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**SOCIO-CULTURAL FACTORS AND THE DIFFUSION
OF MALARIA CONTROL**

By

Richard D. Periman

B. A., University of Montana, 1985

**Presented in partial fulfillment of the requirements
for the degree of
Master of Arts
University of Montana
1987**

Approved by

Katherine M. West by Taylor
Chair, Board of Examiners

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Dean, Graduate School

August 14, 1987
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Anthropology

Socio-Cultural Factors and The Diffusion
of Malaria Control (87pp.)

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This thesis explores the effects of socio-cultural factors on the success or failure of malaria control programs. This success or failure is observed in terms of the diffusion of malaria controls ideas practices and techniques. The diffusion theory used is primarily that of Everett M. Rogers (1983) and the research methods are descriptive and comparative. Malaria control programs of four Third World nations, India, Papua New Guinea, Nigeria, and Zimbabwe, are examined. A general description of malaria and its present global situation is provided in order to place the four countries in a wider perspective. This research concludes that the socio-cultural factors, which occur at the global, national and local levels, affect the diffusion of malaria control. For the diffusion of ideas, practices and techniques to occur, effective communication between the local population and the health care workers must take place. Further, the change agent, in this case the health care workers, must be flexible and take into consideration the views and beliefs of the people in order to communicate the malaria control measures adequately.

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Chapter I

Introduction

In this thesis I will explore the effects of socio-cultural factors on the success or failure of malaria control programs. I will also look at this success or failure in terms of the diffusion of malaria control ideas and practices. I will examine the malaria control programs of four Third World nations: India, Papua New Guinea, Nigeria, and Zimbabwe, with a general "world overview" to help add perspective.

In examining the problems of malaria control I have mainly used the diffusion theories of Everett M. Rogers, in Diffusion of Innovations (1983). Rogers' work is quoted by many other diffusion theorists, and represents one of the most influential contributions to the field. His theory has been easier to relate to and comprehend, from an anthropological point of view, than some of the more abstract, statistical methods being used by modern sociologists and geographers.

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The World Health Organization estimates that there is a total incidence of malaria "in the order of 98 million cases annually" (WHO 1986:171). Malaria, and a seemingly

infinite number of other diseases, has had an enormous effect on the economic development of the Third World. Acute illness may put the family breadwinner in bed for days, during which there will be no earning of income and, therefore, nothing to eat. In endemic areas, malaria is estimated to cause absenteeism rates of 25% or more. This is in contrast to the West where the incidence of worker absenteeism is only 2% to 7% (Harrison 1985:289). Even if malaria does not always kill, it saps peoples' strength and cuts down on productivity, which may already be low because of hunger and heat.

Absenteeism and low productivity, on a national scale, contribute to national poverty. This means that farms and factories must hire more people than they really need. Since there is so much unemployment in the Third World, this may actually spread the work around more widely. But low productivity means there will be little surplus for investment, and disease in families makes it harder for them to save money...So disease creates poverty, while poverty, continuing the cycle, maintains the conditions that foster disease. Behind almost every tropical disease life cycle [including malarial] lies a set of social and physical conditions....(Harrison 1985:288-289).

This study of malaria and diffusion is a brief descriptive survey of the literature, and is not the result of my own participant observation. Studying the process of diffusion from an anthropological point of view can add insight to some of the problems associated with malaria control. Anthropologists try to understand the point of view of the people they study. In the case of malaria control programs, this would be the perspective of the

people being treated by, and/or being educated to modern techniques. This view helps the anthropologist to overcome the "pro-innovation at all costs bias" of many other diffusion researchers (Rogers 1983:49). Anthropologists often gain an holistic perspective of the lifestyles, world views, and social relationships of the groups they study.

In many of their research accounts, anthropologists show that the planners and officials in charge of development programs failed to account fully for the cultural values of the expected adopters of an innovation. As a result, the diffusion programs often failed, or at least it led to unanticipated consequences (Rogers 1983:49).

In order to better understand the difficult and complex nature of malaria control it is necessary to give a brief description of the disease.

The parasites which cause malaria are Protozoa. The four most important species causing malaria in humans are: (1) Plasmodium falciparum (the most widespread form); (2) Plasmodium vivax; (3) Plasmodium malariae; and (4) Plasmodium ovale (Dutta and Dutt 1978:69).

The life cycles of these four parasites can be divided into two phases, asexual and sexual. The sexual stage of the parasite development takes place in the female Anopheles mosquito, which acts as the vector which transmits the disease to man. There are more than 300 species of Anopheles, 85 of which have been directly linked to malaria (1978:71).

The asexual reproductive cycle of Plasmodium occurs in man. It begins with the inoculation of spindle-shaped

sporozoites into the human blood stream by the infected Anopheles mosquito. As soon as the sporozoites are transmitted into the blood they migrate to the liver cells. Inside the liver cells the sporozoites develop into larger spheroid-shaped merozoites. These merozoites leave the liver cells and invade the red blood cells (1978:71). This begins the erythrocytic stage in which the malaria parasites become mature merocytes. The merocytes divide into large numbers of new merozoites which actually cause the damage by breaking out of and destroying the red blood cells; then they invade new blood cells to begin the cycle over again. This whole cycle takes from 48 to 72 hours. The patient begins to feel the symptoms of a malaria attack when the red blood cells are broken open, releasing the merozoites into the blood stream. The fever and chills associated with malarial infection are caused by the body's defense mechanisms in their fight against the invaders, and by the toxic waste products produced by the Plasmodium (1978:72).

Some of the merozoites become sexually differentiated into male and female gametocytes. These gametocytes are only able to continue their reproductive cycle in the gut of the female Anopheles mosquitoes. The gametocytes become gametes inside the mosquito. The sexual reproduction of the organisms results in the development of oocysts which in turn produce large quantities of sporozoites. These sporozoites then invade the salivary glands of the mosquito, and

eventually through the feeding process of the mosquito are passed on to a human host to begin the deadly cycle over again (1978:73).

The parasite, vector, and the human host require certain environmental conditions to continue the life cycle of the malaria parasite. Temperature, rainfall, relative humidity, soils, drainage, altitude, political/economic conditions, and cultural beliefs and practices are directly and indirectly related to the continuance of the cycle (1978:73). Children are usually the worst affected by malaria. People who survive to adulthood are likely to have some resistance to the diseases (Wessen 1972:659). Such factors as malnutrition, poor living conditions, lack of sanitation, and other diseases often weaken people to the point at which an attack of malaria can be overwhelming and cause death (1972).

In chapter II, I have discussed the diffusion theory and methods used. Chapter III is essentially a survey of the literature pertaining to malaria control programs, methods, and beliefs. It begins with a brief general overview of malaria in the world and goes on to examine the disease and various control programs in the four nations of India, Papua New Guinea, Nigeria, and Zimbabwe. Chapter IV is a summary of my findings and results, and Chapter V is a look at their implications.

CHAPTER: II

Theory and Research Methods

Theory

Malaria eradication programs and other health care development programs are implemented primarily through the process of diffusion. The process of Third World development is chiefly one of the diffusion of "Western" ideas into non-Western societies. Third World development programs invariably utilize diffusion to implement economic, industrial, political, and health care development. In this chapter I will discuss theories of diffusion and how I believe these theories pertain to general health care development programs, and specifically how they relate to malaria eradication in developing countries.

"Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are new ideas" (Rogers 1983:5). Communication can then be defined as a process in which participants create and share information with one another in order to reach a mutual understanding. The newness of the idea being communicated

always involves a degree of uncertainty. This uncertainty can in turn be defined as the degree to which a number of alternatives are perceived with respect to the occurrence of an event and the relative probable outcome of these alternatives (Rogers 1983:6). An individual can reduce the degree of uncertainty by obtaining more relevant information about what is being communicated. The information itself is a difference in new ideas that affects uncertainty in a situation where a choice exists among a set of alternatives.

Rogers broke diffusion into these main elements: (1) an innovation, (2) which is communicated through certain channels; (3) this takes place over time, (4) among the members of a social system (1983:10). He defined an innovation as "an idea, practice, or object perceived as new by an individual or other unit of adoption". In this case the innovation is information, medication, and other control measures used in the eradication of malaria by Western medicine. According to Rogers the characteristics of an innovation, as perceived by the members of a social system, determine its rate of adoption. Five attributes of innovations which determine rate of adoption are: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability (1983:10).

Communication is the means by which new ideas are conveyed from one person to another. Diffusion of new ideas and innovations takes place through communication channels,

these are the means by which messages get from one individual to another. The nature of the information exchange relationship between the pair of individuals can determine the conditions under which a source will or will not transmit the innovation to the receiver (Rogers 1983:10). In the case of the health care worker trying to communicate anti-malaria measures and preventions, the choice of communication "channel" is of great importance. If mass media channels are used, the innovations may be effective when the audience of potential adopters has access to such media as radio, television, or newspapers. In contrast, mass media would probably not be optimal in rural areas or among the poor and/or illiterate millions in Third World areas. Interpersonal channels can often be more effective in persuading an individual to adopt a new idea, especially if the interpersonal channel links two or more individuals who are peers. This face-to-face type of communication is much more effective in dealing with rural populations who may be distrusting of "outsiders" (Rogers 1983:17-18). Westley states that "the more important the event to the recipient, the more personal communication contributes to its diffusion" (Zaltman 1973:223).

Another important factor in the diffusion of ideas and innovations in health care is the role of what Everett Rogers called the "change agent" (Rogers 1983). A "change agent" is an individual who influences the client's innovation

decisions in a direction deemed desirable by a change agency, i.e., the World Health Organization.

In most cases, a change agent seeks to implement the adoption of new ideas. The change agents in my study of malaria eradication programs include the World Health Organization, the national health care agencies, and the traditional indigenous healers of the area. The World Health Organization (WHO) change agent may only interact with the countries' national health care professionals, or they may at times actually work directly at the village level. The national health care people are either organized into a hierarchy of national, state (or province), district, block, and village, as in India, or they may work privately. The "village healer" is a member of the community and, as change agent, can be helpful in conveying new information, or he may actually slow down the diffusion of new ideas by not communicating with the people sufficiently.

Here I have taken Roger's "change agent" roles and used them to outline how they may be appropriate in my study of the diffusion of malaria control ideas.

Change Agent roles

1. Developing awareness of a need for change.

Example: The agent may help establish an awareness of a need to spray house walls with an effective insecticide.

2. Establishes information exchange relationship.

Example: The malaria control officer must exhibit credibility, and must show empathy for the people's needs and problems. In order for information to be exchanged, change agent must be accepted by the client people.

3. Diagnoses their problems.

Example: Even though people suffering from malaria will be most often aware of it, the change agent, i.e., primary health worker or malaria control officer, must be able to analyze the problem situation and recommend change.

4. Creates intent to change in the client.

Example: Motivation and interest must be created for change. Often in malaria programs this motivation can assume the form of threat; the government may outright order compliance. On the other hand the change agent must be trusted so that people will take antimalarial drugs and take various other prevention measures.

5. Translate intent into action.

Example: With malaria and other health problems, prevention and tentative control measures are most influential through peer pressure and interpersonal networks of communication. If a man sees that his friend has and uses mosquito netting in his house, he may perceive it as not only a healthful practice, but maybe a status symbol. This perceived

difference of status may influence the first man to also use the netting.

6. Stabilizes adoption and prevents discontinuances.

Example: With malaria control, this role of the change agent may be one of maintenance. This is because often the key to control is continued use of prevention measures. It also may include a steady supply of antimalarial drugs and insecticides, along with weekly health checks.

The change agent is of primary concern in the control and/or eradication of malaria. It is through the various change agency-programs that diffusion of anti-malaria practices, drugs, and technology must pass. Today many anthropologists have taken a role in change, by acting as advisors of directed change programs. As a result of this directed diffusion, a number of books, manuals, and journals have been devoted to the topic of applied change, i.e., diffusion.

