The Patterns of Cultural Behavior Which Promote and Disrupt the Transmission of Malaria in Haiti

Janet Jenks Sloan

Western Michigan University

Follow this and additional works at: http://scholarworks.wmich.edu/masters_theses

Part of the Social and Cultural Anthropology Commons

Recommended Citation
http://scholarworks.wmich.edu/masters_theses/1546

This Masters Thesis-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Master's Theses by an authorized administrator of ScholarWorks at WMU. For more information, please contact maira.bundza@wmich.edu.
THE PATTERNS OF CULTURAL BEHAVIOR WHICH PROMOTE AND DISRUPT
THE TRANSMISSION OF MALARIA IN HAITI

by

Janet Jenks Sloan

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Anthropology

Western Michigan University
Kalamazoo, Michigan
April 1984
THE PATTERNS OF CULTURAL BEHAVIOR WHICH PROMOTE AND DISRUPT
THE TRANSMISSION OF MALARIA IN HAITI

Janet Jenks Sloan, M.A.
Western Michigan University, 1984

Malaria is in epidemic resurgence in the Limbé region of Haiti as a consequence of the termination of internationally-sponsored eradication programs. The presence of endemic disease cannot be considered an exclusively biophysical phenomenon; it is also an aspect of human adaptation within a particular environment. The biocultural ecology of Haiti is an interacting network of historical, cultural, social, and environmental factors. Before malaria can be controlled in Haiti the biocultural context must be understood and the complexity of the interaction of these factors appreciated. Any ameliorative intervention program must be based on a multiple strategy approach that is compatible with the realities of the cultural context or the human ecology of Haiti.
ACKNOWLEDGEMENTS

I would like to thank the entire faculty of the Anthropology Department of Western Michigan University. Each member of the faculty has contributed significantly to my formal education and personal learning.

I would like to offer special thanks to Dr. Robert Jack Smith, major thesis advisor, and Dr. Erika Friedl-Loeffler and Dr. William Garland, thesis committee members. Their continuing support and encouragement have made this project a valuable and pleasurable experience.

The work of Dr. Peter J. Brown of Emory University provided the inspiration for this thesis, and I greatly appreciate the suggestions and advice he has given me.

Dr. William Hodges and Mme. Joanna Hodges of L'Hôpital le Bon Samaritain, Limbé, Haiti and Ms. Alta Hodges have provided me with much valuable information. I thank them for their interest in my work and for their willingness to answer my innumerable questions.

To my friends and family I can offer only my gratitude for their support and endurance. They have listened patiently and counseled wisely. Without their help this task could not have been accomplished.

The faculty of the Anthropology Department of Indiana University also have aided in the completion of this project. I would like to thank them for their time and for their attention to my continuing education.
I would also like to thank Ms. Sue Gibson for her time so generously given to the typing of this manuscript.

Above all else, I wish to thank my daughter, Lacey Scranton Von Deak. The love and wisdom she gives to me cannot be measured. Without her the process of my education could not go on.

The ideas and interpretations presented in this thesis are the result of my research and are my responsibility. I assume full liability for any errors contained herein.

Janet Jenks Sloan
INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.

2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
THE PATTERNS OF CULTURAL BEHAVIOR WHICH PROMOTE AND DISRUPT THE TRANSMISSION OF MALARIA IN HAITI

M.A. 1984
PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark ✓.

1. Glossy photographs or pages
2. Colored illustrations, paper or print
3. Photographs with dark background
4. Illustrations are poor copy
5. Pages with black marks, not original copy
6. Print shows through as there is text on both sides of page
7. Indistinct, broken or small print on several pages ✓
8. Print exceeds margin requirements
9. Tightly bound copy with print lost in spine
10. Computer printout pages with indistinct print
11. Page(s) lacking when material received, and not available from school or author.
12. Page(s) seem to be missing in numbering only as text follows.
13. Two pages numbered. Text follows.
14. Curling and wrinkled pages
15. Other

University Microfilms International

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS ......................................................... ii

LIST OF MAPS ................................................................. v

INTRODUCTION ................................................................. 1

THE HAITIAN CONTEXT ...................................................... 4

  The Physical Setting of Haitian Culture:
  Geography and Ecology ................................................... 5

  The Socio-Historical Patterns of Resources Exploitation:
  Land Tenure and Subsistence Agriculture .......................... 17

MALARIA IN HAITI ............................................................. 29

  The History of Malaria in Haiti ........................................... 29

  Malaria in Haiti in the Twentieth Century .......................... 32

  The Epidemiology of Malaria .......................................... 34

Malarial Immunity, Resistance, and Tolerance:
  Development and Duration ................................................ 37

  The Malaria Vector: Anopheles albimanus ............................ 41

HEALTH AND ILLNESS IN HAITI ........................................ 46

  The Haitian Cosmos: Le Bon Dieu and Les Loa ..................... 48

  Illness: Causes and Cures ............................................... 51

  Malaria from the Haitian Point of View .............................. 57

CONCLUSIONS ................................................................. 64

APPENDIX: Confirmed Cases of Malaria from the Records
  of L'Hôpital le Bon Samaritain, Limbé, Haiti: 1961-1983 ........ 66

BIBLIOGRAPHY .................................................................. 67
LIST OF MAPS

Map

1. Populated Places and Political Subdivisions of Haiti . . . . 6
2. Topography of Haiti .................. 8
INTRODUCTION

Of the many countries which participated in the world-wide malaria control/eradication programs begun in the late 1940s with the introduction of DDT, only eleven have maintained eradication status certified by the World Health Organization. In other areas malaria is recrudescent, high endemicity prevails, and epidemic resurgence has occurred. India, Sri Lanka, parts of tropical Latin America, the islands of the Pacific, the Middle East, and many of the Caribbean Islands have suffered malarial resurgence since the termination of internationally sponsored control/eradication programs in 1973 (Harrison 1978:249-260).

Haiti is no exception to this trend. After a period of relative abeyance from 1966 to 1975, malaria in the Limbé region of Haiti is in full epidemic resurgence (Hodges, personal communication 1983; see Appendix). There is a high degree of probability that this situation is not confined to the north of Haiti, as the conditions which would promote malarial resurgence are present throughout the country. In July of 1983 the Center for Disease Control in Atlanta sent a team to Haiti to investigate this situation. The results of this inquiry are not yet publically available (Hodges, personal communication 1983).

This thesis represents preliminary research on the causes and problems of malaria in Haiti. The ultimate objective of this ongoing
investigation is to design an effective malaria control program for Haiti that may have extended application to other malarial areas.

It has not been possible to undertake field work; therefore, research at this stage has been restricted to library materials, informal interviews with individuals having any experience in Haiti, including medical and missionary personnel, and personal correspondence. Due to these contraints on data collection, the intent of this thesis is to provide the investigator with a framework for further inquiry.

The basic premise of this investigation is that to attack a disease such as malaria as a single problem removed from a socio-cultural context is fundamentally incorrect. The presence of disease is only a symptom of larger, more complex problems within a society. It is imperative to take the widest perspective possible when dealing with the problems presented by endemic disease.

Following the anthropological dictates of the holistic approach and the concept that "culture is man's extra-somatic means of adaptation" (White 1949), this research has focused on the interrelationship of host-vector-parasite in malarial infection and the culturally defined patterns of social behavior that both promote and disrupt the transmission of malaria in Haiti. The epidemiology of malaria; the environmental, historical, and socio-cultural factors which contribute to its presence in Haiti; and Haitian ethnomedical beliefs and practices will be examined. The interaction of man, mosquito, and malaria in Haiti is a subsystem of a larger culturally defined ecology.
Therefore, a modified systems theory model is implicit in this approach to the condition of endemic malaria in Haiti.
THE HAITIAN CONTEXT

Haiti was once the "Pearl of the Antilles," the most precious jewel in the crown of the French colonial empire. Now, it is the poorest nation in the Western Hemisphere.

Located between Cuba to the northwest and Puerto Rico to the southeast, the colony of Saint-Domingue occupied the western one third of the island of Hispaniola. Her ports on the Gulf of Gonâve gave easy access to the Windward Passage, bestowing upon the colony an unrivaled position in the commercial trafficking of the Caribbean. In the late 1780s, just prior to the French revolution, Haiti's yearly exports of sugar, coffee, and cotton carried a value in terms of today's markets of over $75 million. This situation has changed dramatically in the last two hundred years. In the early 1970s the total value of Haiti's yearly exports did not exceed $31 million (Moore 1972:144).

This simple comparison of past and present provides evidence of the brutal fact that in her postcolonial period Haiti has endured a progressive impoverishment. Her annual rates of per capita production and consumption have declined steadily as her population has increased (Rotberg 1971). The culmination of this process is manifest in the incredible poverty of Haiti today. It is a country where the laws of hunger and disease govern almost the whole of human endeavor.

It is necessary to understand the natural conditions and the historical factors which gave rise to this poverty before any other
aspects of contemporary Haitian life may be understood. The extent to which human activities have shaped and have been shaped by the Haitian landscape is one way to measure this process of continual deterioration.

The Physical Setting of Haitian Culture: Geography and Ecology

There is a story told about an English admiral who crumpled a piece of paper in his fist, placed it on a table before George III, and said, "Sire, Hayti looks like that!" (Logan 1968:6). In Haiti more land lies in the vertical plane than lies in the horizontal. More than three quarters of the Republic is covered by steep, uplifted mountains. Fifty-four percent of the land has a slope of more than forty percent (Lundahl 1979:59). This extreme topography accounts for many of the problems Haiti currently faces. Other stories are told of injury and death caused by falling out of hillside cornfields (Weil 1973:9). Amusing but grim, these tales are indicative of the population pressure on the land and the critical lack of arable land in Haiti today.

The Republic of Haiti is located on the western third of the island it shares with the Dominican Republic (Map 1), covering a geographic area of approximately 10,700 square miles. Variously described as looking like a horseshoe or the jaws of an alligator, Haiti is shaped in a westward facing curve surrounding the Gulf of Gonâve. The northern and southern peninsulas are separated by the expanse of the gulf and are joined by the mountainous interior.
Map 1. Populated Places and Political Subdivisions of Haiti
of the east. Haiti's offshore islands, Tortuga, Gonâve, and Île-à-Vache, add very little to her total area (Logan 1968:6; Rotberg, 1971:5).

Estimations of the percentage of highlands versus lowlands range from less than 21% of the land lying below 600 ft to more than 35% of the land lying above 1600 ft. There are five major mountain chains running in a generally east-west direction, interspersed with lowlands and plateaus, the four principal ones being the Plaine du Nord, the Plateau Central, the Plaines de L'Artibonite, and the Cul de Sac (Map 2). Random spurs extend in all directions from these major chains. There are also small areas of cultivable land in the inter-montagne valleys. Assessments of the total flat area of Haiti vary from 21% to 24% of its entire area (Logan 1968; Lundahl 1979; Moore 1972; Weil 1973).

