



THE ROLE OF PARTNERS FOR DEVELOPMENT IN MALARIA PREVENTION AND CONTROL IN CAMBODIA, 2004-2014

WITH SUPPORT FROM
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Title Page Photo: Mobile Malaria Worker (MMW) Mr. Phuong Sophal (middle) and mobile/migrant workers at O'Chrey village, Kratie Province, Cambodia (photo by Selin Volkan)

LIST OF ACRONYMS

BCC	Behavior Change Communication	KAP	Knowledge, Attitudes, and Practices Survey
BN	Bed nets	LSHTM	London School of Hygiene and Tropical Medicine
CC	Commune Council	MDR	Multi Drug Resistance
CMS	Cambodia Malaria Survey	MMP	Mobile Migrant Population
CNM	National Center for Parasitology, Entomology and Malaria Control or National Malaria Center	MMW	Mobile Malaria Worker
		MoA	Memorandum of Agreement
CtC	Child-to-Child Methodology	NFM	New Funding Model
DoE	District Office of Education	OD	Operational District
EAC	Equal Access Cambodia	ODDID	Operational District Drug Inventory Database
EDAT	Early Diagnosis and Treatment	PFD	Partners for Development
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria	PHD	Provincial Health Department
GIS	Geographic Information System	PMU	Provincial Malaria Unit
HCMC	Health Center Management Committee	PMW	Plantation Malaria Worker
		PoE	Provincial Office of Education
HIS	Health Information System	RAI	Regional Artemisinin Initiative
HSS	Health System Strengthening	RH/HC	Referral Hospital/Health Center
IEC	Information, Education and Communication	SHE	School Health Education
LLIN	Long Lasting Insecticide Treated Net	VHSG	Village Health Support Group
		VHV	Village Health Volunteer
ITN	Insecticide Treated Net	VND	Village Net Distributor

1. INTRODUCTION

Malaria is a life-threatening disease caused by parasites that are transmitted to humans through the bites of infected mosquitoes. The disease is endemic in many countries around the world including ten countries of the Western Pacific Region, with resistance to chloroquine and other commonly available antimalarial drugs posing a major concern for malaria control in this sub-region and worldwide. The problem is most critical in the countries of the Greater Mekong Sub-Region, which includes parts of China, Laos, Burma, Thailand, and Cambodia – the global epicenter of multi-drug resistant *P.falciparum* malaria (MDRPF), with such resistance estimated to have started around 2001.

According to the World Health Organization (WHO), a total of 7.92 million people in Cambodia reside in high and low malaria transmission areas combined, representing 53% of the total population (44% in high transmission and 9% in low transmission areas).¹ While morbidity and mortality related to malaria have both been declining steadily in Cambodia over the last decade, it is still one of the leading public health problems in the country, especially given the increase in the incidence of Multi Drug Resistant (MDR) malaria among Mobile and Migrant Populations (MMP)² working and living in at-risk and hard-to-reach areas in close proximity to the tropical forests. This situation is exacerbated further by poor public health care coverage in remote endemic provinces which results in over 70%³ of Cambodian patients with fever cases seeking inappropriate treatment from the unregulated private sector, increasing the risk of building resistance.

The Global Fund to Fight Aids, Tuberculosis, and Malaria (GFATM) began its work in 2002, with funding made competitively available through “rounds” of multiple years. Over the course of six funding rounds (2, 2RCC, 4, 6, 9-SSF, and RAI)⁴ through the GFATM, Partners for Development (PFD) has aimed to strengthen and scale up the most successful malaria control and prevention activities throughout five provinces of Cambodia: Kratie, Stung Treng, Koh Kong, Kampot and Monduliri.

This report summarizes PFD achievements with GFATM funding of \$6,023,659 received to date from January 1st, 2004 through December 31st, 2014 (Please refer to Appendix One for an overview of the GFATM funding grant). It includes PFD’s methodology for malaria prevention and control with a detailed

¹ WHO. World Malaria Report 2014. Country Profiles: Cambodia pg.83 Found at:

http://www.who.int/malaria/publications/country-profiles/profile_khm_en.pdf

² PFD uses the following MMP definitions: Mobile population refers to residents in the area for less than 6 months; and migrant population refers to residents in the area for more than 6 months but less than 1 year. Local population refers to residents in the area for more than 1 year. The key MMP profiles include: seasonal workers (all population types), visitors (mobile), forest workers (all population types), construction/mine workers (mobile/migrant), and security personnel (mobile/ migrant).

³ Global Health Group, University of California, San Francisco (UCSF). The Private Sector’s Role in Malaria Surveillance. December 2014. Found at:

<http://globalhealthsciences.ucsf.edu/sites/default/files/content/ghg/mei-private-sectors-role-in-malaria-surveillance.pdf>

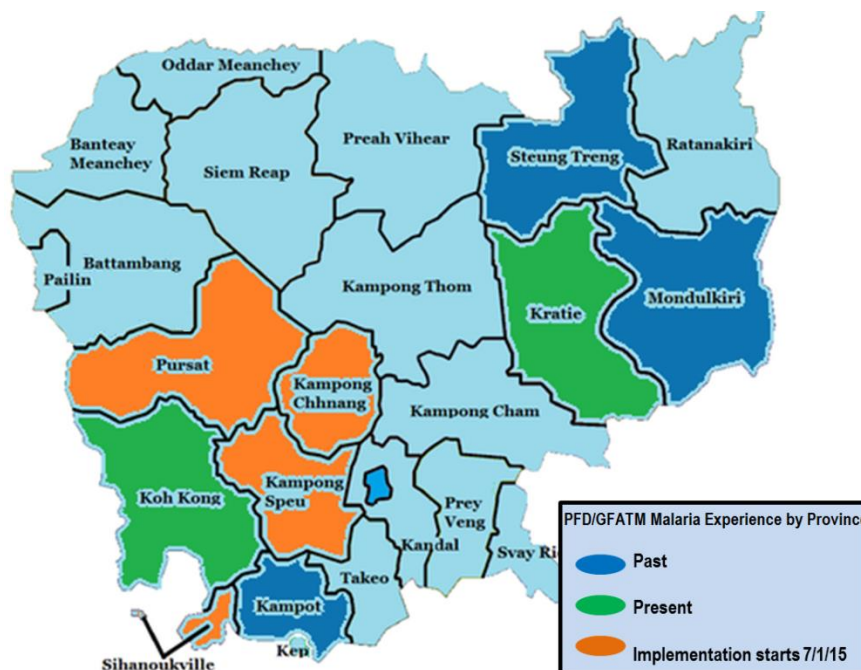
⁴ RCC: Rolling Continuation Channel; SSF: Single Stream Funding; RAI:Regional Artemisinin Initiative.

list of program indicator results and outcomes, activities, trainings, partners and beneficiaries. Over the course of GFATM funding, PFD's approach has been a community-based one: seeking to build the capacity of community level partners so that those partners can themselves sustainably undertake malaria prevention programs once the pre-elimination stage⁵ is reached and continue working towards eliminating all forms of malaria in Cambodia entirely by the target year 2025, in line with the National Strategic Plan for Elimination of Malaria (2011-2025).

The report does not directly correlate an impact between PFD's activities and changes in malaria morbidity or mortality in the country or in the target areas; but it does suggest that these types of programs implemented in collaboration with other similar programs and within a supportive policy environment can pay dividends in both mitigating the effects of malaria and building local capacity to prevent malaria. Due to the GFATM policy of not having sub-recipients report on their geographical area of implementation but rather amalgamating data for an overall national view, it is not possible for PFD to comment on the direct impact of specific program activities. However, PFD can take the national data – from the Cambodia Malaria Survey (CMS) conducted by the National Center for Parasitology, Entomology and Malaria Control (CNM) about every three years, as well as the Global Fund Grant Performance Reports – and apply it largely to its own area of operation in terms of making some suggested conclusions about outcomes impact.

2. PROGRAM BACKGROUND

In Cambodia, malaria remains a health risk for 44% of the population residing in high transmission areas. While morbidity and mortality related to malaria have both been declining in Cambodia over the last decade, malaria transmission among the MMP that travel between endemic and non-endemic regions poses a serious threat to the elimination of the disease and contributes to the potential spread of anti-malarial drug resistance



⁵ Pre-elimination refers to the stage between control and elimination of malaria in endemic countries.

already documented s near neighboring country borders.

Results from the latest Cambodia Malaria Survey -- conducted by CNM in 2013 -- indicate great improvements in terms of mosquito net coverage over the years; with 99.7% of households reporting having at least one net of any type, and 77.8% of households having at least one insecticide-treated net compared to 80% and 25%, respectively, in 2007. However, these results are not as reassuring when they are restricted to households with sufficient number of nets and behaviors related to net usage. According to the same CNM national survey, only 53% of households in at risk areas had sufficient nets (1 net per two people) and only 49.9% reported sleeping under an insecticide-net the previous night; with a slightly higher proportion of people at 57.3%, living in less than 2km from the forest reporting sleeping under an LLIN the previous night.

In addition to the slow paced behavioral change observed among people in terms of adopting malaria prevention measures in their daily lives in Cambodia, poor health care coverage in endemic provinces continues to stand against the access to accurate malaria diagnosis and quality treatment, disproportionately affecting the MMPs in forested and remote areas. Accordingly, PFD and its partners have addressed this challenge by providing training and appropriate diagnosis and treatment tools to Mobile Malaria and Plantation Malaria Workers (MMW/PMWs), who are either MMP themselves or people who are more accessible to this target population.

Over the course of six funding rounds from the GFATM (2, 2RCC, 4, 6, 9) with two ongoing as of late 2014 (SSF and RAI), PFD has aimed to strengthen and scale up effective malaria control activities with the following objectives, corresponding to the national malaria control program's objectives:

- *Strengthen the institutional capacity of the national malaria control program at central, provincial, operational district(OD) and commune levels;*
- *Increase knowledge and ensure universal community awareness and behavior change on malaria prevention and control among the population at large and at-risk through supporting the containment of artemisinin resistant parasites and the elimination of all forms of malaria through comprehensive behavior change communication (BCC), community mobilization, and advocacy;*
- *Improve access to early malaria diagnosis and treatment services with an emphasis on detection of all malaria cases (including among mobile/migrant populations) and ensure effective treatment. Specifically prevent transmission of artemisinin resistant malaria parasites among target populations (including MMPs);Decrease drug pressure for selection of artemisinin resistant malaria parasites by improving access to appropriate treatment and preventing the use of monotherapies⁶ and substandard drugs; and*
- *Provide effective management and oversight of information systems and surveillance and coordination of partners and health services to enable rapid and high quality implementation of the strategy.*

⁶Monotherapies refer to non-combination drug therapies that often lead to the development of drug resistance. While there are likely many factors that contribute to the emergence and spread of resistance, the use of oral artemisinins alone, as monotherapy, is thought to be an important driver because when treated with an oral artemisinin-based monotherapy, patients may discontinue treatment prematurely following the rapid disappearance of malaria symptoms. This results in incomplete treatment, and such patients still have persistent parasites in their blood. Without a second drug given as part of a combination (as is provided with an ACT), these resistant parasites survive and can be passed on to a mosquito and then another person.

The primary goal of PFD malaria programs since mid-2010, including the latest GFATM SSF-Phase II grant, from April 1st, 2013 through June 30th, 2015, has been to move towards pre-elimination of malaria across Cambodia with special efforts to contain artemisinin resistant *P. falciparum* malaria. In order to do so, PFD has been working extensively with the MMPs and forest-goers, who are at the highest risk for contracting both types of malaria, and contributing negatively to the spreading of the multi-drug resistant Pf parasites. Despite over a decade long decrease in malaria prevalence and incidence rates in Cambodia, the 2009 Cambodia Containment Survey reported that the prevalence of malaria among mobile populations is significantly higher than the national rates of the general population. For instance, ‘forest-goers’, a sub-group of the MMP population, were reported to have the highest malaria prevalence rates with 4.1% by microscopy and 11.4% by PCR⁷, stressing the importance of working to improve the health conditions of this PFD target group as a component of moving toward a nation-wide pre-elimination period.⁸

Over the years, PFD program beneficiaries have included students and teachers receiving School Health Education; villagers and other community members receiving training through Information, Education and Communication (IEC) / Behavior Change Communication (BCC) programs throughout five provinces of Cambodia: Kratie, Stung Treng, Koh Kong, Kampot and Mondulhiri, and MMPs in Koh Kong and Kratie Provinces. In addition, PFD’s work with GFATM funding has benefitted our local partners including the Provincial Malaria Units (PMU), district level MOH, commune councils (CC), health center management committees (HCMC), village development committees, referral hospitals (RH), health centers (HC), and health posts.

