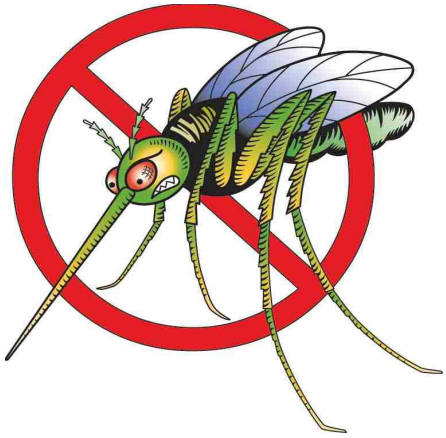
TRANSPARENCY AND ACCOUNTABILITY NETWORK



IMMC

INTEGRATED MOSQUITO AND MALARIA CONTROL

A comprehensive integrated mosquito and malaria control program to reduce the incidence of malaria, and other insect spread diseases.

EXECUTIVE SUMMARY

July 2006

DRAFT – FOR DISCUSSION ONLY

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MALARIA IS A HEALTH AND SOCIO-ECONOMIC CRISIS

An estimated 500 million cases of acute malaria occur worldwide each year, predominantly in Sub-Saharan Africa where there are about 450 million cases annually. There are as many as 1 million deaths a year, primarily among infants and young children. Every 3 minutes a child dies of malaria, or about 3,000 children a day. For years it has been ignored and it only now that global leadership is starting to treat malaria as an emergency and find funds to implement some programs for malaria campaigns.

Malaria is not only a killer of children, but is a debilitating disease for adults. An adult getting malaria can expect to lose between 10 and 30 days of work ... a substantial loss of economic output. In a monetary employment economy this would be somewhere between 5% and 15% of lost production, a huge loss of production. For 400 million people affected by endemic malaria, the aggregate annual economic loss can be conservatively estimated at something way in excess of $4 billion a year (millions ... 400 * $100 * 10% = $4,000).

Malaria is a parasitic disease. The malaria parasite lives in the blood and attacks the internal organs, including the brain. The parasite moves from host to host through mosquitoes, as they feed on human blood. There are three ways to reduce malaria: (1) reducing the mosquito population; (2) reducing human contact with the mosquito vector; and, (3) reducing the malaria parasite. The best results are achieved when all are used in an optimal way based on careful analysis of the facts.

There are a growing number of mosquito and malaria control initiatives being funded in Africa, but more are needed, and the available resources need to be used in the most effective way. This program of Integrated Mosquito and Malaria Control (IMMC) support accelerates progress in reducing malaria and helps get best value from available resources. Where some interventions are already funded and ongoing, this program makes other interventions available, and where needed all available mosquito and malaria control intervention can be provided.

This IMMC support program has seven components: (1) data collection and analysis; (2) planning and organizational support; (3) neighborhood cleanup to reduce mosquito breeding places; (4) interior residual spraying (IRS); (5) ultra low volume (ULV) adulticide spraying to kill flying mosquitoes; (6) larvaciding to kill larvae and stop mosquito recruitment into the population; and, (7) personal use of insecticide treated bednets (ITN).

The program is organized at five levels: (1) international, for funding coordination, operational analysis and oversight; (2) regional, for multi-country support activities like the aerial operations units and some logistics; (3) country programs; (4) district activities; and, (5) community activities.

