

Motivation To Test, Treat, and Report Malaria Cases: A Quantitative Assessment Among Private Sector Providers in The Greater Mekong Subregion

Morgan Brown

PO Box 99 Stratton OH 43961

Paul Bouanchaud

Population Services International

Kemi Tesfazghi (✉ ktesfazghi@psi.org)

Population Services International <https://orcid.org/0000-0001-9202-4517>

Saysana Phanalasy

Population Services International

May Me Thet

Population Services International

Hoa Nguyen

Population Services International

Jennifer Wheeler

Population Services International

Research

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Abstract

Accurately testing, treating, and tracking all malaria cases is critical to achieving elimination. Ensuring health providers are able and motivated to test, treat, and report cases is a necessary component of elimination programs, and particularly challenging in low endemic settings where providers may not encounter a large volume of cases. With funding from the Bill & Melinda Gates Foundation, this study aimed to identify and validate distinctive subtypes of motivation among private sector providers enrolled in the Greater Mekong Subregion Elimination of Malaria through Surveillance (GEMS) program, implemented by Population Services International. Quantitative questionnaires were administered electronically in person by trained enumerators to various provider groups in Myanmar, Lao PDR, and Vietnam. A three-stage confirmatory factor analysis was then conducted in STATA. Following this analysis, a two-factor solution that describes motivation in this population of providers was identified, and providers were scored on the two dimensions of motivation. Provider motivations were analyzed by provider characteristics, and associations with intentions and outcomes related to malaria service provision were explored. These providers, who are often assumed to only be financially motivated, engaged in malaria elimination activities because of both internal and external motivational factors that are independent of remuneration or financial gain. Motivation varied by provider characteristics and was associated with outcomes of importance to malaria elimination. Understanding components of provider motivation to test, treat, and report malaria cases in elimination settings will ensure that malaria programs can establish mechanisms to encourage lasting engagement by providers in pursuit of elimination goals.

Background

Important gains towards malaria elimination have been achieved in recent years in the Greater Mekong Subregion (GMS). Although malaria cases and deaths have declined dramatically, the expansion of artemisinin resistance in the region is a growing threat to malaria control efforts. Thorough surveillance is critical to curbing the epidemic, and private sector contributions, while important, often go unreported (1, 2). Established in 2016 and funded by the Bill and Melinda Gates Foundation, Population Services International's (PSI) Greater Mekong Subregion Elimination of Malaria through Surveillance (GEMS) program aims to increase private sector engagement to accelerate progress towards elimination.

Countries in the GMS aim to eliminate all forms of malaria by 2030. There has been a 74% decline in the number of confirmed malaria cases between 2012 and 2019 and a 95% decline in malaria deaths in the same period (3). The major vectors in the GMS—*Anopheles minimus* and *Anopheles dirus*—are now found primarily in forest and forest-fringe areas. As a result, the malarial burden is concentrated disproportionately among those who live near these zones.

Much progress has been made in the GMS, particularly during the last five years, to reduce the malaria burden. In Lao PDR, the number of malaria cases decreased between 2012 and 2019 by 80% (3). Vietnam has fewer than 5,000 confirmed cases per year, mostly concentrated in three provinces: Binh Phuoc, Dak Lak, and Gia Lai (4). In the past decade, the number of reported malaria deaths in Myanmar has dropped steadily year by year from 1,707 in 2005 to just 19 in 2018 (a 99% reduction over 10 years). The incidence of reported malaria has fallen by 85% since 2012 (from 9.94 per 1,000 population in 2012 to 1.46 per 1,000 population in 2018) (3).

Collectively, GMS countries reported the steepest decline to date in *Plasmodium falciparum* (*Pf*) malaria with cases dropping by 47% in 2019 compared to 2018. For the first time, *Pf* cases no longer compose the majority of cases in the Subregion, as they accounted for just 32% of all cases in 2019 (compared to 80% of all cases in 2012). This substantial achievement is even more important given the ongoing threat posed by antimalarial drug resistance in the GMS, where *P. falciparum* resistance to artemisinin and partner drugs is present across the region (5).

Engaging the private sector is necessary to achieve malaria elimination in the GMS, as a significant proportion of the population first seeks health care within that sector. The preference for private sector providers is likely related to accessibility and perceptions of quality and flexibility in prescribing medicines when compared to the public sector (6). However, none of the six countries in the GMS collect complete case data from private sector points of care such as pharmacies, clinics, shops and private hospitals (7). As a result, national policy makers lack access to a complete malaria case data set to inform program strategies and interventions.