⁷ Microscopy (microscopic diagnosis) and PCR (molecular diagnosis) are both possible diagnosis techniques for malaria; former can be identified by examining a drop of the patient's blood under the microscope, while the latter uses polymerase chain reaction (PCR) in order to detect parasite nucleic acids.

⁸ Malaria Consortium. Report of the Cambodia Containment Survey 2009 and 2010. Found at: <http://www.malariaconsortium.org/media-downloads/151>

3. PROGRAM RESULTS

3.1 Selected Innovative Activities in Malaria Control by PFD

Most of the community-based work PFD manages in Cambodia under its malaria-mitigation initiative is related to Information, Education and Communication (IEC)/ Behavior Change Communication (BCC): this is one of the most important components of moving towards malaria pre-elimination phase and eventually eliminating malaria altogether.

Although the results from the Cambodia Malaria Survey conducted by CNM in 2013 among the households located at the highest risk areas indicate that the knowledge of malaria being caused by mosquito bites is high, there's still a significant level of misconception about the transmission of malaria with 25% of the respondents reporting that malaria is linked to not boiling water. More importantly, there is also an observed gap in understanding the difference between 'treated' and 'untreated' bed nets indicating a lack of sufficient knowledge about the added benefits of using insecticide-treated nets to prevent malaria. Given the current circumstances, PFD continues to stress its community-based efforts and BCC activities, which include malaria education and training provided to companies and plantation workers, students, teachers and other at-risk populations. Along with carrying out these community-based activities, PFD also focuses on health systems strengthening (HSS) activities through local capacity building and providing a number of different trainings to health staff and volunteers at all levels.

To further educate about malaria and thus improve control of the disease, PFD has initiated several innovative activities, such as:

- School health education, including Child-to-Child Methodology, extracurricular activities like role plays and drama, and screenings of a PFD documentary video on malaria school health education. PFD works with children to increase awareness and disseminate knowledge about malaria
- Malaria Week events, including activities such as malaria screening, health education, and an LCD show, quiz and prize. Since 2005, PFD's 'Malaria Week' initiative has provided a forum for interested community members to easily access important messaging related to malaria treatment and prevention.
- Training for Mobile Malaria Workers (MMW) and Plantation Malaria Workers (PMW), and the provision of necessary supplies for diagnosis and treatment of malaria among migrant populations and plantation workers. The work of the MMW and PMW enables free and safe treatment for villagers and forest workers living in remote areas of Cambodia, who otherwise would not have access to malaria treatment.

Please refer to Appendix Two for more comprehensive detail about PFD's several innovative activities in malaria control.

3.2 Program Achievements (output indicators)

This report focuses largely on outputs as the sub grants from GFATM did not provide funding for baseline surveys and GFATM has wanted data from sub recipients to be aggregated together. Thus, when Cambodia Malaria Survey (CMS) reports are issued by the National Malaria Center (CNM), as they have been every three years since 2004, these reports do not include province-specific data apart from two broader geographical Domains 1 and 2.

Please find the summary table of PFD's program achievements containing each program's objectives, indicators, and target and results in Appendix Three.

Despite being unable to report on region specific outcomes of PFD interventions, the latest CMS 2013 is a good baseline comparison for PFD's progress among targeted populations: the households surveyed in this report represent all targeted and non-targeted at-risk villages nationwide, of which some were/are beneficiaries of PFD. In addition, PFD can also gauge its impact to some extent through other means, such as malaria outpatient data. Also, the total number of malaria cases reported and treated at health facilities more than halved from 115,614 in 2001 to 45,553 in 2012, and was further reduced to 26,278 cases in 2014; with malaria incidence rate per 1000 population steadily dropping from 10.8 in 2003 to 1.73 in 2014⁹. As one of the longest standing partners in the fight against malaria in Cambodia, PFD believes its malaria prevention programs in Kratie, Stung Treng, Koh Kong, Kampot and Monduliri provinces have been highly effective in achieving these results:

3.3 Program Achievements (outcome indicators)

To assess its impact in key outcome areas, PFD has conducted various internal, patient and Knowledge, Attitude and Practice (KAP) Surveys targeting PFD beneficiaries. The results of these surveys demonstrate that PFD activities have been effective and that PFD reached or exceeded targets in the Global Fund Performance Framework outcome indicators included in its own work plan. Increasing awareness and ensuring the dissemination of knowledge of malaria among the Cambodian population has been one of the most important objectives and strategies of PFD'S malaria work: awareness is the key to improving the much needed long term behavioral changes in prevention and proper treatment seeking patterns, which will eventually lead to the elimination of the disease.

For this reason, PFD has assessed its impact on outcomes mainly through the two outcome indicators. Theses measure: (1) the percentage of community people who attend community based malaria events and answer malaria questions correctly through quiz-shows; and (2) percentage of school children who disseminate malaria prevention messages to their friends, families and other community members through various activities. In 2014, PFD also created another significant outcome indicator (3) Percentage of company/plantation workers who "slept under an insecticide-treated net the previous

⁹ CNM Presentation. Achievements of National Malaria Control Program. March 2013.
http://www.cnm.gov.kh/userfiles/file/Annual%20Report%202012/1_CNM_Presentation.pdf

night” in order to assess its work with the plantation/ company workers. The progress related to this MMP sub-group is crucial because they are not specifically measured for outcomes under the GF despite displaying lower rates of malaria prevention. Please find a detailed table of outcome indicators, which are further explained below, in Appendix Four.

The school health program survey conducted in Kratie and Koh Kong among 44 students who have received malaria health education via PFD child-to child methodology reported that there were 42 (95%) school children who disseminate malaria prevention messages to their friends, families and community members by either singing songs, teaching information or telling a story about malaria. Additionally, they encouraged families to practice malaria prevention. Moreover, two (5%) school children failed to disseminate malaria prevention messages because they were embarrassed to speak about malaria and a few children were intimidated to speak with adults about it. Furthermore, 95% of school children disseminating malaria information is higher than the grant target of 90%, as well as higher than the 2012’s result of 87%, indicating further positive outcome achievements over the years.

This 2013 survey tracked 254 events and captured data from all of the villagers (n=5713) who participated in the quiz during the LCD shows in Kratie and Koh Kong province and found that; through PFD’s promotion of community based health education via LCD shows, 80% (equal percentage of males and females) of the show participants were able to answer the malaria quiz questions correctly. These community members were able to explain the symptoms, causes, prevention and treatment methods of malaria, identify high-risk areas for conducting malaria, explain how to use LLIN/LLIHNS, including being able to explain the advantages of LLIN/LLIHNS. Specifically, 80% correct answer rate is significant because it demonstrates knowledge of the benefits of treated nets compared to the national malaria survey findings of less than half of respondents (41.8%) mentioning that insecticide-treated nets specifically can be used to prevent malaria.

According to the KAP Survey conducted by PFD among the plantation and company workers in Koh Kong and Kratie in May 2014¹⁰ in order to document program progress and knowledge, perception and behaviors towards malaria among MMPs, it was found that 69% (20% ITN, %46 LLIN, 3% treated hammock net) of the workers slept under a treated net the previous night against the grant target of 30%. Furthermore, these finding compared to the latest national CMS 2013 findings show results either comparable to, or exceeding that of the national progress at high-risk areas; with 43% of people who slept overnight in the forest in the previous 6 months reporting using an ITN on their last trip to the forest.

Furthermore, from the results of the same KAP Survey, PFD also documented that 60% of the respondents mentioned “using treated mosquito net” versus 55% of respondents (35% of Domain 2¹¹) in the CNM Cambodia Malaria Survey 2013, indicating changes in knowledge towards positive malaria prevention behaviors among the plantations and company workers who are engaged with PFD and its activities.

¹⁰The KAP Survey Report can be found at the end of this summary report; Annex II.

¹¹ 10 Southern and Eastern Provinces.

Forest Package project was assessed by PFD after its first year of implementation in 2014. Thirty-nine selected forest goers who bought forest packages through the PFD project were interviewed, and 67% (26) of them reported contracting malaria before 2014 (33% or 13 people reported being malaria-free for over a year), compared to only 1 (3%) forest-goer contracting malaria in 2014. Interview results show that 38 (97%) forest goers who bought forest packages were malaria-free. Between 2013 and 2014, there was a 64% reduction in malaria incidence amongst forest-goers.

3.4 Beneficiaries

PFD partnered with a number of local organizations to implement these programs. Through these partnerships, PFD was able to provide training and assistance to thousands of beneficiaries in Cambodia on a range of issues, including Malaria Health Education, treatment and distribution of bed-nets, and rational drug use.

In particular, PFD trained 208 OD/HC staff and 2,276 VHVs in Koh Kong and Kratie with Malaria Health education, which helped reach more than 260,000 people with community-based health education. In order to reinforce lessons on accurate information regarding malaria treatment and prevention, PFD also trained school teachers so that they were able to reach 50,137 school children with key messaging. In addition, PFD also trained 332 plantation and company volunteers to be mobile malaria and plantation malaria workers in order to target this highly vulnerable population.

In collaboration with PMU, OD, and HC staff, PFD organized 20 malaria events in the Koh Kong and Kratie provinces that were attended by over 6,000 people, half of whom were women. PFD trained nearly 1,000 clinic staff and volunteers on proper treatment and distribution of insecticide-treated bed-nets; thanks to these initiatives, over 96,000 people in more than 400 villages across Koh Kong and Kratie received community-based malaria health education.

The detailed summary table of all partners and beneficiaries can be found in Appendix Five

3.5 Key Partners

Many of PFD's partnerships have lasted over several years and projects, allowing PFD to form solid rapports with local organizations to have a lasting impact in the regions in which these organizations work. With Kratie PMU, PFD's oldest partner in malaria control in Cambodia, PFD's work in distributing bed nets, educate volunteer workers, broadcast malaria messages through TV and LCD shows has successfully decreased malaria mortality rates in the area by almost 20% . PFD implemented similar programs in collaboration with Koh Kong PMU, increasing the number of referrals and diagnoses for malaria cases and decreasing the malaria mortality rate.

For a full summary of PFD's partnerships in Malaria Control in Cambodia from 2003-2014, please refer to Appendix Six.

4. FINDINGS AND RECOMMENDATIONS

4.1 Findings

- 4.1.1 Despite the decline of malaria incidence observed in the last decade in Cambodia, malaria still poses a considerable health burden to its population -- especially to high-risk groups such as inhabitants of its villages in close proximity to forests and mobile and migrant populations (MMP); as a result, these groups have been identified as 'high risk groups' vulnerable to contracting malaria and drug-resistant strains of malaria.
- 4.1.2 Population movements since the 1950's, Cambodia's population movements from non-malaria endemic areas to malaria endemic areas in Cambodia been identified as one of the main factors involved in contributing to the emergence and spread of antimalarial resistant parasites documented in the last years.
- 4.1.3 In 2009, it was reported that during the five years prior to the 2008 Cambodian census, it has been estimated that between 200,000 to 350,000 people, that close to about 25% of 200,000 to 350,000 population them non-immune to malaria, migrated to a "malaria" village or area¹², creating an additional challenge against the overall containment strategy and malaria elimination efforts for in this region. Multi Drug Resistant malaria within Cambodia also poses international threats: those afflicted with this type of malaria can become unintentional carriers of it to other countries, including within South East Asia or sub Saharan Africa, where the burden of malaria is much higher.
- 4.1.4 General economic development and improvement of road infrastructure leading to improved access of land available for various development projects (agriculture/plantation, hydro-electric dam, commercial logging), have further changed malaria epidemiology in Cambodia over the last several years. As a result of job opportunities created by economic development, the country has also seen an increase in the number of the mobile and migrant populations (MMP), who currently constitute the highest risk group for malaria prevention and treatment services due to their high mobility. In addition to travelling between malaria endemic and non-endemic areas, MMP are also documented to have worse risk taking-behaviors due to mobility, poverty and legal status resulting in reductions in proper care seeking behaviors¹³. The lack of regulated treatment and proper drug usage among MMP closely links this population to the emergence and spread of *P. falciparum* multi-drug resistant parasites.
- 4.1.5 Furthermore, the mortality and morbidity related to malaria are especially high in certain densely forested areas and during particular time periods, such as the rainy season¹⁴. Despite the effort made to improve the health system in the country, accessibility to public health services is still limited by inability to pay for transportation costs associated with travelling to faraway public facilities, especially when road conditions worsen during the wet season. On the

¹² Partners for Development. 'Knowledge, Attitude and Practice Survey among Plantation and Construction Workers in Malaria Areas in Kratie and Koh Kong Provinces.' January 2015.