Unfortunately change agents commonly ignore this literature and in so doing commit many costly and unnecessary errors. These are often due to such things as poor planning, failure to adequately communicate a clear understanding of the programs to the recipients, lack of foresight in gauging the effect of induced change, and perhaps most important, ignorance of local cultural patterns (Woods 1975:41-42).

Implicit in this theory of diffusion, and the most important to my study of malaria, is communication between the change agent and the individuals in a community. Frequently, the actual communication of malaria eradication ideas is overlooked (Welsch 1986:108). Communication about

malaria is increasingly important because it hinders Third World development. From a pragmatic point of view, a nation or area afflicted by malaria is not, and cannot be, very productive and therefore is not able to develop. This is one factor which keeps many Third World nations in a perpetual state of poverty and underdevelopment.

Research Methods

The research methods I have used are descriptive and comparative. As part of the descriptive information, I have included world malaria statistics for the period dating 1962 to 1982. These statistics were compiled by the World Health Organization. I looked at and compared the malaria control programs and practices of four countries: India, Papua New Guinea, Nigeria, and Zimbabwe.

For the time period before and after 1962, I have used historical data to help describe malaria control measures in the four countries. I also used ethnographic and historical data, when available, to help gain some insight into the "traditional" or indigenous health practices concerning malaria. These historical data are often sketchy but have provided the majority of my descriptive information. Very little of the specific malaria information is from anthropologists. Some of the ethnographic description used is from the WHO, and national health care professionals, and medical doctors specializing in tropical medicine. Often

these non-anthropologists have provided enlightening insight into the socio-cultural aspects of malaria and the perceptions of the native people studied or treated.

At the beginning of this study I had hoped to be able to investigate and organize my data according to health care organization. For example, I wanted to examine how the WHO, the national government malaria programs, and the traditional or indigenous organizations and structures dealt with malaria control and/or eradication.

At first this seemed a good method of organizing my research, but as I progressed, I realized that I was actually encountering different levels of anti-malaria organization, not just different organizations: (1) WHO is obviously worldwide in approach; (2) national programs are usually implemented by the present government of the country, often with the help of the WHO; (3) the traditional or indigenous level is the local village or tribal level. Frequently traditional concepts of malaria, and its control, or "fever" treatment were only described by the WHO or national primary health care workers when they were encountered and subsequently considered a deterrent to modern control projects control project. A good example of this occurrence is in the section on India.

Often there was only information on national malaria control programs and their subsequent interaction with the traditional local population through the work of the WHO.

Even though some intentional research on the part of the WHO has yielded helpful new information on ethnomedicine and its treatment of malaria, many native or traditional antimalarial practices have been ignored and tragically forgotten.

I have described the history of malaria control efforts in each of the four study countries and given a general idea of how malaria control has reached its present state in those countries. Also I have provided geographical and climatological information as it directly influences the disease of malaria and its various mosquito vectors. In addition I have included a world overview of malaria to help put malaria control into a historical and geographic perspective.

Originally I had planned to use a more nominative approach to this problem. I requested statistical information, and numerical data from the World Health Organization in Geneva, Switzerland. Prior to 1983, this information was stored on computer and made available on tape to potential researchers at their request. In response, the World Health Organization informed me that the massive statistical data were no longer being compiled and stored in Geneva, mainly because of funding problems. This led me to decide to use the statistics I had as part of a description of the malaria situations in the four countries.

I feel that using a descriptive method here gives an

equally valuable picture of malaria control and eradication. A graph showing the reported cases of malaria in the world and in the four study nations, and a map indicating the epidemiological status of malaria in 1984, are provided at the end of chapter III as part of the descriptive process.

Chapter III

Malaria Control: Descriptive Data

Introduction

This chapter contains the historic, descriptive data on malaria, the diffusion of malaria control ideas, and methods through control programs. I have provided a general history of the disease, and a description of the current world malaria situation. I have included this to help put the malaria control programs of India, Papua New Guinea, Nigeria, and Zimbabwe, into the framework of a global perspective. I have described the history of malaria control, and also the traditional beliefs or views, when possible, in each country.

My data are quite variable. In the case of Zimbabwe, references to information about traditional anti-malaria methods were almost impossible to find. Each country, province, district, block, village, and tribe is different, has different values and beliefs, and each views malaria and other diseases in unique ways. Also because of the size of the problem, such factors as time, distance, money, politics, climate, and other determinants contribute to the individuality of the malaria control programs and the

resultant literature. Even an international organization like the WHO must treat each nation differently, and this interaction has a great impact on malaria. In addition each researcher, doctor, and health care worker sees and reports varying aspects of malaria and its control. I have intentionally chosen my information from many different sources to help give a more broad, general picture of the overall malaria situation. The fact that malaria control has not been studied a great deal at the socio-cultural level also accounts for the variability of the data.

Malaria: The General Global Situation

Malaria is a debilitating disease of a global distribution. It has probably been associated with mankind throughout most of our evolutionary development when and where conditions allowed. The name "malaria" was not actually used until the middle of the eighteenth century. It is derived from the two Latin words mal aria, signifying "bad air". The disease was originally called "intermittent fever" or "marsh fever". Among traditional people, malaria is still referred to as "fever", or "fever and chills". Malaria fever recurs in several characteristic patterns: (1) every third day; (2) each fourth day after two days free from fever; (3) irregularly but with a daily high temperature (Dutta and Dutt 1978:69).

The "marsh fever" designation was associated with

stagnant marshy water or the "noxious miasm known to blow from marshes". In the 5th century B.C., Hippocrates assumed that the drinking of stagnant water caused malarial symptoms. It was therefore seen as only logical to believe that the bad air "could be filtered out by placing a barrier of netting over sleeping persons", because the "noxious element" existed in the air particularly at night. As early as 1500 B.C., in India, and later in Italy and East Africa, farmers and other laborers suspected that malaria was inflicted by mosquitoes. In 1883, A.F.A. King formulated a theory which established the bases for a mosquito vector of malaria. An Indian-born Briton, R. Ross, decisively established that a particular kind of mosquito, the Anopheles, worked as the vector in transmitting malaria to humans (Dutta and Dutt 1978:69). Ross isolated the characteristic pigmented oocysts of the malaria parasite in the Anopheles mosquito while doing research in India from 1897-1898. He was subsequently awarded the Nobel Prize in 1902 for this significant contribution to malarial research (1978:69).

I have given only a brief description of the malaria parasite and its mosquito vector here since my main concern is the socio-cultural significance of malaria control and its effect on health and development.

The mosquito vector genus, Anopheles has over 300 species and subspecies. It was first identified by Meigen in 1818 as a species. All Anopheles females are hematophagous,

(blood eating), but only 85 have been definitely identified as vectors of malaria. Each species and subspecies is subject to different climatic and environmental factors (Dutta and Dutt 1978).

The malaria-causing parasites are Protozoa. There are four species which have been identified as causing the most malaria in humans. They are: (1) Plasmodium falciparum, which causes tropical malaria, (fever every 2 days); (2) Plasmodium vivax, which causes tertian malaria, (fever every 3 days); (3) Plasmodium malariae, which causes the quartan malaria, (fever every 4 days); (4) Plasmodium ovale, which causes a kind of malaria that has symptoms of P. malariae, but has a development similar to the vivax (Dutta and Dutt 1978:).

The Plasmodium has little exposure to the outside environment. It either exists in man or in mosquitoes. An important factor in control is the fact that Plasmodium is ectothermic and depends on the body temperature of the vector i.e., Anopheles, which varies with the change in the atmospheric temperature. There are minimum temperatures below which the development of malaria the parasite is indefinitely retarded; 19 degrees C., for P. falciparum, 15 degrees C. for P. vivax and P. malariae. Also temperatures over 32 degrees C., decrease the survival of the parasites. Each parasite has a development cycle which requires 16 or 35 days for growth and transmission (Dutta and Dutt 1978 73-74).

The conditions under which the mosquito vector survives and reproduces is also important. In general, Anopheles are able to survive a dry season as adults, but there are certain species such as A. gambiae, a common vector in West and Central Africa, which have been found active and taking blood during the dry season. Studies made in the Sudan reveal that A. gambiae is highly adapted to maintain itself through acute drought and heat in arid zones. Anopheles can survive at temperatures as low as 12.7 degrees C., if the air is saturated with moisture. The best conditions, however occur at 25-30 degrees C., with 60% relative humidity. The 'best' temperature range is between 22 and 30 degrees C., for Anopheles to bite humans (Dutta and Dutt 1978:74).

The malaria cycle does not require an ideal amount of rainfall so long as there are small amounts of water in which the larvae may develop. Rains are associated with higher relative humidity which, when all other factors remain the same, gives a greater lifespan to the Anopheles and intensifies their biting cycle. Certain vectors such as A. minimus, A. funestus, A. pharoensis, and A. gambiae, bite at night when lower temperatures and higher relative humidity prevail. As a result, the rainy season and a few weeks after are the worst period for the massive breeding and intensification of the biting cycle of the mosquitoes. Consequently the greatest incidence of human malaria occurs

during the later parts of the rainy months and immediately afterwards (Dutta and Dutt 1978:74).

In a year-round malaria susceptible area such the State of Bendel in Southeastern Nigeria, where rainfall, relative humidity and temperature are ideal January through December, the higher rainfall of July has no increasing affect on malaria incidence. On the other hand in Trichy (Tamilnadu, India), lower relative humidity with higher maximum temperatures from April to August prevents large scale occurrence of malaria following high rainfall in May (Dutta and Dutt 1978:).

Even though malaria has occurred in deserts due to the existence of water in oases and canals, the greatest potential for the disease occurs only where and when rainfall is abundant. Dutta and Dutt stated that, "based on empirical evidence of malaria occupance on a global basis, probably 30 inches of annual rainfall may be established as a breaking point between higher and lower incidence of the disease" (1978:74). Also areas with rainfall between 30 and 60 inches have a high potential for malaria. Areas with rainfall above 60 inches, combined with rains spread out more evenly during the year, have the highest potentiality of the disease (1978: 74).

Physical landscape, especially altitude and water saturated terrain, affects malaria transmission. According to Dutta and Dutt (1978:78), Hirsch spoke of altitude as a

factor in malaria, using examples from the United States. For example, he sited the disappearance of malaria west of the Mississippi with increasing elevation. The same was also true with regard to altitude in Texas, Mexico, and Central and South America. Faust confirmed that by 1850, when malaria was well established throughout the U.S., the higher altitudes of northern New England, the Allegheny highlands, the Rocky Mountains, and the western Sierras were free from the disease. (Dutta and Dutt 1978:78).

Because of the direct rays of the sun on or near the equator, higher altitudes are more susceptible to malaria than in more temperate regions. In Colombia for example, two vectors A. albimanus and A. pseudopuntipennis remain active at over 9000 feet, causing malaria up to those elevations. In Kenya, the vectors A. gambiae and A. funestus carry malaria to over 7000 feet. In Vietnam the disease is carried by A. minimus up to 6000 feet. In the subtropical Himalayas, elevations over 4500-5000 feet, are free of malaria (Dutta and Dutt 1978:74).

Often "man-made malaria" has been created by providing the mosquitoes with breeding habitats. Economic activities such as quarrying, mining, brick works, railroad and road construction, and urban buildings create small accumulations of standing water. In addition the water associated with rice and banana cultivation provides enough moisture for mosquitoes to lay their eggs.

Malaria continued to be quite endemic in the southeastern United States until the late 1930s. Accelerated urbanization along with controlled drainage, river draining, screening of house windows and other anti-mosquito measures helped to eventually eradicate malaria in the U.S. (Dutta and Dutt 1978:78).