In 2015 and 2016, cross sectional outlet surveys identified low availability of malaria diagnostic testing and poor access to first-line treatment in the private sector across the GMS (8). Between 2015 and 2019, the GEMS program received funding from the Bill & Melinda Gates Foundation to support national malaria control programs (NMCPs) in Cambodia, Lao PDR, Myanmar and Vietnam to capture private sector data by engaging private providers in malaria case management, generating private sector malaria case data, and integrating these data into national surveillance systems. The GEMS established network has increased access to quality case management in Cambodia, Lao PDR, Vietnam and Myanmar, where use of the private sector remains high (6), and PSI-supported providers detected between 1.8% and 18% of the national caseload in each of the four countries in 2019.

The program includes training eligible private providers according to national malaria case management guidelines, ensuring uninterrupted supply with quality assured malaria rapid diagnostic tests (RDTs) and Artemisinin Combination Therapy (ACT) for treatment, providing routine supportive supervision to providers, and carrying out quality assessments of service provision. It is implemented with a different geographic scope across the four target countries.

PSI/Myanmar implements GEMS nationally in both high and low burden areas and through Sun Quality Health (SUN) network providers, Integrated Community Malaria Volunteers (ICMVs), and Non-Formal Private Outlet network members (POs)¹. SUN providers are qualified physicians, typically General Practitioners (GPs) working in a clinic setting, whereas ICMVs are similar to public sector community volunteers, some of whom have medical training (e.g., auxiliary midwife). The PO network consists of mobile drug vendors, small drug shops, and general retail stores. ICMVs and POs are located in rural and peri-urban areas throughout the country and are responsible for the vast majority of testing and case detection. As part of participation in the program, SUN providers receive a maximum incentive of \$16 per month, ICMVs receive a maximum of \$10 per month, and POs receive a maximum of \$5 per month. Through the engagement of these private sector providers, PSI/Myanmar tested 520,341 fevers in 2019, resulting in 4,388 cases detected. This accounted for approximately 14.2% of total fevers tested in country, with 8.3% of the national caseload detected through PSI's networks (9). The SUN providers detected 13.4% of all PSI networks' positive cases, the ICMV channel detected 57.9%, and the PO channel detected 28.6%. Despite receiving fewer performance-based incentives (see Table 1), the PO network tends to have the highest positivity rate. SUN doctors have the second highest (despite lower testing rates than ICMVs and POs), likely due to their urban and peri-urban location and qualifications, which makes them more likely to test for confirmation of clinical diagnosis.

Table 1
Incentives by channel

Channel	Country						
	Lao PDR	Myanmar			Vietnam		
	PPM	PO (AMTR)	ICMV (CHSP)	Sun	Clinic	Pharmacy	FMCG
Incentives: USD/month per provider; or max. possible if performance based	\$ 40	Maximum USD 5	Maximum \$ 10	Maximum \$ 16	No monetary incentive (Promo items only, ~\$20)	No monetary incentive (Promo items only, ~\$5)	No monetary incentive (Promo items only, ~\$5)

In Lao PDR, the PSI program operates in the five southern provinces and the low-burden, elimination-targeted north. In 2019 PSI supported 474 public-private mix (PPM) providers, consisting primarily of doctors and pharmacists, to test for, treat and report uncomplicated Pf and Pv cases (with ACT only). For their participation in the GEMS program, the PPM providers in Lao PDR receive a maximum incentive of \$40 per month intended to cover things such as internet costs. In 2019, GEMS supported providers tested 73,754 fevers (13% of total fevers tested in the country) and detected 612 cases. A total of 9.2% of the national reported caseload in Lao PDR was detected through the PSI PPM network.

In Vietnam, the GEMS program operates in 4 provinces, primarily in the Central Highlands region. The GEMS network in Vietnam consists of private clinics (staffed by medical doctors), private pharmacies, community-based volunteers known as community malaria champions (CMCs), and fast-moving consumer goods shops (FMCGs). In agreement with some provincial authorities, PSI has trained pharmacies, CMCs, and consumer good shops to test and refer malaria cases. Providers in Vietnam do not receive financial compensation—only monthly/quarterly promotional material incentives valued at less than \$43. In 2019, PSI’s 828 GEMS supported providers tested 28,421 fevers and detected 877 cases, accounting for 1.4% of the total fevers tested in country and 18.7% of the national reported caseload. The majority of cases in the PSI network are detected by clinics (74%), followed by pharmacies (13.6%).

Achieving malaria elimination will require a concerted effort from actors across the public and private sectors. Private sector involvement in malaria surveillance is a relatively recent development. In this study, we sought to understand the motivations of private sector network providers to test, treat, and report malaria cases and determine barriers to quality performance.

Motivation has been defined as, “the level of effort and desire to perform well” and is an important determinant of quality of care (10). Motivation in an employment setting is defined as “... a set of energetic forces that originate both within as well as beyond an individual’s being, to initiate work related behavior, and to determine its form, direction, intensity, and duration” (11). Motivation has been associated with lower levels of staff turnover (12), higher retention, less job burnout, increased performance (13), and higher quality of care (14). Further, motivated employees come to work more regularly, work more diligently, and are more flexible (15).