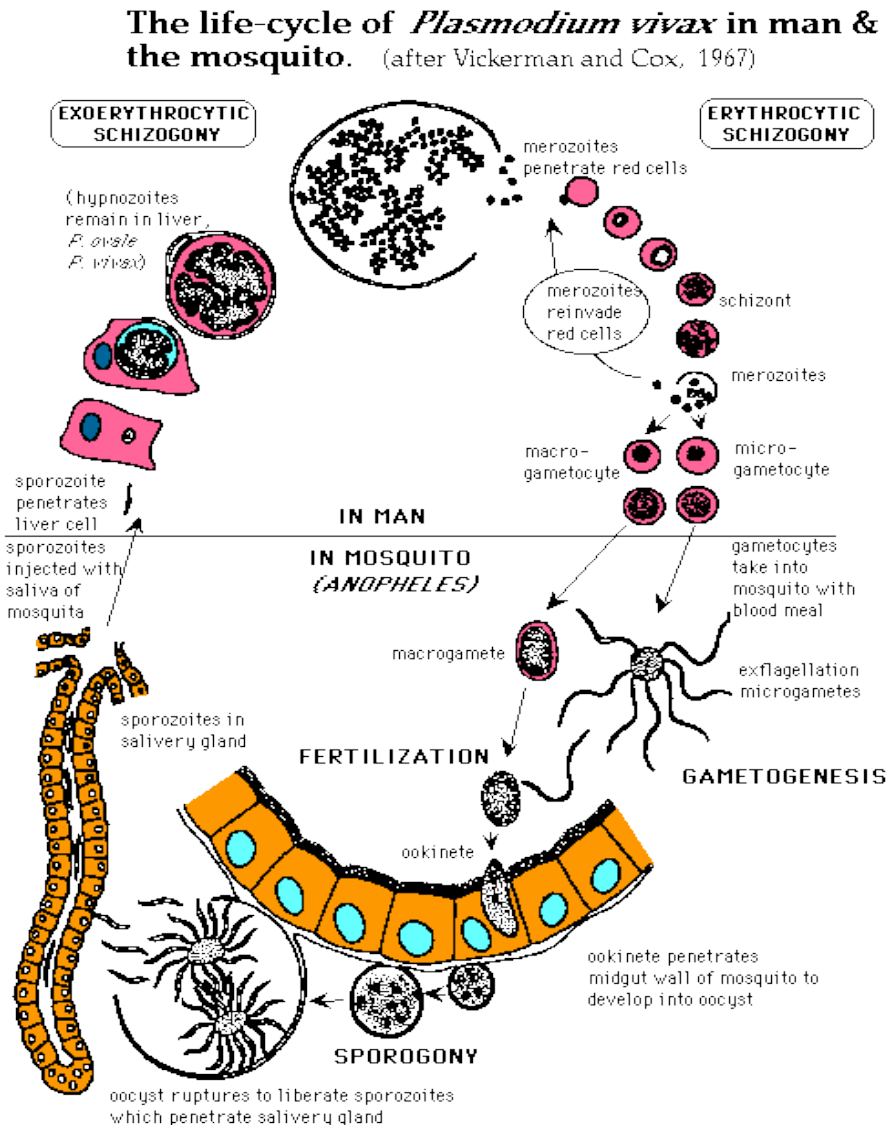
The program aims for functional excellence in all areas. Management information is a key tool for performance analysis, and is used throughout the program. The program links to functional expertise internationally while being very committed to initiatives that are most appropriate and effective at the country and local level.

Activities that are not funded and managed directly through this program can remain independent and still benefit from the implementation of an integrated comprehensive mosquito and malaria control program.

THE DYNAMICS OF THE DISEASE

Mosquitoes and malaria

When a mosquito bites an infected person, it ingests microscopic malaria parasites found in the person's blood.



The malaria parasite must grow in the mosquito for a week or more before infection can be passed to another person. If, after a week, the mosquito then bites another person, the parasites go from the mosquito's mouth into the person's blood. The parasites then travel to the person's liver, enter the liver's cells, grow and multiply. During this time when the parasites are in the liver, the person has not yet felt sick. The parasites leave the liver and enter red blood cells; this may take as little as 8 days or as many as several months. Once inside

the red blood cells, the parasites grow and multiply. The red blood cells burst, freeing the parasites to attack other red blood cells. Toxins from the parasite are also released into the blood, making the person feel sick. If a mosquito bites this person while the parasites are in his or her blood, it will ingest the tiny parasites. After a week or more, the mosquito can infect another person.

Humans get malaria from the bite of a malaria-infected mosquito. The challenge is to stop this cycle of continuing re-infection in a cost effective way that does not have damaging side effects either in the human population or in the environment.

Over the years there has been a lot of research about mosquito behavior and its life cycle. There has also been a lot of work done to learn about the malaria parasite and its life cycle. Rather little of this research has been translated into management information that can easily be used to make planning decisions about the way in which an integrated mosquito and malaria control program should work.

One of the ways in which this IMMC initiative is different from others is that it has a focus on science, data and analysis within a management system that can access the most relevant intervention for the prevailing situation, and can change as needed as the situation evolves.

INTEGRATED MOSQUITO AND MALARIA CONTROL (IMMC) ELEMENTS OF IMMC

IMMC elements or interventions

IMMC elements or interventions include the following: (1) Collecting data and the analysis and interpretation of the data; (2) management information, organizing for optimum performance; (3) malaria awareness and neighborhood cleanup to reduce mosquito breeding places; (4) interior residual spraying (IRS); (5) ultra low volume (ULV) adulticide spraying to kill flying mosquitoes; (6) larvaciding to kill larvae and stop mosquito recruitment into the population; and, (7) personal use of insecticide treated bednets (ITN). The manner in which these various IMMC interventions are implemented is determined by the facts about program performance and the changes taking place.