The invention of DDT in 1943 made it possible for the World Health Organization to begin malaria control programs world wide by 1949. The overall effectiveness of DDT applied to the walls of houses interrupted the transmission of malaria by shortening the life of the Anopheles vector. This residual spraying was the basis of most national malaria programs until 1956, and of the World Malaria Eradication Campaign until 1968. As a result of this program, areas supporting nearly 800 million people, comprising most of the temperate-zone countries, have been liberated from malaria (Brown et.al., 1976). The global malaria eradication battle of the WHO has not achieved its final goal of eradication. However it did free some 500 million people from the threat of endemic malaria and permitted the further economic development of many areas of the world, particularly in Asia, southern and south-eastern Europe, and in the Americas (WHO 1983:791).

Since 1965, after some national programs began to see a reversal in the formerly successful antimalarial activities, the WHO recognized many different factors which

es
affect control. There have been the multiple difficulties of technical, socioeconomic, financial, administrative and operational nature which have crippled the implementation of the strategies of malaria eradication in numerous malarious countries. WHO expected the development of basic health services by national governments. These services did not materialize as planned and it was therefore difficult to ensure the maintenance of positive gains already made in many parts of the world. There were significant resurgences of malaria transmission in many countries, and in some instances malaria epidemics have developed.

It is interesting that according to its epidemiological information, WHO has observed that after 1977, the deterioration of the malaria situation slowed down, or in some cases was even reversed, wherever there was "political determination". In countries where such determination is lacking, malaria threatens either to revert to the original endemic level prevalent before the start of the eradication programs, or to reestablish itself in epidemic form (WHO 1983:791).

WHO states that the main factors contributing to the deterioration of the world malaria situation are social, economic and political. These factors are involved in the planning and implementation of malaria programs, as well as the reduced support given to many malaria control programs by the countries existing health services. The main technical

problems contributing to the deteriorating malaria situation are the spread of vector resistance to insecticides and the resistance of strains of P. falciparum to chloroquine. Chloroquine, and other quinine-based antimalarial drugs, work by killing the Plasmodium parasites in the blood. Over-use of this drug has increased natural selection for parasites that are resistant to it. The WHO has related additional factors to the continued dependence on residual insecticide spraying without attempting to promote other biological or engineering methods. Also, the price of the alternative insecticides is too high for some of the countries concerned (WHO 1983:791-795).

The overall world malaria situation has not improved in the last 15 years, according to WHO. Although some countries have been reporting downward trends to the WHO, the malaria situation continues to deteriorate in rural areas undergoing intensive economic development, notably in Asia and Latin America. In the remaining areas WHO reports fluctuations (WHO 1986:171).

In 1984, 5.3 million cases of malaria were reported. This is compared to 5.6 million in 1983 and 6.5 million in 1982. As of 1984, in terms of total numbers of cases reported, WHO sees that the great resurgence of malaria transmission in the mid-1970s, has been "controlled to a large extent". Still the number of cases has not been reduced to the levels of the mid-1960s. According to

estimates which, in the case of tropical Africa, were based on the number of infections expected according to the degree of endemicity, the total incidence of malaria is more likely in the range of 98 million cases annually (WHO 1986:171).

WHO reports that the level of mortality due to malaria is virtually unknown in parts of the world where the disease is endemic. This is probably because of under-reporting of deaths in general and the unfortunate inability to diagnose the real cause of death (WHO 1986:172). In Africa, south of the Sahara, deaths due to malaria were estimated to be in the order of 750,000 annually in the early 1970s. Recent studies, however, indicate that mortality rates are, in some areas, much lower than expected. This could be attributed to the increasingly widespread use of antimalarial drugs (WHO 1986:172).

The specter of chloroquine-resistant P. falciparum malaria has now been confirmed in more than 40 countries. WHO expects this situation to deteriorate further, especially in Africa where vector control is absent in places, and drug pressure on the parasite has increased. Resistance to other antimalarial drugs such as sulfadoxine has now been reported in eleven countries, including Kenya and Tanzania. Resistance to quinine has been confirmed in three Asian countries and resistance to mefloquine in the Philippines, Thailand and Tanzania. P.falciparum has continued to be sensitive to the above antimalarial drugs in Middle America,

the Caribbean, West Africa and most countries in Asia west of India (WHO 1986:172).

WHO also reports that resistance to more than one insecticide now affects many Anopheline species. In Middle America, the Caribbean, several countries of Asia west of India and in South-east Asian countries, the high level of resistance has affected the malaria control program. In South America, most of East Asia and most of Western Africa, the resistance of the main vectors to common insecticides has not been a major operational problem (WHO 1986:173).

As of 1984, of a total world population of 4.75 billion, about 1.3 billion (28%) lived in areas where malaria never existed or has disappeared without specific anti-malaria measures. Some 776 million people (16%) live in areas where the disease has been eliminated in recent decades by the general improvement of health services, changes in the environment, or successful antimalaria activities. It is astounding that nearly half the world population, 2.27 billion people or (48%), live in areas where anti-malaria measures must be carried out (WHO 1986:172).

In many of these areas the health care infrastructure is not sufficiently developed to ensure maintenance of favorable control. Efforts are being made by the WHO and others to incorporate appropriate anti-malaria activities into developing primary health care systems, but problems plague the programs.

Ironically WHO reports that today about 398 million people (8%) inhabit areas where no specific measures are taken to control malaria transmission and where, as a result, the prevalence of malaria has remained virtually unchanged (WHO 1986:173).

Another approach that WHO and various researchers have been taking is the search for the "magic bullet" of a malaria vaccine. We can only hope that the time, money and dedication of this quest will pay off before malaria becomes pandemic due to vector resistance to insecticides and parasite resistance to present antimalarials (Kolata 1984:676-682).

Malaria in India

The Indian subcontinent, immediately south of the Himalayas, is over 90% malarious. Only areas above 4500-5000 ft. in the subtropical Himalayas are actually free of the threat of malaria infection (Dutta and Dutt 1978:74).

In India malaria has been "the most formidable and serious public health problem for centuries" (Choudhury 1985:243). The disease existed in India centuries before Christ. Reference of malaria is found in the ancient Atharva Veda dating to 1500 B.C.

This reference actually mentions malaria's seasonal prevalence and the periodicity of the fever and suggests that the mosquito may be the carrier of the deadly disease (Choudhury 1985:243).

Brigadier Sinton, the first Director of the Malaria Institute of India, estimated in 1935 that at least 100 million people suffered from malaria every year in India. Sinton also estimated that malaria was responsible for about one million deaths annually in India (1985:244).

In 1845 there was a marked increase in malaria incidence as a result of the opening of the Western Jumna canal. This epidemic prompted Dr. T.E. Dempster, a member of the British army commission, to experimentally use the characteristic swelling of the spleen (splenomegaly) as a diagnostic indicator in determining the endemicity of malaria in the area. This method of determining the prevalence of malaria has been, and still is, used where blood samples are impractical. The first British malaria commission was appointed in 1899 by the Royal Society to look into another outbreak in the Mian Mir Cantonment near Lahore (Choudhury 1985:244).

The government of India convened an Imperial Malaria Conference in Simla in 1909. The Malaria Bureau of India was established as the result of a recommendation made by the conference. In 1927 the Malaria Bureau was changed into the Malaria Survey of India, and eventually to the Malaria Institute of India in 1938 (1985:244).

During the period from 1900 to 1936 the primary emphasis in India's malaria program was the control of mosquito breeding and the destruction of vector habitat by

engineering better drainage of fields, ditches, and stagnant ponds. From 1936-1945 the adult mosquitoes were also attacked by the spraying of pyrethrum. The use of pyrethrum was possible only in urban conditions due to its high cost.

After World War II, experiments to control malaria with DDT were carried out. In India these trials were made in selected areas as demonstration projects (Brown et.al.,1976:3). DDT was very successful in eliminating the mosquitos and gradually control operations were extended to many parts of the country. In 1946 the Health Survey and Development Committee of the Indian Government recommended the establishment of antimalarial programs in all 17 Indian states (Choudhury 1985:244).

During the years between 1949 and 1952, malaria control demonstrations by joint World Health Organization and national Indian teams began to prove that the overall incidence of malaria infection could dramatically be reduced by 1 to 2 years of residual spraying with DDT. The dramatic effect of malaria on population and development can be seen clearly in the Terai area of Uttar Pradesh, India. This large fertile area was left largely uninhabited because of malaria. With the help of the World Health Organization DDT spraying program 3 to 4 years of residual spraying reduced the parasite rate in the area to less than 1/20th of its former level. This reduction allowed the area to be inhabited and to become productive once again (Brown et.al.,

1976).

By 1953, 30 million people in India were under the protection of DDT spraying. This figure was increased to 64 million in the following year. As a result, the proportion of malaria cases to total dispensary cases was reduced from 11% to 4% in 1958 (Brown et.al., 1976:3).

The above WHO program was supplemented in India by the Technical Cooperation Mission U.S.AID., UNICEF, and the Rockefeller Foundation. This combined series of programs was actually launched in April, 1953 by Hon'ble Rajumari Amrit Kaur, then Minister of Health for the Government of India. As a result of this massive antimalaria operation, 132 antimalarial units were established from 1955 to 1956 protecting about 132 million people. Due to this control operation there was a substantial reduction in the incidence of the disease. This drop in malaria brought considerable economic gain for the country by improving the health and productivity of the people. The number of malaria cases was reduced from 75 million in 1952 to 20 million in 1956 (Choudhury 1985;245).

The total population under malaria control programs utilizing DDT and quinine was increased to 230 million by 1957-1958 in India. Following the tremendous success of the control program the Indian Government decided to convert the malaria control program into the malaria eradication program (NMEP) in 1958. This conversion was extended to the whole of

India (Brown 1976:4).

The national malaria eradication program (NMEP) was launched in 1958 and it was predicted that the eradication of malaria would be achieved by 1967 in most parts of India. The director of NMEP was responsible for offering technical assistance, evaluation of the program, and the supplying of insecticides and antimalarial drugs (Choudhury 1985:245).

Surveillance of malaria cases was introduced in the 1960; during that year the number of malaria cases came down considerably. During the first five years of the surveillance (1960-1965) the total number of malaria cases in India was less than 100,000, except in 1964 when it was slightly higher. The number of Plasmodium falciparum cases was lowest in 1962 with an incidence of 16,674 (Choudhury 1985:245).

The malaria picture was looking quite positive in India until 1965 when the number of cases began to increase. By 1976 the malaria incidence reached 6.4 million in India. At this time it was realized that the eradication of malaria in the entire country was no longer possible under the prevailing circumstances. Emphasis was again switched back to the control of malaria rather than "eradication".

The cause of the rise in malaria was the increasing resistance of the mosquito vector to DDT and other insecticides and the cost of alternative insecticides was prohibitive. The new objective of the health service was to

eliminate deaths due to malaria, to reduce malaria morbidity, to maintain "green revolution" development, and to consolidate the achievements already gained. This modified plan of operation stressed chemotherapy. Drug distribution centers (DDCs) and fever treatment depots (FTDs) were started in the rural areas where chloroquine and other antimalarials were made easily available (Choudhury 1985;245).

Another series of problems with malaria control and/or eradication measures became apparent during the period from 1961 to 1965. These problems involved cultural patterns and beliefs among "tribal" populations in India. A joint study was conducted by the NMEP and WHO to discover why the effects of DDT residual spraying was being reduced in certain rural areas. The goal was to achieve cooperation from the tribal population in Orissa India. The people were also resistant to using antimalarial drugs (Dhillon and Kar 1965).

I use this study here to illustrate the diffusion and resistance to the diffusion of health care practices and ideas. Dhillon and Kar also included recommendations for solving this type of problem (1965:37).

Dillon and Kar discussed belief systems which were related to disease and to peoples' awareness of health problems. They found that, although sickness is common in tribal villages, poor health was not regarded as a major problem. Priority was given to problems of irrigation, drinking water, and drainage of sewage. The diseases usually

mentioned by people included: fever Kampoojar (malaria), dysentery, headache and cough (1965:31-32).