¹³ CNM, LSHTM and Malaria Consortium. Strategy to Address Migrant and Mobile Populations for Malaria Elimination in Cambodia. March 2013.

¹⁴ There's a clear seasonal pattern with increases in the number of treated/ reported cases of malaria in the public facilities in Cambodia during the rainy season (May-November). National Malaria Control Program's month distribution of treated cases chart demonstrates this pattern observed every year.

other hand, the private health sector has been expanding quickly since the late 1990s; however, this sector is still not fully regulated with limited ability to enforce existing legislation despite government efforts. In addition, the limited regulation of drug imports has previously led to the use of fake and substandard anti-malaria drugs, especially artemisinin derivatives and monotherapies, which is believed to have triggered the emergence of resistance to antimalarial drugs at the first place¹⁵. Despite this, the majority of malaria patients prefer getting treatment from a private health service setting since it is more adaptable to client demands for the reasons mentioned previously. Fortunately, in 2013 Cambodia Malaria Survey reported that 100% of the outlets surveyed reported that they no longer sell or store Artemisinin monotherapy, showing a better understanding of drug resistance, change in behavior and the success of the national malaria control policy framework that encourages partnerships between public and private sectors. Similarly, other recent studies have also shown major improvements in status of drug quality and availability of substandard and counterfeit medicines in the country. Although in the recent years the drug quality, which is linked to building resistance is less of a problem; the dependence on the private outlets still pose a challenge towards the surveillance of malaria cases and making sure patients receive instructions on how to properly use the anti-malarial drugs¹⁶.

- 4.1.6 All of the complexity of the above issues considered, there needs to be an interdisciplinary approach in research and a multi-sectorial approach for strategy and program implementation. Since 2010, PFD has been involved in conducting research to address the issue of MMP and drug resistance with partner NGOs (University Research Corporation, Population Services International) and research institutions (International Relief and Development, Institute Pasteur du Cambodge, London School of Health and Tropical Medicine). The research conducted has been focused on a better understanding of MMPs population characteristics (including the plantation and company workers), assessing their level of knowledge, preferred prevention and treatment seeking behaviors and movement patterns using a mix of qualitative and quantitative methodologies. As a result of the above research, the drug resistance ‘hot spots’ and the movement patterns of infected MMP will be accessible through various maps created as bi-products of research analysis; which are essential tools for advancing future program interventions and guidelines to be adopted by the National Malaria Control Strategy targeting MMP and moving towards elimination.
- 4.1.7 PFD’s Malaria Program over the last decade has been involved in piloting and developing community-based interventions which have contributed to the reduction of malaria morbidity and mortality in target villages by introducing innovative ways of reaching out to the high-risk

¹⁵ Dondorp AM, Nosten F, Yi P, Das D, Phyo AP, Tarning J, *et al.*: Artemisinin resistance in *Plasmodium falciparum* malaria. N Engl J Med 2009, **361**:455-67.; Dondorp, A. M. *et al.* The threat of artemisinin-resistant malaria. N. Engl. J. Med. 365, 1073–1075 (2011); Phanouvong S, Raymond C, Krech L, Dijiba Y, Mam B, *et al.* (2013) The quality of antimalarial medicines in western Cambodia: a case study along the Thai-Cambodian border. Southeast Asian J Trop Med Public Health 44: 349-362.

¹⁶ “Action plan to significantly reduce the number of substandard and counterfeit medicines...has been successful in reducing the failure rates of samples collected in Cambodia from a high of 7.4% in 2006 to a low of 0.7% in 2011.” Krech LA, Barlow CL, Siv L, Phanouvong S, Yuan WE, *et al.* (2014) Cambodian Ministry of Health Takes Decisive Actions in the Fight Against Substandard and Counterfeit Medicines. Trop Med Surg 2:166. doi: 10.4172/2329-9088.1000166

populations that are still beyond the reach of the national program and resources. Despite the improvements over the last decade, a possible untimely withdrawal of funding from the GFATM, – the major donor of malaria programs in Cambodia¹⁷—following the 22% decrease, could seriously hinder malaria elimination efforts and even result in a reversion of the accomplishments thus far as argued by many development field workers.¹⁸¹⁹

- 4.1.8 The current funding atmosphere stresses the necessity and importance of partnerships to ensure sustainable result and long-lasting social and behavioral changes despite the limited timeframe. Accordingly, PFD will continue implementation of malaria prevention and control programs under the next round of GFATM, *New Funding Model*, as a member of the Cambodia Health Consortium Partnership (CHCP) created between PFD, Health Poverty Action (HPA) and Catholic Relief Services (CRS). The Consortium will be responsible for implementing activities covering all 45 malaria endemic national operational districts – further strengthening the capacity and positioning of Cambodia for its fight against malaria and complete elimination of the disease once the international support is withdrawn.

4.2 Recommendations

- 4.2.1 Continuation of community-based programming as the MOH does not have resources to do so. (Ongoing PFD projects: Malaria Week/Day, School Health Education program, Mobile Malaria Workers, Plantation Malaria Workers)
- 4.2.2 Support of the decentralization process at commune level to empower local communities and improve local governance. (Ongoing PFD projects: Small Funds and capacity building of HCMC and Commune Councils)
- 4.2.3 Continuation and expansion of the innovative delivery systems for prevention and treatment services for the MMPs (Ongoing PFD project: subsidized Forest Package Project)
- 4.2.4 Find innovative ways to attract and create incentives for expanding the network of volunteers and increase the level of commitment among the MMW/PMWs specifically. This approach should involve better timing of recruitment and follow –up given the mobile nature of the MMPs and dependency on the availability of work seasons, workplaces and jobs.

¹⁷ “Of the total US\$80 million expenditure during the period 2009-2013, US\$57.9 million (79%) was funded by the GFATM alone, compared to a government contribution of US\$4.7 million (6%).” CNM. ‘Benefits to National Malaria Programs From Regional Support: The Cambodia Case’. May 2014.

¹⁸ Global Health Group, UCSF. The Impact of the Global Fund’s New Funding Model on Asia Pacific Malaria Elimination Countries. May 2014. Found at:

<http://globalhealthsciences.ucsf.edu/sites/default/files/content/ghg/GF-funding-elimination-APMEN.pdf>

¹⁹ “In 2014 a large overall future funding gap, at \$623.6 million, was already estimated for Cambodia between 2011 and 2025 – which is the additional funds necessary to fully implement the national strategy.” Asia Pacific Leaders Malaria Alliance. “An overview of antimalarial commodity issues in the Asia Pacific region.” 30 May 2014. Found at: <http://aplma.org/upload/resource/Papers/overview%20of%20antimalarial%20commodity%20issues%20in%20the%20asia%20pacific%20region.pdf>

- 4.2.5 Develop research capacity and coordination with research institutions to operationalize research results, especially regarding the issue of drug resistance and MMPs, as information about their areas of movement, and their challenges to access services in the health system are highly limited and the majority of severe malaria cases result from delayed treatment among MMP's. (Ongoing PFD projects: RAI Community-based and survey support, LSHTM TRAC Program collaboration)
- 4.2.6 Develop internal outcome and impact indicators for provincial or district level interventions and systematically collect and evaluate outcome impact of PFD programs. If possible, ensure to conduct more periodic KAP surveys and also contract an external evaluator in order to better document impact over the years.
- 4.2.7 Possible future projects to consider include: (a) multi-sectorial approaches that address malaria, MMP, drug resistance, and climate change- if rainfall or storms increase, there will be more chance for increased transmission of malaria and dengue fever in the region as well.

5. APPENDICES

5.1 Appendix One: Summary Table of Detailed Grant Information, 01 January 2004–30 September 2016

Grant Round	Effective Dates	Grant Number	Funding Amount	
<i>Round 2</i>	January 01, 2004 – December 31, 2008	CAM-202-G03-M-00-PFD1	\$1,076,702	
<i>Round 4</i>	September 01, 2005 – August 31, 2009	CAM-405-G06-M-PFD2	\$944,759.07	
<i>Round 6</i>	January 01, 2008 – December 31, 2010	CAM-607-G10-M-PFD3	\$1,027,919	
<i>Round 2 Rolling Continuation</i>	May 01, 2009 – June 30, 2010	CAM-202-G13-M-PFD	\$454,300	
<i>Round 9 Single Stream Fund SSF Phase I</i>	July 01, 2010 – March 31, 2013	CAM-S10-G14-M-PFD	\$2,169,051	
<i>Round Mal SSF Phase II</i>	April 01, 2013 – June 30, 2015	CAM-M-UNOPS	\$1,036,597.32	
<i>Regional Artemisinin Initiative (RAI)</i>	October 01, 2014 – September 30, 2016	QMU-M-UNOPS	\$283,182.45	
Total		January 01, 2004 – September 30, 2016	Seven Agreements in six rounds (round 9 has two agreements)	\$6,992,510

5.2 Appendix Two: Summary Table of Innovative Activities in Malaria Control by PFD, 01 January 2004– 31 December 2014

Category	Intervention Name	Components & Description	Target Province	Timeframe
Community-based Behavior Change Communication (BCC)	School Health Education (SHE)	SHE initiative consists of many different components such as the Child-to-Child Methodology (CtC), Game & Quiz on Malaria Prevention, School Health Education Sessions, Extracurricular activities, Role Plays, Drama, and screening of the video production of the role-play performed by children. PFD produced one 15-minute documentary video on malaria school health education and one 15- minute student- role- play video on malaria school health education. The documentary video featured background and history of PFD's malaria school health education, malaria situation, project locations, key activities, key partners, advantage of school health education and impact of program results. Working with children in order to increase awareness and disseminate knowledge about malaria has been a priority for PFD given the higher degree of receptivity of children for new knowledge and the enthusiasm to disseminate newly acquired knowledge.	Koh Kong, Stung Treng, Kratie and Mondulhiri	01 September 2005 to 31 August 2009
			Kratie, Koh Kong, Stung Treng	01 July 2010 to 31 December 2015
			Kratie and Koh Kong	01 January 2013 to 30 June 2015
Community-based BCC	Malaria Week/Day Event	PFD has been implementing the Malaria Week since 2005. The activities included in the Malaria Week/ Day events over the years have been: conventional net re-impregnation or LLIN/ITN distribution, malaria screening and treatment, EDAT, health education, and LCD show followed by quiz and prize. The exact duration of these events have varied across provinces and implementation period ranging from a full day and half- night to multiple days. The program seems to be a most effective approach since community people are interested to come and join in the event, which has been increasing the chances of PFD's efforts in creating awareness and reaching out to as many community members as possible. These events are also supporting the national strategy and proven methods of vector control such as the LLIN distribution and re-impregnation, by reaching out to additional community members where it would not be possible exclusively through limited government resources.	Kratie, Stung Treng and Koh Kong	01 September 2005 to 31 August 2009
			Kratie, Stung Treng, Koh Kong and Kampot	01 January 2008 – December 2012
			Kratie and Koh Kong	01 January 2013 to 30 Jun 2015

Category	Intervention Name	Components & Description	Target Province	Timeframe
Community-based BCC & Health Systems Strengthening (HSS)	Volunteers, Workshops and Training	<p>In order to effectively spread the health messages to community people in particular at remote rural communities, Village Health Volunteers are trained and regularly refreshed and retrained on specific health prevention topics and pedagogy. PFD has also trained PMU/OD/HC/HP staff on HIS/ODDID, Basic Epidemiology and GIS/health Mapper and VHSGs/VHVs/CCs/HCMC in Malaria health education, IEC and EDAT (Early Diagnosis and Treatment) use.</p> <p>Basic Epidemiology: The main purpose of the training workshop was to provide basic knowledge to health staff (PHD, OD, HC staff) on data management and analysis, concept of epidemiology, and other necessary topics.</p> <p>GIS/health Mapper: In order to map where exactly the malaria high endemic village is, in collaboration with National Malaria Center (CNM), PFD had organized one GIG/Health Mapper Training for PHD, OD, and HC staff working target provinces. The main purpose of the training workshop is to introduce the new technology equipment, provide basic information/instruction on how to use, and to do mapping which linkage to ITS.</p> <p>EDAT/ Logistics Training: To support access to the early diagnosis and treatment strategy (EDAT), the improvement of drug supply is one of the concerns of PFD. In collaboration with Drug Domestic and Food (DDF) of the ministry of health and PHDs, PFD had organized Logistic Management Trainings for health staff especially those who are the drug storekeepers in order to improve the drug supply system including health information system (HIS) particularly for the anti-malaria drugs and Rapid Diagnosis Test (RDT).</p>	<p>Koh Kong and Kratie</p> <p>Kratie, Stung Treng and Koh Kong</p> <p>Kratie, Koh Kong, Stung Treng and Kampot</p> <p>Kratie and Koh Kong</p>	<p>01 January 2004 to December 2008</p> <p>01 September 2005 to 31 August 2009</p> <p>01 January 2008 to 31 December 2010</p> <p>01 July 2010 to Jun 2015</p>