Haiti's natural drainage system consists of over 100 streams and rivers, the largest of these being the Artibonite which drains the arid and semi-arid Plaines de L'Artibonite. In the mountains these water courses have a fast and permanent flow, but as they hit the plains below, they become slow, shallow, and meandering. There, they are subject to seasonal variation, often disappearing before they reach tidewater in the dry season. Often they form marshes and lagoons, as the wind and wave action creates obstructing sandbars (Paul and Bellerive 1947:42). However, these lowland waterways can cause torrential floods in the rainy season (Logan 1968:8; Weil 1973:11). Only the Artibonite is navigable in the few miles where it is tidal. In the south, near the border of the Dominican
Map 2. Topography of Haiti (from Weil 1973)
Republic, a series of brackish lakes have formed behind the alluvial fan of the Cul de Sac. The largest of these is the Etang Saumâtre. The largest freshwater lake in Haiti is the Etang de Miragoâne, located in the center of the southern peninsula (Paul and Bellerive 1947:41; Weil 1973:11).

Geologically, the island is formed of sandstone and conglomerates overlaid by limestone, clays, and chalk. Most of the soils of Haiti result from the weathering of limestone in the mountains. The detritus is then carried to the plains by precipitate runoff. The plateaus are covered by red clays and clay loams; and the alluvial plains are relatively the most fertile, except in the drier areas where the soils tend to be alkaline (Rodman 1954:45). According to a survey taken in the late 1960s by the Organization of American States, most Haitians are farming lands that are unsuited for agriculture and appropriate only for forestry, grazing, or tree crops (Lundahl 1979:57).

Average mean temperature and rainfall in Haiti vary by locality and season. The only generalization that has any meaning is that it is usually wetter and cooler in the highlands, and drier and warmer in the lowlands. Rainfall can range from an average of as little as 20 in. per year in the northern peninsula (Map 1) to an average of over 120 in. yearly in the Mirebalais region (Rodman 1954:45). The temperature ranges from 81° F on the coastal lowlands to 76° F in the mountains (Weil 1973:13).

Severe thunderstorms and the infrequent hurricanes of summer and fall account for much of Haiti's rainfall. However, the benefit of this precipitation is limited because of high evaporation and runoff.
rates. The runoff also accelerates erosion processes. The hail which accompanies these storms can cause extensive crop damage as well (Logan 1968:9).

The topographically induced variation in precipitation and temperature creates the distinction made by native agriculturalists between hot and cool lands, te cho (terre chaud) and te fret (terre frais) (Lundahl 1979:39). Originally, Haiti supported a wealth of contrasting ecosystems, viz. rainforest, desert scrublands, temperate pine forest, and savannah. Remnants of this diversity still exist, but it is being lost as people encroach on the landscape.

The most apparent and possibly the most significant change in the Haitian landscape since the colonial period has been the razing of the once heavily forested slopes. "In few countries of the world has the destruction of the natural woodland cover been so complete (Weil 1973:14). The deforestation of Haiti began in the early period of the French occupation due to the need for timber, agricultural land, and most importantly, fuel for the refining of sugar (Lundahl 1979:195). Much of Haiti's native exotic hardwoods were cut for export.

The reserves of virgin forest in Haiti were estimated by Moral in the 1960s to be no more than 20,000 to 30,000 hectares. The export of wood has ceased. Reforestation projects have been undertaken, but their success is limited. The demand for fuel increases with the expanding population (Lundahl 1979:199-200).

The geographical and ecological features of the Haitian context detailed above have had a considerable influence on the development and persistence of the current Haitian situation. The constraints
imposed by the physical aspects of the Haitian cultural context and the patterns of resource exploitation in Haiti contribute significantly to her poverty and the prevalence of disease.

The intense ruggedness of the Haitian landscape has severely hindered the development of an effective transport and communication infrastructure. Many communities in the central interior and along the southern peninsula exist in almost complete isolation. Haiti's success as a colony was due to her few coastal roads and coastal waterways; but the contemporary system is comparatively less viable than even the colonial one (Carl, personal communication 1983; Rotberg 1971).

In 1969 there were only 2,250 mi of roads in Haiti outside the capital of Port-au-Prince. Only 50 of these were all-weather roads. The single railroad carried no passengers and hugged the coast from Léogâne to St. Marc, where it straggled into the Artibonite river basin. At this time there were only 2,000 phone lines in Haiti and they serviced only 4,400 phones. The roads that do exist are heavily traveled by large trucks and the smaller trucks known as tap-taps and camions, which are the only form of public transport. These vehicles literally devour the roads they travel; a newly surfaced road will be obliterated within three years (Rotberg 1971).

There is very little interregional exchange of any kind, and many rural Haitians have never been more than a day or so away from home. Goods are still taken to local markets on the heads of the marchands or on the backs of donkeys. Distance is measured in the time it takes to travel it, not in mileage or fuel consumption.
The restrictions the terrain imposes on the people of Haiti are best demonstrated in the difficulties of national administration. A census is nearly impossible to take with any degree of accuracy. There are very few effective or centrally organized educational or medical facilities in Haiti. Most of what is functional results from the activities of international aid agencies and mission work. National and international administrative agents are regarded with hostility and suspicion by rural peoples. This hampers the delivery of even the minimal social services available. The terrain has also served to emphasize the historical independence of the black rural peasant. Until recently, it was the grossest insult imaginable to call a man a Haitian, as he did not conceive of a national identity but only acknowledged a regional or village affiliation (Rotberg 1971).

The ruggedness of Haiti also prevents any more land from being opened for cultivation. There are no frontiers in Haiti waiting to be exploited, even if sophisticated agricultural techniques were available. This absolute limit of arable land is one of the greatest Haitian tragedies.

However, even though the land is limited, an extensive variety of crops can be grown in Haiti. This is a function of the climatic and ecological variation created by the topographical diversity of Haiti. Depending upon locale, rainfall, and elevation, tropical, subtropical, and temperate crops can be grown in Haiti. Unfortunately, because there is no adequate transportation system and, thus, no comprehensive internal marketing system, this varied produce cannot be made available to the entire population. Most Haitians are
confined to a regionally defined diet, and the seasonality of certain foods reduces their value to a hungry populace. Summer for many is a season of famine, even in the fertile areas (Lundahl 1979; Rotberg 1971).

Even as there is an absolute limit to the amount of land in Haiti that can be cultivated, the amount of land in subsistence production is declining. Arable land is being lost as the need for it increases. (For the purposes of this analysis, the effect of the increase in Haitian-fronted American agribusiness on subsistence production will not be considered in depth. However, it has resulted in a major displacement of peasants from the land and in part accounts for the rural to urban and extra-national migration of Haitians [Segal 1982:7]).

This loss of land is also in part a result of the process of deforestation due to the increasing demands for the forest resources. The limited timber reserves represent a severe fuel shortage in Haiti and a dearth of materials for construction and crafts. However, the subsequent problems of erosion have overshadowed these lesser ones.

Because there are no trees to hold the soils to the steep slopes, they have washed away, changing the face of the hillsides to gullied and fissured badlands. Because there are no trees to produce the organic detritus which was the natural fertilizer of the alluvial plains, the washout and deposit are sterile, ruining the productive capacity of the soils downslope and on the alluvial plain. Not only has the fertility of the soil been greatly reduced, but the danger of flashflooding has increased (Moore 1972:142).
This acceleration in slope erosion and aggradation has undoubtedly changed the patterns of drainage basin formation in the lowlands (Strahler 1956:627). The probable effect of this has been the creation of more swamp and marshland, as the porosity of the underlying limestone does not allow for the formation of ponds and lakes, but does maintain a high water table (Rodman 1954). Not only would this result in land being lost to agriculture, but new breeding sites for the vectors of numerous tropical diseases, including malaria, are being formed. This "lost" land would most likely be found in areas that are densely populated due to the original productivity of the soils, thereby increasing the access of malarial vectors to malarial hosts, i.e. mosquitoes to man.

These effects of progressive deforestation, i.e. reduced fertility of the soils due to erosion, land loss due to the formation of swamps, and an increase in the numbers of potential malaria vectors, contribute to a greater incidence of hunger and disease.

The roads of Haiti, limited in extent as they are, have similarly altered the drainage system of Haiti with effects comparable to those of deforestation.

The coastal roads have blocked the natural outlets of many streams and rivers, exacerbating the prevalence of freshwater springs and seepage areas at tidewater, creating even more swamp land and concomitantly reducing arable land. A similar effect occurs when the roads built across the irrigated plains inhibit the runoff of surplus irrigation waters. Once again, these are densely populated areas. Land is not suitable for agriculture; it becomes a breeding place for
mosquitoes, and hunger and disease increase in the area (Paul and Bellerive 1947).

It has been remarked that it is unusual that a country with so much vegetational diversity should have so little animal life (Rodman 1954:46). Haiti has no indigenous land mammals other than rodents, the largest of which are the nocturnal mongoose and the agouti (Rodman 1954:47; Weil 1973:14). As early as the 1850s an observer noted that hares and rabbits were rare; presumably, they are now extinct as no later chronicler mentions them (Redpath 1861/1970:41). Small birds are also rare, having been virtually exterminated by Haitian slingshots (Rodman 1954:47).

The largest animals native to Haiti are the iguana and the crocodile. The only large warmbodied animals in Haiti are domesticated varieties, and even the feral offspring of these are now exceedingly rare (Rodman 1954:47).

There are as many species of insects in Haiti as the diversity of environment will allow, including several species of anopheline mosquitoes. The most important of these is Anopheles albimanus, which is the principal vector of malaria in Haiti.

Further analysis of the significance of these processes of ecological change will be examined in the section on the epidemiology of malaria (p. 34). However, it should be noted here that the absence of large, wild, warmbodied animals and the reduction of the native avian populations are also factors in the maintenance and transmission of malaria in Haiti.
The principal vector of malaria in Haiti, *A. albimanus*, is zoophilic, feeding on both man and animals (Mason and Cavalie 1965:553; Taylor 1966:393). With no wild source of blood available, *A. albimanus* feeds on domesticated animals, especially horses, oxen, pigs, and goats. These are the most common livestock in Haiti. This feeding pattern could have the effect of increasing the contact of man and mosquito. There are no currently available data that indicate that individuals who husband livestock show a greater incidence of malaria than do those individuals whose contact with these animals is restricted. However, further research is needed with regard to who tends to the livestock, the proximity of stabling facilities to human habitation, and the time of day of intensive human-livestock contact. The results of such research might prove to be of value in a malarial control program.

