit the Lubombo corridor is that malaria prophylaxis "mask" the malaria symptoms, and therefore tourists believe that it is better not to take any prophylaxis. This perception is misleading and potentially fatal for people that contract malaria whilst on vacation. All travel doctors; pharmacists and general practitioners should be made aware of this problematic perception and correct information needs to be extended to potential tourists planning to visit malarious area.

The South African media needs to be sensitised towards malaria reporting. Much of the reporting on malaria by television and newspapers tends to focus on the negative aspects of this ancient and dreaded disease. The LSDI project has changed that, and the good news about collaboration, malaria case reductions, parasite prevalence reductions and healthy communities needs to be reported so that people can make informed decisions and create informed perceptions.

One of the objectives of this study was to supply the correct information to tourism organisations, tourism operators and tourism facilities, so that tourists have updated malaria distribution maps and malaria prophylaxis advice booklets.

Malaria is one of the main issues of concern amongst local and international tourists that visit the Lubombo corridor. Tourist facility owners and managers perceive malaria to have a negative influence on local and international tourists that visit the area. Malaria is therefore having a detrimental effect on the tourism industry as a whole.

Although malaria is seen as the main impediment to tourism in the Lubombo corridor, many other factors exist that have a negative influence on the tourism industry. Factors such as crime, HIV/Aids, environmental degradation, violence, leakage, lack of infrastructure and negative media reporting have a negative influence on the tourism industry in the area.

Another problem facing South African tourism is the rampant crime and violence in the country. South Africa is losing foreign revenue as a result of choosing not to visit South Africa. Extreme measures need to be taken to make South Africa a safe tourism

destination. Tourism is the biggest earner of foreign currency in the world and South Africa cannot miss out on the opportunity that tourism provides to address issues of poverty and inequality.

The HIV/Aids pandemic in South Africa is another issue of concern that prevents tourists coming to this country. There is no easy solution to this crisis but special attention needs to be given to tourist's safety concerns while visiting South Africa and tourist facilities across the country. As with malaria correct and appropriate information needs to be provided to tourists.

The lack of infrastructure development is a major impediment to tourism development in southern Mozambique. The lack of clean water, electricity and roads is an attraction to some tourists but it prevents more people from visiting the area, resulting in major revenue loss. Proper environmental impact assessments need to be done when infrastructure development takes place in this ecologically sensitive area. All of these factors need to be addressed in an integrated way if tourism is going to develop and expand to its full potential in the Lubombo corridor.

Plate 13 – Coastal forest wood is covered with mud and smouldered to make charcoal, Ponta Mamoli, southern Mozambique, 2002.

The impacts of tourism such as environmental degradation and monetary leakage need to be considered. The influx of tourism to the area has created a market for charcoal (Carvau). Many local people are taking the opportunity to supply charcoal and serious damage is done to the indigenous forests (See Plate 13). An alternative solution needs to be found so that the indigenous coastal forests are protected and further research needs to be conducted to assess the environmental destruction of the coastal forests and to monitor it on a yearly basis.

Mozambique has adequate environmental laws in place to protect the natural environment but these laws need to be stringently applied with the influx of tourists to the area. Areas need to be clearly demarcated for driving since people are causing severe damage in the form of soil and dune erosion (See Plate 12). Beach driving is prohibited in Mozambique but tourists tend to ignore the ban. Beach guards need to be placed at strategic positions to apprehend perpetrators. Tourists that visit Mozambique need to be educated in responsible and ecologically friendly tourism.

Plate 12 – Dune erosion due to irresponsible 4x4 driving by tourists, Ponta Do Ouro, southern Mozambique, 2002.

Tourism leakage occurs when the financial benefit of tourism does not reach the people of the area. Most tourism facilities are managed or leased by South Africans. A mechanism needs to be put in place and further research needs to be undertaken to ensure that leakage is prevented when tourism expands in southern Mozambique. Tourism is currently creating many job opportunities to local people in the form of camp guards, kitchen staff, dive staff, cleaning staff and management staff of tourist facilities.