Diseases were believed to be caused by spirits of the dead, evil spirits, the anger of local deities, and black magic. Climatic and dietary factors were regarded as causative for a few illnesses such as skin diseases and fever. There was no knowledge of the role of micro-organisms as agents of disease and no concept of the transmission of disease from person to person or through insects as in the case of malaria (Dillon and Kar 1965:32).

Dhillon and Kar discovered that vaccination against disease was accepted, but reluctantly and with little faith. On the other hand, the tribal people utilized their own indigenous medicine quite readily. The healers included viadya (herbalist), pujari (priests), dessari (astrologer-practitioners), and "magic" men and women. If these local sources failed, the same types of practitioners from neighbouring villages were consulted for health advice. At times, as a last resort, people went to government health centers. Christian missions' medical facilities and those of tribal welfare agencies were sometimes used where available (1965:33).

Dillon and Kar found that villagers did not differentiate malaria from other types of fever. Fever, including malaria, was thought of as a relatively minor problem. Malaria was viewed as a mild disease and its

primary effect was thought to be among children. Malaria fever was believed to be the result climatic factors. When a person working in the field in summer was exposed to rains, his body temperature might possibly drop suddenly and this would cause fever which comes with chill and shivering. Neither mosquitos nor sick people were considered to be carriers of malaria. Mosquito bites, like bed-bug bites, were annoying but not considered harmful to health. Generally no treatment was taken for fever because it was considered to be a self-limiting disease (1965:33)

One of the practices found by Dillon and Kar, which decreases the effectiveness of DDT, was house plastering. This practice which is associated with religious, ceremonial and aesthetic traditions covers up the residual DDT after it had been sprayed on the walls. House plastering was regarded as necessary when someone died, when someone in the house recovered from smallpox or chickenpox, following childbirth, just before a marriage (for the houses of close relatives), after menstruation, and whenever a housewife found time and/or considered it desirable. In general every house was plastered at least eight to ten times a year (Dillon and Kar 1965:34).

The tribal people disliked DDT spraying. They were aware of some decline in the malaria incidence but did not associate it with the use of DDT. Even though they were told of the positive effects of DDT in killing mosquitos, the fear

of prosecution was the major reason for the acceptance of spraying. The people also thought that DDT increased the bed-bug nuisance. They disliked the bad smell, and did not like the way the insecticide disfigured the walls which led to replastering. Preparing for the spraying was considered inconvenient and a waste of time. Since the people were not sufficiently educated by the local health program, they were not aware of its benefits. Spraying was not linked with malaria eradication, rather it was only expected to do away with mosquitos and other insects, which it failed to do. In the opinion of the people, using smoke was far more effective in reducing the mosquito nuisance.

The WHO study suggested that local people would probably accept and use salt mixed with antimalarial drugs. People in all of the study areas expressed willingness to store drugs with their own village leaders and to take them during illness. It was suggested by Dillon and Kar, as well as by WHO, that the people's confidence in drugs would increase because of the demonstrative results produced by antimalaria drugs.

It was found that traditional leaders and healers could act as intermediaries between the government programs and the people. Also the government primary health center staff was more successful when it became more educated to villagers' belief systems, and spoke the local language.

The diffusion of ideas and procedures for the

antimalaria project were best seen communicated through the "channels" of: local leadership such as niako (village headman), pujani (priests), dessari (astrologers), vaidya (herbalists), and challan (traditionally appointed village messengers) (Dillon and Kar 1965:33-36).

It was suggested by Dillon and Kar that the training of NMEP workers concentrate on more becoming competent in: (1) Identifying village leaders and involving them positively in the eradication program; (2) Understanding villagers' attitudes and practices and identifying and neutralizing elements that may hinder the operation of the program; (3) Explaining their program to villagers in ways that are understandable and acceptable; (4) Winning cooperation of the villagers for the programs (1965:38).

The study suggested that funds should be given to local leaders to help provide incentives and enlist their active cooperation. It was suggested that new ideas would diffuse from the towns and cities to the rural tribal level, after being introduced by the communication channel of the mass media (1965:38).

After 1965 the massive, well-organized anti-malaria campaign began to lose the war against malaria. Even though the Indian government, the WHO, and other agencies were contributing large amounts of time, money and personnel to what should have been a successful malaria eradication program, malaria began to become persistently worse and

seemed to be increasing. This increase was primarily due to vector resistance to insecticides, and chloroquine resistance in P. falciparum (Choudhury 1985:246).

After the 1983 malaria epidemic in the Shahjahaupur district of India, observations revealed that further intensive anti-malaria measures were not effective in interrupting the transmission of the disease. Studies during May 1985 confirmed that the parasite load was high with high vector (mosquito) densities. It was suggested then by the NMEP that a complete interruption of transmission was only possible with the replacement of insecticides and different antimalarial drugs other than chloroquine (Sharma et.al.).

Malaria in Papua New Guinea

Papua New Guinea is located on the eastern half of the large island of New Guinea. It has been an independent nation only since 1975. The Western half is part of Indonesia. The elevation ranges from sea level to almost 15,000 feet. New Guinea has a long coastline which is mostly inaccessible because of swamps, steep cliffs, and mountain ranges extending into the sea (Howlett 1967:31).

The central part of Papua New Guinea is dominated by mountain ranges and valleys running east to west. There are broad valleys and plateaus within the central cordillera with an average elevation of 5000 ft. New Guinea was described in the 1930s as follows:

...Take Switzerland and drop it down into the Southern ocean near the equator, overspread its peaks and gorges with a rank growth of tropical vegetation, put in a wide barrier of malarial swamps to guard its borders, pollute it with tropical diseases, add a malignant assortment of poisonous snakes and insects for variety, and you have a good idea why New Guinea has remained one of the last spots on this planet to be explored and mapped (Leahy and Crain 1937, quoted by Howlett 1967:31).

The highlands, especially the zone between 5000 and 7000 feet above sea level, are more densely settled than the coasts and lowlands. The highlands are able to support greater numbers of people than the lowlands because of the cooler temperatures and a higher abundance of fertile soil. This means a shorter fallow period between cultivations. The subsistence is mainly horticultural. One important factor in the location of the populations at higher altitudes is the lower occurrence of diseases such as malaria. The incidence of malaria is universal in the lowlands and lower mountain ranges, but at 4500 feet and above, its occurrence is irregular and confined to the wet season. Malaria is an important, but not uniform factor in settlement patterns in parts of Papua New Guinea (Howlett 1967:24).

Because of Papua New Guinea's rich and diverse social and cultural make up, it has been the focus of many anthropological studies. Since I am mainly concerned with malaria and its ramifications here, I only give a brief description of the indigenous peoples of Papua New Guinea, as I was not able to find any specific reference to the

traditional treatment of malaria there.

Until a century ago the Island of New Guinea was inhabited by many small tribes living by a horticultural subsistence. Very little was known about the interior of the island before explorations in the 1930s. The mystique of cannibalism and head hunting prevailed in the Western view of the people of New Guinea (Howlett 1967:6).

New Guinea society was, and remains to some degree, very diverse. The population in the past was limited by warfare, disease, high infant mortality and, in places, infanticide and cannibalism. The diverse ethnic groups of the island, with a total population of fewer than 2 million, spoke more than five hundred languages. This was probably due to the isolation of tribes due to the extensive topographical barriers. Today as in the past the people live in villages which are organized into tribal clusters, and the indigenous population is estimated at 2,096,330 for the entire island.

Prior to the introduction of western medicine, the indigenous people explained all sickness, accidents, and death in terms of sorcery and magic. The types of beliefs differed greatly from village to village. To these people, the causes of death, other than tribal warfare, were activities of spirits of long-dead relatives who for one reason or another had been offended by the living. These offenses included such things as poisoned food, including

betel nuts, and offenses inflicted by powerful sorcerers (Howlett 1967:118).

The idea that microorganizims or germs could cause disease and/or death was unknown. All accidental deaths such as those resulting from snake bites and attacks by crocodiles, were attributed to supernatural factors. Today sorcery practitioners still exist within the "more sophisticated communities" (National Research Council 1967:84). They may practice in such contrasting places as isolated valleys or in local modern hospitals in the modern towns.

Although the fee paid to a sorcerer is high compared with the fee paid to a medical specialist, sorcerers are still popular and are respected by their village communities. This seems to be due primarily to fear rather than politeness. Obviously the sorcerer is an extremely influential individual in the community.

Over half the health workers in the field still believe and practice traditional remedies based on magic. These formulae are referred to in Pidgin as Maresin Bolong Tubuna. These practices are traditional and form an important part of every culture in Papua New Guinea. Belief in magic and sorcery is instilled into village children from infancy as part of their upbringing; to the people, sorcery is a blatant realty (National Research Council:85). In some areas, people are afraid to advance in any field, be it

social, economic, political, or even athletic, for fear that such activities may cause their death by displeasing a sorcerer. For these reasons sorcery and traditional beliefs are the main rivals to modern medicine (1967:86).

Before 1975 Papua New Guinea was not even considered by WHO for malaria eradication. The challenge was far too great due to the "primitive" rugged nature of the country. In 1976, however, WHO and the new local government started the introduction of primary health care units to try and introduce a higher standard of health in Papua New Guinea (WHO 1977:90).

One of the innovative features of the World Health Organization's model of Primary Health Care (PHC) is a concern for community participation and local self-determination, i.e., that it is a community's right and duty to determine its own health future. Simultaneously, WHO and the biomedical community stress that PHC must be scientifically sound when dealing with malaria and other diseases. These concerns were viewed as an inherent contradiction within the PHC model by Welsch (1986). He based his observations on WHO documents and reports, and also within the context of health care administration in Papua New Guinea. Papua New Guinea has endorsed PHC and has created a system of village-based health workers. The organization of the health care system in Papua New Guinea structures the flow of information from the top down and from

what is accepted as a knowledgeable center to an unsophisticated and "unknowledgeable" periphery. This kind of administrative culture, which is common in most bureaucracies, effectively prevents an upward flow of information about health concerns from the village to the district, provincial and national levels of the administration. Welsch stated that this structuring of information and communication undermines the potential for meaningful local self-determination in health care (1986:107).

In assessing the role of self-determination and community participation in Papua New Guinea's rural health care system a WHO study concluded that:

Papua New Guinea has been pursuing essentially an improved basic health services approach, with mechanisms for intersectoral coordination of health related activities being relatively well developed; the idea of community involvement is only just entering the planning stage (WHO 1981: 47).

With its roots firmly planted in the village, the structure of health care has led most health planners and administrations to see the "aid post" system as fitting a WHO primary health care model. On the other hand, as the WHO suggested, mechanisms to promote community participation beyond village-based health auxiliaries, referred to as aid post orderlies, (APOs) are poorly developed. Recent efforts toward expansion rather than reorganization of the existing system have led health services further from the goal of

self-determination (Welsch 1986:108).

Like other developing countries, Papua New Guinea has encountered many problems trying to implement an effective rural health service. Many of these problems have been recognized for some time, particularly the irregularities of staffing, supplies, and village-based health auxiliary performance. APOs have often been seen as the focus or even the cause of many problems because of their key roles in the system. These problems are routinely attributed to their low morale and dependability, limited training, and inadequate supervision (Welsch 1986:108).

Welsch noted that the structural position of APOs within both the health service and the community is far more important than has usually been acknowledged. Some problems of implementation may legitimately be attributed to local factors, whether due to environmental constraints, the personal attributes of individual APOs, or the characteristics of particular ethnic groups. Many problems emerge from the administrative structure itself and an organizational culture that grants superior status to the knowledge and authority at the center. Communication does not travel in both directions.

Papua New Guinea's health services are by no means a failure (Welsch 1986:109). They have unmistakably improved the quality of life, raised the life expectancy, lowered mortality and morbidity rates, and helped to prevent severe

epidemics. However, as a primary health care system, it fails in several ways since it has been unable to promote effective community involvement and local self-determination.