In addition to animals, there is the indigenous small bird population of Haiti, which has been reduced both for sport and for the protection of crops (Lundahl 1979; Rodman 1954). This has probably had the effect of disrupting the balance of the natural predator-prey relationship of birds and mosquitoes. Without this check and balance, the mosquito population has one less control on its proliferation. As the numbers of mosquitoes increase, so does the potential for the transmission of malaria to humans.
The Socio-Historical Patterns of Resource Exploitation: Land Tenure and Subsistence Agriculture

The history of ecological change and environmental degradation in Haiti can be related directly to land use practices and land tenure patterns which have been developed and maintained in Haiti's postcolonial period. These in turn are related to the socio-political history of Haiti in the period after the slave rebellion and national revolution, from 1804 to the mid-1820s.

Haiti is a country of minifundia or very small garden-sized farms. According to the 1971 census, the average size of most landholdings was no more than 1.4 hectares (2.47 acres); and these "farms" often consisted of several small scattered plots located a considerable distance from one another (Lundahl 1979). Almost all of the large consolidated landholdings in Haiti are owned and operated by foreign investors. Therefore, almost none of the capital created by such holdings is reinvested in Haiti. Even the produce is destined for foreign markets. The only fiscal benefit the Haitian economy derives from these plantations is in the limited cash flow to the day/wage laborers, who must spend all of it on the subsistence goods they themselves do not produce (Lundahl 1979:266-288).

Therefore, there are two types of agrarian economy in Haiti. The subsistence economy or peasant sector produces for domestic consumption and is still the predominant form of agricultural enterprise. Its limited surplus may be sold in local markets for manufactured goods such as matches, rum, kerosene, materials, and even a few
foreign luxury items. The export cash economy or the agribusiness sector produces such goods as coffee, sugar, sisal, and cotton (Mintz 1966:xxvii). (Coffee can be grown and is grown to a limited extent on an individual basis. However, generally it does not provide a substantial cash flow in the peasant sector.) It will not be necessary to consider the plantation/export economy for the purposes of this analysis, except to note its large-scale effect on the Haitian condition.

By displacing the lowland peasant farmer, agribusiness activities are taking the most fertile land in Haiti out of subsistence production. More people have to be supported by fewer producers with less good land. Prices of domestic goods increase and consumption decreases, compounding the problems of poverty and malnutrition.

In his introduction to Leyburn's The Haitian People (1941/1966), Mintz describes the Haitian economy as "quasi-capitalistic" (1966:xxv). Although the influence of agribusiness has changed the situation to the extent described above, this is still a correct assessment of the peasant sector. Mintz's analysis emphasizes that Haiti is a country of small independent producers who work with little or no capital investment. This lack is apparent in a variety of aspects of domestic production and consumption. The explication which follows is drawn exclusively from Mats Lundahl's analysis of the Haitian economy, Peasants and Poverty: A Study of Haiti (1979).

There are few attempts made at selective plant and seed breeding or improved cultivation techniques in the peasant sector. The catch-as-catch-can techniques of the peasant are best demonstrated in the
individual growing of coffee, which is not cultivated, but only harvested. Reproduction is left entirely to nature, and there is no selective harvesting. The berries, both ripe and green, are simply raked off the branches, often damaging potential bud sites. The consequences of this tactic are that both the yields and quality of this cash crop are low; therefore, the income generated is also low. This pattern of minimal cultivation extends to many of the crops grown for domestic consumption, with the result being exceedingly low yields for the labor invested.

The tools used in cultivation are limited to the machete, the hoe, and occasionally the dibble stick. The small size of the plots to be cultivated and the incline of these plots makes the use of more complicated technology unfeasible.

Due to the restrictions of cost, chemical fertilizer is used only by the plantation sector. Natural fertilizers, such as dung or field and household refuse, are neither collected nor composted for application. The limited livestock probably do not produce sufficient quantities to make the effort worthwhile, and other refuse is burned. (Although Lundahl does not state this, this may be a source of fuel for the peasant. As such, it would have a greater value to the peasant when fuel is scarce than it does as fertilizer.)

Irrigation techniques are seldom employed, with less than 10% of the land in Haiti irrigated. Much of this is most likely restricted to the agribusiness sector. During the colonial period, irrigation works were extensive and profitable, but these fell into disuse or were destroyed during the wars of rebellion and revolution and have
not been revived on a similar scale. The irrigation facilities which do exist create more problems than benefits. Artificial drainage is inefficient and is not compensated for by natural drainage. Therefore, a primary effect of irrigation is to increase the salinity of the soils so watered and reduce crop yields. Maintenance is haphazard and sedimentation and silting reduce the efficiency of water distribution, exacerbating the problems of seepage. In their current state of disrepair, irrigation works are ideal breeding places for mosquitoes and they are found in areas of high population density due to the former productivity of such areas.

Natural or chemical pest control techniques are not employed to any demonstrable effect. Both cash and subsistence crops suffer extensive damage from various pests, and hungry domestic animals can constitute a threat to growing crops. Hedges, bamboo fences, and small children with slingshots are the principal defense against the larger animals and birds. Blights, insects, and vermin cannot be controlled by these methods.

There are no apparent planned fallowing or crop rotation systems in the peasant agrarian practices. Few peasants have large enough holdings to allow any regular fallowing, and most plots are mixed cropped. While this tactic does prolong the productive life of a field, eventually yields are so reduced that a period of fallowing is enforced. Fields do not return to previous levels of productivity, even after long fallow periods.

Finally, storage practices and facilities are inadequate to the point of being nonexistent. Warehousing, silos, or granaries are
rare. Humidity and pests such as rats and birds can destroy a significant portion of a harvested crop. Roots crops are stored in the ground until consumption. Consequently, the Haitian peasant must consume or sell almost all of his produce as soon as it is harvested. As there is often little left from a previous harvest, seed must be purchased at sowing time, usually at a higher price than that which prevailed at the last harvest. This creates debt cycles that are difficult to escape.

There are long periods of scarcity and famine for the Haitian peasant in the agricultural cycle that are not compensated for by seasonal extra-local employment or cash artisanship as is the case in other Latin American peasant economies.

The only "capital" the Haitian peasant has to invest in production is his own labor, and the agrarian peasant economy is labor intensive. But even this one capital resource is diminished by the physical debilitation of the average peasant whose capacity for work is diminished by chronic malnutrition, a variety of endemic diseases, such as malaria and tuberculosis (Coreil 1983a), and the ubiquitous host of internal parasites which are his constant companions almost from birth. Life expectancy for the rural Haitian is 48 years (Coreil 1983a).

The above description is a general one and suffers the problems inherent in broad description. Lundahl's bias as an economist is to focus on quantitative, i.e. averaged data. Qualitative differences would be obscured in his analysis. Even though the rural Haitian peoples may appear uniformly poor, internal differentiation in terms
of social stratification exists in Haiti as in other peasant cultures (Cancian 1976). The local Voudun priest or priestess is often better off than his or her congregation due to payments made for the various religious services rendered (Murray 1980). The Chef de Section, a minor political functionary, is also often better off fiscally than his peers as he may exploit his situation to his own financial ends (Rotberg 1971). The modified polygamy of placage marriages in Haiti may give a man control over the produce of his several "wives'" small holdings, increasing his wealth without any apparent increase in his own landholdings. However, although internal differentiation does exist in the rural culture, the characterization of peasant agriculture presented by Lundahl is accurate in its portrayal of hardship and duress.

It has been suggested by Mintz (1966:xxvi), Leyburn (1941/1966: 74-79), and Lundahl (1979:255-291) that the solution to Haiti's problems would be a land reform program in terms of consolidation. The rationale for this proposal is that as no single peasant has the capital to farm efficiently due to the restrictions on holding size, an increase in "farm" size might make a greater capital investment viable in the peasant sector. However, Mintz attributes extreme conservatism to the Haitian "yeomanry" both in land use practices and personal autonomy (1966:xxiv). He assumes that the peasant is reluctant to use any innovative methods of cultivation because the risks must be undertaken by the individual and failure must be borne by the individual. Therefore, adopting the novel is madness in a situation where there is no margin for safety.
While this may have been an accurate assessment of the situation in Haiti 20 years ago, the conditions of agriculture have changed with the agribusiness influence, as previously noted. Also, recent studies of innovation in agricultural techniques in peasant economies indicate that the process of innovation adoption is far more complexly motivated than Mintz's analysis allows (Cancian 1979; Rogers 1962).

Although the poverty of Haiti is a reality, Mintz apparently holds the "conservatism" of the peasant responsible for Haiti's historic decline, as does Leyburn (see below). Both analysts neglect to recognize the restrictive features of the larger economic sphere of which the peasant sector is only a part. Albeit unobtrusive and possibly unintentional, this assessment is very much akin to the fallacy of "blaming poverty on the poor."

Given current conditions, small scale consolidation by individual producers is being obviated by large scale consolidation in agribusiness. The decreasing availability of arable land is forcing migration and may be reinforcing the historical pattern of small freeholds.

In terms of the formal legal relationship of the peasant to his landholding, the patterns of land tenure in Haiti are varied. However, approximately 88% of the total Haitian population owns or has regular use of some land, however small the plot. But the ratio of freeholders to sharecroppers to squatters cannot be accurately determined due to the above-noted problems of national administration. Records are kept sporadically at best. Land transfers through inheritance, marriage, and religiously incurred debts (Murray 1980) further confuse the issue of titled ownership.
This pattern was established in the postrevolutionary period in Haiti (Leyburn 1941/1966). Beginning in 1804 an attempt was made to maintain the plantation system in Haiti by forced labor. All individuals who were not soldiers, craftsmen, or of the elite were bound to the land by edict and denied mobility. Under this system there was a short recovery of former prosperity. However, in 1807 the country was split by peaceful succession. The plantation system was maintained in the north, but in the south government lands and lands under dubious title were parcelled out to small freeholders. In 1820, Haiti was reunited and this freeholder policy was instituted in the north. By 1823, the government's treasury was depleted. In 1826, President Boyer and the Haitian Senate issued the Code Rural as an attempt to reinstate the forced labor system. This Code proved to be unworkable as it required the cooperation of both the small freeholders and the army. This was not forthcoming.

In the previous year Boyer had negotiated an agreement with France which was essentially a ransoming of Haiti's security against a French invasion. Boyer agreed to pay an initial lump sum and an annual amount for the next 60 years to insure that France would not attempt to reclaim her lost colony or seek by force recompense for properties lost in the revolution. This diplomatic action had the effect of removing the one factor that had maintained political unity and national identity in Haiti, fear of invasion. Soldiers who would fight for their country and personal freedom would not use force against their own countrymen to enforce the provisions of an unpopular Code.
The Code was the last real attempt to maintain a consolidated land tenure pattern. As it was, the process of partitioning continued, to the detriment of a cash/export sector for the Haitian agrarian economy.

