



PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau. Regional Office of the
WORLD HEALTH ORGANIZATION

525 TWENTY-THIRD STREET, N.W., WASHINGTON, D.C. 20037-2895, U.S.A.

TELEPHONE (202) 974-3000

PAHO/HCP/HCT/222/02
Original: English

Pan American Health Organization's
Proposed Contribution to the
United States Agency for International Development/
Latin America and Caribbean Bureau
Amazon Malaria Initiative (AMI):

Project Proposal

Division of Disease Prevention and Control
Program on Communicable Diseases

21 September 2001

Table of Contents

Executive Summary	3
I. Background.....	5
1. Available data.....	5
2. Prior activities	6
II. Project Proposal	7
III. Responsibilities/Collaboration	8
IV. Project Management.....	9
V. Project Description.....	10
VI. Approaches for Subregional Surveillance and Policy Reform.....	11
VII. Strategic Objective (SO), Goal, Intermediate Results and Activities.....	12
1. Goal.....	12
2. Purpose.....	12
3. Intermediate results (IR)	12
4. Activities	13
VIII. Budget.....	15
IX. Logical Framework / Monitoring Framework	17
Annex I	18

Executive Summary

Based on 1999 data, the total estimated population of the Amazon countries is 280 million, of which 42% (118 million) live in areas where ecological conditions favor malaria transmission. Of the latter, 93 million (33.2%) are exposed to low risk for malaria transmission, and the other 25 million (9.0%) live in areas of moderate to high risk of transmission.

Currently, no systematic data nor in-depth information are available on resistance to antimalarial drugs in the Americas, but isolated studies have found resistance of *Plasmodium falciparum*, the more deadly form of malaria, to a number of the most commonly used drugs.

In March 1998, the Pan American Health Organization (PAHO), Regional Office of the World Health Organization, sponsored an expert committee meeting in Manaus, Brazil, to develop standardized methods to assess the therapeutic efficacy of drugs used to treat *P. falciparum* malaria in the Americas. In that meeting, the lack of standardized protocols to evaluate and monitor treatment failure for *P. vivax* malaria became evident. In 1999, within the framework of WHO's *Roll Back Malaria Initiative*, and under PAHO's leadership, a regional strategy was developed for the Americas focusing on the Amazon region. National participants agreed to set up a surveillance network to determine and monitor the efficacy of malaria treatments. Other activities followed, and culminated in a meeting held in Salvador, Bahia, Brazil in March 2001.

During discussions at the Bahia meeting, it was shown that current policies regarding malarial drugs in the region do not necessarily respond to scientific evidence, and that the scarcity of information on drug effectiveness limits its potential use for national decision-making regarding malaria treatment policies.

In view of the above, this project proposes two sets of interventions addressing two main issues:

1. Surveillance of antimalarial drug resistance
2. The formulation of evidence-based national policies and strategies for the implementation of appropriate use of antimalarial drugs.

This PAHO project supports the USAID's Amazon Malaria Initiative (AMI) objective "Malaria control programs in target countries in the Amazon Basin subregion substantially incorporate selected best practices," and the USAID Latin America and Caribbean Regional Strategic Objective "More effective delivery of selected health services and policy interventions." The project also contributes to the worldwide goal of Roll Back Malaria Initiative to significantly reduce the global burden of malaria through interventions adapted to local needs.

In consequence, the first steps in this project will be to develop a sentinel surveillance network to generate reliable and standardized drug efficacy information of

antimalarial drug resistance in the Amazon countries, and to initiate drug efficacy studies in Brazil, Colombia, Ecuador, Guyana, Suriname, and Venezuela. USAID missions, in coordination with PAHO, will implement parallel activities in Bolivia and Peru, where both missions work jointly with national communicable diseases programs on malaria control. The USAID Amazon Malaria Initiative will be implemented during a five-year period. However, this document provides a proposal for PAHO's participation in the first year only, during which activities will be devoted to the establishment of the sentinel surveillance network, initiation of drug efficacy studies, and selected tools adaptation and testing activities. The budget required for implementing this proposal is US\$ 1,382,000 (including program support costs). A detailed description of goals, expected results, indicators and activities, and the budget are provided in the body of the document.

Funding provided separately to USAID missions in Bolivia and Peru (\$200,000 each); the US Centers for Disease Control and Prevention (\$90,000), and the US Institute of Medicine (\$100,000) will also contribute to the implementation of the Amazon Malaria Initiative.