Category	Intervention Name	Components & Description	Target Province	Timeframe
HSS	Small Fund Initiative Capacity building for HCMC and CCs	This initiative is based on the idea of decentralization, and commune level community and governance empowerment. PFD's Small Fund Initiative is of malaria prevention and control interventions which play a main role in preventing the malaria and improving access to the early diagnosis and treatment of people living at the malaria endemic communities. The small fund support allows VHVs to conduct face-to-face malaria health education to villagers in the endemic targeted areas. This initiative is being integrated into commune investment plan and managed by Health Center Management Committee (HCMC) with a regular supervision from OD, PHD, and PFD. The HCMC consists of health center chief, health center malaria focal person, commune chiefs, and representatives of VHV/VHSG. Approximately \$200 is provided to each commune on a quarterly basis in PFD's selected communes. The fund provided is being used as follows: 25% for malaria health education, 30% for malaria suspected case referral, 15% for supervision of HCMC to community, 25% for communication and 5% for HCMC's stationary. In 2014 alone, small funds were provided to 10 Communes, reaching 3,325 community members and resulting in the referral of 36 malaria cases to health facilities.	Kratie and Koh Kong Kratie, Koh Kong, Kampot and Stung Treng Kratie and Koh Kong	01 January 2008 to 31 December 2010 01 July 2010 to 01 December 2012 01 January 2013 to 30 June 2015
HSS	Tuk-Tuk for Health	PFD piloted a tuk-tuk project to serve two objectives: (1) To strengthen/improve outreach service of HC to communities; (2) To strengthen/improve referral of patients from communities to HCs and HCs to RH, with the goal of improving the access to proper health care services. The tuk-tuks used in this project were under the responsibility of the health facility and they transported severe malaria cases from the rural communities to the health centers/ facilities. This approach ensured that all cases were tested and treated even in hard to reach areas where patients would normally seek help at the unregulated private sector due to high costs associated with travelling to faraway public health facilities.	Kratie and Koh Kong Kratie and Koh Kong	01 January 2004 to 31 December 2008 01 January 2008 to 31 December 2010

Category	Intervention Name	Components & Description	Target Province	Timeframe
Containing Resistance	D3 Positive Program	D3 Data Management and Case Follow up for Mobile Malaria Workers (MMW): PFD, in collaboration with the PR-CNM, PMU, ODs and HCs in Kratie, organized training on D3 data management and case follow-up for 40 MMWs in Kratie Province in March 2012. After the training, the PMU provided the trained MMW with materials and drug supplies so that they could practice their knowledge and skills, providing education, diagnosis and treatment to MMP. With technical support from resource personnel from the PR-CNM, in collaboration with the PMU, ODs and HCs staff in Kratie, PFD and the PMU set up two D3 stations: one in Snuol and one in Damreiphong under Kratie and Chhloung ODs.	In Snuol and in Damreiphong under Kratie and Chhloung ODs, Kratie province.	
MMPs	Mobile Malaria Workers (MMWs)/ Plantation Malaria Workers (PMWs)	Mobile Malaria Workers (MMW) and Plantation Malaria Workers (PMW) are trained under PFD's Global Fund activities in Kratie and Koh Kong provinces and they are provided with a bag of supplies necessary for diagnosis and treatment of malaria . The supplies include a thermometer, examination gloves, RDTs for diagnosis, and Eurartesim, a fixed-dose combination of dihydroartemisinin-piperaquine (DHA-PQP) for the treatment of uncomplicated <i>P. falciparum</i> malaria, which is administered once a day for 3 days – making it easier for patients to comply with the dosing. Through the knowledge they gain from the MMW/PMW trainings, the malaria workers are able to diagnose malaria patients rapidly and administer drugs, which makes it possible for many villagers and forest workers in remote parts of rural Cambodia to receive free and safe treatment . Every three months, the MMW and PMW hand over their patient report charts to the PFD team; once the MMW/PMW and in the reports and the stored RDTs, they receive new supplies for the upcoming months to diagnose and treat new patients.	Kratie, Koh Kong and Kampot Kratie and Koh Kong	01 July 2010 to 31 December 2012 01 January 2013 to 30 June 2015

Category	Intervention Name	Components & Description	Target Province	Timeframe
MMPs Delivery System Innovation	Forest Package Pilot Project	Under the SSF grant, PFD trains Mobile and Plantation Malaria Workers (MMW/PMW) to collect and transport blood samples, diagnose and provide treatment for patients testing positive for malaria in regions that attract. Along with training MMWs and PMWs, PFD started a pilot “forest package” project which distributes subsidized backpacks to forest-goers through a voucher system between the PDF trained MMW/PMW, local retailers and the forest goers. These backpacks are equipped with insect repellent, LLIN/LLIHs, flashlight and an informative brochure on malaria: they offer an innovative way to reach out to forest-goers who travel most of the time and are not connected to routine services.	Koh Kong, Stung Treng, Kratie and Mondulkiri Kratie, Koh Kong, Stung Treng Kratie and Koh Kong	01 September 2005 to 31 August 2009 01 July 2010 to 31 December 2015 01 January 2013 to 30 June 2015
Surveillance/ Operational Research	RAI Program and LSHTM TRAC I and II, IPC partnership	The RAI program includes different activities for partners with different roles. PFD, in collaboration with IPC and LSHTM conducted a training for MMWs/PMWs, PHD/PMU/RH/HC and PFD provincial staff on how to collect and transport blood sample. The lab expert from IPC trains participants on both theory and practice on how to conduct blood spots on paper filter, how to code and store the blood sample, and how the blood paper filter be collected for sending to IPC for analysis. In addition to collecting and transporting blood samples for investigating molecular epidemiology of drug resistance to malaria, the PFD staff is also trained to conduct patient surveys, record GPS locations of the patients’ homes and gather information on patients’ mobility and previous travel destinations. The collected data is then used to map the emerging location and possible spreading direction of multi-drug resistance to malaria	Kratie, Stung Treng and Koh Kong Kratie, Stung Treng, Koh Kong and Kampot Kratie and Koh Kong	01 September 2005 to 31 August 2009 01 January 2008 – December 2012 01 January 2013 to 30 Jun 2015

5.3 Appendix Three: Summary Table of Program Achievements (outputs indicator), 01 January 2004– 31 December 2014

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
Round 2	1. To increase awareness, practices on malaria prevention and proper health seeking behavior among the target population in malaria endemic areas in Cambodia	1-Number of Health Operational District(OD) staff trained in Malaria health education	20	18	90%	
		2-Number of health center staff trained in Malaria health education	215	190	88%	
		3-Number of Village Health Volunteers (VHVs) trained in Malaria health education	2190	2276	104%	
	2. To improve access to preventive measures that protect the population at-risk, with a focus on complete coverage for bed net distribution and re-impregnation in targeted malaria endemic areas, employing an effective community-based approach.	4-Number of villages provided at least one health education session per quarter	240	240	100%	
		5-Number of Health center/community based malaria events	28	81	289%	To reach increased numbers, PFD conducted additional events than originally planned by dividing one event into three or more per health center catchment area.
	3. To increase access to early diagnosis and treatment (EDAT) for malaria throughout the country by making dipstick diagnosis and pre-packaged combination therapy available everywhere by means of a three pronged approach	6-Number of VHVs supervised by HC staff per quarter	1056	1103	104%	
		7- Number of villages with at least one supervision visit by HC staff per quarter	240	240	100%	
		8-Number of Health (OD) staff trained in treatment of nets	20	21	105%	
		9-Number of health center staff trained in treatment of nets	190	170	89%	
	4. To strengthen the institutional capacity of the national malaria control program at central, provincial, operational district and	10-Number of Village Net Distributors (VNDs) trained in treatment of nets	1085	903	83%	
		11-Number of VNDs supervised by HC staff per quarter	519	479	92%	
		12-Number of new bed-nets (BN) distributed	60000	52922	88%	
		13-Number of bed-nets re-impregnated	60000	72688	121%	

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
	commune levels.	14-Number of villages covered with BN distribution and re-impregnation	240	282	118%	
		15-Percentage of villages in endemic areas covered by BN distribution and re-impregnation	80%		117%	
		16-Number of villages with quarterly re-impregnation sessions	240	246	103%	
		17-Number of health personnel at the Referral Hospital/Health Center (RH/HC) involved in patient care trained in malaria case management.	362	247	68%	PFD did not train 25 staff each year because the principal recipient (PR) increased the original target.
		18-Percentage of patients with malaria in public health facilities prescribed correctly according to national guidelines	80%		91%	
Round 4	1. To significantly increase community awareness and care-taking practice on malaria prevention and control with promotion of proper health seeking behavior in malaria endemic areas in Cambodia. 2. To improve access to preventive measures that protect the population at risk, with focus on complete coverage for bed net distribution and re-treatment in targeted malaria endemic areas, employing an effective community-based approach	1- Number of Provincial and District Office of Education (PoE/DoE) staff trained	126	121	96%	
		2- Number of school teachers trained in malaria School Health Education (SHE)	564	573	102%	
		3- Number of students benefiting from SHE session	57524	66177	115%	
		4- Number of monitoring and follow-up visits of trained teachers	2030	1642	81%	
		5- Number of performances by students during campaigns, local fairs, community gatherings	78	80	103%	
		6- Number of teachers who received refresher training	1215	1278	105%	
		7- Number of schools in target areas visited and provided with materials storage boxes	562	679	121%	
		8- % of public video-showing venues in target areas provided with at least one copy of 'Combat Malaria' video	90%		119%	
		9- Number of community malaria theater workshops/	12	37	308%	Overachievement due to the

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
		performances				consolidation of R2 and R4.
		10- % of target population who can explain how malaria is transmitted	90%		97%	
		11- % of trained Grade 5 teachers in target schools correctly implementing Child to Child (CtC) methodology	80%	77%	96%	
		12- % of target area families reporting extracurricular student activities regarding health messages	80%	92%	115%	
		13- % of target Grade 5 students demonstrating knowledge about malaria transmission and prevention	80%	93%	116%	
Round 6	1. Halt the development and prevent the spread of anti-malarial drug resistance 2. Improve access to and utilization of effective diagnosis and treatment for malaria 3. Improve access to and utilization of effective malaria prevention measures 4. Strengthen the management of the national malaria control effort especially at operational levels.	1-Number of providers trained on Information Education Communication (IEC) use on fake drugs	1680	1469	87%	
		2-Number of health facilities with trained providers	50	54	108%	
		3-Number of providers trained on IEC use on rational drug use	1680	1469	87%	
		4-Number of health facilities with trained providers	50	54	108%	
		5-Number of bi-monthly meetings to strengthen drug management conducted	52	24	46%	Cash disbursements from the PR were significantly late, thus affecting numbers. As this activity is routine, PFD could not catch up when funds became available.
		6-Number of health staff trained on Health Information System/Operational District Drug Inventory Database (HIS/ODDID) tools	128	129	101%	
		7-Number of health facilities with trained providers on HIS/ODDID tools	32	34	106%	
		8-Number of Village Health Support Groups/Commune	750	762	102%	

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
		Councils/Health Center Management Committees (VHSGs/CC/HCMC) trained on referral system				
		9-Number of providers trained on IEC use on EDAT	1680	1469	87%	
		10-Number of health facilities with trained providers	50	54	108%	
		11-Number of providers trained on long lasting /regularly treated insecticide nets (LLIN/ITN) and IEC use on prevention	1580	1527	97%	
		12-Number of villages with trained providers for LLIN/ITN distribution/re-treatment	350	326	93%	
		13-Number of LLIN/ITN distributed	103815	134481	130%	Results are over achieved for indicators #13, #14 and #15 because the Provincial Malaria Units (PMU) in Kratie and Koh Kong provinces pushed for PFD to distribute stored LLINs to the target audience and areas before the raining season.
		14-Number of villages covered by LLIN/ITN distribution	350	473	135%	
		15-Number of people covered with LLIN	240000	311870	130%	
		16-Number of semi-annual community-based events	134	142	106%	
		17-Number of people attending community-based events on malaria	58290	60964	105%	
		18-Number of health staff trained on basic epidemiology	204	203	100%	
		19-Number of health facilities with trained staff in basic epidemiology	34	50	147%	
		20-Number of health staff trained on Global Information System (GIS)/health Mapper	55	31	56%	Cash disbursements from the PR were significantly late, thus affecting