Collecting data and the interpretation and analysis of the data

The starting point for the IMMC program is to collect and organize existing data so that it is easier to understand and to have a baseline and starting point. A lot of data are already available, and these data should be supplemented and updated as needed. There are several sets of data that are needed: (1)

entomological data concerning the mosquito population and its breeding locations; (2) geographical or spatial information about the community ... population, buildings, water, etc; (3) medical information about malaria in the community and how cases are being treated (if at all); (4) the actual IMMC interventions that have taken place and where; and, (5) updates of all the information so that results can be compared to activities.

The collection of data and its organization so that it is easily available for analysis and planning can be done now using a combination of low cost local data collectors and the low cost and power of modern information and communications technology (ICT). The IMMC program pulls together a lot of data that have been collected in the past, as well as current data to provide a starting point for planning. The IMMC process then continues data collection, analysis and planning to ensure that IMMC interventions are as effective as they can be and low cost.

Data collection incorporates information flows that relate to the physical situation and spatial information for the area, entomological information about the mosquito, medical information about the human population and medical information about the malaria parasite. Data is needed to measure results and also to alert the program managers to side effects like resistance or environmental risks that need to be minimized.

Management information, organizing for optimum performance

Organization is very important. Good performance results from management information that uses data and an appropriate analysis process, and organization that converts ideas and plans into action, and measures the results.

A planning model is being developed so that critical variables that affect the dynamic of the mosquito and malaria can be studied with easy to understand “what if?” simulations. The model attempts to relate cost with result, on top of calculations that reflect the underlying science.

Available data are being organized and used in financial and cost analysis spreadsheets. The aim is to understand the costs and the behavior of all of the possible interventions and how these costs are related to performance in different combinations of interventions. The spreadsheets help to make cost projections for a successful IMMC program in any district or community and to understand the costs and results that can be expected based on an operational model.

One of the critical parameters that emerges from these data is that time and scale are the two very critical variables. What the operating model shows is that timing makes a big difference and fast response to changing situations is very valuable. It is also apparent that spatial information can be very valuable in helping to design interventions that improve the results and reduce costs.

Spatial information is very valuable. Spatial information is needed about the physical characteristics of the area, how mosquitoes behave in the area and the prevalence of malaria in the population. It is also needed to show how various IMMC interventions have been deployed. Spatial information gives a way to relate activity to the area as a whole, and to focus effort where it has the most impact. The following is a satellite image of Monrovia, Liberia. The area within

the yellow line is 50,000 acres, and the dark brown area is a tidal marsh where mosquitoes breed prolifically. The marsh area is around 15,000 acres.

Data related to spatial distribution of malaria cases may be particularly useful, because it may be possible to focus effort in ways that reduce costs and increase results significantly. The following image shows a built up area, and helps to show visually how much work needs to be done. Where there is a population of 1 million people, there are perhaps 400,000 rooms that need to be sprayed to get complete coverage, and many of these rooms are in houses that do not have easy vehicular access.

In Darwin, Northern Territories, Australia, which is now malaria free, all malaria cases are reported and a range of control measures are immediately implemented. These include quarantining the patient, killing all mosquitoes near where the case was reported and intensive monitoring of people in the area. As a result Darwin has had no cases of local transmission of malaria since 1962. All the reported cases have been associated with visitors and travel from malaria affected areas.

Malaria awareness and neighborhood clean up

The community is where success is best measured, and it is community people that will benefit the most from success. Everyone from an early age needs to be made aware of malaria, and how it can be controlled. A lot of what is needed to have success depends on the community. There are many ways that local organizations, schools, churches, etc can be engaged in the IMMC program.

Schools should be making children aware about mosquitoes and malaria, and

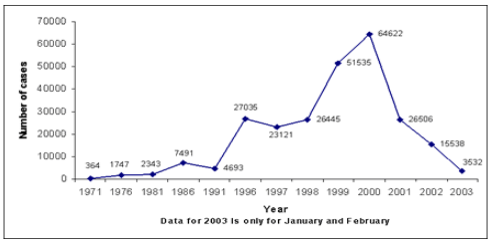
adult organizations like churches should do the same for adults. Some people in a community can help with data collection about mosquitoes and malaria.

Reducing mosquito breeding places is a simple way to start getting control of the mosquito population. If the community is organized to help with clean up, and to remove places where mosquitoes can breed, they also learn about other aspects of the malaria problem.