I. Background

1. Available data

Based on 1999 data, the estimated total population of the countries in the Amazon is 280 million, of which 42% (118 million) live in areas where ecological conditions favor malaria transmission. (Table 1). Of the latter, 93 million (33.2%) are exposed to low risk for malaria transmission, and the other 25 million (9.0%) live in areas of moderate to high risk of transmission. In these areas, malaria morbidity constitutes a serious problem, and it is estimated that the malaria incidence rate is 39.6 per 1,000, but the rate fluctuates between 10.1 in Venezuela and 331.7 per 1,000 population in French Guiana (Table 2). (Annex I. tables 1-4 provide more detailed data on malaria affected populations and treatments in the Region).

An analysis by country indicates that Brazil reported the highest number of cases of malaria (58.5% of the total for the subregion), followed by Peru (16.3%). However, the worst risk of transmission was observed in French Guiana, Guyana, and Suriname (Annual Parasitic Index¹ [API] = 247.5 per 1,000), followed by Brazil (73.9 per 1,000) and Peru (32.0 per 1000).

In the Region of the Americas, the most common parasites in malaria infection are *Plasmodium vivax* and *P. falciparum*. The latter produces the highest lethality and has been increasing in the Americas in the last decade. In one instance (Loreto, Peru) the proportion of *P. falciparum* malaria cases increased from 1.2% in 1992 to 36% in 1998. To treat these infections, first and second line malaria drugs are available for the treatment of cases reported in the Amazon region (see tables 4 and 5). Parasite resistance to malarial schemes has been identified in the Americas as well as in the rest of the world, and has become one of the main factors contributing to the spread of *P. falciparum* malaria. Furthermore, resistance of *P. falciparum* to chloroquine, the first line drug of choice in the treatment of malaria, is common in the region. Nevertheless, it is worth noting that treatment failure is not equivalent to drug resistance, given that patient behavior (adherence to the treatment) also constitutes a preponderant factor. In this regard, border areas opening to development and a high degree of cross-border migration in search of work have helped increase the spread of malaria in border areas.

Neither systematic data nor standardized methods are available to obtain in-depth information on resistance to antimalarials drugs in the Americas. Isolated studies have found resistance of *Plasmodium falciparum* to a number of the most commonly used drugs since the end of the 1950s and beginning of the 1960s. In 1997 cases of *Plasmodium vivax* resistance were reported in Guyana.

As was already mentioned, resistance of *Plasmodium falciparum* to chloroquine is widespread in the Region, and is as high as 20% in some areas of the Peruvian Amazon region.² Studies conducted in Colombia between 1995 and 2000 indicated that treatment failure for cases of *P. falciparum* ranged from 44% to 97% for chloroquine, between 6%

¹ The number of cases per thousand population per year

²PAHO/WHO (2000). Malaria Program Situation in the Americas Report.

and 15% for sulfadoxine-pyrimethamine and from 7% to 11% for amodiaquine. Other studies carried out in Ecuador during the 1970s reported a 26% rate of treatment failure to chloroquine.

In addition, a greater increase in the annual *P. falciparum* infection index (IFA or the number of cases due to this parasite per 1,000 population) has been observed when compared to the API. Indeed, between 1996 and 1999, the IFA increased 9.8%, while the API grew 2.9% (see tables 2 and 3). (Tables 2 to 5 provide information on the epidemiological situation by country, types of malarial treatment by country and available information about antimalarial drug resistance).

2. Prior activities

In March 1998, the Pan American Health Organization (PAHO) sponsored an expert committee meeting in Manaus, Brazil, to develop standardized methods to assess the therapeutic efficacy of drugs used to treat *P. falciparum* malaria in the Americas. Prior to this meeting, the WHO Division of Tropical Diseases in collaboration with PAHO prepared the protocol for use in the Americas. At the Manaus meeting, said group adapted the protocol for clinical evaluation of selected malaria patients, to determine the response to treatment.

A lack of standardized protocols to evaluate and monitor treatment failure for *P. vivax* malaria induced PAHO to convene a group of experts to develop a protocol to assess and monitor chloroquine resistance of *P. vivax* parasites. A meeting was held in Brazil in 2000 with participants from WHO's research institutions and member countries. The protocol is being finalized with assistance from WHO.