The evidence base on provider motivation in a malaria context is limited, particularly in terms of a robust, multi-country quantitative analysis. Existing studies tend to be qualitative in nature, conducted in the public, not private, sector, and largely focused on community health workers (CHWs). Available evidence suggests that providers are motivated by both financial and non-financial incentives. A study in Vietnam found the main motivating factors for public sector

health workers were appreciation by managers, colleagues and the community, a stable job and income, and training (16). A study in Tanzania examined sources of CHW motivation at multiple levels: the individual, family, community, and organization. CHWs were found to be predisposed to volunteer work and were motivated to apply the knowledge gained through their work to their own personal problems and to those of their families and communities. On a family and community level, supplemental motivation was provided in the form of moral, financial, and material support, such as service fees, supplies, money for transportation, and assistance with farm work and CHW tasks. The government and development partners, at the organizational level, motivate CHWs with stipends, potential employment, materials, training, and supervision (17). Another study among CHWs in Mozambique and Uganda found CHWs are motivated by status and community standing (18).

Within the malaria context, existing literature explores provider motivations for testing and treatment (19–21), but little is known regarding provider motivations for case reporting. There is also a dearth of literature for Pf elimination contexts. A 2015 study with health providers in Myanmar identified empowerment and improved provider-patient relationships as motivations for using rapid diagnostic tests (22). Research in Cameroon and Nigeria found treatment preferences among providers were determined largely by patient preference and government recommendations, not personal motivating factors (23). Finally, a study in Uganda found community medicine distributors are motivated for altruistic reasons, but the main reported benefits of their work were self-importance, social mobility for self and family, and relationship building (21).

Quantitative measurement of provider motivation involves defining motivation, a multidimensional construct. It must also consider the multiple components of motivation that influence behavior, and the context-specific language used to discuss motivation in different cultural settings. Furthermore, employment motivations can differ in both conceptualization and measurement between different provider subgroups. Direct measures are typically derived through measurement scales within a survey or through qualitative methods. Indirect measures of motivation can be derived through surveys or qualitative methods via experimental games or observations of behavior (24). Further, where measuring motivation has been attempted, it has been focused on the public and community sectors.

In 2000, Bennett, Franco, Kanfer and Stubblebine developed a specific tool to measure the determinants and consequences of public sector health worker motivation in developing countries, which was then used in a three-part study of health worker motivation in hospitals in Jordan and Georgia (25). The tool encompasses a number of motivational and performance categories, theoretical constructs, and scales.

In 2017 Lohmann et al. developed a psychometric scale to measure motivation composition (26). The scale was grounded in the self-determination theory (SDT), a theory introduced in the 1980's as a general framework of human motivation. The SDT captures a generalized measure of motivation toward work and identifies five dimensions of motivation that can be placed along a continuum from extrinsic (motivation to attain or avoid a consequence that is maintained by rewards/punishment) to intrinsic (motivation stemming from the enjoyment of a task).

The present study aims to identify and validate different underlying subtypes of motivation among private sector providers enrolled in the GEMS program. We then examine how these subtypes of motivation differ by provider characteristics, and whether they are associated with intentions and outcomes related to malaria service provision. These analyses will allow us to develop recommendations that influence policies on the role of the private sector in national malaria elimination strategies.

Footnote:

[1] Between data collection and publication of results, the Artemisinin Monotherapy Replacement Network (AMTR) was renamed to Private Outlets, and the Community Health Services Provider (CHSP) was renamed Integrated Community Malaria Volunteers. In the text we refer to the networks as POs and ICMVs.

Methods

Study population

Formal healthcare providers served as the sampling frame for this study and were eligible for inclusion if they were actively enrolled in the GEMS malaria programs and consented to participate. GEMS works with different provider types in each country, thus specific provider types varied accordingly.

In Myanmar, three types of providers were sampled: POs, ICMVs, and SUN Network providers. In Vietnam, three provider cadres were targeted for this study: clinics, pharmacies, and FMCGs (CMCs were excluded from this study). In Lao PDR, clinics and pharmacies were included in this study. In Lao PDR, these providers are largely identical and have similar educational and training requirements and responsibilities.

A random sample of providers, stratified by type of provider, was drawn from each country's list of providers who met the study inclusion criteria (Table 2). We used a sample size calculation for the number of providers needed to estimate key measures with a precision of $\pm 7.5\%$. Providers within each stratified group were selected using a simple random sampling. In Myanmar, providers were selected using systematic random sampling.

Table 2. Provider sample size.