Among the landholders, adherence to the inheritance laws of the Napoleonic Code, which states that all heirs shall receive equally, ensured that even reasonably sized estates were fragmented within a few generations. (This pattern of partible inheritance persists in Haiti today and may be the economic root of the social pattern of multiple "placage" marriages or the modified polygamy which is fairly widespread in the peasant culture. This system gives a man a certain limited control over the produce of his "wives'" land as well as his own.)

The parcelling of land and the practice of partible inheritance drove the remnants of the planter elite into the cities and towns. The sons of the light-skinned mulatto elite do not work with their hands (Leyburn 1941/1966:4). The urban areas, as the centers of the professions, offered the only occupation for this group. They turned especially to law, for that was the surest road to political advancement, which became economic power via taxation and fiscal manipulation. Very few went into commerce, which was declassed, or any other capital forming occupation. This was left to foreigners who could not by law own land in Haiti. The black rural peasant was left with his land and little else.

This polarization in color and class occupation led to what Leyburn (1941/1966) has described as the "color/caste" dichotomy of Haiti.
Although this situation has been modified somewhat in recent years, Duvalier père is the most outstanding exception to this rule. The caste system persists in Haiti.

Caste is the only word to describe the effective separation of aristocrats (light-skinned) from the masses (black). The caste system is a vivid fact, for it regulates a person's profession, speech, religion, marriage, family life, politics, clothes, social mobility—in short, his whole life from cradle to grave. (Leyburn 1941:4)

Except in matters of taxation, the urban elite has assumed a very laissez-faire attitude towards the peasant. The peasant in turn, by maintaining his land-based autonomy and avoiding all formal legal processes, has isolated himself from any possibility of affecting national affairs as conducted by the elite.

Therefore, both the economic and the socio-cultural patterns which are manifest in Haiti today were formed in the practices of land tenure and use established in Haiti over 100 years ago.

Having investigated the environmental context and the socio-historical roots of the economy and culture of contemporary Haiti, it is possible to understand why there is neither a viable indigenous industrial or service infrastructure in Haiti.

Any attempts to ameliorate Haiti's plight must take the context of Haitian culture into realistic account; otherwise the result of any assistance program will be to aggravate her condition, not to mitigate it. This particular caveat has not been particularly well attended to by the various aid programs put forth in Haiti over the years since the American Occupation began in 1915.
Lundahl cites one significant instance of such an aid program producing unanticipated and possibly long-term devastating effects (1979:437-448). This was the yaws eradication program which was considered to be successfully concluded in the early 1950s. Lundahl indicates that it is difficult to assess the relationship between morbidity, mortality, and economic production, and that his was the first attempt to do so in Haiti (1979:431-439). His conclusions about the economic effects and subsequent socio-cultural effects of disease eradication are chilling. He suggests that when the "Malthusian check" of an endemic disease, such as yaws, is removed from a population without an increase in the productive capacity of that population, the inevitable result is more people, less food, more misery.

It is likely that eradication of yaws was not the only consequence of that program. The wholesale distribution of penicillin probably reduced the incidence of a number of chronic infections, again removing Lundahl's "Malthusian check." The population data necessary to confirm that hypothesis were not available in the course of this research. However, the potential for creating this kind of imbalance is an aspect of international aid that should receive serious consideration in policy formulation. The possibility of such disruptive phenomena confirms the necessity of multiple strategy approaches in aid and development.

The consequences of the malaria control eradication program that was initiated in the early 1960s and terminated in the mid-1970s may be somewhat different, given the nature of the disease. However,
it is incontestable that after a period of relative abeyance, malaria in the Limbé region of Haiti is in full epidemic resurgence. The cost and consequences of this cannot be estimated at this point. The fact remains that people are sick and people are dying of malaria.
MALARIA IN HAITI

The History of Malaria in Haiti

Malaria in Haiti and the rest of the New World appears to have been introduced with European exploration. The rapidity with which it became manifest has led some theorists to suggest that it was already present in the New World before the arrival of explorers and conquistadores. However, there is no evidence of a long-term genetic adaptation to malaria among Amerindian populations as there is among African populations; and the malarial plasmodia which infest various species of New World monkeys are identical to those found in Africa (McNeill 1976:187).

It is possible that malaria came to Haiti with Columbus himself. Lherrison reports without citation (1935:927), that on his second trip, Columbus contracted a fever which left him in a coma. Although other explanations of this event are possible, this is one of the common symptoms of recrudescent tertian malaria caused by the *Plasmodium falciparum* (Harrison 1978:117). It is quite possible that Columbus and his crew were already infected with this malaria, as the Mediterranean of that period had a high endemicity.

Malaria apparently found an ideal transmission situation in the tropical and subtropical New World, i.e. adaptable vectors in the anopheline mosquito populations and in a population of nonimmune hosts. Among the other new diseases introduced to the Amerindian populations, in the tropical lowland areas, malaria appears to have
been a major factor in the destruction of the indigenous populations, "so as to empty formerly well populated regions almost completely" (McNeill 1976:188). At the time of discovery, the original population of Haiti is thought to have been approximately 1 million inhabitants, most Tainos of Arawak derivation. In a 1508 census survivors of the original population numbered only 60,000; and in 1548 estimations indicated that there were less than 500 folk of indigenous origin left (Logan 1968:10-11). European brutality, slavery, and the total disruption of native culture are probably the primary reasons for this annihilation; but malaria must have contributed significantly to the decline.

The presence of "fevers" and their epidemic nature in the New World took toll of the European population as well. Columbus had to change his headquarters on Hispaniola in 1496 to find a more healthful location (McNeill 1976:187). That malaria should so severely affect European populations, which were most likely chronically infected by the disease, can be accounted for by the high incidence of malnutrition suffered by the inadequately provisioned expeditions of the period. The explorers and conquerors did not know how to utilize the native foodstuffs, interfered with native production, but were expected to live off the land.

Physical stress, such as malnutrition, can induce relapses in a chronic malarial infection. It is also possible that given a rapid proliferation of malaria in an anopheline vector population, many Europeans may have been reinfected or infected for the first time in the early postdiscovery period. Malaria was
definitely well established in Haiti by the late colonial period and was wreaking havoc among the white population. Moreau de Saint-Mery reported in 1797 on the conditions that prevailed in Fort-Dauphin (now Fort-Liberté), describing the swampy land associated with the river nearby:

It is to this disastrous situation that the town of Fort-Dauphin owes the just reputation of insalubrity which it enjoys. Those who live there show by their livid color, by the deterioration of their health, and their rapid death, how much the air of that place is dangerous... The first battalion of the Regiment of Querry lost in the garrison of Fort-Dauphin, in 1763 and 1764, an infinite number of men. And in 1782 the Spanish regiment of Leon composed of 1,400 men, witnessed the death in three months of 17 officers, 3 cadets, and 647 soldiers. (Translated, Hodges 1982)

The ascription of this situation to the dangerous air, "malaria," and the symptoms presented indicate the culprit was most likely tertian malaria caused by *P. falciparum*. The life of soldiers and civil servants in colonial outposts was notorious for horrific conditions and intemperate behavior which mitigated the boredom and isolation. Therefore, it is likely that susceptibility to malaria was enhanced by malnutrition, unsanitary conditions, and alcohol.

However the European population may have suffered from malaria, the black African slave population apparently did not do so to such a degree. The African genetic heritage of long-term adaptation to a much more complex system of vector-primary host-secondary host malarial transmission granted a far higher degree of immunity to malaria in the New World than was present in Mediterranean populations (McNeill 1976:190).
In 1861, Dr. W. G. Smith reported in Redpath's Guide to Hayti (1861/1970:159) that:

In the maritime towns, and in marshy situations near the seacoast, during the hot months, and also towards the fall of the year, remittent, bilious-remittent, or inflammatory-remittent, typhus, and simple continued fevers, and intermit-ments of the tertian type, usually prevail.

However, in his description of the various fevers, Smith also states that:

Hence, it may be said that black and colored persons . . . may certainly fall under the influence of the fevers of this country, particularly if imprudent and intemperate in their habitats; but that, with certain rare exceptions, the attack will be comparatively less virulent than with the white person. (Redpath 1861/1970:161)

McNeill considers this enhanced resistance of the black population to be a contributing factor in the rapid population growth in the Caribbean in the postcolonial period. He suggests that once the limiting conditions of the slave lifeway were removed, the genetic adaptations to malaria and other diseases allowed the blacks' numbers to increase as the white population diminished (McNeill 1976:190).

Malaria in Haiti in the Twentieth Century

When the American Occupation of Haiti began in 1915, it soon became apparent that one of Haiti's major problems was the abysmal state of health of most of the population. Endemic malaria was recognized as a significant contributor to the general apathy and low productivity of the black rural masses. An effort to correct the situation was begun immediately. Rural clinics were established and activity was directed towards interrupting the transmission of malaria.
This consisted primarily of drainage projects and their maintenance, as well as efforts to clean up existing water works and build new ones (Moore 1972:182).

From a 1924 survey taken by the Rockefeller Foundation, it was discovered that of a sample population from the Port-au-Prince region, 67% of the 4,439 people tested had malarial infection. A survey cited by Lundahl taken in 1928 of adult workers and children under 14 indicated an infection rate of 24% and 51% respectively (Lundahl 1979:422). In 1929 a survey taken of emigrant workers from the north and northeast showed a 23.5% infection rate (Lherrison 1935:927). In 1947 the Rockefeller Foundation conducted a comprehensive survey of school-age children in Haiti. It was found that in a sample of 11,841, the infection rate was 31%, with *P. falciparum* accounting for 86.6% of the infections (Paul and Bellerive 1947:66).

By the criteria established by the Expert Malaria Committee of the World Health Organization (WHO) based upon percentages of splenic enlargement, malaria in Haiti in 1947 was meso-endemic (Russell 1952:94). These findings provoked a number of cooperative Haitian and American efforts at instituting control/eradication programs for malaria in Haiti. In 1973, when WHO terminated its world-wide malaria program, the national government of Haiti undertook to continue such programs on its own. However, due to the previously mentioned problems of internal administration of services and the high cost factor, these maintenance efforts have not been effective.
The Epidemiology of Malaria

Malaria has long been an especially dreaded disease because mortality among nonimmune individuals can be very high; and the morbidity factor among immune individuals is such that even though death may not ensue, the capacity to function "normally" is significantly impaired. In addition to this, malaria is truly horrific because of the multiplicity of symptoms it can induce.

For the purposes of this analysis, only the malaria caused by the plasmodium *P. falciparum* will be considered. It is the predominant form of malaria in Haiti, responsible for nearly 87% of all infections, with *P. malariae* following at 9%, and *P. vivax* at 2% (Paul and Bellerive 1947:60).