In 1998, WHO and partners launched a Global Roll Back Malaria Initiative, which advocates the following approaches: (1) building technical malaria control capacity at decentralized levels of the health system; (2) integration of human resources to improve malaria diagnosis, treatment, and prevention; (3) monitoring and evaluation of drug efficacy and selection of treatment regimens in accord with local conditions; (4) strengthening of referral systems; (5) promotion of resource networks to address specific issues such as disaster preparedness and mitigation, access and quality of drugs, monitoring of resistance to anti-malarial drugs and pesticides; and (6) control of transmission.

In 1999, within the framework of WHO's Roll Back Malaria Initiative, and under PAHO's leadership, the regional malaria strategy for the Americas focused on the Amazon region. At that point, the need to have national evidenced-based treatment policies was determined. National representatives present at the meeting agreed to set up a surveillance network to determine and monitor the efficacy of malaria treatments. This decision was made despite evidence that indicated that countries had different levels of expertise and capacity to carry out such studies. In order to promote such studies, in 2000 PAHO invited researchers in Member Countries to apply for small grants provided by the WHO Special Program for Research and Training in Tropical Diseases (TDR). The idea behind this strategy was to test the efficacy of antimalarial therapies. Five efficacy studies of anti-malarial drug were approved and initiated in 2001.

In March 2001, a meeting was held in Salvador, Bahia, Brazil with the aim of establishing a network for monitoring anti-malarial drug resistance in the Amazon countries, as part of the Roll Back Malaria Initiative. A review of *in vivo* studies (studies in humans) using the 1998 WHO/PAHO protocol previously undertaken in the Amazon countries and their potential use in the formulation of treatment policies were discussed at the meeting. Participants included representatives of national malaria control programs and national epidemiology programs of the Ministries of Health of the Amazon countries. Also present were a representative of the Network for Anti-Malarial Drug Surveillance in East African countries; representatives of the Roll Back Malaria Initiative, and Drug Resistance Surveillance and Response of programs of WHO; USAID; CDC, and regional and local PAHO staff.

During discussions at that meeting, it was shown that current policies regarding malarial drugs in the region do not necessarily respond to scientific evidence. In addition, it was determined that several countries required technical assistance to carry out studies of drug efficacy. Furthermore, it was shown that the scarcity of reliable information on drug effectiveness limits its potential use for national decision-making regarding malaria treatment policies.

II. Project Proposal

This project proposes two sets of interventions, one to address surveillance of antimalarial drug resistance, and the other, the formulation of evidence-based national policies and strategies for the appropriate use of antimalarial drugs.

Surveillance systems for antimalarial drug resistance

Most countries within the Amazon region do not have a surveillance system that can routinely evaluate the efficacy of antimalarial treatments. Reliable and standardized malaria information is not available for decision-making. In addition, health services medical personnel and laboratories are not yet integrated into a surveillance system that can determine the efficacy of antimalarial drugs.

For this reason, the project's first step will be devoted to the development of a surveillance network of antimalarial drug resistance in countries of the Amazon, in order to generate reliable and standardized drug efficacy information (based on evidence).

National policies and strategies on the use of appropriate and evidence-based antimalarial drug schemes

In general, national policies on malarial drugs in Amazon countries are not based on complete scientific evidence, and do not always take into account resistance to those drugs.

Thus, it is proposed that project resources will be used to promote the formulation and implementation of national policies and strategies for pharmacological management of malaria based on data produced by a drug resistance surveillance system. One objective of the project would be for national governments to ensure the administration of effective antimalarial drug treatment schemes, and to implement policies that help to ensure the availability of quality drugs in participating countries.

The Global Malarial Control strategy promotes rapid diagnosis and opportune treatment of cases, as well as the use of methodologies for prevention of epidemics, selective vector control, and operational research. In this context, the Roll Back Malarial Initiative has promoted tools such as the use of mosquito nets and of rapid tests for malaria diagnosis. . It is envisaged that, in the context of the project, some interventions will be adapted and tested for use in the Amazon Basin setting.

Target countries

Given the information above, PAHO will supervise implementation of the project in Brazil, Colombia, Ecuador, Guyana, Suriname, and Venezuela. USAID missions, in coordination with PAHO, will implement the project in Bolivia and Peru, where both missions work jointly with national communicable diseases programs.

III. Responsibilities/Collaboration

The project will be coordinated and managed by PAHO, under the responsibility of the Regional Advisor in Malaria, Communicable Diseases Program, Division of Disease Prevention and Control.