Interior residual spraying (IRS)

The use of interior residual spraying (IRS) has been successful in many different settings, from South America to South Asia, in the Mediterranean region and in South Africa. IRS requires workers to enter houses and do the spraying according to a protocol that is safe for residents and the spray teams.

IRS is most effective when DDT is used as the pesticide, but DDT use is controversial. The graphic below shows what happened In Kwa Zulu Natal, South Africa, when IRS with DDT was stopped. Malaria cases increased dramatically, but cases were brought under control again when IRS with DDT was once more used. More than 40,000 cases in 2000 reduced to around 1,500 three years later Similar results were obtained in neighboring Swaziland and in the south of Mozambique.



IRS works through three mechanisms: (1) there is a repellent action that keeps mosquitoes out of the house; (2) there is an irritant action that makes a mosquito

leave a house quickly after entering; and, (3) a toxic action that kills the mosquito if it chooses to rest in the house. Broadly speaking, the size of the mosquito population is not affected by an IRS intervention, but behavior is modified so that there is less human blood meal taking by the mosquitoes. In an area where there is a substantial IRS intervention, the mosquito population moves outside, where it can be effectively subject to adulticide control.

The use of DDT for IRS has been controversial since the 1970s when the US Environmental Protection Agency banned DDT use in the United States. This was mainly a result of excessive use of DDT in US agriculture and concern about the persistence of DDT in the food chain. Other countries followed the US lead and use of DDT for any purpose was banned in a number of countries around the world including Canada and several countries in Europe including Norway and Sweden.

The ban on DDT use has been a significant factor in the failure to control malaria. It has increased the cost of IRS by a factor of around 4, and other chemicals were not as effective. IRS still works, but is much less effective when DDT is not used ... perhaps 10 times less effective. In practical terms Africa has had to stop doing malaria control because of cost and budget constraints, and no countervailing initiatives from the donor community to make malaria control a priority.

Ultra low volume (ULV) adulticide spraying.

The purpose of adulticide spraying is to kill adult mosquitoes. The ULV approach kills mosquitoes mainly when they are flying, and the micron sized droplets attach to the mosquitoes legs.

All pesticide use must be done under controlled conditions with strong safety protocols in place. Used in the manner intended, the pesticides and biological agents used are highly toxic to mosquitoes, but safe for humans, animals and the environment. Compared to many of the chemicals used in treatment of malaria and other human diseases, the pesticides have low human toxicity.

Adulticiding can be done using vehicle mounted equipment or from the air. It is a safe way of reducing the mosquito population and used regularly around the world under protocols that ensure safety for people, animals and the environment.

The following are typical aircraft used for ULV spraying. They are very maneuverable, and suited to flying with very precise positioning and they are also equipped with spray equipment that enables them to generate very small spray

droplets just microns in size.

Hand carried spray equipment can also be used:

Adulticide treatment is commonly used where public health authorities are concerned about the possibility of insect borne disease. In the USA, large areas where sprayed in the aftermath of Hurricane Katrina, and similar interventions have been used after other devastating hurricanes in the USA. Spraying is widely used when West Nile Virus is detected in US communities. Spraying has a role in getting control of mosquito vectors in malaria endemic areas.

Larvaciding and environmental control

Mosquito population control is best when mosquitoes are never recruited into the flying adult population. Mosquitoes lay eggs in stagnant water, and in a matter of days eggs become larvae, become pupae and then adult flying mosquitoes. This is what larvae look like, just below the surface of the water.

There is a high natural mortality in the stages between egg and adult mosquito, and natural mortality can be supplemented by larvacide control measures to stop all the recruitment from the water body. For larvaciding to be effective, there needs to be accurate and timely knowledge about the water bodies and the status of the mosquito larvae .. and interventions to control the larvae need to be scientifically suitable and timely.

The success of larvaciding is determined in large part by the entomological data that is collected and the analysis of this data to design effective interventions.

Data has various dimensions, including a spatial dimension, a time and multiple elements of information about the mosquito life cycle and its interaction with the malaria parasite.

The success of larvaciding has been demonstrated over and over again, but it requires a lot of organization. Precise data are needed, timely intervention and well trained staff.

Some bodies of water are difficult to access, and larvaciding can be done by air. In some places helicopters are used for very precise delivery of treatment.

The environment makes a big difference to the recruitment of mosquitoes into the population. The data seem to suggest that man-made construction has a big role in creating the sort of environment that encourages mosquito breeding. Natural water is often associated with natural vegetation that seems to inhibit mosquito breeding. While the mechanism is not known, the idea that mosquito breeding varies spatially argues for precise information about the spatial entomological situation, and the precise interventions for each place.