Country	Provider Type	Sample Size
Lao PDR	Formal Clinic/Pharmacy Providers	96
Myanmar	Sun Quality Health (SUN) Network Providers	132
	Integrated Community Malaria Volunteers	150
	Private outlets	134
Vietnam	Formal Clinic Providers	96
	Pharmacies	134
	FMCGs	13

Survey Instruments

For this study, a quantitative survey instrument was developed, borrowing from previously tested measures of motivation (25,26) and incorporating additional questions with input from in-country expert teams with the dual aim of ensuring programmatic relevance while generating robust measures. Respondents were asked a range of questions about their motivations for participating in PSI's malaria program, measured using five-point Likert-type scales. All motivation questions were identically written and administered across the three countries, while some programmatic questions varied.

Questionnaires were administered in person by trained enumerators and responses were captured electronically. This study was approved by the PSI Research and Ethics Board and local review boards in each of the three countries (Myanmar MM - PSI REB #26.2018; Lao PDR LA - Local IRB #2018.69.MP and Vietnam VN - Local IRB #462/2018/YTCC-HD3.) All participants provided informed consent and data were deidentified prior to analysis. The provider motivation module is shown in annex 1.

Analysis

As we conceptualized provider motivation to be a multidimensional construct and given the dearth of previous research into provider motivation in the GMS, a large number of survey items hypothesized to relate to provider motivation were included in the data collection tool. We first needed to establish that the items used in the questionnaire did in fact pertain to the different elements of motivation suggested in the literature (24). We used exploratory factor analysis (EFA) and reviewed the substantive content of the questions to validate that our questionnaire items were measuring two constructs, intrinsic and extrinsic motivation, in the Myanmar data. Next, confirmatory factor analysis (CFA) was used to test construct validity in the Lao PDR and Vietnam data. We then used factor loadings to calculate weighted scores, which we used in subsequent analyses. The analysis proceeded in the following stages:

Stage 1: The analysis was conducted initially on the Myanmar dataset. We used EFA to explore the underlying structure of the correlations between the survey items and to develop a parsimonious set of provider motivation questions relevant to this context. A two-factor model was fitted based on an examination of scree plots and factor eigenvalues. Of the original 32 items pertaining to motivation in the dataset, 16 items with communalities greater than 0.5 were retained. Using maximum likelihood estimation, and promax (oblique) rotation of the factors, a simple solution was achieved (i.e. each item loading onto only one factor). The use of oblique rotation reflects our expectation that the two motivation subtypes are correlated.

Stage 2: We developed a CFA model, using the structural equation modeling (SEM) command in Stata, with two latent variables and item loadings reflecting the simple solution found in the EFA model. This model was first fitted for the Myanmar dataset. We then applied the same model specification separately to the Lao PDR and Vietnam datasets to validate the proposed structure. The results and Satorra-Bentler (adjusted for non-normality) goodness of fit statistics are detailed in the results section below.

Stage 3: For each of the three CFA models (Myanmar, Lao PDR and Vietnam), we calculated predicted Bayes scores (with zero mean, and unit variance) for each provider on both latent factors using the SEM postestimation *predict, latent* command in STATA. We conducted further analyses on these scores to examine how these two dimensions of provider motivation were associated with a series of background demographics and outcome variables of interest. Significance testing was performed on these analyses using oneway ANOVA, simple linear regression, or t-tests according to variable type.

Results

Respondents were majority female (53% Myanmar, 77% Lao PDR, and 54% Vietnam), averaging 44, 48, and 43 years of age in Myanmar, Lao PDR, and Vietnam, respectively (Table 3). In Myanmar respondents had an average of 5 years of experience working as a provider, whereas in Vietnam providers had an average of 15 years of experience. In Lao PDR, this question was not asked. Instead, providers were asked how long they had worked in the PSI program, with an average of 6 months reported. Levels of education varied widely across countries.

Table 3
Sample characteristics for the three countries

		Myanmar	Lao PDR	Vietnam
	N	416	126	243
Gender	Female	53%	77%	54%
	Male	47%	23%	47%
Age	Mean (years)	44.5	48.5	43.2
	s.d.	14.4	12.2	11.9
Time working as a provider*	Mean (years)	5.1	0.7	15.4
	s.d.	4.8	0.5	11.3
Education	Monastery or Other	29%	3%	27%
	High School	25%	15%	7%
	Some college	3%	58%	30%
	Bachelor's Degree	40%	20%	30%
	Masters or above	3%	4%	5%
*Time as provider was not collected in Lao PDR - this variable measures time in PSI program				

Exploratory Factor Analysis

Following the three-stage process described above using data from Myanmar, EFA identified a two-factor solution that describes motivation in this population of providers. Annex 3 shows the unrotated and rotated factor loadings for a bidimensional model for provider motivation with loadings greater than 0.4 indicated in bold. The correlation between the two rotated factors was 0.3889, and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.93, indicating an excellent level of suitability.