Nevertheless, in order to achieve the objectives, various institutions need to be involved, both at the national and international level. The project will be closely coordinated with antimalarial drug resistance and research activities supported by the WHO Roll Back Malaria Initiative and the Tropical Diseases Research (TDR) Program. PAHO will coordinate activities with technical support provided by the Centers for Disease Control and Prevention of the United States (CDC). CDC will assist target countries through training, data analysis, and operations research.

All national partners in the project will be coordinated under the PAHO umbrella to ensure that all participating countries benefit from and contribute to the surveillance network. PAHO will promote the standardization of methods and will disseminate periodically the results of efficacy trials through its Web page. The Organization will also support policy dialogue and advocacy activities to promote the use of surveillance data in decision making on drug treatment policies at the national level in the target countries.

Partnerships with national institutions will include:

- ❖ In *Brazil*, PAHO would work with the Ministry of Health, Technical Manager's Office of Malaria - CENEPI - National Foundation of Health (FUNASA); the Tropical Health Foundation of the Amazon -FMT-AM/Manaos; the Inquiry Center in Malaria - CEPEN/Porto Velho/Rondonia; and the Evandro Chagas Institute- IEC/Belen/Para.
- ❖ In *Colombia*, with the Health Ministry and the Vector - Borne Communicable Diseases Control Program (ETV). In the first three years the following centers will participate: Training and Health Research International Center (CIDEIM), Cali; Del Valle University, Cali; National of Health Institute (INS), Bogota; Immunology Institute, Bogota; Antioquia University, Medellin; Tropical Health Institute, Medellin; and Biological Research Corporation, Medellin.

- ❖ In *Ecuador*, with the Ministry of Public Health. National Undersecretary of Tropical Medicine. - Malaria and Vector Control National Service.
- ❖ In *Suriname*, with Ministry of Health of Suriname and the National Malaria Board of Suriname. The Medical Mission (MM); the Anti-Malaria Campaign (AMC) of the Bureau of Public Health (BOG/Min of Health); Regional Health Services (RGD); Hospitals, and BGVS and the Bureau of Health Education (GVO/BOG).
- ❖ In *Guyana*, with the Ministry of Health of Guyana and relevant partners, such as: Regional Health (RH) Services; the Vector Control Service and the Guyana Agency for Health Education (GAHEF).
- ❖ In *Venezuela*, with the Health Ministry of Venezuela - General Directorate of Risk Control and Environmental Sanitation. - Malariology Direction and the CAICET, the Tropical Health Institute of the Central University of Venezuela and the Microbiology Center.

IV. Project Management

This project will be coordinated by PAHO's Communicable Diseases Program of the Division of Disease Prevention and Control. Dr. Renato D'A. Gusmão, Coordinator of the Communicable Disease Program will provide policy and program guidance. Dr. Keith Carter, Regional Advisor in Communicable Diseases (Malaria), is proposed as the project coordinator and will guide overall implementation of activities. A project technical coordinator (candidate to be determined; post funded by USAID project funds) will provide technical assistance to all components of the project, conduct site visits both for detailed planning of activities and supervision, and will ensure coordination of PAHO activities with Amazon Malaria Initiative activities carried out by CDC and USAID missions in Bolivia and Peru. In the field, Dr. Gustavo Bretas, Roll-Back Malaria Advisor for the Amazon Countries, with duty station in Ecuador, is proposed as the field technical advisor and will provide direct technical cooperation and supervision of national activities in all participating countries, under the direction of Drs. Carter, Gusmão, and the project technical coordinator. Additional technical consultant support will be contracted as required.

Additional project management and monitoring support at PAHO HQ will be provided by Ms. Raquel Requejo and Ms. Roxane Salvatierra-González. Dr. Zaida Yadón will provide technical cooperation in research methods and analysis. The table below provides approximate contributions as a proportion of staff time.

Each national component of the project will receive direct technical guidance and support from PAHO country staff, also listed below. In Bolivia and Peru, PAHO staff will contribute, as deemed appropriate, to USAID mission activities related to the project.