The reason for this failure of the system lies in the general lack of communication from village to health worker about how communities define and understand their health programs. This in turn is related to the structure of health administration in Papua New Guinea, which all but ensures a lack of communication from the periphery to the center, so that health planners never really understand how communities perceive their health needs. Equally important is the problem that planners never fully understand how rural health workers perceive their own working conditions and the health services that they are expected to provide (Welsch 1986:109).

At the heart of this problem is a clash between "scientifically" sound health knowledge and community perceptions of their own health problems. What has emerged in Papua New Guinea is a situation in which rural health workers are expected to educate villagers using a type of "health education model" of improving rural health. Ironically the villagers are assumed to be backward and to lack knowledge about health matters. This contempt by the health worker for the uneducated only serves to stifle communication. The contempt probably goes both ways.

Offering relevant and useful health information is a worthy task, but the situation in Papua New Guinea has

encouraged rural health workers to feel that they are in a privileged position because they possess superior health knowledge. Unfortunately the health workers exhibit no interest in ideas of the village people (Welsh 1986:108).

This pattern is replicated at each level of the health service. Welsh has observed that higher ranking personnel act authoritatively, as if they have some private esoteric health knowledge, and deal with lower ranking staff as passive "acceptors" of this wisdom. WHO advisors offer guidance to the National Health Ministry, and from there, the Ministry sets guidelines and policy for the provinces. The Provincial Health Officers in turn set policies and issue directives to Sub-provincial Health Officers in the outstations. The outstations issue directives to aid post orderlies working in the villages who tell villagers what they should do about health problems, and specifically, malaria (1986:109).

Control of the flow of information within the system has become a liability. Rarely are explanations of new policies, guidelines, and directives effectively communicated from officers in the center to those in the periphery. Virtually no information, except that in the form of inconsistently kept statistics, moves in the opposite direction. Nor can rural personnel easily explain their difficulties in implementing policies in the periphery to officers in more central locations. At every level there is

a blind spot as to what other levels perceive about health conditions and the effectiveness of specific health care efforts (1986:109).

Villagers are thought of as conservative, uncooperative, and resistant to change. This model of resistant villagers and rural health workers is not an uncommon one in the bureaucracies of developing countries. According to Welsch (1986), and also Charlwood (1984), this is not, however, an accurate model of either village attitudes toward change or the views of all lower-level rural health workers. Investigators have found that village people are extremely quick to evaluate the advantages and disadvantages of newly introduced health services, but they do so in their own terms, not in "biomedical" terms (Welsch 1986:109). Very often in Papua New Guinea, rural health facilities were rapidly incorporated into their own strategies for combating illness. The villages had not adopted theories of disease, but interpreted new practices in terms of customary knowledge about illness. It was found that village people were by no means resistant to change or development.

In direct reference to the malaria experiments by J.D. Charlwood of the Papua New Guinea Health Institute, it was found the people both receptive and innovative. Charlwood's research found that the traditional practice of building houses on raised platforms reduced mosquito bites (1984).

With cooperation and effective communication to the people, Charlwood was able to encourage a change in behavior. This change was merely having people keep themselves and their children on the house platform in the evening. This practice was effective in reducing mosquito bites because the local vector, Anopheles farauti, usually stayed no more than 35cm off the ground during the evening, which is the primary feeding time (Charlwood 1986:958).

Other studies by Charlwood found the village people quite receptive to mosquito netting and mosquito smoke coils, which were both used at night (Charlwood and Jolly 1984, 1979). These alternative measures, in contrast to the PHC practice of DDT residual spraying and massive drug prophylaxis, were seen by the people as something that they could use to help possibly control malaria themselves (1984:640).

Again the use of an effective communication channel was important in this diffusion process. However, in the case of the World Health Organization's primary health care systems in Papua New Guinea, health workers at all levels tended to disregard the villagers' point of view. This short-sightedness only served to alienate the villagers and has caused antagonism. Despite good intentions, rural health workers were typically unaware of how ineffectual they were as health educators because they understood so little about how the villagers actually approached health problems (Welsh

1986).

More reliance on quantitative health indicators of the kind favored by WHO (1981) for assessing health needs further guarantees that central planners will continue to remain isolated from villagers in Papua New Guinea. In addition rural health workers perceived wrongly that health surveys and monthly statistics represent concrete information about health needs and make them the basis of planning, thus all but eliminating any possibility of the local people of Papua New Guinea having any say in their community health programs (Welsch 1986:109).

Malaria in Nigeria

Nigeria is located in Western Africa entirely within the tropics. The approximate area of Nigeria is 356,669 square miles. It was isolated from Europeans for many centuries because of its imposing physical barriers: the southern Sahara or Sudan desert to the north, and along the coast to the south was the dense forest country and disease-infested swamps. The thickest forests were along the two major rivers, the Niger and the Benue (Burns 1969:33). North of the towns of Abeokuta, Ondo, and Afikpo the tropical forest begins to thin out and the country turns to parkland. This parkland becomes open savanna and eventually desert in northern Nigeria (Burns 1969:35).

Even though some of Nigeria is 6000 to 7000 feet above sea level and some of it is desert, the entire country is

malarious. Like much of central Africa, malaria is so endemic in the western regions that the sickle-cell anemia form of malaria adaptation is extensive. Malaria has been and is still a major health problem in Nigeria (WHO 1986:177).

In the past, while under British rule, it was thought that racial segregation was one of the best methods of preserving the health of Nigeria's European population. Separate residential areas were laid out for Europeans and Africans. This was done for various reasons including the idea that a "higher standard of sanitation could be maintained in the reservation than was thought possible in a 'mixed' neighborhood" (Burns 1969:310). Apparently this segregation was abandoned after a period of time because of resentment.

Nigeria has many distinct ethnic groups. These are mainly the Hausa, Kanuri, Fulani, Tiv, Yoruba, Nupe, Ebo, and many others. Each one of these groups has its own medical tradition dealing with malaria (Burns 1969). Today traditional medicine is practiced along with western medicine. Herbalists, diviners, and at times "witches'" tribal cures are used in combination with Western medicines or practices. Some traditional cures have proven to be quite effective, while some depend more on tradition and cultural belief (Burns 1969:31).

Curers sometimes mix western and traditional medicines

as seen in this "remedy for high temperature and severe headache" (malaria), from a translation of Yoruba medical literature:

Use shea butter to make a ring around your neck. Underneath it make a ring with palm oil. If it is a female patient, put your left hand on her head. Use the right hand for a man. And then recite the following incantation:

'The mosquito with six children is the name given to the blacksmith who makes headaches (repeat thrice). Two of the children went to a white tree, two went to a Kogbe tree, the last two were sent to Orunmila [the deity] to go and beat the Kiriji drum on the heads of human beings.

But Orunmil ordered that this drum should not be beaten on the head of those patients who make this mark of shea butter and oil around their neck. Because of this, [name of patient] whose neck has been marked around with shea butter and oil, should be quickly spared' (Maclean 1974:92).

A "Traditional Naturopathic Physician" Dr. Joseph Ojo Mume, suggests traditional and other natural herbal cures for malaria and other "fevers". It is Dr. Mume's opinion that malaria treatment by medical doctors has proven unsuccessful and suggests his own cure:

...The cause of fever (malaria) is the accumulation of toxic matters in the blood and deficiency of certain elements through faulty diet...The cure is by application of compress baths and the steam vapor baths in which some herbs have been digested. The Dogonzaro leaves are well known specific remedy for ordinary and malaria fevers. There has been much development in the field of herbal medicine carried out by me, and many years of research and clinical experience have enabled me to produce a special formula which is a compound preparation of dogonzaro, guaver leaves and pawpaw leaves for the traditional herbal treatment of all kinds of fevers (Mume 1973:84).

Indigenous traditional medicine in the past has been

viewed as only superstition and placebo by western medical professionals. An increased interest in the importance of research on indigenous plant medicines has more recently been emphasized by the World Health Organization. This was in recognition of the fact that traditional healers and their pharmacopoeia constitute the basic core of primary health care in 90% of the rural populations in most developing countries (Etkin 1979:400).

An extensive investigation of the uses and efficiency of indigenous medicines used by the Hausa people of northern Nigeria was conducted by Nina Etkin from May 1975 through October 1976 in a small agricultural community in Wudil District of Northern Nigeria. Etkin was interested in indigenous cures and specifically studied the efficiency of antimalarial medicines used by the Hausa (1979:403).

Eradication of malaria in the savanna area has been increasingly unsuccessful due to an increased resistance among malaria parasites to chloroquine and other antimalarial drugs. The plants analyzed were the more common Hausa medicines used in the treatment of one or more of the malaria symptom complex. These symptoms included periodic fevers as well as spleno-hepatomegaly, jaundice, and anemia (Etkin 1979:402).

The resulting data suggested that some of the plants chemistry interfered with malaria parasite development. This interference may occur by increasing the levels of

intercellular oxidation and starving the parasite for oxygen. These plants may have therapeutic value in the prevention and/or treatment of malaria (Etkin 1979:421-424).

Etkin found that many of the plants used by the Hausa to treat various malaria symptoms were important in the diet during that period of the year when there was a shortage of regular grain food staples. The pre-harvest period coincided with the main malaria season in the area. Etkin suggests that oxidant generation by the food plants may have had a preventative effect on malaria infection. This was compared with other dietary factors in other countries, such as fava bean consumption in causing antimalarial effects through its oxidant generating activity (Etkin 1979:425-426).

Nigerian government malaria control programs and their interaction with native peoples are illustrated very effectively by an article by Vincent van Amelsvoort (1968). This article stressed the importance of exploring and using indigenous patterns and channels of communication in health education and deals specifically with malaria control problems (1968:69).

In 1954 the Nigerian Government in the Birnin-Kebbi area started a mass malaria control campaign. The area is 8000 sq. miles of savannah in the extreme north west of the country. The population of 800,000 (in 1968) is made up mostly of two large traditional societies, the Hausa who are settled in villages, and the Fulani who are a nomadic cattle-

raising people (Amelsvoort 1968:69).

In 1963 the Nigerian Government requested help from the World Health Organization. WHO agreed to set up a pre-eradication program and a year later the malaria activities were integrated into a model basic public health infrastructure.

For the first time health education was included in the planning. By this time, WHO and administrations of other malaria programs were becoming concerned by reports on malaria programs which were encountering "unexpected" problems because cultural factors had been overlooked (Amelsvoort 1968:69).

Amelsvoort headed the malaria project in Nigeria and decided that the first step would be to undertake a study of the native community in order to find out the views and attitudes of the people regarding malaria and the pre-eradication program. After studying the local community, they examined the problem of "how best to induce cultural change" (Amelsvoort 1968:69).

Amelsvoort organized health education meetings in two selected parts of the area. Two medical assistants were trained locally before they started to visit the villages. The local authorities were always informed of the arrival of the health teams and educational meetings a few days in advance. Open air meetings were scheduled in the evenings to which all the village men were invited. The meetings were

always started with a short prayer and the traditional greetings. One of the local medical staff members would then address the audience on a simple topic, "more or less familiar to them, and announce the arrival in a few weeks of a spraying team or a parasitology team. This was talked about and announced in a round-about way so as not to appear rude or disrespectful. The health worker then asked for the villagers' cooperation in moving household furniture outside of the huts, and to help in obtaining water for the spraying process. They also requested permission to take blood samples from all children in the village (1969:70-71). The main purpose of the local medical assistant was to stimulate comments from the audience. For the purpose of clarity he would ask an influential member of the community whether or not what he had said was clear (1969:71).

The main goal of the program was to collect as much information from the reactions of the audience as possible. The two trained staff members and the subordinate staff of the team would take turns during the session. Each one would introduce different subjects and this contributed to holding the peoples' attention. The sessions lasted a maximum of an hour and a half and closed with a prayer and the usual salutations.

One year of these health education meetings resulted in a list of 75 topics dealing with all aspects of malaria work. I list a few of these topics as described by

Amelsvoort because they represent one of the best studies of interaction between malaria control programs and local traditional people that I was able to find in my research.