The face validity of the two factor solution rests on the theoretical model for motivation that identifies internal and external motivation as key constructs. Examining the questionnaire items that are associated with each of the two factors in the EFA confirms that internal and external motivation are the two key dimensions of provider motivation in Myanmar. The positive correlation between internal and external motivation dimensions confirms our assumption that both represent different dimensions a larger concept of “provider motivation” in this context.

As the second stage in the analysis, a confirmatory model was estimated for the Myanmar data (Model 1, Table 4). Figure 1 shows this model. The same bidimensional structure was then applied to the Lao PDR (model 2) and Vietnam (model 3) datasets. The model coefficients, *P*-values, covariance between latent variables and goodness of fit statistics are shown in Table 4. Recognizing that financial motivations were predicted to be important in the literature, we conducted a further confirmatory factor analysis, adding a third latent trait for financial motivation, measured by three financial motivation-related items in the questionnaire. These items were only asked to two of the three provider types in Myanmar who receive financial compensation (model 4, Table 4).

Table 4

CFA models for Myanmar, Lao PDR and Vietnam, showing standardized coefficients and significance levels

		Model 1		Model 2		Model 3		Model 4	
		Myanmar		Lao PDR		Vietnam		Myanmar AMTR and CHSP only	
Motivation Type	Item	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Measurement model									
External	Because my reputation depends on it	0.500	***	0.022	ns	0.773	***	0.523	***
	Because I receive appreciation for doing it	0.652	***	0.402	***	0.745	***	0.581	***
	It brings pride to my family to know that I'm contributing to malaria elimination	0.787	***	0.161	*	0.490	***	0.778	***
	It is a source of pride to participate in the franchise malaria program	0.593	***	0.638	***	0.469	***	0.559	***
Internal	Because the program is interesting	0.557	***	0.495	***	0.549	***	0.538	***
	Because it is extremely important for my patients	0.524	***	0.418	***	0.544	***	0.476	***
	I value the feedback about the effectiveness (e.g., quality and quantity)	0.619	***	0.563	***	0.492	***	0.536	***
	My franchise malaria program-related job duties, requirements, and goal	0.665	***	0.417	***	0.588	***	0.591	***
	Participating in the SQH Franchise malaria program gives me a feeling of accomplishment	0.722	***	0.603	***	0.674	***	0.672	***
	I feel I am contributing to malaria elimination in my community and country	0.750	***	0.377	***	0.686	***	0.756	***

*P < .05, ***P < .001

		Model 1		Model 2		Model 3		Model 4	
	Participating in the program makes me feel like I'm doing something worthwhile	0.765	***	0.659	***	0.635	***	0.735	***
	There is satisfaction in a job well done	0.824	***	0.535	***	0.687	***	0.829	***
	I am satisfied with the chances I have to learn new things	0.870	***	0.741	***	0.711	***	0.891	***
	I am satisfied with the chances I have to accomplish something worthwhile	0.859	***	0.640	***	0.696	***	0.830	***
	I am satisfied with the chances I have to do something that makes me feel good a	0.717	***	0.573	***	0.642	***	0.752	***
	I am satisfied with the educational/training opportunities I get	0.751	***	0.447	***	0.695	***	0.737	***
Financial	Because of the financial benefits associated with it							0.921	***
	In order to be able to provide for my family financially							0.848	***
	In order to earn money/make a profit							0.563	***
Structural model									
	External <-> Internal covariance	0.324	***	1.021	***	0.698	***	0.205	***
	External <-> Financial covariance							0.234	***
	Internal <-> Financial covariance							-0.113	ns
Goodness of Fit									
	Satorra-Bentler adjusted GoF results (for non-normality)								
	Model Chi2	246.945		127.883		307.334		267.679	

*P < .05, ***P < .001

	Model 1	Model 2	Model 3	Model 4
	< 0.001	0.049	< 0.001	< 0.001
	103	103	103	149
Chi2/df ratio	2.397524	1.241583	2.983825	1.796503
RMSEA	0.058	0.044	0.091	0.053
CFI	0.936	0.921	0.852	0.914
SRMR	0.06	0.074	0.083	0.065
*P < .05, ***P < .001				

Loadings And Country Comparison

Four variables constitute the construct of external motivation in the original Myanmar analysis (model 1), and this was replicable for the Vietnam dataset (model 2), with all coefficients of a similar magnitude and statistical significance in both countries. In applying this model structure to the Lao PDR provider data (model 3), however, we found that one coefficient for the statement, “Because my reputation depends on it” was not significantly associated with the latent construct. Furthermore, a second coefficient for “It brings pride to my family to know that I’m contributing to malaria elimination” had a small loading. This suggests that the external motivation construct may look different or was not fully captured for providers in Lao PDR. The latent construct of internal motivation, modelled originally in the Myanmar dataset, was stable across both additional countries, with statistically significant coefficients of a comparable magnitude for Lao PDR and Vietnam. For all three countries’ data, we found positive, significant covariances between the two latent variables for internal and external motivation. The covariance was higher in Lao PDR and Vietnam than in Myanmar.