Community level efforts to reduce mosquito breeding places is valuable. These can be organized through schools, churches, women's groups either as independent efforts or as part of a comprehensive set of activities.

Malaria case management

There are many millions of malaria cases in Africa every year. Many Africans get malaria several times a year. Only relatively few of the malaria cases in Africa get any form of professional treatment. Data that only comes from clinics is a subset

of data that is not representative of the population as a whole. With 400 million at risk, it is difficult to comprehend that each case has a human face. This child got to a clinic, but the clinic had no medicine. The child died.

Quinine was found to be a useful treatment for malaria in the 19th century and was used as part of the Panama Canal anti-malaria campaign in the early 1900s. In the post WWII years Chloroquine became the most widespread malaria treatment, both as a prophylactic and for treatment, but many malaria strains have now become resistance to Chloroquine.

Other treatments have been developed. Fansidar is now widely used but it has significant side effects, and resistance has emerged.

Artemesin based combination therapies have been developed, but cost a lot more than earlier treatments, and supplies are limited from available natural artemesin sources.

Concern over the development of resistance and side effects from anti-malaria treatments are valid, and as long as endemic malaria in the environment prevails, there will have to be ongoing leap-frogging of medical science and resistance development. This of course, argues for an anti-malaria strategy that addresses the environment and the endemic malaria.

A malaria vaccine has not yet been developed. Malaria is not an easy disease to control with a vaccine, but it is scientifically possible. Whether there is an enabling economic environment for vaccine development and deployment is questionable, and needed political support is also problematic. For the purposes of this IMMC program a malaria vaccine is “in the future”. However, the understanding of the parasite may help in accelerating treatment so that the environment can be improved by more rapid treatment to minimize parasite prevalence.

Bednets and insecticide treated textiles

Bednets, insecticide treated nets (ITN), are another intervention that should be part of a comprehensive anti-malaria campaign. The model being used for IMMC planning has not been able to demonstrate that bednets on their own are as cost effective as other IMMC interventions, but they do have a favorable impact for the people who choose to use bednets.

The model suggests that bednets in fact have a potential value to help reduce the transmission of malaria from infected humans to others, and could be used to facilitate a form of quarantine for infected patients.

Long lasting insecticide treated bednets have been introduced in Africa since around 2003. These nets retain their effectiveness for about 5 years. The bednet shown below is being used in Uganda.

Data regarding the effectiveness of bednets seems to show that a bednet reduces the risk of malaria infection for the users of the bednets, but has no appreciable impact on the community as a whole that does not have bednets. This is in contrast to IRS, where the community at large seems to benefit from an IRS program, even where less than all the houses are sprayed.

Insecticide treated textiles can be used to manufacture clothes. The technology has been used already for military uniforms for soldiers being deployed in malaria endemic areas. The approach might be used in an IMMC program for uniforms for “Malaria Control Teams” as well as for the various uniformed services of countries in malaria endemic areas.

AN ORGANIZATION SPECIFICALLY STRUCTURED FOR IMMC ALL LINKED BY COMMON MANAGEMENT INFORMATION

IMMC elements or interventions

The organization needed to have success in a large scale integrated mosquito and malaria control (IMMC) intervention has a geographic component and a functional component. By optimizing organization along these two lines, it is possible to have excellence at a reasonable cost. A common use of timely, relevant and reliable management information enables a complex organization to be efficient without an expensive and time consuming coordinating function.

International organization

The international IMMC organization has a planning and coordination role, and a responsibility for the overall management information framework. The international management group has a functional responsibility to ensure that all the IMMC interventions are best practice and effective. The international organization makes it possible for the IMMC group to have access to world class expertise without having an excessively high cost to be allocated to the local community interventions. The international organization has the primary responsibility for the strategy to finance the needed interventions in cooperation with all of the stakeholders.

Regional organization

Some of the IMMC interventions, specifically aerial operations and logistics are more efficient on a scale that is larger than needed for a single country

intervention. Accordingly aerial operations and logistics are organized as regional units that operate to serve several country operations.

Country program

An IMMC country program has overall responsibility for the activities and effectiveness of the IMMC program in the country. There are many activities that the country program has to be responsible for including: (1) all the relations with government and the cooperation with government in the establishment and implementation of public policy with respect to mosquitoes and malaria. This includes having permission to operate from government and local authorities where required and the joint planning of interventions to achieve success; (2) setting up a data collection and analysis capability at the country level, including cooperating with government and private entities that already make use of some of the needed data; and, (3) setting up to undertake the physical operations including mobilizing and maintaining equipment, running a coordinating office, recruiting and training staff, and all of the other things needed for the smooth running of an efficient organization. At the country level, the country organization has a big responsibility to ensure that the financing strategy facilitates effective use of IMMC interventions.