PAHO Staff Time Contribution to the Project

	Approximate time contributed (%)
Staff at Headquarters	
Renato D'A. Gusmão, Coordinator, Communicable Diseases Program	10
Gustavo Bretas, Roll-Back Malaria Advisor for Amazon Countries	60
Keith Carter, Regional Advisor, Communicable Diseases (Malaria)	30
Raquel Requejo, Consultant, Project Management	20
Roxane Salvatierra-González, Public Health Officer	10
Zaida Yadón, Regional Advisor, Communicable Diseases, (Research)	10
Staff under the guidance of PAHO/WHO Country Representatives	
Bolivia - Enrique Gil, Communicable Diseases Advisor	5
Brazil - Loiola, Dr. Carlos Catao Prates, Communicable Diseases Advisor	10
Colombia -Celsa Sampson, Communicable Diseases Advisor	10
Ecuador - Angel Valencia, Communicable Diseases Advisor	10
Guyana - Bernadette Theodore-Gandi, PAHO/WHO Representative	10
Peru - Rubén Figueroa, Communicable Diseases Advisor	5
Suriname - Marthelise Eersel, Communicable Diseases Advisor	10
Venezuela - Mario Valcárcel, Communicable Diseases Advisor	10

V. Project Description

Although the project is intended to be a five-year effort, this document provides a plan for the first year only, during which activities will be devoted to the establishment of the surveillance network and initiation of drug efficacy studies. This enables the project to begin during the current USAID Strategic Objective timeframe.

Thus, in the first year of this project, regional activities will concentrate on the establishment of the sentinel surveillance network of participating institutions and national and international partners; and the development of a priority agenda and instruments to monitor national work plans. The agenda issues will include discussions and agreement on data collection and transmission, and establishment of priority lines for operational research, including the on-going or planned activities by the ministries of health and health services efforts to prevent and control malaria. In addition, the regional level will be responsible for facilitating South to South partnerships.

During the first year, activities in target countries will include the establishment of, and providing support to, the National Coordinating Technical Committee, in order to ensure that it is adequately constituted, and that it can operate and sustain a malaria surveillance network in each country. The selection and operation of sentinel sites to participate in the network will be a priority. Selected sites will initiate *in vivo* evaluations of the efficacy of antimalarial therapeutic drugs by means of standardized protocols and quality control by reference laboratories.

In addition, selected national collaborating centers will participate in the surveillance network as reference centers, in order to validate malaria drugs sensitivity *in vitro* and biological markers associated with resistance, as well as drug plasma levels.

Among the first tasks will be to define selection criteria for sentinel sites, determine equipment needs, and train program staff. The latter activity will require an identification of issues that may require training at regional level, such as the management of sentinel sites. It will also be necessary to provide training in the implementation of standardized protocols, and analysis, interpretation and use of surveillance data. Selected centers of excellence in South America will be identified for each subject area. Training materials will be produced and disseminated in target countries.

Within the project, the WHO/PAHO standardized protocol will be adapted to local conditions and disseminated in target countries, and drug efficacy studies will be planned, initiated and monitored. Project results will be analyzed and used as input to make recommendations about treatment at a later stage of the project.

PAHO and other collaborating partners will assist program managers in using surveillance information in advocacy meetings with national health authorities and other stakeholders to discuss possible changes in national malarial treatment schemes.

In reference to the development of new tools and approaches, the project will identify sites in inaccessible areas of the rain forest, where rapid tests are considered appropriate. Assessment trials of rapid tests, such as cost effectiveness as well as sensitivity and specificity studies will be conducted.

In future years, PAHO will assist target countries in the establishment of policy review committees consisting of key stakeholders for consensus building around issues, such as revision of treatment policies. In addition, through advocacy, PAHO will promote a strategic design and allocation of resources to implement new evidence-based policies for appropriate malaria drug schemes.

VI. Approaches for Subregional Surveillance and Policy Reform

The success of the strategies proposed to develop surveillance systems for drug resistance and to design and implement national policies for appropriate use of effective anti-malarial drugs will depend on:

- The management and responsibility for implementing sentinel surveillance resting with national technical bodies designated for this purpose. Surveillance of antimalarial drug resistance should be part of the regular epidemiological surveillance system. A national technical coordinating committee will be established to manage the project locally in each of the six countries.
- Selection, planning, organization, monitoring and evaluation, and definition of responsibilities related to sentinel sites and policy reform processes and related

activities would be undertaken by national authorities with local and regional representation.