Goodness Of Fit

Various measures of goodness of fit for structural equation and CFA models are proposed in the literature. We report several here in line with recommended best practices in SEM modelling (27). The models were found to be of adequate to good fit for the data across all three countries.²

To understand whether provider characteristics are associated with different levels of internal and external motivation, we predicted scores on the two dimensions of motivation for all providers in the three country’s datasets (Tables 5–7). These predicted scores were then used in subsequent analyses to understand how the two motivation subtypes vary according to characteristics of providers.

Table 5
Myanmar predicted external and internal motivation scores

Myanmar		Standardized Mean Scores	
		External Motivation	Internal Motivation
Provider characteristics			
Overall	Overall mean score	-0.001	-0.002
	SD	0.655	0.313
	Min	-1.832	-1.223
	Max	0.812	0.256
Gender	Female	0.050	0.029
	Male	-0.058	-0.037
Provider type	AMTR	0.210	0.030
	CHSP	-0.017	0.085
	SQH	-0.197	-0.133
Region	Yangon	-0.111	0.096
	Mandalay	-0.029	-0.114
	Sagaing	-0.480	0.103
	Taninthar	0.378	0.084
	Shan	0.274	0.126
	Kachin	0.144	-0.048
	Chin	0.059	-0.017
Education level	Monastery	0.264	0.098
	High school	-0.035	0.064
	Higher education	-0.157	-0.111
Provider age (yrs)	Regression coefficient :	0.003**	-0.002*
Outcomes			
Attended PSI training	Yes	-0.009	0.004
	Not yet	0.200	-0.152
How willing would you be to continue to keeping records and sharing them with the government?	Extremely unwilling	-0.118	-0.133
	Not willing	-0.128	-0.019
	Neutral	-0.292	-0.278

Myanmar		Standardized Mean Scores	
		External Motivation	Internal Motivation
	Willing	-0.024	-0.047
	Extremely willing	0.149	0.138
Imagine that all of PSI's support for your practice ended tomorrow. How would you restock on commodities	I wouldn't restock	-0.054	-0.101
	Receive from the government	-0.078	0.130
	Buy from another source	0.038	-0.005
	Other	0.038	-0.029
Time in program (yrs)	Regression coefficient :	-0.008	-0.012***
<p>Bold scores indicate significant difference within group at the 5% level (ANOVA); significance of regression coefficients= *=5%; **=1%; ***<0.1%</p>			

Table 6
Lao PDR predicted external and internal motivation scores

Lao PDR		Mean Scores	
		External Motivation	Internal Motivation
Provider characteristics			
Overall	Overall mean score	0.000	0.000
	SD	0.017	0.225
	Min	-0.059	0.798
	Max	0.014	0.185
Gender	Female	-0.001	-0.009
	Male	0.002	0.029
Region	Savannakhet	0.006	0.081
	Saravan	0.006	0.802
	Champasac	-0.001	-0.005
	Sekong	-0.012	-0.169
	Attapeu	-0.008	-0.102
Education level	High school	0.005	0.064
	Some college	-0.001	-0.011
	Higher	-0.001	-0.012
		Regression coefficient	
Provider age (yrs)	Regression coefficient :	0.000	-0.001
Outcomes			
Willing to continue records/reporting if had to take reports to local health center?	Yes	0.001	0.008
	No	-0.002	-0.025
Willing to continue records/sharing if could submit my phone or SMS	Yes	0.002	0.027
	No	-0.005	-0.064
Imagine that all of PSI's support for your practice ended tomorrow. How would you ...	I wouldn't restock	0.001	0.013
	Receive from the government	-0.005	-0.064
	Buy from another source	0.003	0.042
	Other	-0.007	-0.091
Time in program (yrs)	Regression coefficient :	-0.005	-0.071

Lao PDR	Mean Scores	
	External Motivation	Internal Motivation
<p>Bold scores indicate significant difference within group at the 5% level (ANOVA); significance of regression coefficients= *=5%; **=1%; ***<0.1%</p>		