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
						numbers. As a result, PFD and PMUs were not able to conduct the training on GIS/Health Mapper as planned for this reporting period.
		21-Number of management units with trained staff in GIS/Health Mapper	13	13	100%	
		22-Number of quarterly monitoring visits from OD to HC	360	348	97%	
		23-Number of target community in 2 provinces that integrate malaria control activities in commune annual plan	30	28	93%	
		24-Number of target community in 2 provinces that implement malaria control activities in commune annual plan	30	28	93%	
		25-Number of provincial quarterly workshops conducted	12	11	92%	
		26-Number of health staff/volunteers at provincial level attending workshop	300	372	124%	The project over achieved the results for indicator #26 because health staff and volunteers were highly motivated and encouraged by PFD to attend the workshop.
Round 9/ SSF Phase I	1. To improve access to early malaria diagnosis and treatment services with an emphasis on detection of all malaria cases (including among mobile/migrant populations) and ensure effective treatment and P.	1-Number of Day Three (D3) positive cases actively followed up (treated & epidemiological investigation carried out)	326	159	49%	Delayed signing of a Memorandum of Agreement (MoA) by the PR and delayed approval of the training plan affected numbers. PFD trained

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
	falciparum gametocyte clearance.					volunteers in March 2012 and finalized its strategy in April 2012.
	2. To decrease drug pressure for selection of artemisinin resistant malaria parasites by improving access to appropriate treatment and preventing use of monotherapies and substandard drugs in both public and private sectors.	2- Number of villages where Community Health Education (1/village/year) is conducted	520	805	155%	
		3- Number of broadcasts of radio series and radio spots	1,740	1,750	101%	
		4- Number of Malaria Events conducted (Malaria Weeks, Semi-annual Lucky Draw; National Malaria Day)	84	105	125%	
	3. To improve access to preventive measures and specifically prevent transmission of artemisinin resistant malaria parasites among target populations (including mobile/migrant populations) by mosquito control and personal protection.	5- Number of school children benefit from school health education program	19,240	21,031	109%	
		6- Number of people reached through community based malaria health education (Malaria Events; Community Health Education)	96,900	146,342	151%	
		7- Number of Bi-monthly meetings held between HC staff and VHVs at HC level.	196	195	99%	.
		8- Number of health staff trained in Malaria Health Education and BCC packages	104	167	160%	
	4. To increase community awareness and behavior change among the population at risk and support the containment of artemisinin resistant parasites through comprehensive behavior change communication (BCC), community mobilization, and advocacy.	9- Number of new VHVs trained in Malaria Health Education and Referral System	287	226	79%	
		10- Number of existing VHVs received refresher training on Malaria Health Education	750	659	88%	
		11- Number of school teachers received refresher training on Malaria School Health Education using CtC methodology	481	492	102%	
		12- Number of trained school teachers monitored	560	705	126%	
		13- Number of monitoring/ supervision from Provincial Health Department/Provincial Malaria Unit/Operational District (PHD/PMU/OD) to OD/RH/HC	1,326	1,133	85%	
	5. To provide effective	14- Number of quarterly planning meeting for Community-	124	86	69%	

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
	management (including information systems and surveillance) and coordination to enable rapid and high quality implementation of the strategy	based Malaria Intervention at commune level				
		15- Number of communes participating in Community Based Malaria Intervention	12	12	100%	
		16- Number of Semi-annual and annual meetings/workshops conducted	27	20	74%	.
		17- Number of quarterly HCMC meetings conducted	270	193	71%	
Round 9/ SSF Phase II	1. To ensure universal access to early malaria diagnosis and treatment services with an emphasis on detection of all malaria cases (including among mobile/migrant populations) and ensure effective treatment including clearance of P. falciparum gametocytes and dormant liver stage of P. vivax;	1. Percentage of all suspected malaria cases that received a parasitological test - in the community i.e. by company malaria workers and plantation malaria workers	90	100	111%	
		2. Percentage of confirmed outpatient malaria cases that received first line antimalarial treatment according to national policy – in the community i.e. by company malaria workers and plantation malaria workers	95	100	105%	
		3. Number of villages where Community Health Education is conducted	323	320	99%	
		4. Number of Malaria Events conducted (Malaria Weeks, Semi-annual Lucky Draw; National Malaria Day)	20	20	100%	
	2. To halt drug pressure for selection of artemisinin resistant malaria parasites by improving access to appropriate treatment and preventing use of monotherapies and substandard drugs in both public and private sectors;	5. Number of new VHVs trained in Malaria Health Education and Referral System	80	81	101%	
		6. Number of existing VHVs received refresher training on Malaria Health Education	400	400	100%	
		7. Number of company/plantation based volunteers trained	176	182	103%	
		8. Number of school teachers received refresher training on Malaria School Health Education using Child-to-Child methodology.	290	267	92%	
	3. To ensure universal access	9. Number of school children benefit from school health education program	11,600	8,480	78%	

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
	to preventive measures and specifically prevent transmission of artemisinin resistant malaria parasites among target populations (including mobile/migrant populations) by mosquito control, personal protection and environmental manipulation;	10. Number of quarterly meetings held between HC staff and VHVs at HC level	180	132	73%	
		11. Student role-play in community and schools using Child-to-Child methodology	36	30	83%	
		12. Number of Commune Councils (CCs) actively participating in Community Based Malaria Intervention.	10	10	100%	
		13. Number of Health Center Management Committee (HCMC) meetings conducted	40	40	100%	
		14. Number of trained school teachers monitored	165	188	114%	
	4. To ensure universal community awareness and behavior change among the population at risk and support the containment of artemisinin resistant parasites and eliminate all forms of malaria through comprehensive behavior change communication (BCC), community mobilization, and advocacy;	15. Number of monitoring/supervision visit by PFD/HCs to community/ company/plantation.	144	132	92%	
	5. To provide effective management (including information systems and surveillance) and coordination to enable					

Grant round	Objective	Program Indicators	Target	Actual Results	% Achieved	Remarks
	rapid and high quality implementation of the elimination strategy					
RAI	<p>Tier 1</p> <p>1. To establish and operationalize a rigorous surveillance system linked to a focal response mechanism.</p> <p>To interrupt transmission of <i>P. falciparum</i> by universal coverage and usage of insecticide treated bed nets (either long-lasting nets or treated conventional nets) in targeted areas.</p>	1-Number of MMWs/PMWs, PHD/PMU/RH/HC and PFD provincial staff received training on the process of how to collect and transport blood sample	40	38	95%	
		2-Number of MMWs/PMWs, PHD/PMU/RH/HC and PFD provincial staff received refresher training on the process of how to collect and transport blood sample	40	-	-	RAI grant just started in October 2014, thus some indicators are not yet collected.
		3-Number of blood sample collected and transported from service delivery point to IPC (Phnom Penh)	570	41	7%	Actual results are very low because it only covers the first quarter when the target is set for the whole duration of the grant.
		4-Number of quarterly meetings conducted at the provincial level	5	0	0%	
		5-Number of monitoring visit conducted by HC staff to community (MMWs/PMWs)	30	0	0%	RAI grant just started in October 2014, thus some indicators are not applicable or data not yet collected.
		6-Number of monitoring visit conducted by PFD central to provincial level	14	2	14%	
		7-Number of monitoring visit conducted by PMU/OD and PFD provincial team to HC	8	0	0%	

5.4 Appendix Four: Summary Table of Program Achievements (outcome indicator), 01 January 2004– 31 December 2014

Grant Round	GF & PFD Outcome Indicators	Target 2011	Results 2012	Target 2013	Result 2013	Target 2014	Results 2014	Target 2015	Data Source
Round 9 SSF Phase I & II	1. Percentage of school children who disseminate malaria prevention messages to their friends, families and other community members through various activities.	40%	87%	90%	95%				2013 Internal Survey Report
Round 9 SSF Phase I & II	2. Percentage of community individuals who attend community based malaria events answer malaria questions correctly through quiz-show.	50%	82%	50%	80%				2013 Internal Survey Report
Round 9 SFF Phase II	3. Percentage of company/plantation workers who slept under an insecticide-treated net the previous night.					30%	69% (46% LLIN)		KAP Survey Report 2015
Forest Package under SSF	4. Forest Package program under the SSF grant has surpassed its target goals in the last year since its inception in Dec. 2013. Although PFD planned to sell 150 forest packages in the first 6 months of reporting period from Jan –June 2014, 96 forest packages were sold out within just one week after the launching of the workshop on 5/Dec/2013. At the end of the first year, a total of 224 packages were sold and PFD conducted an assessment of the project by interviewing the buyers/ forest-goers.				33% Malaria free before 2014	97% Malaria free after forest package			
Round 9 SFF Phase I	5. Percentage of communes actively involved in malaria prevention and referral that implement the small fund program.	50%	33%						2011 Internal Survey Report
RAI	6. Percentage of confirmed Pf cases in selected sites for which molecular marker results are available into the MIS within 2 weeks.					60%		80%	Started last Quarter of 2014

5.5 Appendix Five: Summary Table of Partners and Beneficiaries, 01 January 2004– 31 December 2014

Grant Round	Location	Number and Type of Beneficiaries	Partners
R2	Kratie	<ul style="list-style-type: none"> 208 OD/HC staff trained on Malaria Health Education and 191 on treatment of nets 2,276 VHV's trained on Malaria health education and 903 VNDs trained on treatment of nets 282 villages covered with bed-net distribution and re-impregnation 	PMU in Kratie and Koh Kong province
	Koh Kong		
R4	Kratie	<ul style="list-style-type: none"> 121 Provincial Office for Education (PoE) and District Officer for Education (DoE) trained on Malaria health education 573 school teachers trained on School health education 66,177 students benefiting from School health education session 97% target population can explain how malaria is transmitted 	PMU in Kratie and Koh Kong; Nomad RSI and Partners for Development Cambodia (PFD-C)
	Koh Kong		
	Stung Treng		
	Monduliri		
R6	Kratie	<ul style="list-style-type: none"> 1,469 health providers trained on IEC use on fake drugs, rational drug use and EDAT 762 Village Health Supporting Group (VHSGs), Commune Council (CCs) and Health Management committee (HCMCs) trained on referral system 311,870 people covered with LLIN/ITN 60,964 people attended community-based events on malaria 28 target community in two target provinces (Kratie and Koh Kong) that integrate and implement malaria control activities in commune annual plan 	PMU in Kratie and Koh Kong and Nomad RSI.
	Koh Kong		
	Monduliri		

Grant Round	Location	Number and Type of Beneficiaries	Partners
<i>SSF Phase I</i>	Kratie	<ul style="list-style-type: none"> Organized 136 malaria events/weeks at health center and community levels starting in January 2010. Community health education covered 1,350 villages reaching counts of 258, 122 for people who attended community based malaria health education including multiple attendance (malaria events & community health education) 50, 137 school children benefited from school health program activities. In collaboration with PMUs, trained and retrained 167 health staff on malaria health education and behavior change communication (BCC) packages. Trained 226 new VHV and 649 existing VHV on malaria health education and referral skills in two provinces of Kratie and Koh Kong. 750 existing VHV received refresher training on malaria health education 1,126 school teachers received refresher trainings on malaria school health education using Child-to-Child methodology. 12 communes participated in community based malaria intervention, increasing referrals. 	<p>PMUs, OD and HC staff in three provinces of Koh Kong, Kampot and Kratie</p> <p>PMUs in Stung Treng Province</p> <p>Equal Access Cambodia (EAC)</p>
	Koh Kong		
	Stung Treng		
	Kampot		
<i>SSF Phase II</i>	Koh Kong Kratie	<ul style="list-style-type: none"> 6,080 (3,165 women) people participated in 20 malaria day/ week events organized by PFD in collaboration with Koh Kong and Kratie PMU, OD, and HC staff. 96,607 people (counts are multiple if various sessions are attended) were reached through community based health education conducted in 435 villages. LCD shows for community based health education were also conducted in 64 company/ plantations with the participation of 6,244 workers. 9,050 school children benefit from the SHE program. 332 company/plantation based volunteers trained as MMW and PMWs. 441 school teachers received refresher training on Malaria School Health Education using Child-to-Child methodology. 807 existing VHV received refresher training on Malaria Health Education. 81 new VHV trained in Malaria Health Education and Referral System; resulting in referral of 36 malaria cases to health facilities. 	<p>PMUs, OD and HC staff in two provinces of Koh Kong, and Kratie</p> <p>Commune Councils (CC)</p> <p>Provincial Department of Education, Youth and Sport (PDoEYS); District of Education, Youth and Sport (DoEYS)</p>