The cause of malaria- Hard work, the will of Allah, lack of proper food and the strong desert wind, "harmattan", were frequently mentioned. Treatment of malaria- In villages where drug trials had been conducted, there was a general demand for antimalarial drugs. In other villages, people frequently complained that malaria drugs had a weakening effect and prevented them from farming. A few people only suggested seeking medical advice from a dispensary in case of a fever attack. The majority sought help from the village head, a native healer or their relatives.

Questions and complaints about spraying- Mosquitos, bedbugs, lice, ticks, and rats were no longer killed by the spraying. Two weeks after spraying all biting insects increased in number. Chickens often died after spraying...The people also wanted to know if they should report a hut replastered outside [after spraying], or when a floor repaired or a roof rethatched. Should the Fulani people report alterations to nearest village head of the settled Hausa people? What about a hut under construction: should it be resprayed after completion? Could village heads receive copies of the village maps made by the malaria team, so as to note every alteration and change?
(Amelsvoort 1968:71-72).

This list goes on to tell of other problems and questions, but is too long to repeat here. The rest of the questions ranged from "should the women have their calabashes sprayed"? to "why do the tobacco huts have to be sprayed?". The Fulani people did not like to give blood samples during the hot season. At first it was explained that this was because it was painful, but it was later discovered that during the hot season loss of blood was thought to cause weakness (Amelsvoort 1968:72).

After finding out what the questions and problems were Amelsvoort's teams were better able to educate the villagers. An innovative approach used by the teams to help in the malaria education project, was to seek the cooperation of the local artists. These dankamas are composers, musicians, dancers and comedians who perform at private celebrations, ceremonies, and on many official occasions. They have a tremendous impact on their audiences and enjoy a wide popularity. It was for these reasons that they were excellent potential channels of communication (1968:74).

The malaria service worked with three groups of dankamas. Each group was invited to stay one week with the malaria service. They were shown around the headquarters, the laboratories and the spraying areas, and given full information on the malaria work. At the end of the visit, the dankamas were asked to prepare a song drama reflecting their impressions. After a few weeks the dankamas announced that their performances were to be held in informal setting in a traditional compound, and attended by the staff of the health education section. The dramas lasted between 10 and 18 minutes, and were recorded on tape. The number of artists varied between four and six and they were accompanied by drums, flutes and singing. At the end of the performance the dankamas received a negotiated fee (Amelsvoort 1968:77).

Later Amelsvoort's teams played the recordings of these songs and dramas as an introduction to their health

education meetings in the villages. The dramas were also used extensively by the Nigerian Broadcasting Company. This represents an appropriate use of the mass-media form of communication channel for instigating diffusion and change. The artists were left entirely free in the production of their dramas. They received no guidance or suggestions as to subject matter or method other than being told what the malaria project was trying to accomplish. This is an essential difference with health education dramas, puppet plays or songs produced elsewhere (Amelsvoort 1968:72).

I think it is pertinent to provide a sample of a health drama provided in Amelsvoort's report because it helps to illustrate how the team and malaria itself might be seen through the eyes of the native artist. This is an extract from the health drama by Millam Illo Kalgo, translated by Mallam Aliyu Besse.

Let us pry to Allah, that He may help us in all things that we do. This is the time of the year when malaria prevails, but it will not worry us this time. The mosquito has to be careful now, because of the doctor. And thanks to our Government who has given us the malaria service. With the help of the malaria service, we can get rid of disease, we can defeat that senseless insect which used to cheat our people, that insect which has no wisdom.

I, Illo, the big drummer and musician, I knew from the very beginning that the mosquito was a traitor. I knew it even before there was a malaria service. I knew that the mosquito used to cheat our people, but unfortunately our Fathers did not know. They would put mosquito nets on their beds and protect their children with them. But the mosquito walked slowly inside, the mosquito which has long legs, long wings and a long needle in its mouth.

This is the time of the year when malaria used to kill our people, but now we can get rid of it. In Northern Nigeria we have a strong medicine, which no other region has. I have travelled all over the world and I found more than 80,000 doctors. But I never found doctors such as in the malaria service in our country.

Before the malaria service existed, every baby that was born used to have a big stomach and small feet, and sometimes boys would look like skeletons. This was all because of the mosquito. Therefore, when people from the malaria service come to tell you that your compound will be sprayed, take out all your furniture, your calabashes and cooking pots, and see that you will have a container with water ready near the entrance of your house.

The quote goes on to some length, but this gives a good idea of how the dankamas communicate their knowledge. In this next quote the performer qualifies himself explains and why people should listen to his song.

I am the one who knows about mosquitoes because I am a man from the other side of the Niger river. It was over there that mosquitoes bit my ear, my forehead, my back and all my body. Then I came to the Gwandu Emirate where I found the malaria service. I showed my hand to the doctor and that was the very day that I thanked Alhaji Haruna, the Emir of Gwandu, and the Premier of Northern Nigeria who brought this new doctor. This new doctor is very happy in Gwandu and always likes to help people. He makes all people healthy. And all the people of Gwandu are happy, because they have healthy babies (Amelsvoort 1968:74-76).

The education teams did have some problems however. One singer was so enthusiastic that he attributed the decrease of leprosy in the area (there was no leprosy to begin with) to the effects of the DDT spraying. These incorrect statements can be overlooked in the light of Amelsvoort's report that through this new method 95% correct information with full impact on the audience was achieved. In

contrast, imported methods of health education achieved 100% correct information, but often are misunderstood and have a very limited impact. Amelsvoort states that much discretion has been used in trying to solve the problem of misunderstanding by the artists (Amelsvoort 1968:75). It would be interesting to know if there has been any follow-up work done to see how well the idea worked in the long run, and if it is still being utilized. I could not, however, find any reference to local artists songs and dramas being used in malaria control in present literature.

Malaria in Zimbabwe

Zimbabwe is located in central Africa, and before 1980, was known as Southern Rhodesia. Zimbabwe is divided by a central watershed running from northeast to southwest. The rivers originating on this watershed drain into the Zambezi river system in the north or into the Sabi-Limpopo system in the south (Taylor and Mutambu 1986:12).

A malaria control operation was implemented in 1949 by the Rhodesian government (Alves and Blair 1953). This project was later extended to several parts of the country as a "barrier" spraying program, designed to keep the mosquito vector out of areas less susceptible to malaria. Malaria was recognized as following an annual wet season invasion of the central highveld plateau by A. gambiae mosquitoes ("Veld" is the name given to the savanna bush country of Africa by the

Afrikaners of South Africa). This spraying project was started to prevent this seasonal attack of malaria in the middle altitude zones and to create a barrier to the movement of the vector. The fact that this spraying project was successful is shown by the decrease in European hospital admissions for malaria during the following year (Alves and Blair 1955).

The World Health Organization began working in Zimbabwe in 1957 and began a pre-eradication control program in the south of the country in 1959. Barrier spraying continued throughout this period until 1962. DDT and Gamma-HCH (lindane) were the main insecticides used during this time. Changing policies of WHO and some disagreement with the authorities of the then Federation of Rhodesia and Nyasaland prevented any further development of the eradication program (Wolf 1964:708). Despite disagreements, the malaria control programs had achieved a considerable improvement in the malaria situation as shown by recorded hospital cases for Europeans (Alves and Blair 1955).

The Federal Malaria Eradication Organization was created with the responsibility of malaria control in 1962. This responsibility was passed on to the Provincial Health Departments in 1964 after the break up of the Federation. Meanwhile a separate malaria unit continued to carry out malaria control measures in south-east Zimbabwe. Negotiations continued between the Southern Rhodesian

Government and WHO but were abruptly terminated with the Unilateral Declaration of Independence of Southern Rhodesia from Great Britain in 1965. The Malaria Unit was unfortunately disbanded and a paltry malaria control program was subsequently carried out by the Provincial Health Departments without much central planning and with very limited financial resources (Taylor and Mulambu 1986).

In 1971 malaria control operations once again came under a central co-ordinating body. The increasing incidence of malaria in the central highveld stimulated the re-introduction of the 'barrier' spraying in 1972 using HCH. A four-year control program was initiated in 1973 along with DDT spraying in 1974. The control operation planned for malaria control only in those areas of unstable (epidemic) malaria. Spraying frequency varied according to the endemicity, but was conducted at least once during the four-year period in each area (Kouznetsou 1977:85-86).

This control program was largely successful and epidemics were not reported in areas considered under 'control'. However the intensification of the war for black liberation, starting in 1972, constantly reduced access of the control program to more remote areas. This spraying was limited to what were called "Protected Villages" which were in essence villages where the rural population was gathered ostensibly for their own protection from rebel forces roaming the countryside destroying every thing in their path.

....The effects of control persisted until approximately 1978, despite the limitations of control operations as a result of the war. However, by 1978, there were signs of a resurgence of malaria, and this was climaxed by the exceptionally high incidence of malaria in the summer season of 1979, which is accepted by authorities as the worst malaria season since the introduction of residual insecticides for routine control in 1955 (Internal report, Ministry of Health, Sept 1980 V.de V. Clarke quoted by Taylor and Mulambu 1986:17).

When independence was achieved and hostilities brought under control in 1980, residual spraying and other control measures were re-introduced. Malaria epidemics in the north and northeast of Zimbabwe were rapidly brought under control by a single application of DDT. However, with the limited resources available, the control program could not reach the south of Zimbabwe to prevent a continuation of the epidemic in the 1980-1981 season. Spraying in the following 1981-1982 season prevented any resurgence of malaria in southern Zimbabwe. The Ministry of Health revised the malaria control program in 1983 with the goal of reducing morbidity and mortality rather than only trying to prevent epidemics. The Ministry also has tried to increase community involvement in the organization and implementation of the anti-malaria program (Taylor and Mutambu 1986).

Since 1971 the method used to survey the prevalence of malaria in Zimbabwe was by obtaining blood samples and sending the prepared slides to a central laboratory for examination. Apparently there has been no other system in operation to collect data on either clinical or confirmed cases of malaria from rural clinics. As a result these data

represent a gross underestimate of the real malaria situation in Zimbabwe for several reasons: (1) many patients with malaria do not attend clinics "as they are too distant"; they buy antimalarial tablets from the local stores or wait until they get better; (2) The clinics were understaffed and staff did not have time to take blood slides from all or sometimes any of the clinical malaria cases; (3) the liberation war from 1972 to 1980 resulted in the closure of many clinics or restricted access with consequent difficulties in collecting and sending blood slides (Taylor and Mutambu 1986:17). Another problem was that most clinics and hospitals did not submit patient summaries for epidemiological analysis to any higher level and, therefore, it is impossible to give any estimate of the actual number of malaria cases. Taylor and Mutambu do say that "despite these limitations the blood slides received give a clear indication of the 'relative' incidence of malaria in Zimbabwe" (1986:16).

Zimbabwe has a population of 7.5 million of which 51% are below the age of 15. The vast majority of the people live in middle and highveld at an elevation over 3000 feet. A total of 4.5 million are considered to be at risk of malaria infection (WHO 1984; Taylor and Mutambu 1986).

Taylor and Mutambu reported that there are no defined patterns of population movement. This may be directly relevant to malaria "however many refugees came to the major towns to escape the fighting during the liberation war. At

the end of the war many of these people returned home to the rural areas, and others moved to towns in search of employment" (1986:17). Another factor in population distribution is the fact that "most workers in urban areas maintain farmland in rural areas which they visit regularly" (Taylor and Mutambu 1986:18). As a result, much of the malaria reported in zones considered to be free of malaria is found on investigation to have been contracted while the people were on visits to known malarious regions.

From Taylor and Mutambu's data it is known that in general P. falciparum is the predominant species of malaria pathogen in Zimbabwe. It ranges from hyperendemicity in the low altitudes to hypoendemic or absent on much of the central watershed. Over most of Zimbabwe the population has a low prevalence of malaria. In years when the conditions are favorable for a high transmission, the disease becomes more epidemic in nature. Only in the low-lying areas of the Zambezi Valley in the north is malaria transmission high enough to maintain a high prevalence of the disease. It is also in the Zambezi Valley that the highest frequency of acquired immunity is present in the population (1986:17).