District program

The district programs are responsible for the detail planning of interventions that are needed in a district, based on detailed information about the geography and the physical setting, detailed information about entomology and detailed information about the malaria prevalence and malaria case management. The district programs also recruit, train and supervise the staff needed to implement district IMMC interventions, and arrange for the required equipment to be deployed into the district. The district identifies the need for aerial interventions and logistical support in conjunction with the country office. The district office in cooperation with the country office also serves as the mentor and developer of community level activities.

Community program

Several communities can be in a single district. The district office is responsible for helping community groups understand how malaria can be alleviated by controlling mosquitoes, and how mosquitoes can be controlled using IMMC interventions, including interventions that only require effort on the part of the local community, such as cleaning up potential mosquito breeding sites, and helping to provide information to manage the IMMC interventions and measure results.

Management information and coordination

The goal is simple ... to have the most reduction in malaria prevalence for the least possible cost, and for this to be sustainable.

HISTORY OF SUCCESS IN REDUCING MALARIA
IT WAS POSSIBLE 50 YEARS AGO, WHY NOT NOW?

Panama Canal

For many years, efforts to build the Panama Canal failed because workers succumbed to malaria. But in the early 1900s the Panama Canal was constructed and the impact of malaria on workers was controlled. Quinine was used as a medicine, and major efforts were made to reduce the mosquito population and its proximity to people.

USA

Prior to WWII, the USA experience malaria seasonally in many parts of the country, especially, but not only in the Southern States. In the period 1946 to 1951 an agency of the US Government had a public health mandate to eradicate malaria and used mosquito control as a key intervention. This agency of the US Government is now the well respected Center for Disease Control (CDC).

Europe

Much of Europe suffered from malaria, but malaria receded as the habitat for mosquito breeding became constrained with modern agriculture and better drainage. But it remained a problem in the Mediteranean countries until after WWII. Greece and Italy, including famously, Sardinia, reduced malaria almost completely in the post war years. In Sardinia, very heavy use of DDT was effective in eliminating mosquitoes and malaria, but there was a concern that heavy DDT use would have lasting health consequences for the human population. Surprisingly, 50 years later, this has not materialized as expected.

Japan

Japan had endemic malaria until after WWII. A major campaign in the years following the war reduced malaria to a negligible problem and malaria has remained under control until now.

Australia

The Northern Territory of Australia had endemic malaria, but this was reduced by intensive mosquito and malaria control. The last reported case of local malaria transmission was in 1962. They continue a strong mosquito and malaria control program because of the continuing possibility that imported cases of malaria could easily become epidemic because of the high efficiency of the vector.

Caribbean

In the Caribbean, for centuries malaria killed more people, especially Europeans, than were killed in military conflict. During the 1940s and 1950s malaria was effectively eradicated in the Caribbean, except in Haiti. This is a difference in governance capability rather than a difference in science.

South Africa

Parts of South Africa have endemic malaria. This was brought under control using IRS and DDT, but when DDT uses was terminated malaria cases increased dramatically. They have been brought under control again by using

IRS and DDT again.

India

Programs to reduce the prevalence of malaria in India were largely successful in the 1950s and 1960s. Millions of cases a year were reduced to tens of thousands. The programs appear to be less successful now, in part because of reduced interventions, partly increased resistance and probably greater travel between areas, especially into neighboring countries such as Bangladesh.

Sri Lanka

The malaria prevalence reduction programs in Sri Lanka were very successful in the 1950s and 1960s, but malaria has come back as continuing intervention was eliminated, and little attention was paid to the continuing science. It is now apparent that resistance is an important factor in Sri Lanka, both for the mosquito against pesticides and the malaria parasite against low cost drug therapy.

Africa

The mosquito and malaria prevalence was reduced in many corporate locations in Africa, but because the interventions were not extended widely into the surrounding communities, the total impact on the local population was small. Substantial reduction in the malaria case load can be achieved in Africa when there are appropriate IMMC interventions, as for example in Liberia, Zambia, Equatorial Guinea, Mozambique, etc.

Why was Africa not a success?

The quick answer is because no resources were ever allocated to IMMC interventions in Africa. All rich countries became malaria free more than 50 years ago. Both Europe and North America had malaria up until the immediate post-WWII years. The major campaigns organized by UNICEF and WHO reached most parts of the world, but NOT Africa.