- The selection of sentinel sites to test for antimalarial drug resistance should depend on local needs and epidemiological and sanitary characteristics in each country. Furthermore, issues related to access, communication channels, representativeness, and epidemiological interest should be taken into account.
- Surveillance of drug resistance in border areas may be done simultaneously by neighboring countries. Nevertheless, if common factors exist in both countries, surveillance could be shared alternatively or conducted by one of the countries. In order for a sentinel site to be selected, it must be representative of the epidemiological characteristics of the pilot area it serves and be accessible to the population.
- Epidemiological and scientific data generated by each participating country through sentinel sites will be shared. Feedback will be provided to network partners through available electronic and other communications media.

VII. Strategic Objective (SO), Goal, Intermediate Results and Activities

This PAHO project supports the USAID's Amazon Malaria Initiative objective "Malaria control programs in target countries in the Amazon Basin subregion substantially incorporate selected best practices." This project aims to contribute to the attainment of that objective, and will also contribute to PAHO/ WHO's Roll Back Malaria Initiative in the Americas (RBM/WHO-1999), which is to significantly reduce the global burden of malaria through interventions adapted to local needs.

1. Goal

The PAHO goal to which this project will contribute is to decrease morbidity and mortality from malaria by introducing safe and effective drug treatment schemes in areas where incidence rates are the highest, and in border areas.

2. Purpose

The PAHO purpose to which this project will contribute is to establish the surveillance network of anti-malarial drug resistance in Amazon region (at regional and national levels) (Spanish acronym, RAVREDA) in order to orient national policy formulation to manage safe and effective anti-malaria drug treatment.

3. Intermediate results (IR)

The project supports the following USAID's Amazon Malaria Initiative intermediate results:

- IR1: Reliable and standardized malaria drug efficacy information available.
- IR2: Tools and approaches developed, adapted, tested and disseminated.
- IR3: Partnerships to improve malaria control in the subregion enhanced.

4. Activities

Following are the proposed areas of activity (A) under each intermediate result for year 1.

At the Regional level, PAHO will coordinate and monitor the implementation of project activities. It will also provide the context within which each national activity will be planned. National coordinating committees will be established to direct the activities at the national level and reach consensus on common issues. The committees will include national representatives selected by national health authorities, and representatives of participating institutions .

PAHO will provide technical leadership and strongly assist RAVREDA in the collection, analysis and dissemination of malaria drug efficacy and effectiveness data in the Region. Information will be shared through the PAHO web site. The project will also support the development of local capacity to monitor and contain anti-malarial drug resistance.

IR1: Reliable and standardized malaria drug efficacy information available

The strategy will be to promote the development of a surveillance network of selected sentinel sites for anti-malaria drug resistance in each Amazon country. During year 1, the project will define the criteria for selecting sentinel sites, the equipment needed to implement it and training programs, in order to carry out the evaluation of therapeutic efficacy —through the utilization of standardized protocols— and the participation of reference laboratories for quality control.

Collaborating centers will be integrated into the RAVREDA in order to conduct *in vitro* sensitivity test validation. A RAVREDA Gene Bank - well-characterized samples of parasite DNA - will be developed in selected countries (see III).

Training will be provided in, inter alia, sentinel site management; WHO/PAHO protocol adaptation and implementation; susceptibility testing, and anti-malarial drug efficacy quantification.

There are four activities for IR 1 for FY01:

- A.1.1 Establish a regional network for surveillance of drug resistance and monitoring of activities under the coordination of PAHO.
- A.1.2 Establish national sentinel surveillance networks with quality control in each target country to assess the efficacy of malarial drugs.
- A.1.3 Provide training to improve national capability to conduct the surveillance network of malaria drug resistance in all target countries.
- A.1.4. Study findings reviewed, alternative treatments evaluated, and consensus on appropriate treatment protocols reached.

IR2: Tools and approaches developed, adapted, tested and disseminated

Through targeted tool adaptation and dissemination activities, interventions, such as rapid diagnosis, will be available for integration into national malaria control programs. During the first year, the project will focus on Brazil, where the use of rapid tests may be considered appropriate. Design or adaptation of protocols for rapid test trials, and inputs for conducting rapid test trial will be provided to selected sites. PAHO will also coordinate with other partners the use of surveillance and other tools. There is one activity within IR 2 for FY01.

A2.1 Rapid tests for malaria evaluated in selected sites and appraisal of their cost-effectiveness evaluated.

IR3: Partnerships to improve malaria control in the subregion enhanced.