The malaria caused by *P. falciparum* is distinct from those caused by the other three forms of human malaria in its marked invasiveness. The plasmodia are not specifically localized in the human body, but may affect any organ system. As a result, the illness can manifest itself in a wide variety of symptoms (Kitchen 1949a:966-994).

In the initial stage of an infection, the plasmodia enter the blood stream when a human is bitten by an infected mosquito. It is the asexual reproduction, or schizogony, of the plasmodium in the red blood cells that produces malarial symptoms in man. Because of the very rapid multiplication of the plasmodia, numerous red cells may be destroyed very quickly, causing a high fever reaction and death. Another peculiar aspect of *P. falciparum* is that the red blood cells become sticky and tend to coalesce in the capillaries of various

However, a high fever does not always mark the onset of *P. falciparum* malaria. The initial stages may be characterized by a few days of general malaise as more and more of the red blood cells are involved. The individual may show a slight elevation in temperature, complain of appetite loss, chills, and an all-over aching feeling. This is particularly the case if some resistance has developed due to previous infection. The major manifestation of malaria in these instances can be an abrupt decline into coma after a few days (Kitchen 1949a:966-994). Due to an irregular cycle of reproduction in the red blood cells, the fever which accompanies a *P. falciparum* infection is not regularly periodic, but intermittent. However, it persists longer, the aching is more severe than in other infections, and vomiting and intense abdominal pain may precede a fever bout (Kitchen 1949a:966-994).

*P. falciparum* malaria can be manifested in two ways. The first is a simple general infection that invades the whole body but does not concentrate on any one system. The second type of infection may involve a concentration of plasmodia in one or more organic systems. The former is the more benign infection as general involvement is better resisted by the body. The more specific types of infection involvement of the latter are the more dangerous and can cause death (Kitchen 1949b:995-1016). Because of this potential for specific systemic infection, the range of symptoms and the causes of death from a *P. falciparum* infection are numerous. It is this diversity
that makes malaria so dreadful a disease as it can mimic almost every other tropical and subtropical disease in its various manifestations.

If the nervous system is involved, the symptoms can include: coma, stupor, paralysis, convulsions, headaches, irritability, delirium, psychosis, aphasia, amnesia, reflex changes, violent behavior, and spasticity (Kitchen 1949a:966-994).

In gastrointestinal involvement, major symptoms may be syndromes of acute appendicitis, pancreatic hemorrhaging, acute gastritis, cholera, dysentery, peritonitis, blood or bile in the vomitus, and diarrhoea.

The involvement of the cardiovascular system and blood-related organs can produce symptoms of thrombosis, heart failure, angina-like pain, anemia, splenic rupture, as well as general hemorrhaging.

Pneumonia and bronchitis represent involvement of the respiratory system and can prove fatal. The genito-urinary system can also manifest syndromic malfunctions, with death resulting from blackwater fever and uremia (Kitchen 1949a).

For a people who are unaware of the scientific etiology of malarial infection and who must rely on ethnomedical etiologies, this welter of symptoms is probably not associated with one particular causative agent. Therefore, it is entirely possible that malarial symptom complexes are not recognized in Haiti. However, the fever as such is recognized and some understanding of malaria may have been created by the several control/eradication programs. But no researcher has yet inquired into the extent of Haitian knowledge of malaria (Coreil 1983a).
It is interesting to note that while some observers suggest that Haitians can discriminate among the various types of fevers (Silver-nail, personal communication 1983), others indicate that fevers are regarded as "generic" (Hodges, personal communication 1983; Morier 1980:3). The symptoms of typhoid fever are often interpreted to be indications of spirit possession (Morier 1980:3).

It is possible that malaria, especially when the nervous system is involved, may also be taken as a result of spirit possession and not as an organic illness. Among the aftereffects of a malarial attack is prolonged psychic disruption which on occasion may be classified as overt psychosis. This occurs when the infection is not interrupted by medical treatment (Kitchen 1949b:995-1016). It would be interesting to investigate whether in these cases the illness and subsequent effects are regarded as possession and how the individual so afflicted is regarded and treated by peers. Such information would be important to an educational phase in a malaria control program in that it indicates a particular tack that could be undertaken in explanation and promotion of alternative attitudes.

Malarial Immunity, Resistance, and Tolerance: Development and Duration

It is difficult to discuss the concept of "immunity" to malaria in human populations, especially when dealing with *P. falciparum* infections. *P. falciparum* is the malignant form of malaria and kills probably because it is the newest form of malaria to have adapted to human hosts (Harrison 1978:118).
In an experimental context, real immunity as an antigenic reaction to P. falciparum inoculations did not develop as rapidly as did immunity to other types of malarial infections. It required 10 reinoculations of P. falciparum to establish an immunity in a majority of the test group subjects (Taliaferro 1949:935-964). Therefore, in the Haitian situation, immunity to P. falciparum is not likely to occur before the host dies of other complications.

However, blacks are naturally resistant to P. vivax infections (Harrison 1978:5; Russell 1952:39), which accounts for the low infection rate, 2%, of P. vivax in Haiti. This true racial immunity may have developed because P. vivax may have had the longest period of endemicity in Africa or the longest period of adaptation to human hosts.

Sickle-cell trait is the genetic adaptation to P. falciparum in black populations (Harrison 1978:5). Even though the homogeneous form, sickle-cell anemia, is eventually lethal, the heterogeneous form, sickle-cell trait, confers a certain degree of resistance to infection because the plasmodia cannot invade or reproduce in the sickled red cell. Its presence in Haiti indicates that there is most likely a selective advantage maintained by high levels of endemicity of malaria.

Dr. H. Rogers of L'Hôpital le Bon Samaritain in Limbé, Haiti conducted an informal survey among the hospital clientele for the presence of sickle-cell trait and sickle-cell anemia in the early 1980s. Sickle-cell trait, the allele AS, confers an enhanced resistance to malaria. He found that approximately 15% of his sample
population carried either the AS (trait) or the SS (anemia) allele. He did not consider that to be a significant portion of the population to warrant describing sickle-cell trait as an adaptive mechanism to malaria in Haiti (A. Hodges, personal communication 1983). However, the frequency of the AS allele in African populations seldom exceeds 20% (Weiss and Mann 1981:82), so that a level of 15% AS and SS combined, even if taken on an uncontrolled sample, suggests that this trait may confer an adaptive advantage to Haitians against malaria.

However, regarding the epidemic resurgence of malaria in Haiti, it is the process of acquired tolerance for malaria that is of the most interest to this analysis.

Tolerance is immunity contingent on and conditioned by continued presence of the parasite in the host. A host with tolerance exhibits less reaction to a given quantum of infection, whereas one who has simple immunity has an increased ability to limit the quantum of infection developed. (Russell 1952:38)

Tolerance may develop for either of two reasons. The first is in a latent or chronic form of malarial infection, where the malaria plasmodia are not present in great numbers in the blood stream, but are fixed in other organs, especially in the liver. This is called the pre-erythrocytic phase (before entering the red blood cells) (Hodges 1982:2; Russell 1952:40). Latency periods manifest no clinical symptoms. However, there is a tendency to relapse when the plasmodia enter the blood stream and begin to reproduce. This occurs when the individual's resistance is lowered due to other physical stress factors.
The several species of human malaria have different relapse periods, but in an untreated, nonreinfected individual, *P. falciparum* malaria disappears in about six months, if it is not fatal. However, it can last up to two or three years (Russell 1952:41).

The second form of tolerance that can develop relates to recurrent reinfection.

When malaria is highly endemic, the unprotected indigenous people may develop and maintain a high degree of malaria tolerance through the process of often-repeated infection. . . . This tolerance is not innate, but is slowly acquired so that infants and children in such communities may suffer severely; indeed, a third or more may die of malaria before adulthood. Fifteen to thirty years of intense exposure may be required to develop a stable truce between host and parasite. (Russell 1952:39)

Tolerance, therefore, is conferred by a chronic low level maintenance of plasmodia in the human body due to periodic reinfection. However, the clinical symptoms are comparatively mild in terms of fevers and other manifestations. This is not to suggest that a chronic infection is not debilitating; it is. It is just that debilitation is not acute.

Although Russell indicates that infant and child mortality rates are high for unprotected individuals, recent research in Haiti indicates that there is a comparatively low infection rate among children under 2 years of age (Krogstad et al. 1975). This has been attributed to two possible causes which are related to cultural practices. The first is that children are not usually weaned until about the age of two and there may be some limited tolerance transferred in the maternal milk (Russell 1952:38). The second reason is that small children are seldom out in the evening, the major biting/feeding
period for the principal vector *Anopheles albimanus*. When they are
out-of-doors, it is usually with their mothers in the proximity of
smoky cook fires which discourage mosquitoes (Krogstad et al. 1975).

However, as indicated by the 1928 and 1947 surveys, children
above this age do show a higher degree of infection than do adults.
Further research will be necessary to reconcile this apparent con-tradiction ré infant mortality rates. There are several possible
explanations. It is possible that due to inadequate reporting,
infant mortality rates from malaria are not recorded. Also,
Russell's research was conducted in cultures with behavior patterns
that may differ from those in Haiti. The biting/feeding behavior of
the principal vectors may also differ, so that infection transmission
patterns may be different as well.

The key to tolerance for malaria in adults in an endemic situa-
tion is periodic reinfection. If this process is interrupted, as it
has been in Haiti, the immunity/tolerance capacity in an individual
does not persist but is gradually lost. After a period of time, the
individual must be considered nonimmune, and reinfection at this point
can prove quite serious, if not fatal.

The Malaria Vector: *Anopheles albimanus*

In a situation of high malarial endemicity, such as Haiti, it is
essential to understand the patterns of malaria transmission as they
relate to both human and mosquito behavior. The nature of the inter-
action of host and vector is crucial to the disruption of malarial
infection in a human population.
Anopheles albimanus is currently the principal vector of P. falciparum in Haiti. In the interests of parsimony, it will be considered the only vector of malaria in Haiti. However, let it be understood that this is a simplification. There are two other types of malaria and at least two other vectors in Haiti. Vector shifts are not unknown.

A. albimanus is zoophilic, feeding on man and animals, especially horses, oxen, pigs, and goats. As previously noted, this behavior may increase its proximity to man. Within its range it is the most common mosquito found inside human habitation (Taylor 1966:393). Therefore, it is possible to suggest that most rural Haitians are quite familiar with this insect and its presence. This could lead to a kind of desensitization on the part of Haitians that should be addressed in an educational outreach part of a malaria control program.