Table 7
Vietnam predicted external and internal motivation scores

Vietnam		Mean Scores	
		External Motivation	Internal Motivation
Provider characteristics			
Overall	Overall mean score	-0.008	-0.004
	SD	0.636	0.427
	Min	-1.276	-0.804
	Max	1.505	1.133
Gender	Female	-0.108	-0.079
	Male	0.108	0.082
Provider type	Pharmacies	-0.141	-0.111
	Clinics	0.214	0.161
	FMCGs	-0.273	-0.126
Region	Binh Phuoc	0.109	0.151
	Dak Lak	-0.031	-0.003
	Gia Lai	-0.045	-0.095
Education level	High school	-0.140	0.010
	Some college	-0.023	-0.072
	Bachelors	0.221	0.134
	Masters	0.379	0.355
	Other	-0.291	-0.162
		Regression coefficient	
Provider age (yrs)	Regression coefficient :	0.008**	0.005**
Outcomes			
How willing would you be to continue to keeping records and sharing them with the government?	Extremely unwilling	n/a	n/a
	Not willing	-0.246	-0.111
	Neutral	-0.295	-0.245
	Willing	-0.035	0.035
	Extremely willing	0.478	0.241
Imagine that all of PSI's support for your practice ended tomorrow. How would you restock ...	I wouldn't restock	-0.424	-0.309

Vietnam	Mean Scores		
	External Motivation	Internal Motivation	
	Receive from the government	0.171	0.145
	Buy from another source	0.035	0.021
	Other	0.613	0.307
Time in program (yrs)	Regression coefficient :	0.006	0.006**
Bold scores indicate significant difference within group at the 5% level (ANOVA); significance of regression coefficients= * =5%; ** =1%; *** < 0.1%			

Predicted scores for both latent constructs of motivation were standardized with zero mean and unit variance. Female providers in Myanmar had significantly higher average scores on the internal motivation scale than their male peers, while the opposite was found in Vietnam. No difference was found between female and male providers in Lao PDR.

Some geographic variation in motivation across all three countries was seen. External motivation in Myanmar was highest among providers in Tanintharyi Region and lowest in Sagaing Region, while internal motivation was highest in Shan State and lowest in Mandalay Region. In Lao PDR, providers in Saravan and Savannakhet scored highest on both internal and external motivation scales, while those in Attapeu and Sekong scored lowest. In Vietnam, significant differences by region were only seen for the internal motivation scale, where providers in Binh Phuoc scored highest, and those in Gia Lai lowest.

The education level of providers was significantly related to both dimensions of motivation in Myanmar and Vietnam, but the direction of effect differed between the two countries. In Myanmar, higher levels of education were associated with lower levels of both subscales of motivation. In Vietnam, providers reporting more advanced levels of education scored higher on both subscales of motivation.

The age of providers was significantly related to external and internal motivation scores in both Myanmar and Vietnam, with increased provider age associated with a small but significant increase in the standardized external motivation score in both countries, while internal motivation decreased with age in Myanmar and increased with age in Vietnam.

The measure of time spent in the PSI malaria program was significantly related to providers' internal motivation scores in Myanmar and Vietnam. In Myanmar, each additional year in the program was associated with a small but significant decrease in internal motivation, while in Vietnam the relationship was positive.

We also sought to understand what role external and internal motivation might play in predicting some key outcomes. In Myanmar and Vietnam, higher internal and external motivation scores were significantly associated with greater willingness to continue to maintain and share records with the government after the end of program implementation. This implies that providers with higher motivation would continue to test, treat, and report malaria cases once financial incentives provided by the program are withdrawn. This question was phrased differently in Lao PDR, where providers were asked if they would be willing to continue to share malaria case records by phone or SMS after the end of the program. Here also for both internal and external motivation, significantly higher scores were associated with affirmative responses.

Finally, providers were asked what they would do to maintain malaria test and treatment stocks if the program ended. In Myanmar those reporting that they would not restock had significantly lower levels of internal motivation than those with any other response. In Vietnam those reporting that they would not restock were found to have significantly lower scores on both internal and external motivation.

The inclusion of a third type of motivation related to financial benefits of being involved in the malaria program resulted in a CFA model with adequate fit to the data (model 4 in Table 4, and Fig. 2). The coefficients and *P*-values for items loading on to internal and external motivation remained similar to the two-factor model (Models 4 and 1 in Table 4, respectively). The three finance-related items loaded positively on to the latent variable for financial motivation and all loadings were statistically significant at the 1% level. The structural part of the model suggests that when financial motivation is included, the positive and significant relationship between internal and external motivation persists. We also found a non-negligible positive, statistically significant covariance between external and financial motivation types. This means that providers who reported being more strongly motivated by external factors were also likely to be more strongly motivated by financial factors. The relationship between internal motivation and financial motivation was not statistically significant.

The predicted factor scores for the three motivation constructs (including financial motivation) are shown in Table 8. There was little statistically significant variation in financial motivation by background demographics. This suggests that the degree to which providers are motivated by money in their malaria testing and treatment activities is less related to age, education or gender than is the case for internal and external motivation. Likewise, financial motivation scores were not significantly related to the outcome of intention to continue to maintain records after the end of the PSI program – one measure of program sustainability. However, for the other outcome of source of supplies after the end of the program, there was a significant relationship with financial motivation: providers who reported that they would not restock testing and treatments scored significantly higher on the financial motivation scale than their peers.