Grant Round	Location	Number and Type of Beneficiaries	Partners
RAI	Kratie	<ul style="list-style-type: none"> ▪ Beneficiaries: Mobile, Migrant and Static Population seeking malaria diagnosis and treatment at various levels in Kratie Province (Tier 1). ▪ 200 Pf cases/ patients expected to benefit from treatment, conducting interviews and mapping of patients homes for creating a surveillance system of drug resistant parasites (target estimated for 2014 by the baseline of 550 cases in 2012 with a 50% decrease from 2012 to 2013) ▪ In collaboration with the Regional Artemisinin Initiative partners CNM, IPC and LSHTM, PFD established the Early Warning System in Snuol and Ksim HC, Kratie Provincial hospital and Snuol RH. ▪ PFD staff has trained 17 health staff from the two collaborating HCs and the Kratie Referral Hospital (RH); 15 MMW/VMW, 4 private providers on how to collect and transport blood samples to IPC Lab in Phnom Penh. ▪ Since the beginning of the project, PFD Kratie staff has sent 41 blood samples to IPC for molecular analysis (this target was planned as 570; however, the late initiation of the project and the lack of Pf positive cases is the reason for underachievement) 	<p>National Malaria Control Program (CNM)</p> <p>LSHTM, Institute Pasteur du Cambodge (IPC)</p> <p>Snuol and Ksim HCs; Kratie PH</p>

5.6 Appendix Six: Summary Table of Partnership Overview, 01 January 2004– 31 December 2014

Partner	Initiation of Partnership	Activity Results
<i>Kratie PMU</i>	2003	<ul style="list-style-type: none"> ▪ Bed net distribution and re-impregnation- over 90% of community members use their nets, and attend distribution and re-impregnation sessions, even during busy harvest times. ▪ Education of VHV and VMWs- first line of defense in reducing malaria incidence ▪ Capacity building of HC staff ▪ Broadcasting malaria messages through television and LCD shows- PFD suspects there has been a significant increase in knowledge on malaria among villagers since onset of the GF program. There is no baseline to compare levels of knowledge to, but approximately 80% of community members now display knowledge on malaria. This increased knowledge has led to people properly using their bed nets and understanding how malaria is transmitted (previously individuals believed that malaria was caused by water or spirits). ▪ Mortality rates decreased- Mortality rates among diagnosed malaria cases before the GF program were 25-27%. This rate has decreased to only 7% of malaria patients dying. ▪ Mobile and Migrant Population- the new VMMW program (initiated in October 2011) has begun to target the remaining mortality cases, as these were all among the mobile and migrant population. VMMWs provide education and treatment of malaria for the mobile and migrant population only. ▪ Increase in HC Attendance- Since the onset of the program the number of people coming to the HC for malaria diagnostics and treatment when they suspect malaria has dramatically increased. Currently, approximately 70 positives were diagnosed per month. ▪ Collaboration- indicated that their relationship with PFD has been very positive.
<i>Koh Kong PMU</i>	2004	<ul style="list-style-type: none"> ▪ Health education of villagers by VHVs ▪ Bed Net distribution- The latest bed net distribution occurred from July through September 2011; most families consistently utilize their nets. ▪ Trainings of VMWs for education and treatment throughout communities. ▪ Decrease in mortality rate- since the initiation of the GF program, there has been an increase in referred and diagnosed malaria cases, while the rate of malaria mortality has decreased (there were four malaria related deaths in 2010 and one in 2011). The morbidity rate has increased due to an increase in the number of MMWs in the region; a new hydroelectric plant was built and has attracted many mobile workers, who were at increased risk for malaria due to their work in close proximity to forested areas and their difficulty in being reached with educational programming. ▪ Excellent collaboration- the PMU experience with the program thus far has been positive, as PFD has good cooperation and works effectively with community members. ▪ LCD shows have been implemented effectively in this area.

Partner	Initiation of Partnership	Activity Results
Koh Sdach, Koh Kong HC Supervisor	2005	<ul style="list-style-type: none"> ▪ Support to VHVs –PFD provides a \$4 per month incentive for all VHVs who reach at least 15 individuals with health education programs. ▪ Decrease in malaria related mortality- while malaria related mortality has significantly decreased since the onset of programming (approximately 15 deaths per year to zero), morbidity rates have increased due to a recent increase in relocation of families to forested areas, away from access to public services and health education messages. In early 2010 there were approximately five to six cases per year, and now there are around 10 per year.
Stung Treng PMU	2005	<ul style="list-style-type: none"> ▪ TOT – These training expanded the reach of people who could also receive training. ▪ School Health Education (SHE) – pre and post-test results have shown that SHE significantly increases the knowledge and dissemination of newly acquired knowledge on malaria and other diseases between the students and teachers. ▪ Community Outreach – all of these activities increased the interest to local events/ gathering and special day events – which has been the source of knowledge exchange and dissemination, making community outreach and collaboration between the local members and authorities a lot stronger.

Partner	Initiation of Partnership	Activity Results
Kampot PMU	2011	<ul style="list-style-type: none"> ▪ Support to VHVs- VHV's are trained in malaria management and are now able to provide health education to villagers (3-4 sessions per month). ▪ Distribution of LLINs and hammock nets- in previous programs, one to two nets were distributed per family. Now, in malaria endemic areas, one net is given per person. No research to date has been conducted on the number of families utilizing their bed nets, but observations have been made that since the onset of the LCD shows, families have properly and consistently been sleeping under their nets. Previous to this program families were using the nets for other purposes such as hanging the nets but not sleeping under them, now fully covering their bodies by the nets. ▪ LCD shows- previously malaria incidence was stagnant, even though activities were occurring. PFD's innovative LCD video show demonstrates to villagers the reality of the malaria situation. This method has never been used before but is promising for the education of villagers. With the onset of LCD shows, villagers displaying knowledge on malaria has increased from approximately 10% to over 50%. Continued LCD shows in the future will foster this downward trend of reducing the incidences of malaria. ▪ Mobile and Migrant Worker programming- since 2002, malaria cases have decreased from around 2,000 per year to fewer than 1,000. Specifically, Stung Keo commune is a highly endemic area and since 2010-2011, initiation of PFD programming, this region has seen a decrease in cases. ▪ Experienced excellent collaboration with PFD- this continued collaboration is believed to have led to a sharp decrease in cases by 2013. The PMU Kampot indicated that previous partnerships were not as smooth as the current partnership with PFD. ▪ Decrease in malaria related mortality in 1997 there were approximately 50 malaria deaths per year; in 2011 there were three. The mortality rate fluctuated between 1997 and 2008, when number of malaria deaths dropped to five per year. Now, with the support of VHVs, LCD shows, and other educational and behavior change communication activities, this rate has continued to decrease to two per year.

Partner	Initiation of Partnership	Activity Results
<i>Snuol and Khsim HCs, Kratie PH, London School of Hygiene and Tropical Medicine (LSHTM)</i>	2013	<ul style="list-style-type: none"> ▪ Surveillance and Operational Research: Under the RAI Project which started in October 2014, is implemented through a partnership between Partners for Development (PFD) carrying out community level interventions and trainings; the LSHTM – Tracking Resistance to Artemisinin Collaboration (TRAC) team conducting operational research and analysis; and Institute Pasteur Cambodia (IPC) laboratory testing blood samples for artemisinin resistant P.f parasite malaria. ▪ 5-M approach allows the program to reach out and focus on 1.Migrant and Mobile Populations; 2. Monotherapy; 3. Monitoring and surveillance; 4. Malaria Posts; 5. Malaria Parasite. ▪ Early Warning System established in Snuol and Ksim HC, Kratie Provincial hospital and Snul RH in collaborate with CNM, IPC and LSHTM, which overall contributes to the strengthening of MIS, in line with the national strategy and objectives.

PFD's Contribution to the USAID funded Malaria Control in Cambodia (MCC) Project

November 2011



Photo: Community members listening to malaria radio call-in show as part of the Malaria Control in Cambodia (MCC) project

Executive Summary

The Malaria Control in Cambodia (MCC) Project- implemented in Western Cambodia by the University Research Co. LLC (URC) in collaboration with Partners for Development (PFD) and other non-governmental organizations (NGOs) - is a community-based malaria control and prevention project.

The objective of the project is to reduce malaria in Western Cambodia, home to multi-drug-resistant malaria. Funded by the United States Agency for International Development Regional Development Mission for Asia (USAID/RDMA) since October 2007, the project provides technical assistance and support to the Cambodian National Malaria Control Program (NMCP) to improve the diagnosis and treatment of malaria, and educate the community about malaria prevention, control and appropriate health seeking behaviors.

As part of this collaborative partnership, PFD was responsible for the design and implementation of activities in the areas of capacity-building; information, education and behavior change communication (IEC/BCC); operational research; and for providing overall technical assistance to the project. PFD developed various innovative IEC/BCC strategies and materials, including the “taxi drivers” pilot project targeting mobile and migrant populations in North West Cambodia. PFD’s initial research and assessment revealed that mobile and migrant populations (MMP) travel primarily by taxi. On this premise, PFD recruited and trained local taxi drivers on malaria prevention and treatment, and gave them IEC materials to distribute to their customers. Over 20,000 migrant workers received health education and IEC materials. Due to the success of the pilot, the Battambang provincial health department has adopted it as one of its community-based malaria interventions.

PFD leveraged its expertise in school health education and child-to-child methodologies to work with the Ministry of Education, Youth and Sports (MoEYS) to develop a standardized national curriculum for malaria education in primary schools. The MoEYS approved the curriculum and integrated it into primary school classrooms. PFD trained 32 trainers from provincial and district education offices on how to work with teachers to disseminate and integrate the curriculum into school programs.

PFD-in partnership with the Pasteur Institute of Cambodia, the Institute of Research for Development and with support from the NMCP- designed and conducted research on drug resistance and mobile and migrant populations. PFD conducted the “Malaria, Mobile Population and Migrants in the Context of Drug Resistance in Cambodia” study which shed light on the relationship between population movement, land development, malaria and the issue of drug resistance. As a result of this study, PFD developed a conceptual and operational framework using proxy indicators to define areas of concern for potentially imported malaria; emergence; and spread of drug resistance. By using this framework and geographical information systems (GIS), PFD was able to identify geographical areas of concern and to estimate the number of people in each of the three categories. PFD continues to refine this framework and develop it as an operational tool.

PFD played a critical role in building capacity among health professionals and community health workers. PFD designed and facilitated training workshops for health center and hospital staff in malaria prevention and health education; diagnosis and treatment, including severe case clinical management; logistics/drugs management; proposal writing and project cycle management. PFD selected and trained community members as Village Malaria Workers and Village Health Workers- PFD trainings reached over 1,553 participants.

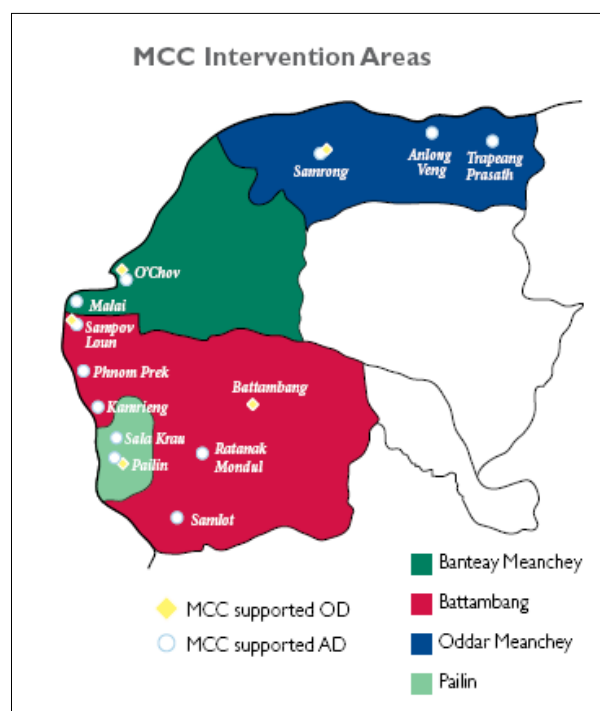
PFD's role in the MCC project was a key factor in the success of the project. PFD's innovative interventions and research contributed to the development of strategies to address multi-drug resistant malaria in Cambodia, and the underlying challenge of mobile and migrant populations in this context.