However, most of A. albimanus biting activity, 75%-92%, occurs out-of-doors (Taylor 1966:394). The period of most active feeding occurs at twilight and during the early evening, between 5:30 and 9:00 (Taylor 1966:396). One of the commonly held beliefs in Haiti is that twilight is a dangerous time for humans to be abroad. This rests on the understanding that this is a time when the potential for misfortune or malign influences to act is highest (A. Hodges, personal communication 1983). This belief may be less well defined or more specific in various localities. However, it might have the effect of encouraging avoidance behavior with respect to A. albimanus during the time the vector is most active.
A. albimanus is usually considered to be a lowland and coastal mosquito found mainly at altitudes under 500 m (Mason and Cavalie 1965:553), but it can adapt to much higher altitudes (Paul and Bellerive 1947:55). It is a very strong flier, capable of distances up to 12 mi from its breeding ground in series of short flights; it can fly for more than .5 mi at right angles to strong prevailing winds (Galbadon 1949:766). The 1947 Rockefeller Foundation research team reported that "From the very topography of the country, a few hundred feet of altitude does not ordinarily represent a great linear distance, and many elevations are included in the flight range of anophelines from a single breeding area" (Paul and Bellerive 1947:55). They also report that marketing patterns can promote the presence of malaria at the higher altitudes where it would be expected to be less prevalent than in the lowlands (Paul and Bellerive 1947:45):

Each roadside or village market has its "special" day of the week when visitors from a wide surrounding area may outnumber its permanent population manyfold. It is unfortunately a common custom of those residing in the more remote hill districts to arrive at about sundown before market day, sleeping in the open with their produce where they are exposed to the bite of infected anophelines which have found shelter in neighboring huts. These persons thus maintain a relatively constant supply of gametocytes (the sexual form of plasmodium) in their home settlements, where mosquito density may never be very high or where anopheline breeding is strictly confined to the rainy season.

A. albimanus can breed in a variety of environments, in either fresh or brackish water, provided there is adequate sunlight and a biological equilibrium. The larvae have been found in: (1) semipermanent flood and rain pools, (2) seepages and springs, (3) irrigation ditches, (4) along the shorelines of clear lakes that have emergent
vegetation, (5) in salt marshes that have been flooded in the rainy season so the brackishness is somewhat reduced, (6) in the quiet sunlit backwashes of streams and rivers, (7) and in artificial water collections that have developed a stable biology (Galbadon 1949:766).

It is apparent that all of these breeding sites are also sources of water for human utilization. Among those not mentioned previously, rivers and streams serve as the most common laundry and bathing facilities in Haiti (A. Hodges, personal communication 1983). Although such activities do not generally take place during the major biting/feeding period of the day, as morning is the time for washing and personal ablutions, the potential for infection does exist. In the lake regions of Haiti, waterfowl are hunted by a variety of means as a supplement to the meager diet (Cave 1952). This activity again fosters proximity of man and mosquito as stalking tactics often involve waiting hidden in the reeds at lake's edge. It is also probable that most of the artificial water collections are man-made reservoirs and would be found within convenient distance of human habitation.

It is difficult, given the prevalence of potential breeding places for A. albimanus, to correlate density of the mosquito population with rainfall; as some breeding occurs even during the driest season (Mason and Cavalie 1965:533; Taylor 1966:394). However, it can be assumed that there is some correlation, as malarial fluctuation in Haiti does show a fairly close correlation with alterations in rainfall patterns (Mason and Cavalie 1965:533). But these measures can be confounded by human activity, such as cutting rice or the fresh
flooding of rice fields, the latter occurring when it is required due to aridity and evaporation, i.e. during the dry season (Taylor 1966: 394).

Given the prevalence of breeding sites in close proximity to human activities and habitation sites, the zoophilic nature of *A. albimanus*, its flight capacity, and its high population densities even during seasonal fluctuations of rain, the patterns of high malaria endemicity can be accounted for in Haiti. As has been demonstrated, many of the most common human activities and needs behaviors interact with these patterns of anopheline behavior to promote the transmission and maintenance of malaria.
HEALTH AND ILLNESS IN HAITI

The emic perspective of disease is essential to the design and implementation of a malaria control program for Haiti. What a people understand of disease is possibly the most important aspect of the cultural context of disease. How people relate the presence of disease and death to their defined universe is a critical part of ideological adaptation to the specific environment. This kind of knowledge allows the investigator to understand how people have coped with disease, not simply "medically," but intellectually and emotionally as well.

Traditional theories of causation, methods of diagnosis, prophylaxis, treatment, and prognostic assessment are the fundamental components of an ethnomedical system, which must be thoroughly investigated by anyone who hopes to create an effective ameliorative program. With this kind of comprehension, it may be possible to forestall the numerous problems that so many medical service programs have encountered in the Third World countries. Recently, there has been a growing demand for just this sort of understanding on the part of Western-trained medical personnel operating in the Third World (Coreil 1980:98; Hiegel 1982:231-235; Scotney 1981:531-532; Wiese 1974:359).

In the following explication of previous Western attitudes towards native cultures' medical practices, Scotney (1981:52) underlines the basic problems of the etic perspective and offers possible solutions:
It has sometimes been suggested that customs can be sorted into three categories: those that are harmful and must be discouraged; those that are neither harmful nor helpful and should be disregarded; and those that are helpful and should be encouraged. This "cultural surgery," however, ignores the belief systems and social needs that are the basis of the customs and traditions... No custom is meaningless, though the meaning may be hard to unravel; in fact the original justification may have been forgotten. Nevertheless, if it is now accepted that services must be planned to be compatible with local cultures, then far more needs to be known about those cultures.

What Scotney describes is the postcolonial paternalism which characterizes all too many aid efforts in the "underdeveloped" world. The triple tactic of discourage-ignore-support is a kind of rudimentary behavior modification which betokens an unfortunate lack of respect or understanding of the integrity of native cultures. A greater appreciation of local ethnomedical practices and beliefs could enhance efforts to deliver adequate health care to those who lack it. The facilitation of such communication might encourage mutual respect and mitigate the disruptive effects of the imposition of alien practices on a native group.

For Haiti, this "knowledge of the local culture" must include a consideration of the role of Voudun in the lives of the people and its significance in ethnomedicine. Due to the sensationalism which surrounds Voudun, many Western-trained medical personnel are antipathetic towards Voudun practices and practitioners because it has been assumed that belief in Voudun prevents native acceptance and use of the Western facilities and services (Hodges, personal communication 1983; Kiev 1966; Noel 1975). Were the real nature of this religion better understood and its role within Haitian culture accepted as valid; then
such misconceptions might be avoided. Coreil reports that Haitians do use Western facilities and services when they are available and affordable, and when they are seen as the most appropriate and effective medical resource (Coreil 1980, 1983a, 1983b). Native practitioners will refer patients to Western treatment, if the illness is beyond their scope of expertise (Coreil 1980; Hodges, personal communication 1983).

The Haitian Cosmos: Le Bon Dieu and Les Loa

Although Haiti is a nominally Catholic country, Voudun is the primary and principal religion of the black peasant masses. As Herskovits 1937/1971) has described it, Voudun is a syncretic religion, an amalgam of colonial French Catholicism and various West African religious traditions. However, Voudun cannot be considered to be a piecemeal derivative of two conflicting systems, rather it is a coherent integration of both. Therefore, the adherents of Voudun do not see any contradiction between their Catholicism and their practice of Voudun (Herskovits 1937/1971:270-295).

Haitians believe that all things come from le Bon Dieu, and they worship the Trinity; but, as all things come from God, so do all the gods and all good and evil.

The principles of Voudun are important in the ethnomedical belief system of Haiti in the definition of the cosmos, in the relation of man to the deities, and in the image of self. As with many of its African progenitor religions, Voudun is a fluid and flexible religion, changing over time and varying by locality. There is no overarching
ecumenical governance in Voudun; and the loa, the symbols, and the rituals of worship may differ somewhat from place to place. However, it is possible to isolate features of this religion which are consistent throughout Haiti. Therefore, it is possible to see the world as the Haitian sees it.

The universe of the Haitian peasant is really two worlds. For everything that is seen or apparent in this physical realm, there is a second significance in a world beyond everyday reality. Because of this duality, people are vulnerable to occurrences in the realm of the unseen and must protect themselves as best they can. The correspondences between these two worlds are so strong that even the uninitiated often can see into the second realm which is inhabited by a vast array of beings and forces, both benign and malign. The presence of these beings and forces is manifest in the events of this world; whether seen or unseen, all peoples are affected by this second realm. It is this meta-reality of the Haitian universe that is the most important ideological feature of the culture; and it is fundamental to an emic perspective.

Voudun is a pantheistic religion; le Bon Dieu heads the pantheon, removed from the affairs of men, but governing the universe. The loa, or lesser gods, proceed from the one Good God, but are closer to mankind and descend to partake in the lives of men during spirit possession.

There are three pantheons of loa: the Rada loa, who are the benign loa de Guinee (Africa) whose role is to oversee the good fortune of their petitioners; the more malicious and capricious Petro
loa, who require continual propitiation; and the indigenous loa, who are more idiosyncratic and personal in their manifestation and have emerged as there has been need of them.

Possession of a human by a loa is the most important form of worship for those who believe. Although not every believer is so possessed, the possibility of possession permeates Haitian life. Possession usually occurs in a ritual context, but can occur in secular situations. This extra-ritual possession appears to be occurring more often than it has previously and may be symptomatic of increasing stress in the Haitian situation (Sloan 1983). Also, as noted before, there are reports of the altered behavior induced by fever being taken as indication of possession (Morier 1980:3).

The phenomenon of spirit possession defines the Haitian concept of self. The "human being" is composed of a governing soul or super-ego called the gran' bon ange, or good big angel; a 'ti bon ange, the soul that animates the body and serves as man's conscience; and the corps cadavre, literally the body corpse, which is the physical self. During possession the loa displaces the gran' bon ange; taking over the body of the individual. The individual so possessed becomes the god incarnate, advising, chastising, and ordering action as the god intends. The 'ti bon ange remains as a kind of caretaker soul so that the gran' bon ange may return to the body when the god/loa has departed. The relationship in the "human being" among the motivating self, the animating self, and the physical self is tenuous; the gran' bon ange is easily displaced, not only by the loa, but by sorcery and witchcraft. When this occurs, madness, illness, and even death can
follow. The ubiquitous Zombi of Haiti is an unfortunate whose gran' bon ange has been stolen by a bocor or sorcerer whose purpose is to use the body for manual labor (Huxley 1966).

The cosmological duality of the Haitian universe, the immediacy and anthropomorphic character of the loa, and the fragile complexity of the human being, strongly influence the Haitian perception of illness and disease. Sickness and death are commonplace and are regarded with a paradoxical combination of resignation and resistance. To suffer and die is the fate of all; but it is sometimes possible to affect the course of the inevitable.