6.1 Conclusion

The malaria control component of the LSDI project has had major success with unprecedented malaria reductions in South Africa, Swaziland and Mozambique. The LSDI model for malaria control could be used by other African countries to enable this ancient disease to be fought on a regional front. Regional collaborations amongst African countries is the key to future successful malaria control on the African continent. Malaria is posing a threat to future tourism growth in Africa and effective malaria control is essential if the African continent wants to develop its tourism industry.

Tourism is the fastest growing industry in the world and Southern Africa is the sleeping giant with abundant tourism potential. Tourism can and will bring development and jobs to areas that utilise their tourism potential in a sustainable manner. The information flow between tourists, tourism facility operators and authorities is crucial. If the information flow between tourists and authorities are not improved, many tourists will continue to avoid malarious areas.

Malaria remains a critical health issue for the vulnerable and poor in Africa. The international community should be reminded that malaria is still one of the biggest killers in Africa and international funding should therefore be allocated accordingly for continued and sustainable malaria research and control. These residents of Africa are impacted on directly by the disease in their day-to-day lives. The majority of these people are poor and vulnerable and their plight with regard to malaria, which is a preventable disease, needs to receive greater attention.

This research has focused on the impacts of this disease on tourists who voluntarily visit these areas. Tourism generates economic growth and raises the profile both locally and internationally of remote areas. It is hoped that the increased focus on malaria control as a result of the need to promote tourism, will have positive benefits for local people who have no choice but to live in malarious areas.

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Appendix 1 – Tourist questionnaire

Tourism Questionaire for LSDI Study:

Address:

Contact Person:
Tel:
Cell No:
Co – Ordinates:

Please tick the appropriate box ☐

- **Are you aware of the Lubombo Spatial Development Initiative?** **Y** **N**
- **If yes please provide a brief description of your understanding of the project.**
- **Comment:**

- **Which factors influence tourism in your area?**
- **Positive:** **Negative:**

1.	**1.**
2.	**2.**
3.	**3.**
4.	**4.**
5.	**5.**

- **Do you stay in a Malaria risk area?** **Y** **N**
- **In your understanding, which are the peak Malaria months?**

Ja Fe Ma Ap Ma Ju Ju Au Se Ok No De

Rating scale for following questions:

1. **Strongly disagree**
2. **Disagree**
3. **Neither agree nor disagree**
4. **Agree**
5. **Strongly agree**

RATE 1. 2. (3.) 4. 5.

Please circle the appropriate rating

- **Does Malaria have any influence on Tourism?** Y N

  RATE 1. 2. 3. 4. 5.

- **Does Malaria have a negative impact on South – African tourists visiting this area / facility?** Y N

  RATE 1. 2. 3. 4. 5.

- **Does Malaria have a greater negative impact on overseas tourists (as apposed to S.A tourists) visiting this area / facility?** Y N

  RATE 1. 2. 3. 4. 5.

- **Have you had any cancellation due to Malaria in the past 6 months? If yes / How many?** Y N
- **Comment:**

- **Do you do any kind of Malaria control at your facility?** Y N
- **If yes / how and which product is used?**
- **Comment:**

- **Will you be willing to make a contribution towards malaria control in your area?**
- **Comment:** Y N

- **Total number people employed:**
- **Number of full time employees:**
- **Number of part time employees:**
- **Number of temporary employees:**
- **Do you employ more people during peak season?**
- **Is tourism seasonal to the area? If yes which months?** Y N
- **Jan:**
- **Feb:**
- **Mar**
- **Apr:**
- **May:**
- **Jun:**
- **Jul:**
- **Aug:**
- **Sep:**

- Oct:
- Nov:
- Dec:

- No. of beds at this facility?

- What is the average monthly occupancy rate of this facility?

- Rooms:
- Beds:

- How long have you been in business?

- < 1 year
- 1-2 years
- 2-5 years
- 5-10 years
- >10 years

- What is the average stay of visitors at this facility?