Partnerships will facilitate south-to-south technical assistance, build on and take advantage of the capacity of existing institutions and encourage coordinated sub-regional and cross border control activities. In addition, IR 3 will contribute to sustainability of project activities. To achieve this purpose the project will conduct seminars and/or sponsor working groups, periodical meetings, and provide support documentation. At least one annual meeting will be convened for all members of the network and sponsoring organization to review progress and share concerns.

Centers of excellence will be identified in the Amazon Basin countries to provide South to South training and technical support in areas such as surveillance, drug efficacy studies and vector control.

There are three activities for IR3 for FY01.

- A3.1 Subregional dialogue and planning for prevention and containment anti-malaria drug resistance facilitated.
- A3.2 Centers of excellence for regional training identified and supported.
- A3.3 South-to-south technical assistance and training activities executed..

VIII. Budget

The proposed first year budget for PAHO's proposal is \$1,382,000 which will be used to assist countries to establish a malaria drug resistance surveillance network and carry out malaria drug efficacy studies (\$680,000) under IR1, tests tools and approaches (\$20,000) under IR2, and building partnerships (\$305,000) under IR3. Many of the partnership activities will support the implementation of surveillance network and drug efficacy studies through south to south training and technical exchange activities. The proposed budget includes a project technical coordinator as described in section IV. Project Management.

PAHO will provide \$200,000 for FY01 in direct contribution to malaria activities, in addition to approximately \$230,000 in staff salary. The total budget provided by USAID and PAHO amounts to \$1,812,000.

IX. Logical Framework / Monitoring Framework

Amazonian Network for Surveillance of Anti-Malarial Drug Resistance (RAVREDA)

SO Statement: Malaria control programs in target countries in the Amazon Basin sub-region substantially incorporate selected best practices.

Expected intermediate results	Milestones Year 1	Assumptions and Risks
IR1: Reliable and standardized malaria drug efficacy information available	<ul style="list-style-type: none"> ➤ Number of target countries that have selected an adequate number of sentinel surveillance sites, including a reference laboratory, and initiated training activities. ➤ Number of target countries where the WHO/PAHO protocol has been adapted. ➤ Number of target countries that initiated anti-malarial drug resistance studies based on the WHO/PAHO protocol. 	<ul style="list-style-type: none"> ➤ Continued political and financial support from the government regarding RAVREDA. ➤ Commitment from the institution responsible for sentinel sites to execute the WHO/PAHO protocols. ➤ Continued financial support from government and donors to develop and improve access to new anti-malaria scheme.
IR2: Tools and approaches developed, adapted, tested and disseminated.	<ul style="list-style-type: none"> ➤ Number of sites identified in Brazil with trials of rapid tests for malaria diagnosis initiated. 	<ul style="list-style-type: none"> ➤ Commitments from the institution responsible for carry outs trials of rapid test for malaria diagnosis.
IR3: Partnerships to improve malaria control in the sub-region enhanced.	<ul style="list-style-type: none"> ➤ Number of surveillance network of anti-malarial drug resistance activities carried out with technical assistance or exchanges between target countries 	<ul style="list-style-type: none"> ➤ Commitment between the authorities or institutions involved in the sub-regional cooperation process.

**Table 1: Risk of Malaria Transmission in the Americas,
(by country, 1999)**

Country	Population (in 1,000) in areas with ecological risk of malaria transmission								
	Total Population*	Low risk		Moderate risk		High risk		Total at risk	
		Total	%	Total	%	Total	%	Total	%
Bolivia	8,142	205	2.52	2,149	26.39	1,147	14.09	3,501	43.00
Brazil	167,988	65,077	38.64	4,063	2.74	3,328	1.98	73,008	43.46
Colombia	41,564	15,903	38.26	2,099	5.05	1,537	3.70	19,539	47.01
Ecuador	12,411	3,333	26.86	770	6.20	2,714	21.87	6,817	54.93
French Guiana	157	2	1.27	3	1.91	13	8.28	18	11.46
Guyana	855	503	58.83	45	5.26	57	6.67	605	70.76
Peru	25,230	6,957	27.57	2,590	10.27	2,537	10.06	12,084	47.90
Suriname	415	-	-	2	0.48	43	10.36	45	10.84
Venezuela	23,706	1,133	4.78	1,387	5.85	263	1.11	2,783	11.74
T O T A L	280,468	93,113	33.20	13,648	4.87	11,639	4.15	118,400	42.22

* Source: *Health Situation in the Americas: Basic Indicators 1999*.