Zimbabwe, like all countries confronted with the devastating effects of epidemic malaria, is in the position of having to maintain a massive costly program to prevent catastrophic outbreaks of the disease. Zimbabwe is fortunate in that its geographical features (like those in Papua New

Guinea) help to confine the majority of the population to the high altitude, thus lower malaria, zones.

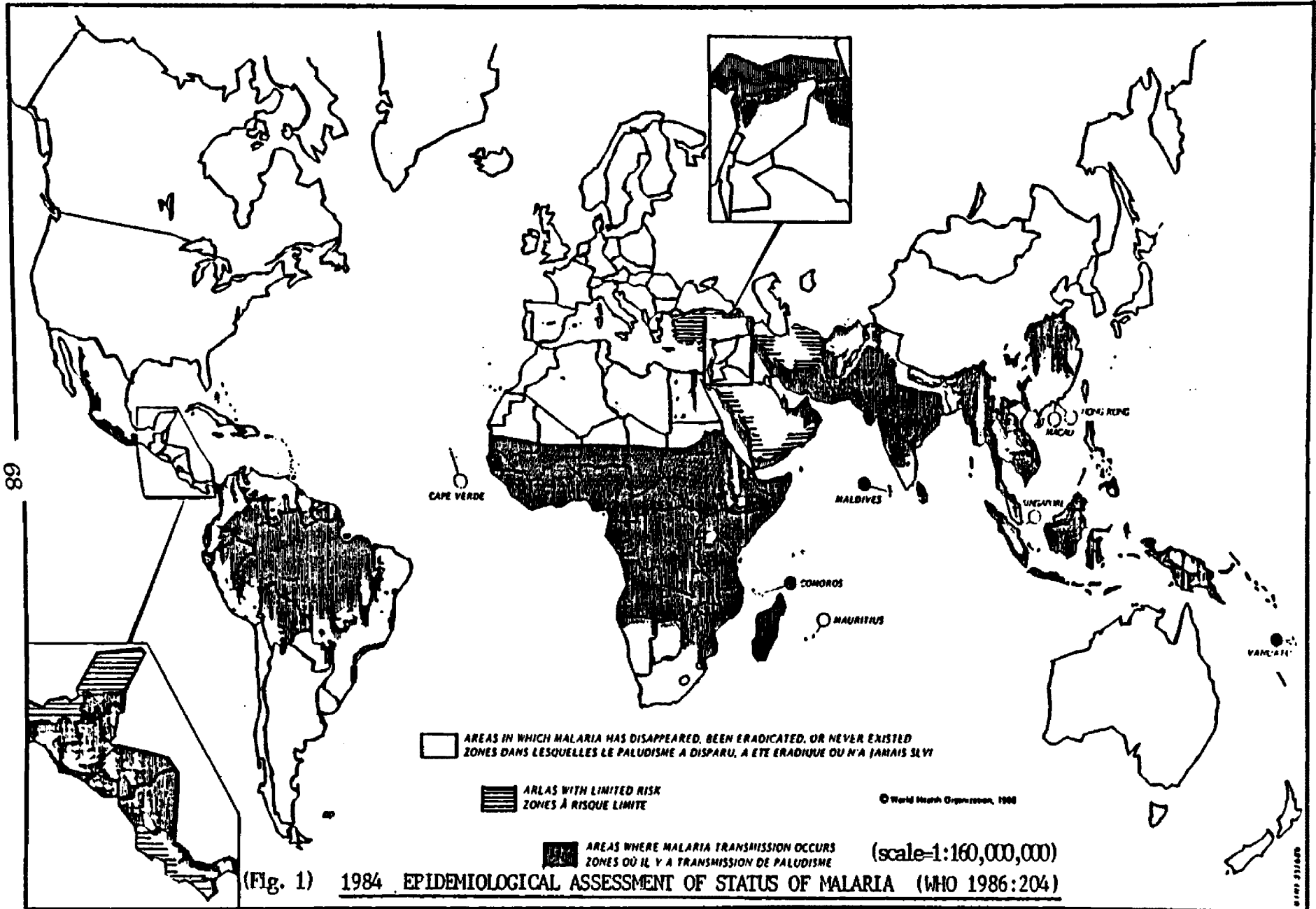
Taylor and Mutambu concluded in their report:

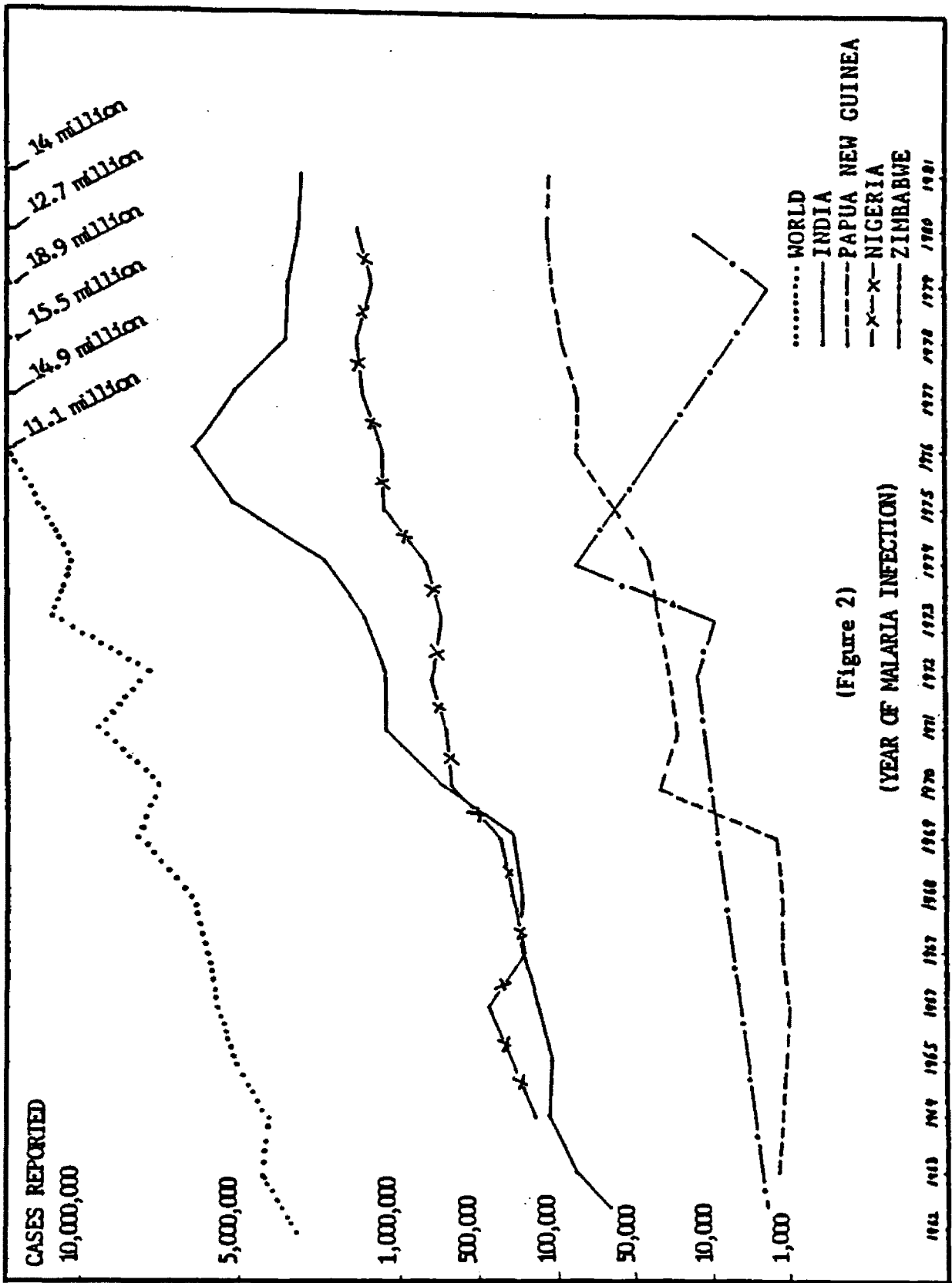
....The lack of reliable epidemiological data has undoubtedly had adverse effects on the organization of the national malaria control programme and this lack of information is likely to be of even more significant as malaria incidence is reduced in an enlarged control operation as is now being implemented in Zimbabwe. A reliable surveillance system, preferably implemented through a health information system, is essential for the most cost effective allocation of resources for malaria control (1986: 17).

WHO reports in Zimbabwe and the countries around it, such as Botswana, and Swaziland, that vector control operations, with or without drug utilization to reduce incidence, are not feasible especially in rural areas. This is for a variety of technical, operational, administrative and financial reasons (WHO 1986:174). They went on to state that the only action that could be attempted, at the present time, is the prevention and reduction of mortality and morbidity through the rational use of antimalarial drugs (WHO 1986:174). In Zimbabwe, as in many African nations, there are no realistic plans of action and coverage is still very low. Drug shortages are quite common and there is no epidemiological or operational monitoring of the activities (1986:174).

Unfortunately I was not able to find reference to the traditional beliefs and treatment of malaria in Zimbabwe. This may be due to the Rhodesian government's white supremacist dominance of the country, before 1980,

which in many respects was like the Republic of South Africa in its policies concerning the black population.





(Figure 2)
(YEAR OF MALARIA INFECTION)

Chapter IV

Summary of Results

In chapter III, I have given a general history of malaria, its causes, how it was fought after the invention of DDT, and the implementation of the World Health Organization's world malaria control and eradication programs after WWII. I also provided a description of the world malaria situation as it now stands, according to the WHO. In the sample countries of India, Papua New Guinea, Nigeria, and Zimbabwe, I provided a general history and description of malaria programs and, where data were available, traditional malaria treatments.

I have looked at how malaria has been a recognized problem in India for thousands of years. The British established the first Malaria Commission in 1899, followed by the Malaria Bureau of India in 1909. This anti-malaria organization eventually evolved into the National Malaria Eradication Program in 1958. Even though the incidence of malaria was down to as low as 100,000, between 1960 and 1965, by 1976, there were 6.4 million reported cases. The NMEP then modified their goals to control the disease, rather than its eradication.

I have examined the work of Dhillon and Kar dealing with village "tribal" people and their beliefs and practices concerning malaria. They studied the reasons that village people did not like or trust the spraying of DDT, and why when the spraying was conducted it did not produce adequate results. The practice of replastering house walls in homes, covering the DDT after spraying, was one of the reasons for the ineffectiveness of the program. The fact that the people disliked the smell of DDT and attributed an increase in the bed bug population to it, also decreased their receptiveness to the spraying.

Dhillon and Kar suggested that traditional tribal leaders and healers be utilized in educating the people about the malaria control programs, and that the malaria control workers become more familiar with the beliefs and values of the villagers to help attain trust and cooperation.

For Papua New Guinea, I discussed the influence of the rugged topography, and the diverse, sometimes hostile population as having been deterrents in its exploration. In the traditional societies of Papua New Guinea, sickness, accidents, and death were all attributed to sorcery and magic. Illnesses, including malaria, were due to the activities of spirits of long-dead relatives offended by the living.

Because of substantial operational, administrative,

and environmental problems, Papua New Guinea was not even considered for malaria control program implementation, before 1975 by the WHO.

The WHO and the government of Papua New Guinea established a malaria control program in 1977 with a central administration located in the main cities, and rural village health workers on the peripheries. Communication has been mainly from the top administrative management level, down to the local village community. There is little understanding of the traditional value systems, yet villagers are accused of not cooperating.

In contrast, more simple methods of vector control have been proved successful by Charlwood. He has studied the use of mosquito netting, smoke coils, and raised platform houses; all having an affect in decreasing the rate of mosquito biting and therefore the malaria incidence.