1. Background

The Malaria Control in Cambodia (MCC) Project, implemented in partnership with University Research Co. LLC (URC), is a community-based malaria control and prevention project that aims to reduce malaria in the Western part of Cambodia, home to drug-resistant malaria. Funded by the United States Agency for International Development Regional Development Mission for Asia (USAID/RDMA) since October 2007, the project provides technical assistance and support to the Cambodian National Malaria Control Program (NMCP), in collaboration with Partners for Development (PFD) and other non-governmental organizations (NGOs) involved in malaria control.

Aligned with USAID's objective to strengthen national and regional capacity to monitor and respond to drug-resistant malaria in Southeast Asia, the project aimed to:

1. Support the NMCP to increase access to and utilization of insecticide treated bednets (ITNs).
2. Support the NMCP to improve access to and utilization of malaria case management services (public, private, and community).
3. Strengthen managerial capacity at Provincial Health Department (PHD) and Operational District (OD) levels.
4. Collaborate in the development of policy and strategic interventions.



MCC activities were conducted in four western provinces of Cambodia where the risk of multi-drug tolerant/resistant malaria is emerging: Battambang, Banteay Meanchey, Oddar Meanchey and Pailin.

With an estimated aggregate total population of over 2,228,600 people, this region accounts for over 15% of the national population of Cambodia. As this region is predominantly rural, approximately 15% of the total population in these four provinces currently lives in malaria-endemic regions (zero to two kilometers from the forest) and access to health centers and hospitals is limited. These project areas are part of the Cambodia National Malaria (CNM) program's designated malaria "containment zones". Containment Zone One includes areas where resistance of *Plasmodium falciparum* to artemisinin has already been documented, including Pailin, Battambang, and Pursat, and the northern area of Kampot. Containment Zone Two encompasses a "buffer area" surrounding Containment Zone One where resistant parasites are feared likely to spread but have yet to be formally detected. Zone Two includes the ten provinces along the Cambodian Thai border (Ref MCC report August 2010).

2. Summary of Achievements & Results by PFD

PFD's scope of work in the Malaria Control in Cambodia (MCC) project was developing and facilitating training and capacity building programs; community mobilization and behavior change; operational research; and providing technical staff for the project. These activities directly contributed to project aims, as capacity building was conducted in close collaboration with the NMCP and local government offices. Additionally, research provided information on current trends in drug resistance to the Cambodian government for next steps in the development of policy and strategic interventions to monitor and respond to drug-resistant malaria.

2.1 Capacity-building

PFD was responsible for implementing training and capacity building activities for health staff at provincial, operational district (OD) and health facility levels in the areas of:

A. Nursing Care Training:

PFD facilitated a three-day training workshop in Battambang PHD for 27 participants from Referral Hospitals (RH) and Health Centers (HC) in the target area. Two experienced trainers from Calmette Hospital and the Center of Hope facilitated the training for theory and practical sessions.

B. Severe Case Management Training

PFD facilitated a five-day training workshop in Battambang Provincial Health Department (PHD) which reached 12 participants from Referral Hospitals (RH) and Health Centers (HC) in the target area. The training workshop was organized through joint cooperation of the CNM, Battambang PHD, and MCC team. The training workshop was divided into theory and practical sessions that took place over the course of five days. During the practical sessions participants practiced how to manage the complications presented in severe malaria cases. Pre-test results found that



only 42.3% of participants had the knowledge and capacity to manage severe malaria cases, while the post test results increased to 90.3%.

C. Village Malaria Workers Recruitment and Training

In collaboration with CNM, PFD recruited and trained Village Malaria Workers (VMWs) to provide health education, diagnosis and treatment to suspected malaria patients living in their communities.

The VMW project component covered five operational districts of four provinces. In conjunction with MCC partners, PFD has recruited and trained 532 VMWs: 247 in Battambang, 41 in Pailin, 170 in Oddar Meanchey, and 74 in Banteay Meanchey provinces. Pre-test results determined that 8% of participants had a very good understanding of malaria prevention and control, 77% good, and 15% poor. Based on this evaluation, the knowledge and capacity of participants in malaria prevention and control improved dramatically. After the training, 69% of participants scored very good, 23% good, and 8% poor.

D. Malaria Case Management Training

PFD organized malaria case management training sessions for health staff working in health centers, former district hospitals and referral hospitals, and trained staff on the new national malaria treatment guidelines. The training sessions involved 67 health staff working in 15 health facilities, teaching them skills in malaria case management, including malaria risk factors, life cycle of malaria parasites, malaria transmission, signs and symptoms of complicated and uncomplicated malaria, and use of rapid diagnostic tests (RDT). The training curriculum was



based on the new treatment guidelines for the management of malaria. The pre-test found that over 60% of participants had poor knowledge, skills, and capacity of malaria prevention and control. (See table below). After the training post-test results showed that 32% of participants tested very well, 55% good, and 14% poor. This evaluation indicates that the knowledge and capacity of participants in malaria prevention and control improved dramatically due to the training.

E. Logistic/Drug Management Training

PFD, in collaboration with MCC partners and the Department of Drug and Food (DDF) of the MoH and the Reproductive and Child Health Alliance (RACHA), conducted Drug Management Training workshops for store keepers and store keeper assistants working in targeted HCs and ODs, in order to strengthen



the drug supply system. Five training workshops reached 151 store keepers and store keeper assistants: 28 from Pailin, 25 from Banteay Meanchey, 64 from Battambang, and 34 from Oddar Meanchey provinces. The pre-test results found that 72% of participants had poor knowledge of drug management. Post-test results found that 57% of participants had very good knowledge, 33% good, and 5% poor.

F. Planning and Proposal Writing Training

To enhance the management capacity of OD and PHD supervisors in planning and proposal writing, PFD organized a workshop on planning and proposal writing for targeted health staff in partnership with the PHD and the training institute (SILAKA). During the five-day training workshop, 16 participants from four targeted provinces were invited: seven from Battambang, three from Banteay Meanchey, three from Pailin, and three from Oddar Meanchey.

G. Project Cycle Management Training

PFD not only strengthened the capacity of health staff in malaria prevention and case management, drug supply systems, health education and referral systems through the MCC project, but also enhanced project management as well. In collaboration with the SILAKA, PFD organized a training workshop on Project Cycle Management to develop partner capabilities in project development, implementation, and management. The five-day training workshop had six priority topics: project cycle, project design, indicators, assumptions, budgeting, monitoring and evaluation, and planning for implementation. The program extended invitations for this training to 16 participants from different health facilities: seven from Battambang, five from Banteay Meanchey, three from Pailin, and one from Oddar Meanchey. For both the planning and proposal writing training and project cycle management training pre-test results had an average of 24/100 and a maximum of 45. Post test results had an average of 70/100 and a maximum score of 100/100.

2.2 IEC/BCC



A. Training of Trainers (ToT) on Malaria Health Education for HC Staff

PFD conducted five sessions of ToT on malaria health education to health center and health post staff through collaboration with the National Malaria Center and Provincial Health Department. The training took place in five operational districts (Pailin, Battambang, Oddar Meanchey, Banteay Meanchey) covering 40 HCs and HPs and trained 122 HC/HP staff.

B. Village Health Volunteer (VHV) training on Malaria Health Education

VHVs are essential to the health network in communities as they play a key role in disseminating malaria prevention and treatment messages to community members. In order to build the capacity of VHVs, PFD collaborated with local counterparts (PHD, OD, and HC) to organize 24 sessions of VHV refresher trainings on malaria health education in four provinces, with financial and technical support from PFD. Through the MCC Project, PFD trained 622 VHVs from 25 HCs and 319 villages in target provinces on malaria health education.

C. Mobile/migrant Malaria Education through Taxi Drivers: A pilot project

Based on information gathered through workshop and focus group discussions conducted in 2008, PFD began the “taxi drivers” pilot project. Early research highlighted that mobile and migrant populations travel primarily by taxi on the North Western border of Cambodia. PFD selected and recruited taxi drivers on a voluntary basis from a pool of drivers who work between Battambang town, Samlot and Sampov Luon districts in Battambang province and Pailin province. PFD trained 33 drivers in July 2010 in



collaboration with CNM and the Provincial Malaria Program to provide malaria education. 15 drivers were from Sampov Loun and Phnom Prek, ten from Samlot and eight from Pailin.

This pilot project included the distribution of T-shirts and caps as incentives, and leaflets, portable computer memory cards, cassettes, CDs and USBs to be used as IEC materials during travel. Volunteer taxi drivers provided talks while driving and played the CDs, cassettes. PFD began implementation in August 2010 and after six months of implementation; results indicated that the “taxi drivers” pilot was a feasible way to reach mobile and migrant workers. Out of 33 drivers initially selected and trained in August 2010, 29 were still reporting in April 2011. The malaria monitoring system shows that in ten months, over 47,000 passengers were transported, out of which about 45% (21,660 people) were mobile/migrant workers. Over 20,000 passengers received health education and IEC materials.

This pilot scheme provided critical data that was utilized to estimate the number of nets needed for mobile and migrant workers traveling to the different program regions. Exit interviews will be conducted in July 2011 to assess whether the IEC materials provided were used and if passengers gained knowledge about malaria. The taxi driver project is currently being replicated by the PHD of Battambang.

D. Radio Call-in Show

PFD IEC/BCC specialist developed the radio call-in show in collaboration with Equal Access, an NGO focused on delivering vital information to underserved Cambodians to improve communities.



PFD broadcast 33 call-in shows on Radio 92.70 MHz in Chamkar Chek of Battambang province. PFD programs attracted 61 callers in phase one (Feb-Jun 2009), 97 callers in phase two (Jan-Jun 2010), and 58 callers in phase three (Jan-Jun 2011). The majority of callers were from malaria endemic areas.

E. Support Malaria Spots Broadcasting

PFD collaborated with MCC partners and provincial malaria programs to broadcast malaria health educational spots through local TV and radio channels for five months in 2009, six months in 2010 and two months in 2011. The one minute spots were obtained from the National Malaria Center and broadcast three times per day.

F. IEC Materials Development

Through the MCC project, PFD developed and printed 18 billboards to promote malaria prevention messages: “Sleeping under ITN/LLIN, you will be healthy and save much money;” “To prevent malaria, you have to sleep under ITN/LLIN regularly when you are at home or in the forest;” and “Now you are arriving in malaria zone, you must be careful.” The billboards were displayed near markets and crossroads in malaria endemic areas where migrant workers pass.

PFD and partners also printed and distributed 950 educational flipcharts and 7,000 malaria promotion posters for HC staff and VHV/VMW. Additional radio spots promoted the services provided by VMWs. Educational materials provided included 70 sets of treatment charts and 52,000 posters.



Through the MCC project, PFD also provided IEC materials for pregnant women. PFD and partners distributed 1,200 cotton bags and 8,000 flyers to promote the messages “Pregnant women sleep under ITN regularly, mother and baby will be healthy” and “When pregnant women suspects malaria, please go immediately to do blood test by VMW or go to HC”. The bags were given to pregnant women during antenatal care visits and the flyers were distributed during World Malaria Day celebrations in 2010.