Recent interventions for Africa related to malaria have been single component strategies and usually not at a scale that can have a significant impact. Use of best practice for IRS using DDT has been constrained by donor countries citing environmental concerns that are essentially baseless. Distriubution of bednets has been a preferred intervention, though it seems that this cannot have much community wide impact.

FINANCIAL COST PROJECTIONS
FINANCING PLAN

Financial projections

The projections of costs are derived from an operations cost model that is being development both for planning and for ongoing operations management. The numbers are still being refined and the program optimized taking advantage of all existing cost and performance information that is available to us.

The following table is an estimate of investment required for for equipment and durable assets:

Investment Costs for Five Years*
In thousand dollars ($ 000)

	Year 1	Year 2	Year 3	Year 4	Year 5	5Yr total
International (mainly ICT)	100					100
Regional (mainly aircraft)	2,000					2,000
Country (Liberia) Vehicles and equipment	300	150	150	150	150	900
Building improvements	400	100	100	100	100	800
Working capital	700					700
Contingency	500					500
PROJECT INVESTMENT	**4,000**	**250**	**250**	**250**	**250**	**5,000**

* Preliminary – under review

The cost of mobilization and start up is estimated to be $3 million as set out in the table below. The timeline for start up is 6 months after confirmation that funds are available and accessible:

Mobilization and Start Up *
In thousand dollars ($ 000)

Description	Total
Start up expenditures – remuneration	300
Start up expenditures – travel, hotels, etc.	200
Improvements to buildings	200
Aircraft, with support and spray equipment	900
Ground spray equipment	150
Lab equipment and other	150
Transport	300
Logistics (shipping, insurance, etc.)	300
Working capital (inventory)	500
Mobilization and Start Up	**$3,000**

* Preliminary – under review

The next table shows as an order of magnitude the various intervention costs that need to be planned for in the operating projections. The planning model will be completed as soon as key operating assumptions are available for the proposed locations.

Operating Costs for Five Years* In thousand dollars ($ 000)						
	Year 1	Year 2	Year 3	Year 4	Year 5	5Yr total
Environmental Clean Up	100	100	100	100	100	500
Data collection	300	300	300	300	300	1,500
Data analysis	100	100	100	100	100	500
Data system	100	100	100	100	100	500
IRS using DDT	1,000	1,000	1,000	1,000	1,000	5,000
Increment if not DDT	2,000	2,000	2,000	2,000	2,000	10,000
Aerial adulticiding	1,000	1,000	1,000	1,000	1,000	5,000
Ground adulticiding	300	300	300	300	300	1,500
Larvaciding (air)	500	500	500	500	500	2,500
Larvaciding (ground)	500	500	500	500	500	2,500
Medical treatment (people)	500	500	500	500	500	2,500
Medical treatment (drugs)	500	500	500	500	500	2,500
Bednets (distribution)	500	500	500	500	500	2,500
Bednets (product)	500	500	500	500	500	2,500
Public relations - awareness	500	500	500	500	500	2,500
Training	500	500	500	500	500	2,500
Management and admin.	600	600	600	600	600	3,000
Contingency	500	500	500	500	500	2,500
TOTAL PROJECT COST	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**50,000**

* Preliminary – under review

If this project cost is serving 2.5 million people, then the annual cost is $4 per capita, and the 5 year cost is $20. The IMMC planning model suggests that the costs can be significantly lower than this with costs in later years substantially reduced without reducing the value of benefits accruing to the community.

MORE TO COME

Financing

IMMC program funding is being sought from a variety of sources. The following table shows a possible mix of funding that would support the IMMC. Multiple sources of funding are desirable:

Financing Plan In thousand dollars ($ 000)						
	Year 1	Year 2	Year 3	Year 4	Year 5	Ongoing
Government of Liberia	1,000	500	500	500	500	500
Private sector in Liberia	0	500	500	500	500	500
Multilateral funding agencies	2,000	2,000	2,000	2,000	2,000	2,000
Bilateral funding agencies	4,000	4,000	4,000	4,000	4,000	4,000
Private philanthropic funding	1,000	1,000	1,000	1,000	1,000	1,000
International corporate support	1,000	1,000	1,000	1,000	1,000	1,000
Small private contributors	1,000	1,000	1,000	1,000	1,000	1,000
TOTAL	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**

In the long run the financing of the Monrovia Mosquito / Malaria Program must be possible by some form of local funding, along the lines of the funding for Mosquito Abatement Districts in many parts of the United States. In order for local funding to be feasible the whole of the operation must be sustainable with a world class Liberian management and operating team.