PAHO/WHO

Brazil: Low Risk IPA < 10, Mod Risk 10 > IPA < 50, High Risk IPA > 50

All other countries: Low Risk IPA < 1/1000, Mod. Risk 1/1000 > IPA < 10/1000, High Risk IPA > 10/1000

- Not applicable

... Data not available.

Table 2: Epidemiological Status in High and Moderate Malaria Risk Areas for Amazon Countries with Active Malaria Programs (by country, 1999)

Country	Population* in mod./high risk areas (1999)	Persons at risk			Parasite species					Mortality
		Examined	Positive	API	<i>P.falciparum</i> & mixed	AFI	<i>P. vivax</i>	AVI	<i>P. malariae</i>	Preliminary data
Bolivia	3,296	159,009	49,847	15.12	7,525	2.28	42,480	12.89	0	1
Brazil	7,931	2,093,022	585,769	73.86	111,444	14.05	473,437	59.69	888	75
Colombia	3,636	...	62,999	17.33	24,736	6.80	36,514	10.04	310	12
Ecuador	3,484	349,905	81,066	23.27	46,984	13.49	34,082	9.78	0	16
French Guiana	16	47,974	5,307	331.69	4,528	283.00	564	35.25	214	5
Guyana	102	202,897	21,044	206.31	15,968	156.55	11,052	108.35	0	...
Suriname	45	65,087	13,939	309.76	11,685	259.67	1,371	30.47	883	...
Peru	5,127	1,980,330	164,105	32.01	66,988	13.07	91,795	17.90	46	49
Venezuela	1,650	171,942	16,686	10.11	2,499	1.51	11,435	6.93	7	2
T O T A L	25,287	5,070,166	1,000,762	39.58	292,357	11.56	702,730	27.79	2,348	160

* Population in thousands (Moderate and High Risk areas only)

Malariometric indices:

Annual Parasitic Index (API) = (Number of confirmed cases/population at moderate and high risk) * 1000

Annual *P. falciparum* Index (API) = (Number of confirmed *P. falciparum* cases/population at moderate and high risk) * 1000

Annual *P. vivax* Index (API) = (Number of confirmed *P. vivax* cases/population at moderate and high risk) * 1000

Source: PAHO (1999). Situation of Malaria Programs in the America. (Communicable Diseases Program).

Table 3: Antimalarial Treatments Completed (by Type of Treatment and by country, 1999)

Country	Treatments complete @ 1,500 mg of 4-amino quinolines	Number of reported cases	Number of first-line treatments available per 100 cases reported	Number treatments completed for resistant <i>P. falciparum</i>	Number of <i>P. falciparum</i> and mixed cases reported	Number of second-line treatments available per 100 cases <i>P. falciparum</i>
Bolivia	70,800	50,037	141	6,085	7,557	81
Brazil	935,150	609,594	153	171,195	114,605	149
Colombia	195,230	66,845	292	112,101	25,389	442
Ecuador	177,842	87,620	203	110	49,993	0
French Guiana	...	5,307	4,528	...
Guyana	23,300	27,283	85	39,244	16,144	243
Peru	94,259	166,579	57	57,653	67,169	86
Suriname	12,096	13,939	87	8,301	11,685	71
Venezuela	79,497	19,086	417	1,576	3,531	45

... Data not available.

**Table 4: Antimalarial Drugs Used in Target Countries in 1999 (by Drug and by country)
(number of tablets)**

Country	Chloroquine and or amodiaquine 150 mg	Primaquine 15 mg	Sulfa- pyrimethamine @500/25 mg	Mefloquine @250 mg	Artemisine derivatives Number of treatments*	Quinine @300 mg
Bolivia	708,000	967,000	-	2,500	-	238,085
Brazil	9,351,500	7,218,322	-	489,400	14,673	3,148,091
Colombia	1,952,300	1,459,506	332,000	-	-	60,233
Ecuador	1,778,424	495,256	-	-	-	-
French Guiana
Guyana	233,000	269,000	84,100	-	-	470,878
Peru	942,588	1,481,448	162,348	-	-	148,560
Suriname	120,960	30,650	21,000	1,068	-	452,780
Venezuela	794,972	421,304	2,408	-	-	32,461

* Artesunate and Artemeter @ 724 mg/treatment; Artemisinin @ 4,800 mg./treatment

... Data not available

- Not applicable