G. School Health Education

PFD leveraged its expertise in school health education and child-to-child methodologies to support the development of a standardized national curriculum for malaria education in primary schools. Following a series of meetings coordinated by the IEC/BCC specialist, the Ministry of Education, Youth and Sports finalized and approved the curriculum. In February 2011, PFD facilitated a training session for provincial trainers in Battambang province. 32 participants from provincial and district offices of education attended the training from the four provinces of the project. The training objectives were to:

1. Build the knowledge and skills of provincial education trainers;
2. Disseminate and integrate malaria education into primary school program; and

3. Strategize on best practices for the integration of malaria education into primary school classrooms.

H. Malaria Week

Through the MCC project, PFD successfully replicated and expanded Malaria Week into the four provinces under the MCC project. PFD's Malaria Week programs reached 142 villages with over 30,000 people in 2008-2009 and over 43,000 people in 2010 with the Malaria Week interventions aimed to cover at risk populations before the rainy season. Interventions include:

1. Community-based HE/BCC;
2. Bed net distribution and re-impregnation; and
3. Early Diagnosis and treatment.

2.3 Research

In the first year of the project, following discussions with URC and USAID/RDMA, PFD implementation expanded to include operational research. Research areas focused on drug resistance issues and mobile and migrant populations and were vital to PFD's ability to develop trainings and educational materials for the targeted population, as well as to provide the Cambodian government with updated statistics on drug-resistant malaria to improve future policy. The studies were designed by the STMO and conducted by PFD with support from CNM in collaboration with the Pasteur Institute of Cambodia (for drug resistance research) and the Institute of Research for Development (for research on mobile and migrant populations). The main achievements and results are presented below:

A. "Beyond Monitoring Drug Resistance in Cambodia: An Innovative Strategy to Actively Control the Spread of Existing Drug Resistant/tolerant Strains"

PFD's original research design evolved from findings in 2007 that suggested the presence of *Plasmodium falciparum* parasites with altered response to artemisinin derivatives. This implied that artemisinins may be losing their powerful and rapid action against *falciparum* infections. This operational research aimed at better defining the geographical distribution of potential drug resistant/tolerant carriers in order to better target the containment interventions regarding the spread of multi-drug resistant (MDR) parasites. The existing hospital and lab staff conducted the research and a PFD research coordinator ensured proper coordination and implementation in this multi-level, multi-site study conducted in collaboration with Pasteur Institute of Cambodia (IPC).

PFD's research team presented preliminary results at various national or regional workshops and meetings and will publish them in a peer-reviewed international journal. The results of the study will allow for a better understanding of the geographical location and spread of drug resistant parasites and to improve containment interventions. Research conducted by PFD helps to further define operational criteria and indicators for potential drug resistant carriers.

B. “Ethnographic Investigation on Migrant and Mobile Population in the North West”

To refine and deepen the initial findings about MMP, PFD began collaborating with Institute of Research for Development (IRD) to focus on the health dynamics of mobile and migrant populations with regard to multi-drug resistance. The two main objectives of the collaboration were: 1) to document migrant and mobile populations’ heterogeneous spatial mobility and to provide a detailed account of the migration flows in the North Western provinces (where the first resistant strains have been officially reported) and other provinces in the country; and 2) to develop a detailed understanding of the spatial and social therapeutic trajectories of the populations affected by malaria.

An extensive report of the findings was produced by Dr Frederic Bourdier of IRD. The report generated interest from partners and stakeholders; for example, the BBC World Trust used the findings to develop PSA for TV broadcasts on malaria in Cambodia. Dr Bourdier presented the research scope in May 2010 in Phnom Penh at an international conference on migration in Southeast Asia.

C. “Malaria, Mobile Population and Migrants in the Context of Drug Resistance in Cambodia”

Based on the above results and the analysis of additional data (epidemiological and demographic from the 2008 census) and documents, PFD produced a report leading to a better understanding of the relationship between population movement, land development, malaria and the issue of drug resistance in Cambodia. The PFD research team presented the preliminary results at the National Containment Task force meeting in Phnom Penh in December 2010.

The report outlines the interactions between malaria and its ecosystem, mobile and migrant populations, and the emergence and spread of anti-malarial drug resistance. The complexity of these interactions requires a multi-disciplinary approach which has been used over the last three years in the MCC project. PFD’s approach combines quantitative and qualitative information drawn from field investigations, secondary sources, and spatial data analysis using basic statistics and Geographic Information Systems (GIS). This allows PFD to estimate the number of migrants and mobile populations, to understand their relationship with malaria and to identify the main drivers of migration, namely land use, resources and socio-economic conditions. PFD proposes a multi-dimensional vulnerability index for malaria, which needs further investigation for operational use.

The report introduces a conceptual and operational framework developed using proxy indicators based on known factors that influence the development of anti-malarial resistance to define areas of concern for potential 1) imported malaria, 2) emergence, and 3) spread of drug resistance. Using this framework and GIS, allowed PFD to identify geographical areas of concern and to estimate the number of people in each of the three categories. More work is needed to refine this framework and to develop it as an operational tool, although a list of communes identified as areas of concern is already available for use by the malaria control program at various levels. PFD proposed adjustments to the current malaria strategy including the development of a more horizontal structure, extension to the non-health sector, and the development of an outline for an implementation strategy to reach migrants and mobile populations with malaria control services.

D. Rapid Diagnostic Test (RDT) Study

In March 2010 PFD developed a protocol to study the quality of RDT use at the community/facility level for a rapid investigative study. The study covered two Operational Districts (Zone1: Battambang, Zone 2: Samrong), four Health Centers (Battambang OD: Tasanh & Samlot HCs, Samrong OD: Trapeang Prey & Trapeang Prasath HCs) and 8 VMWs (two per each HC) to review the current Quality Assurance (QA) procedures to ensure quality of RDT use (proper storage, tracking expiry date, waste management, etc.). Based on anecdotal field results reporting invalid tests, a rapid assessment study examined the quality of RDTs stored and used at different levels of the health system in Cambodia (OD, HC and VMW storage and use at the HC level vs. microscopy). The comparative analysis of RDT vs. microscopy at health centers indicates no difference in sensitivity or specificity, as both tested at 100% for all plasmodium species.

PFD found that RDTs collected in OD storage rooms, HC storage rooms and VMW houses all displayed optimal sensitivity and specificity when tested according to WHO Standard Lot Quality testing procedures. In this study PFD found that storage conditions (storage duration of up to 140 days, existence of a cooler box or air-conditioning, expiration date, and lot number) did not affect the quality of RDTs. The results imply that duration of storage is the main factor affecting the quality of RDTs, independent of other storage conditions. Sub-optimal storage conditions, specifically increases in temperature, decrease the shelf life of RDT. RDT quality in the field is likely to be a function of storage duration and storage temperatures.

Recommendations include:

- Further investigation with a longer follow-up period is needed to confirm the initial results.
- Studies assessing the quality of RDTs should include temperature and humidity data.
- The monitoring system of RDT quality should include a systematic monitoring of temperature of storage conditions.

PFD staff, from time to time, was involved in tasks not directly under the scope of work (SOW), at the request of the COP. These activities include:

- LLIN Loaning Scheme for Mobile and Migrant Population: set up and assessment
- Malaria Week
- Malaria Day
- Private Drug-Outlet Survey & Mapping
- VMW meeting
- Monitoring & Evaluation

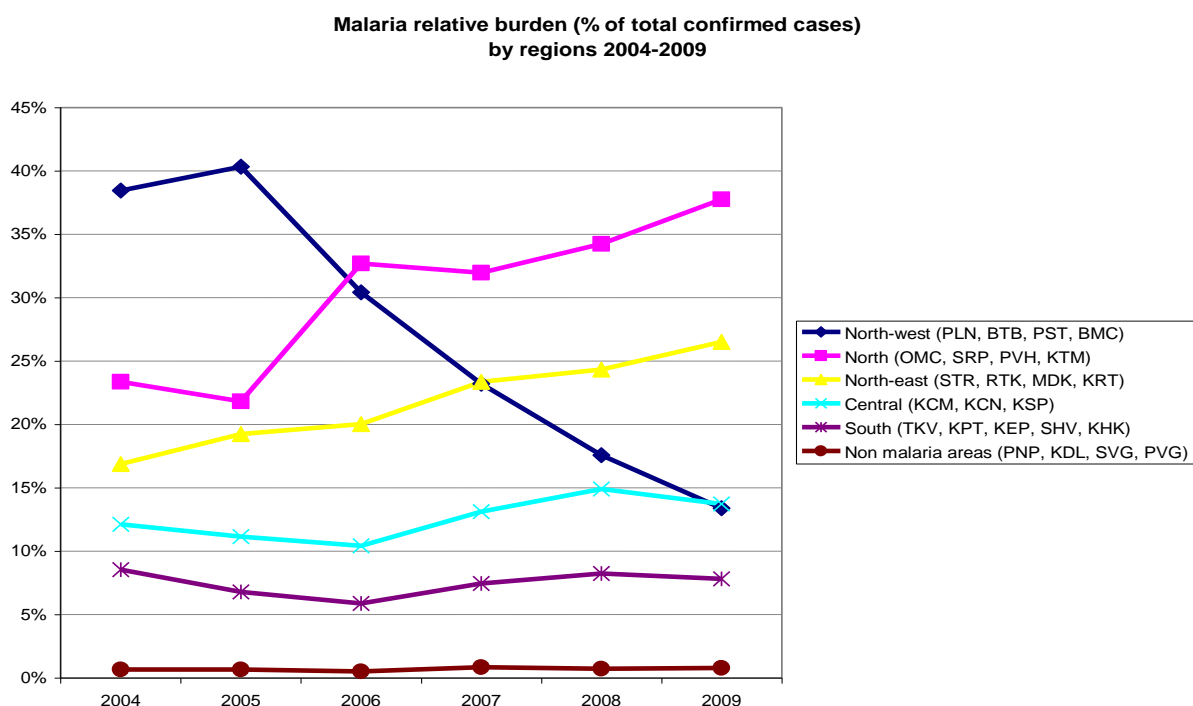
3. Project Management

Contractor of the MCC project was University Research Corporation (URC) of Bethesda, Maryland, reporting to the USAID East Asia Regional Office in Bangkok, Thailand. PFD was the project's main sub-contractor and reported to URC for the 45 month period of 01 October 2007-30 June 2011. Sub-contract value during that time was \$588,403. Main expenses were for PFD staff dedicated to the MCC project, on short term technical assistance (STTA) and on trainings. The lead staff person in the MCC for PFD was a Senior Malaria Technical Officer, Philippe Guyant, M.D. and other full time staff included: IEC/BCC Officer, Capacity Building Officer, M&E Survey Advisor, and M&E Survey Coordinator.

4. Project Outcomes and PFD Impact

The results presented in this report are primarily outputs. A baseline survey conducted in 2008 determined outcome and impact USAID indicators based on monitoring data on a quarterly basis from Q4-08 to Q4-09 (see MCC preliminary report August 2010). Quarterly data related to malaria outcomes and impacts are difficult to interpret given the seasonality of malaria epidemiology. There is no available End of Project evaluation data, using the same methodology, at the time of writing.

Assessing the impact of specific interventions from one implementer/funding source are notoriously difficult when similar interventions with multiple/overlapping implementer/funding sources are taking place in a given area, as was the case during the course of the MCC project. In addition to the MCC project, malaria control interventions were being implemented by provincial level partners with Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) funding.



Malaria spatial and temporal trends are influenced by multiple factors: socio-economics, land cover, climate, and demographics, all of which cannot be directly controlled. The figure above shows the malaria trend over time grouped by geographical regions in Cambodia. The North Western region, where three of the four MCC target provinces are located, shows a decreasing trend since 2005 (about three years prior to the start of the MCC). Although it would be tempting to solely attribute the declining trend between 2007 and 2009 to the MCC project, recognition must be given to other factors that have played an important role in decreasing the malaria burden (mainly deforestation for agricultural purposes). The Northern region of Oddar Meanchey, the fourth target province, showed an increase in malaria burden since 2005. This trend is likely related to an increase of migrants in the forested area of this province.

PFD's role in the MCC project was a key factor for successful implementation; PFD contributed to building the capacity of PHD/OD/RH/HC staff and creating cadres of VHV and VMWs trained in prevention and health education, and malaria diagnosis and treatment.

PFD developed innovative IEC/BCC strategies and materials focusing on mobile and migrant populations. Qualitative research conducted during the course of the project later drove implementation. The taxi-driver project has already been replicated by the provincial health department in one of the target provinces (Battambang) and has the potential to be replicated in other regions.

PFD's previous experiences in malaria control through community-based integrated interventions (Malaria Week and School Health Education) allowed for the successful replication and scaling-up in the MCC project areas.

PFD cultivated partnerships with research institutions (IPC and IRD) to conduct operational research on anti-malarial drug resistance and mobile and migrant populations, providing new insights into these themes. Recommendations made by PFD can be used by the National Malaria Program and partners to adjust malaria control strategies at both the national and local levels.

Through this collaborative partnership, PFD was able to expand its programs to Western Cambodia where anti-malarial drug resistance is of great concern not only to the Mekong region, but to the rest of the world. Additionally, the MCC project offered an opportunity for PFD to augment its profile and visibility as a significant player in the field of malaria control, in particular, development of interventions to address multi-drug resistant malaria among migrant and mobile populations in Cambodia.