MANAGEMENT
KEY STAFF AND ADVISERS

Corporate organization

The international IMMC group is a unit of Tr-Ac-Net Inc., a not for profit corporation registered in Vermont.

The IMMC regional aerial operations and the IMMC Liberia country program are carried out by units of West Africa Aerial Applicators Inc. (WAAA) a Liberian company.

An experienced team of experts and advisers has been identified to manage the operations. This team includes personnel and consultants with management experience in medical entomology, medical science, aerial ULV spray operations, pesticide application management, and accounting, financial control and data processing. The core team includes:

Bill Nesler,
A veteran pilot and aerial operations manager with experience in US pest control and international contract flight operations in Africa.

Peter Burgess
Former CFO of Continental Seafoods Inc. a US based international fishing company and management consultant to the UN, World Bank and private organizations

Delvin Walker
A medical entomologist, former professor at Cuttington University in Liberia and consultant to international organizations.

Bob Novak
A medical entomologist, professor at University of Illinois, Champlain and consultant to international programs.

Jeffrey Widmann
An experienced pilot and trainer.

Advisory Group

The IMMC group has an advisory group that includes a number of people who are very experienced in various elements of modern mosquito and malaria control including:

WE NEED TO GET PERMISSION TO INCLUDE SOME OF OUR FRIENDS AND COLLEAGUES IN THIS SECTION

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Corporate Cooperation

ADAPCO has agreed to give the IMMC group support and expertise in connection with the use of pesticides and biological agents. ADAPCO is a major distributor of pest control products with more than fifteen years of experience. They will assist the IMMC group in the training of staff and ensure that the protocols being applied in best international practice.

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APPENDIX 1

MANAGEMENT AND STAFF BIOGRAPHIES

Biographies of Some Key Staff

The following are some of the people who are committed to the success of this initiative and will form the core of the management team – in alphabetical order.

Delvin Walker
General Manager
Delvin Walker will be the overall manager of the project. He was chief of the science department at Cuttington College in Liberia prior to the outbreak of the civil war. He has extensive experience in program management and is a trained entomologist. He has worked with international relief and development assistance organizations in countries around Africa for many years. He received a master's degree from California Polytechnic and has other academic training from other universities.

Robert J. Novak
Medical Entomologist
Robert Novak will ensure that the Program follows rigorous scientific discipline and help to optimize the activities of the Program to ensure effective operation and good results. He is a professional scientist affiliated with the University of Illinois at Urbana-Champaign with vast experience with vector control both in the United States and in Africa. He earned a Masters degree at the University of Utah and PhD at University of Illinois.

William Nesler
Operations Manager and Senior Pilot
Bill Nesler is commercial aircraft pilot with over 20,000 hours of flying time, of which 15,000 hours have been in agricultural pest control operations. He has been chief pilot in charge of 8 airplanes, 9 pilots, 3 mechanics and numerous ground crews. He has been licensed and has worked in most of the agricultural states in the USA and has lived and worked in Liberia for almost 20 years. He has experience working with Liberians and an understanding and appreciation of the local traditions and customs. While living in Liberia, Mr. Nesler and his family suffered from severe attacks of malaria, giving him a personal understanding of the problem. Mr. Nesler will serve as the Program's operations manager.

Peter Burgess
Controller and Management Information Services
Peter Burgess is an expert in financial control and management with experience with international companies and the global relief and development sector. He is the founder and CEO of Tr-Ac-Net Inc, the Transparency and Accountability Network. He has been a pioneer in using available data to improve management informations and decision making. During his corporate career, he was CFO of Continental Seafoods, Inc, a US company that operated a successful fisheries joint venture in Liberia and around the world during the 1970s. He earned a double major in engineering and economics at Cambridge University and trained as a chartered accountant with Coopers and Lybrand in London.

Jeffrey Widmann
Training Manager and Senior Pilot
Jeffrey Widmann is an experienced aerial applicator and an active and highly regarded flight instructor, with over thirty years experience, he has provided students with the specific training necessary to operate the Grumman Agcat safely. He is a retired U.S. military officer with experience in international flight operations and training and is a Federal Aviation Administration certified aircraft mechanic. Mr. Widmann will assume the position of training manager and chief pilot to train selected Liberian pilots in the field of aerial application of pesticides. Mr. Widmann has lived and worked in Monrovia and is familiar with the customs and culture of the Liberian people. He has flown commercial flight operations in Liberia and has held a Liberian commercial pilot certification and work permits.