Illness: Causes and Cures

There are two theories of causation which account for sickness in Haiti. The first is a dichotomy between those diseases which are natural and the will of le Bon Dieu, and those diseases which are supernatural and may occur as the manifest wrath of the loa or by sorcery and witchcraft (Huxley 1966:85).

The second is the hot/cold humoral system which prevails in other areas of Latin America (Coreil 1983a:711). This latter assumes that illness results from the disequilibrium of hot and cold elements in the human body. This can be induced by exposure to environmental extremes, excesses of hot or cold foods, and various other aspects of daily living. The severity of the illness relates to its relative distance on the continuum from the balance point which is health. The hotter or colder the disease, the more serious the illness.
Natural diseases and the illnesses they cause cannot be cured because they occur as the will of God, "The destiny He writes for man cannot be altered" (Huxley 1966:85). (This point of view is not as prevalent as it once was, however, as Western medicine has proven itself effective against a number of "natural diseases.) But neo-natal tetanus, for example, remains as one of the incurable "natural diseases." It is one of the major causes of neo-natal mortality in Haiti. Because of this, it may be regarded as inevitable and evidence of the incontestable will of God (Coreil 1983a, 1983b).

Cure for the supernatural diseases, however, is more available to man because of the closer proximity to him in the cosmos of the causal agents. In this realm Haitians believe in both prophylaxis and cure as described by Huxley (1966:85-86):

The treatment of a supernatural illness falls into two parts. First there is an emergency remedy to bring the erring gros-bon-ange back to its right place, and then a magical baptism which protects it from further disturbances. The treatment, in fact, is a secular version of the ritual undergone by novices when being initiated into Voodoo, where a headwashing, with leaves crushed in water, strengthens the gros-bon-ange and makes it capable of being possessed by loa without its owner becoming mad.

The humoral system of disease classification appears to supersede and govern the natural-supernatural dichotomy. Most of the "cold" diseases seem to be classified as natural and are characteristically respiratory infections. Tuberculosis is the most serious of the "cold" types. The hottest and most dangerous diseases are those caused by sorcery and are characterized by fever, sweating, edema, seizures, and loss of consciousness (Coreil 1983a:711).
Coreil remarks that typhoid, malaria, and tetanus are usually regarded as natural diseases. Given the symptomology of malaria, especially when there is cerebral/nervous system involvement, this assertion appears to contradict what would be the expected classification of malarial fevers.

There are several ways to reconcile this information with the anticipated diagnosis of supernatural cause. The first rests on the Haitian ethnomedical prognostic assessment of malarial fevers. As there is periodic reinfection and relapse, Haitians may regard this fever manifestation as an inevitable part of living because it is recurrent. This would signify the will of God. Therefore, malaria may be seen as incurable, or at least natural, as is neo-natal tetanus.

The second factor that may account for the taxonomic classification of malaria reported by Coreil is that given the variation in the religious tenets of Voudun, it is probable that the ethnomedical beliefs could be similarly variable throughout Haiti. This variation could relate to the relative isolation of a particular group from outside and urban contact; the extent to which Western medical facilities are present and utilized by a group; the strength of the local hougan (priest) and/or mambo (priestess) in shaping the beliefs and practices of a group; and possible regional variations in the prevalence of malaria due to geographic and climatic factors. Also, malaria is multisymptomatic, and the various symptomologies are age specific (Cook, personal communication 1983), so that which is described as malaria in adults may not be recognized as such in children.
It cannot be determined from the available data whether malaria is consistently identified as such by Haitian ethnomedical traditions. A survey of individuals with confirmed malaria designed to identify self-diagnosis and other diagnosis would be useful in disclosing native perception of the disease.

Although the supernatural-natural distinction is made on the hot-cold continuum, any illness may be caused supernaturally (Coreil 1983a:711). Illness is regarded as misfortune and in the reality of the Haitian universe, such misfortune as comes to man is often found in the workings of the second world. Therefore, although a disease may be understood as natural and the how of a particular illness; the why of that illness, the timing and severity, can be perceived as the intervention of a supernatural agency.

Diagnosis is made and treatment is prescribed on the basis of the symptoms of a particular illness; but the life-situation of the individual involved--age, sex, and status in the group--also has influence in the search for a cure (Coreil 1983a; Huxley 1966). As in many other cultures, there are recognized childhood illnesses in Haiti as well as illnesses that appear to characterize specific personality profiles.

In the more moderate hot-cold humoral diseases, cure is attempted by restoring the individual's body equilibrium by means of herbal infusions and decoctions, regulated diet, compresses, washes, and massage techniques. Many of these remedies are part of the domestic repertoire or may be acquired or administered by an herbalist or leaf doctor.
The more severe and debilitating illnesses marked by extreme hot/cold symptomology require the attention of a specialist, a hougan, mambo, or any individual who has a special knowledge of the second realm but may not have formalized status as do the former practitioners. This is because extremes of illness usually indicate supernatural influence. (Coreil reports, however, that Western services are being utilized more often than in the past in these instances. Also, she reports that prognosis in six of the most severe supernatural illnesses is considerably improved, since the intervention of Western medicine. Multiple resort strategies are becoming more common as the availability of such services increases [Coreil 1983a].)

If an illness has been caused by the loa in retaliation for sins of omission and commission, this must be discerned by the hougan or mambo under a trance state of possession. Costly and prolonged rituals of propitiation may be undertaken to effect a cure, even if Western medical resources are also used. Murray notes that such healing rituals are the predominant part of contemporary Voudun in the rural areas and the largest source of income for traditional practitioners (Murray 1980:301).

If the agency of illness is the sorcery of a bocor, then counter charms must be purchased against the individual who engaged the sorcerer's services. Often, these can be obtained from the same bocor at a somewhat higher price.

The illnesses that result from "witchcraft" are harder to define as they may be inadvertent or unintentional. The individual who is the alleged instigating agent may be unaware of it. In these
situations there is often a close relationship, consanguineal or affinal, between the two parties involved. The tensions and hostilities that can develop in such a situation can manifest themselves in supernatural illness. Such illness is an expression of the extreme physical and psychological duress the Haitians must endure as an aspect of daily life. Even the closest of relationships are qualified by the mutual distrust found in the attribution of illness by witchcraft. Although many of these illnesses could be described as psychological disorders, others are based in pathogenic disorder (A. Hodges, personal communication 1983; Huxley 1966).

Insufficient information prevents an analysis of the cures sought for such illnesses; however, most often the response to this category of illness is prophylactic. Countermeasures against such anticipated illnesses are usually public and, therefore, may serve as confrontational devices. In cases of interdomestic tension, such crisis or catharsis may bring resolution, but this would be ineffective for physical pathologies.

Therefore, illness and disease cannot be categorized strictly or absolutely in the Haitian ethnomedical situation. The ascribed agent, diagnosis, treatment, and prognosis are dependent upon the severity, timing, duration, and status of the individual involved. It is not surprising, then, that Western services premised on a mind-body model of health and illness should have had so little effect in combating disease in Haiti as they have had in the past. However, in spite of the difficulties this "nonrecognition" has created in the effective delivery of health care in Haiti, patterns of medical resort are
determined by the exigencies of pragmatics: real cost and effectiveness of therapy. As noted above, Western medical services are increasingly utilized where they are present and affordable. This has been a slow process, based in part upon demonstration of therapeutic validity, but also based upon the decline in the numbers of traditional practitioners, the high cost of spiritual healing, and the pursuit of multiple strategies in health seeking behavior (Coreil 1980; Huxley 1966; Wiese 1974).

Malaria from the Haitian Point of View

So far as can be determined at this stage of research, no investigator has made a systematic effort to discern how Haitians perceive or respond to malaria. Given the complexity of Haitian ethnomedical beliefs and practices; the abundance of conflicting information about ethnomedical comprehension of fevers in general; and the multiplicity and age specificity of malaria symptomology, the following explication is highly speculative. However, there appears to be a connection between the disease, malaria, and the phenomenon known in Haiti as the "loup-garou."

Although the term "loup-garou" is apparently borrowed from the French notion of a werewolf, this preternatural creature in Haiti is more a combination of the idea were and vampire. It is a were being in that an animal transformation occurs, but it is vampiric in that the creature is a bloodsucker.

The following information derives from a single source, Huxley's The Invisibles: Voodoo Gods in Haiti, published in 1966. This
Huxley work is not a formal ethnography, but an ethnological analysis of Haitian life and culture, one of the more acute interpretations encountered in the research process.

A loupgarou . . . is a kind of witch who whizzed through the air at night like a firework, settled on the thatch of your house, worked its way through in the shape of a mosquito and sucked the life out of your children. (17-18)

So why should an aunt suddenly become a loupgarou and eat her nephew? It must be something stronger than she was, that forced itself on her, made her do it. That's not a crime you make up your mind to do. You do it against your will. Then she's a kind of medium. But what allows such things to happen? (18)

From these two passages it is possible to isolate several important concepts about the childhood illness that may be malaria. (Also they offer insight into the Haitian condition. Loup-garous are compelled to evil; there is no volition or choice. Their prey are children, "those other victims of obedience" [Huxley 1966:103]. This evocation of powerlessness on the part of both predator and prey is all the more poignant a reminder of the real helplessness that Haitians suffer in daily life. It is also exemplary of ideological adaptation to invariants in an environment as it provides explanation and ethical reconciliation of a high stress situation.)

First, the agent is a were mosquito. Even if the scientific etiology of malaria and other mosquito borne diseases is not understood by Haitians, the identification of mosquitoes as carriers or agents of illness and death could encourage avoidance in particular situations, even if mosquitoes are too familiar in others, as previously noted.
Secondly, children are especially vulnerable to the loup-garou. Because it requires periodic reinfection over a long time span to establish tolerance to malaria, children suffer the highest morbidity and mortality rates from malaria. This described vulnerability of children to loup-garou attack may also be an ethnomedical profile of the group most susceptible to malarial infection.

Thirdly, the were-mosquito is defined as a witch and the victim of witchcraft or supernatural illness. The statement of the consanguineal or affinal relationship in the above passage, aunt and nephew, indicates that rather than cure, prophylactic behavior may be more likely to occur where the threat of loup-garou poisoning is present.