- Overseas Tourists: ____ days .
- South-African Tourists: ____ days .

- How many overseas tourists visit this facility yearly?

- How many South – African tourists visit this facility yearly?

- Do you supply guests with Malaria information?

- **Formally:**
- **Informally:**
- **If yes / how and source?**
- **Comment:**

- **Do you need more Malaria information?**
- Y N

Facility Type:

- **Hotel / Motel**
- **Youth Hostel / Backpackers**
- **Caravan Park / Camping**
- **Guesthouse / B&B**
- **Lodge**

Other:

Other Facilities:

- **Restaurant facilities**
- **Ablution Blocks**
- **Electricity**
- **Water**
- **Showers**
- **Television**

- Bird / Game watching

- Hunting

- Fishing

- Diving

- Hiking

- Gym facilities

- Golf course

- Horse riding

- Disabled facilities

- Cell phone coverage

TOURIST QUESTIONAIRE:

(Please tick the appropriate box) ☑

- **Questionnaire completed in:**

Hlabisa		**Ubombo**	
Ingwavuma		**Mozambique**	
Swaziland			

- **Are you a local or international tourist?**

Local		Area:
International		Country:

- **As a traveller in this region list a few issues of concern**

(Please rank issues from 1(Important) to 6(Less important) in order of concern)

- **Were you at all hesitant about coming on this trip?** **Y** **N**
  If yes / Explain reasons for your concern:
- **Comment:**

- **Where do you think malaria occurs in Southern Africa?**
  Comment:

- **Who made you aware of Malaria before coming on this trip?**
- **Comment:**

- **Do you believe that the area you are currently traveling in is a malarious area?** Y N

- **If yes / would you define the risk area as LOW** ☐
  MEDIUM ☐
  HIGH ☐

- **Has the media influenced your perception of Malaria in S.A in any way?**
- **Comment:**

- **Do you think the Mozambican floods influenced malaria levels in South Africa?** Y N

- **Are you aware of malaria control efforts in the region?** Y N
- **If yes / do you know what methods are used to control malaria**
- **Comment:**

- **Is malaria treatable?** Y N
- **Comment:**

- **Can malaria cause death?** Y N
- **Comment:**

- **How is malaria transmitted?**
- **Comment:**

- **What are the main symptoms of malaria?**

1.
2.
3.
4.
5.

- **When is malaria transmitted?**

- **Day** ☐
- **Night** ☐
- **Both** ☐

- **What would you do if you got sick?**
- **Comment:**

- **Have you ever had Malaria?** Y N

- **Do you know anyone who has contracted Malaria?** Y N
- **Where did they / you contract Malaria?**
- **Comment:**

- **What are the best precautionary measures a tourist can take to prevent malaria infection?**

1.
2.
3.
4.
5.

- **Were do you generally get your malaria information from?**

  Please provide sources

- **Are you visiting other malaria areas in Africa?** Y N

If yes/ which country/area are you going to?

- **Have you traveled to other non African countries where malaria occurs?**

- **Are you taking any drugs to prevent malaria?** Y N

- **If yes / which of the following prophylaxis are you using?**

- **Azithromycin**
- **Chloroquine**
- **Chloroquine plus proguanil**
- **Doxycycline**
- **Mefloquine**
- **Proguanil**
- **Lariam**
- **Primaquine**
- **Pyrimethamine plus dapsone**
- **Homeopathic repellants or medicines**
- **Other – Please specify**

- **If no / why, please give reasons why prophylaxis are not used.**
- **Comment:**

- **Do you think any particular group is more at risk if they visit a malarious area?** Y N

If yes / please list the groups.

- **Who advised you on which prophylaxis to take?**

- **Your doctor** ☐
- **Your pharmacist** ☐
- **A medical person** ☐
- **A non medical person** ☐
- **A travel clinic** ☐

- **What other measures do you take to prevent being infected with malaria?**
- **Comment:**