Nigeria was quite interesting in that there seems to have been much documentation of the various tribal malaria cures and treatments. There are still many practicing herbalists, diviners, and "witches" whose curing skills are relied upon along with modern medicine and a combination of the two for malaria treatment.

Amelsvoort's creative and innovative work is a classic example of how malaria control measures can be communicated to a population using traditional "channels of communication". This makes the diffusion of new ideas more

efficient, and as a result the people are more open to change.

For Zimbabwe I was only able to give a brief history of malaria control, and describe the affects of war, politics, and to a small extent, altitude, on the disease. Information on traditional, indigenous malaria treatments was not available. Zimbabwe, like many Third World countries, is struggling with political, organizational, and administrative problems. The problems with health care involve a lack of trained personnel, inadequate supplies, and funding.

In summary, I found that in India there was a definite attempt to control malaria using modern techniques, with at least some effort to understand and cooperate with the traditional, rural peoples. In Papua New Guinea and Zimbabwe, modern/western malaria control programs have been instituted to varying degrees of success. Administrative, organizational, and financial problems have been rampant in these countries. It seems that there has been very little investigation of traditional medicine, including malaria treatments or beliefs.

Nigeria was very different from the other three countries. There seems to be more of an implied willingness to explore, and document, the various cures for malaria. Traditional medicine has been recorded to a greater extent in Nigeria. Even with the diffusion of western malaria

control methods, Nigerians of various ethnic, tribal identity continue to assert that their traditional beliefs and medical practices are effective. There seems to have been a considerable amount of two-way communication in Nigeria, in contrast to Zimbabwe or Papua New Guinea. Malaria incidence is, however, increasing to some extent in all four countries. Nigeria, despite the success of the traditional medicine, has political, economic, and organizational problems which greatly decrease the influence of western malaria programs.

In conclusion, each country in my study has had its own unique set of socio-cultural factors which have affected the success or failure of their malaria control programs. These problems range from the national political, economic level, to the interpersonal communication between health workers and villagers. These are all human factors and involve communication. From this perspective, malaria control is an extremely complicated task. There are abundant barriers to communication and diffusion at every level of social organization within a nation. This makes the communication and diffusion of new and innovative ideas at the point where the government and local people interface even more important for the control of all disease, including malaria.

Chapter: V

Conclusion and Interpretations

To get the bad customs of a country changed and new ones, though better, introduced, it is necessary first to remove the prejudices of the people, enlighten their ignorance, and convince them that their interests will be promoted by the proposed changes; and this is not the work of a day.

(Benjamin Franklin 1781)

One must learn by doing the thing, for though you think you know it you have no certainty, until you try.

(Sophocles 400 B.C.)

Briefly, the results of the research have been, first of all, that human, cultural factors contribute to the success or failure of malaria control programs. These factors occur at least at three levels; the global, WHO, bureaucratic level; the national government level; and the local traditional village level.

Second, the diffusion of malaria control ideas and practices, does depend upon adequate communication between the "change agent" the health worker and the local people. I have come to the conclusion that this "communication" should go in both directions. The "change agent" himself must be able to "change" in order to fulfill the "roles" assigned him. I believe my examination of malaria control

in India, Papua New Guinea, Nigeria, and Zimbabwe, shows how the battle against malaria has been fought all too frequently, from an "arm-chair" vantage point. Welsch's critique of the structure of primary health care in Papua New Guinea is an example of this unfortunate view and its problems. He also makes an argument against the use of blind statistical methods employed by WHO (Welsch 1986).

In general, my ultimate finding has been that anti-malaria programs have been organized from the "top down" and that communication presumably also travels in that direction. I do not see this "one-way" infliction of information as actual communication. Ideally communication should go in both directions, and it can, as demonstrated by Amelsvoort in Nigeria. It appears, based on my research of the literature, that the human factor in malaria control has been neglected. I do however recognize that WHO and other organizations have made significant progress in the control of malaria in some countries. I will discuss here some of the human factors and ideas which I believe led to the inevitable failure of the WHO's malaria eradication program, and why malaria control remains a problem today.

It is clear that human factors contribute to the maintenance of high levels of malaria infection, and that they frustrate attempts to deal with the disease and bedevil the eradication programs which are either in progress or which are in the process of development (Prothero, 1965:142).

Albert F. Wessen recognized the "vicious cycle of malaria", as one of the important human factors involved in

the control of malaria. This is "the correlation between malaria (as well as other diseases) and poverty, ignorance, illiteracy and social deprivation" (1972:658). Wessen stated that medical care is less accessible to poor people. This is especially true in the cases of isolated, subsistence-based, rural villages. The sections on Papua New Guinea, and India give examples of this. It is in these areas that quality services, whether in the areas of education or medical care and malaria control, are the hardest to achieve and maintain. At national levels, developing countries have limited resources and face multiple demands for funds. Often the priority for spending is divided between political/military aspirations and health care needs.

Wessen stated that the quality of the relationships between the people and malaria programs is affected by the attitudes of the population toward health authorities (1972:659). The control of malaria, like any disease, depends upon the cooperation of the members of the community with the health care workers. Problems arise when a population does not regard a health worker's efforts as actual "help". The reverse is also common when the health care worker sees the people as difficult or uncooperative. When a great discrepancy exists between the beliefs, perceptions, and values of the health professional and those of the people, a lack of communication and cooperation

becomes apparent (Wessen 1972; Welsch 1986:109).

Anthropological and sociological theories and ideas assume an enhanced importance in malaria control. People must be motivated if they are to change. If they do not perceive problems as their "helpers" do, disagree with the values and behavior exhibited by them, or find social contacts with them difficult or unrewarding, the desired motivation is not likely to be generated (Wessen 1972:660).

Unfortunately, the history of malaria control shows that health workers all too often know little about the beliefs and customs of the people whom they are trying to help. Operational programs have been planned and executed in terms of "technical blueprints", assumed to be universally applicable. "Front-line" workers have often been ill-trained and poorly supervised. They may have been taught to do specific technical jobs, but with little indication that it must be done within a social situation, many times with built-in limitations.

Southgate and Heisch criticize this "technical blueprint". They refer to it as the "Utopian Approach". The utopian health services (WHO in particular), according to Southgate and Heisch, have been designed to execute an "integrated holistic" approach to health, combining "curative, preventive, and promotive medicine in a unified, centrally directed service" and carrying "some service to all the people all the time" (1966:76). It is their opinion

that these types of plans are often made by men remote in distance and spirit from the countries concerned. Southgate and Heisch criticized the World Health Organization's definition of health, ("a state of complete physical, mental and social well being"), as impractically utopian, and "serving as an excuse for inaction and [that it] distracts attention from short-term, realizable goals" (1966:76). The "danger of holism", in health and applied to any aspect of human life, they say, is that it leads men to construct systems of thought which seem to provide "panaceas" for all problems (1966:76).

Southgate and Heisch were quite derisive about the "Utopian" ideals of WHO. Though I see the usefulness of an "holistic" approach, I have come to realize through my research that the massive superstructure of WHO and its malaria programs are actually impractically ideological. Southgate and Heisch suggested instead of a malaria program built on the pyramidal model with information going from the top down, that the plan for individual countries should be built up from the district level, putting an emphasis on the people and the village. They stated about health services that, "paper is no substitute for penicillin and talk will not terminate typhoid" (1966:80).

The assumption of the outside health organization too often has been that "if it's all right with the government and the headman, everybody else will cooperate" (Wessen

1972:660-661). This is ethnocentric and non-communicative. It overlooks the fact that all too frequently villagers regard government officials as remote and threatening figures. Because of this they understandably try to have as little as possible to do with malaria and/or other health projects while still appearing to cooperate. This attitude also overlooks the "equally common fact that headmen's authority is often incomplete and limited..." (Wessen 1972:661).

DDT and antimalarial drugs have been the main weapon in the war on malaria. Prior to the invention of DDT in 1943, and its massive distribution by WHO in 1949, malaria control was mainly limited to trying to eliminate the breeding environment of the vector. This was done by draining swamps and getting rid of other potential mosquito breeding areas. After DDT was introduced it became the primary means of killing mosquitoes. More often than not, older, traditional methods of dealing with malaria were replaced and forgotten. These were probably treatments similar to the ones described by Etkin. DDT did a fine job of controlling malaria transmission in the years before 1965, however, after that time it became increasingly evident that the vector was gaining resistance to the insecticide.

I have described the present world malaria situation in the "world overview" section and so will not repeat it

here. Rather, I wish to discuss what I see as a lack of real "human" understanding in malaria control programs. As I have said, communication is an "exchange" of ideas. It can serve to give the health worker an idea of the local "client" people and their perspective of malaria and other health matters. This does not happen often enough.

While doing the research I found an abundance of information in books and articles on the subject of malaria. The vast majority of the literature was extremely medical, microbiological, and technical. Very little actually dealt directly with the "human" factors or attitudes about malaria. The literature about traditional health care was helpful, but did not deal specifically with malaria to any great extent. The opinions and views of traditional peoples as well as their own malaria treatments have been largely ignored or dismissed. Etkin's research in Nigeria and any like it seem to be positive exceptions (1979).

The World Health Organization publications which I examined were concerned mainly with implementing their health and malaria "blueprint". There are multiple WHO documents on the subject of malaria control and the subsequent building of national control programs. These publications discuss every topic from malarial statistical techniques to basic mosquito entomology. They do not however stress flexibility as one of the "roles" of the "change

agent"/health worker.

The lack of information about the ideas and perceptions of traditional peoples illustrates the problem of non-communication. Interpersonal and mass-media communication channels need to be utilized equally. In malaria health education, communication is a "must", and has to diffuse equally in both directions. Not only must the "change agent" educate the traditional people about malaria, the people must be able to express their own point of view. The educator must in essence become educated by those he is attempting to educate.

The diffusion of western ideas about malaria control is hampered by a problem of "over technology" or what I call "over-development". This over-development of one aspect of an incredibly complicated disease, has led to the adaptation of Anopheles to many insecticides and Plasmodium to many antimalarial drugs. It has also been too heavily relied upon for control in some areas to the point where other methods have been forgotten and/or ignored.

Over-development can be described as an over emphasis of one ideology, technique, or innovation to the exclusion or disregard of all or most alternatives. Modern technocrats, though often starting with good intentions, have tended to design health programs from a western technological point of view. This perspective is similar to such notions as "west is best" and "bigger is better". All

other non-western technologies are seen as either "old fashioned" or "superstitious".

When these modern techniques fail, too often they are replaced by even more "sophisticated" programs and methods. The failure itself is measured by increasingly modern and more complicated statistical methodology. Even though statistical methods are considerably useful in estimating epidemiological and diffusionary patterns, they must not be over-emphasized or over-developed. Malaria control programs must utilize a combination of methods. These should include useful modern/western methods, incorporate the traditional perspective, and be flexible enough to change. Even though a successful malaria vaccine would indeed be a blessing to the health, prosperity, and development of Third World countries, the world cannot afford to disregard the cultural factors of the disease, while waiting for its invention. If malaria is to be controlled and/or eradicated, then people, as well as Plasmodia need to be studied. There is a vast need for the education, and reorganization of the administrative and management level of malaria control programs. The administrators of the programs must be educated to the needs, values, beliefs, and problems of their people. Older malaria control methods should be incorporated into modern programs, and not only replaced with "new" technology.

In order for these recommendations to be implemented

it is necessary to study and document the behavior, beliefs, and practices of the indigenous people involved. The scope for further research is vast. Individual villages and ethnic groups need to be studied in order to accurately determine the true status of malaria in separate areas. The organization of individual malaria control programs must be scrutinized in order to determine and anticipate areas of possible communication breakdown. Malaria involves the interaction of the natural environment with the cultural behavior of humans. Therefore, the control of malaria requires that anthropological research be carried out and utilized in the planning and implementation of malaria control programs.

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