Loup-garous appear to be exclusively female. In Haiti, one of the closest relationships is between children and caretaker adults, who are usually older females. It is not unreasonable to assume that these relationships may be a major source of interdomestic tension. Prophylactic behavior against the loup-garou may provide a means of expressing that tension in a socially sanctioned form, as well as giving the mother-aunt-sister of the possible victim a sense of protecting the child in danger. The latter is a strategy of empowerment or control that is important in a high stress situation. This feature of the loup-garou phenomenon could be exploited in a malaria control program. The desire to prevent or protect children from malign influences already exists. A slight alteration in the devices employed could prevent possible infection. The following (Huxley
1966:44) indicates the nature of the various means in use against the loup-garou:

I forgot that loupgarous, or vampires, are also called mauvais air—a term, had I thought of it, equivalent to that infectious miasma known to the Romans as malaria and signifying evil spirits. Next day I remarked to the maid on the mauvais air in my room, meaning little more than there was a disagreeable smell. She, poor girl, dashed off to the market immediately for a supply of asafoetida and sesame seeds. These she burnt in the courtyard to drive the loupgarous away; the seeds popped in the heat, like vegetable firecrackers, and the asafoetida made a much more disagreeable smell than the one I'd gotten used to.

The following provide information on the properties of various plants.

"He brought out the leaves of gate sang, a defense against loupgarous and stomach aches among babies when pounded and placed in the navel" (Huxley 1966:76).

"Children should be dressed in a white mesh dress like a net ... to catch the offensive loupgarou" (Huxley 1966:106).

"And feuilles aveugles (used against obsessions to blind the power of mauvais air) are pounded in water and the liquid poured over patients' heads" (Huxley 1966:123).

From the obvious connection made by Haitians among the mosquitoes, loup-garou, and mauvais air, it is far too tempting not to suggest that Haitian ethnomedical beliefs in this case, come very close to describing the actual pattern of transmission of malaria. Certainly, the various preventative devices are reminiscent of Western anti-mosquito tactics. The "disagreeable smell" of the asafoetida may serve a purpose similar to bug-bombs; although the sesame seed
component of this prophylactic tactic may be only a stage effect, it is possible that its popping provides a satisfactory reassurance of effectiveness against demons. The various leaves that are infused, decocted, and pounded for application may serve as repellant. The white mesh dress evokes images of screen and netting as well as suggesting the common North American folk belief that the color white repels mosquitoes. None of these suppositions can be confirmed without field testing. However, it is possible to suggest that all of these devices may serve to foster mosquito avoidance and, therefore, have an adaptive value in the interruption of malaria transmission.

The last connection between loup-garous and malaria that can be made is in the symptoms exhibited by those children who are diagnosed as suffering from poisoning by a loup-garou. "Most of the children who are diagnosed as suffering from loup-garous are in fact infested with intestinal worms, which can produce fever and convulsions" (Huxley 1966:103).

The following (Huxley 1966:76) is a discussion of the use of gate sang as a remedy against loup-garous:

The logic of the magical remedy is weak. Sang gate is a common illness, often synonymous with a sulk, sometimes brought about by a shock or saissisement and producing confusion and disorders of the temperament. Sometimes it refers to syphilis. Loupgarous do the same by poisoning the blood of the children they attack. However, many of the convulsions among children are brought about by intestinal worms, and houigans will treat such cases with vermifuges while still holding to the loup-garous hypothesis which is more profitable.

Although Huxley attributes the symptomology of loup-garou poisoning to intestinal worms or syphilis, it is possible to suggest
that, given the symptoms, it may often be a malarial infection as well. Fever, convulsions, confusion, and disordered temperament are also indicative of \textit{P. falciparum} when there is cerebral/nervous system involvement.

Were this the case, the treatment with a vermifuge is neither unreasonable nor counterproductive, if it is not too cathartic. All children are infected with intestinal worms, hookworm in particular, which has a severely debilitating effect. The synergistic combination of worm infestation and malarial infection (or any other infection) could prove fatal due to the child's lowered resistance to the secondary infection complicated by the nutritional deficiencies exacerbated by worms. An effective vermifuge under these conditions might enhance resistance and the possibility of survival.

This is not to suggest that this is a conscious practice. However, if the above suppositions are correct, the effect of this treatment based on the loup-garou etiology may often be beneficial. Therefore, it is possible to regard these practices as an aspect of cultural adaptation to a particular environment.

In summation, it is quite possible that the loup-garou phenomenon and malaria are related. If this is so, then Haitian ethnomedical beliefs provide an agent of causation, a rationale for illness, diagnostic parameters, prophylaxis and treatment, and a profile of the victims; in short, an explanation and response in the most salient cultural terms, of and to malaria in children.

There are still many questions to be asked, and there are several problems with the above explication. It will be necessary to
undertake field investigation before any assertions as to the accuracy of this hypothesis can be made.

The information used in this explication derived from one non-native informant and the material may be dated. Given the fluidity and rapid changes in belief systems in Haiti, 17 years could make a difference in the contemporaneity of the data. The work was not a formal ethnography; therefore, the biases of the author may affect the materials reported.

Native perception of malaria in adults is not yet well documented. It is completely uninvestigated with respect to children.

The decline of traditional practitioners and the increase in the presence and use of Western medical services may have had a profound effect on native beliefs and practices. The impact of Protestant Christian missionizing and the malaria control/eradication programs may also have had a significant ideological effect.

However, it cannot be overemphasized that native ethnomedical beliefs are a significant part of a cultural adaptation to an environment. They should be understood, their value recognized, and their rationale appreciated before any attempt to alter the context is made. If aid programs are to be effective and not disruptive, then donor agencies must attend to the realities of the situation as they are known and explained by the people who must endure them.
CONCLUSIONS

The presence of malaria in Haiti is not a simple problem, nor does it have a simple solution. Unlike smallpox, there is no vaccine against malaria. While hope of eradication is slight, it is possible that control could be achieved. Such an objective would require a careful consideration of all the factors involved in the presence and transmission of malaria in Haiti.

As has been demonstrated in this review, many of the most fundamental features of the Haitian lifeway promote the transmission of malaria. The only aspect of Haitian culture that appears to provide some relief from this disease is the avoidance behavior encouraged by ethnomedical beliefs and practices based on Voudun.

The current epidemic resurgence of malaria in Haiti is the result of the failure of a high technology, cost intensive program that was intended to eliminate the problem. Perhaps it is time to realize that quick fixes are not the solution. When dealing with problems that have a multiplicity of origins and a multiplicity of effects, only a multiple strategy approach will be effective, and it will take time.

Any program that intends to ameliorate the problems of poverty and disease, in Haiti or elsewhere, must take as its basic premise the concept of a cultural ecology. Man is not apart from nature, but is a part of it. Only a real comprehension of the ways in which we shape and are shaped by our environment can provide the foundation
for solutions to the crises we create. Only an appreciation of the many universes of human cultures will allow us to achieve a universal freedom from disease, hunger, and human suffering.
### APPENDIX

Confirmed Cases of Malaria from the Records of L'Hôpital le Bon Samaritain, Limbé, Haiti: 1961-1983

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Number of Cases</th>
<th>Percentage of Case Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>397</td>
<td>2.5</td>
</tr>
<tr>
<td>1962</td>
<td>283</td>
<td>1.7</td>
</tr>
<tr>
<td>1963</td>
<td>46</td>
<td>0.3</td>
</tr>
<tr>
<td>1964</td>
<td>92</td>
<td>0.4</td>
</tr>
<tr>
<td>1965</td>
<td>54</td>
<td>0.3</td>
</tr>
<tr>
<td>1966</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>1967</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>1968</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>1969</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1970</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>1971</td>
<td>28</td>
<td>0.05</td>
</tr>
<tr>
<td>1972</td>
<td>37</td>
<td>0.06</td>
</tr>
<tr>
<td>1973</td>
<td>25</td>
<td>0.04</td>
</tr>
<tr>
<td>1974</td>
<td>50</td>
<td>0.09</td>
</tr>
<tr>
<td>1975</td>
<td>53</td>
<td>0.10</td>
</tr>
<tr>
<td>1976</td>
<td>135</td>
<td>0.20</td>
</tr>
<tr>
<td>1977</td>
<td>866</td>
<td>1.2</td>
</tr>
<tr>
<td>1978</td>
<td>1075</td>
<td>1.3</td>
</tr>
<tr>
<td>1979</td>
<td>1186</td>
<td>1.5</td>
</tr>
<tr>
<td>1980</td>
<td>774</td>
<td>1.0</td>
</tr>
<tr>
<td>1981</td>
<td>1677</td>
<td>2.0</td>
</tr>
<tr>
<td>1982</td>
<td>2768</td>
<td>3.3</td>
</tr>
<tr>
<td>1983</td>
<td>1262(^a)</td>
<td></td>
</tr>
</tbody>
</table>

Note. These data were provided by Ms. Alta Hodges.

\(^a\)This figure represents the number of confirmed cases from January to April of 1983.
BIBLIOGRAPHY

Bourguinon, Erika

Brown, Peter J.

Cave, Hugh B.

Cancian, Frank

Coreil, Jeannine

Courlander, Harold, and Remy Bastien

Crapanzano, Vincent, and Vivian Garrison

Curtin, Phillip D.
Deren, Maya

Diederich, Bernard, and Al Burt

Dunham, Katherine

Eliason, Donal A., Joseph Volvich, and Jalil Karam

Faich, Geral A., and John Mason

Foster, George M.

Galbadon, Arnaldo


Gramiccia, G.

Hall, Robert et al.

Harrison, Gordon

Heinl, Robert Debs, and Nancy Gordon Heinl
Herskovits, Melville J.
(Original work published 1937)

Hiegl, J. P.

Hippolyte-Manigat, Mirlande
1980 Haiti and the Caribbean Community: Profile of an Applicant and the Problematic of Widening the Integration Movement. (Keith Q. Warner, trans.) Kingston, Jamaica: University of the West Indies.

Hodges, William H.

Huxley, Francis

Kiev, Ari

Kilson, Martin L., and Robert I. Rotberg

Kitchen, S. F.

Krogstad, Donald J., Joseph Volvich, and Ladene H. Newton

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
La Guerre, Michel S.  


Leyburn, James G.  
(Original work published 1941)

Lherrison, Camille  

Logan, Rayford W.  

Lundahl, Mats  

Mason, John, and Philippe Cavalie  

McLean, Robert G., Janet T. Spillane, and James W. Miles  

McNeill, William H.  

Metraux, Alfred  


Mintz, Sidney W.  


Nicholls, David 1979 From Dessalines to Duvalier: Race, Colour, and National Independence. Cambridge: Cambridge University Press.


Rotberg, Robert I., with Christopher Clague

Russell, Paul F.

Sauer, Carl Ortwin

Scotney, N.

Seabrook, W. B.

Segal, Aaron

Sloan, Janet Jenks

Strahler, Arthur N.

Taliaferro, W. H.

Taylor, Robert T.

Walker, Sheila S.
Weil, Thomas E.

Weiss, Mark L., and Alan E. Mann

White, Leslie A.

World Health Organization


Wiese, H. Jean C.

Wolf, Eric

Yekutiel, Perez