Table 8
Myanmar predicted external, internal, and financial motivation scores

		External Motivation	Internal Motivation	Financial Motivation
Provider characteristics				
Overall	Overall mean score	0.000	0.001	-0.002
	SD	0.710	0.262	0.798
	Min	-1.971	-1.207	-0.579
	Max	0.957	0.183	3.094
Gender	Female	-0.021	-0.004	0.037
	Male	0.040	0.009	-0.077
Provider type	AMTR	0.129	-0.028	-0.019
	CHSP	-0.116	0.026	0.014
	SQH	n/a	n/a	n/a
Region	Yangon	n/a	n/a	n/a
	Mandalay	0.111	-0.066	0.402
	Sagaing	-0.607	0.072	-0.437
	Taninthar	0.410	0.064	-0.028
	Shan	0.353	0.109	0.400
	Kachin	0.112	-0.102	-0.116
	Chin	0.043	-0.050	0.494
Education level	Monastery	0.191	0.037	0.040
	High school	-0.139	0.006	-0.046
	Higher education	-0.150	-0.103	0.000
Provider age	Regression coefficient	0.008 **	0.001 ns	-0.003 ns
Outcomes				
Attended PSI training	Yes	-0.008	0.013	-0.003
	Not yet	0.127	-0.192	0.017
How willing would you be to continue to keeping records and sharing them with the government?	Extremely unwilling	0.769	0.333	0.167
	Not willing	-0.110	-0.022	-0.042
	Neutral	-0.142	-0.296	0.243
	Willing	-0.028	-0.041	-0.003

		External Motivation	Internal Motivation	Financial Motivation
	Extremely willing	0.051	0.078	-0.037
Imagine that all of PSI's support for your practice ended tomorrow. How would you ...	I wouldn't restock	0.612	0.294	0.136
	Receive from the government	0.206	-0.080	-0.375
	Buy from another source	-0.205	0.078	-0.128
	Other	0.092	0.028	0.060
Years in program	Regression coefficient	0.027 ns	-0.001 ns	-0.015 ns
Bold scores indicate significant difference within group at the 5% level (ANOVA); significance of regression coefficients= *=5%; **=1%; ***<0.1%				

Footnote:

[2] The chi-squared test statistic, while indicative of good fit, is also sensitive to violations of its assumptions and may not be a very good indicator of model adequacy, particularly with smaller sample sizes (ibid. ref?). To correct for sample size sensitivity, the chi-squared to degrees of freedom ratio may additionally be considered. Values below 3 indicate model adequacy, with lower values indicating better fit. All three models presented here have adequate fit according to this measure. RMSEA is less sensitive to sample size than chi-squared. Values below 0.05 indicate close fit, between 0.05 and 0.08 fair fit, and between 0.08 and 0.1 mediocre fit (45). Comparative fit index (CFI) values greater than 0.9 are considered to indicate good fit. In the above analysis, both Lao PDR and Myanmar attain this criterion. Finally, the standardized root mean squared residual (SRMR) is a standardized measure of the difference between observed and predicted correlations, with a value of less than 0.08 indicating good fit. Models for both Lao PDR and Myanmar achieved this level, with Vietnam exceeding the cut off only slightly.

Discussion

Ensuring that every suspected malaria case presenting to the public or private sector is tested and treated is critical to malaria elimination. To achieve this, private provider engagement in national malaria response is key, particularly in areas where a significant proportion of the population seeks care in the private sector. Provider motivation is a central component of most behavior change theoretical frameworks, including those frequently used in public health interventions (28–30). Furthermore, it is a critical factor in addressing health care provider know-do and can-do gaps (31). Motivation of health care providers is essential to the delivery of quality care services, retention, and performance (32). An understanding of what motivates private sector health providers, the dimensions of their motivation, and how motivation may be associated with current performance and sustained engagement, can be used as a helpful input to the design of interventions that select for or encourage the development of motivation dimensions that are associated with improved care and reporting (32). For example, interventions can use these tools to identify and recruit health providers with specific motivational attributes to be part of programs that require greater affinity to non-financial over financial motivations (33, 34) or frame program or network objectives in a way that appeals to providers with specific motivational attributes (35). Alternatively, programs can take the perspective that motivation is mutable and develop interventions that are meant to enhance motivational dimensions that are associated with desired behaviors (36).

Examples of this approach include the use of values clarification (37), clinical coaching (38–40), or emotional intelligence training (41, 42).

The measurement of healthcare provider motivation is difficult because it is a transitive construct that can be unidimensional or multidimensional and can be measured directly or indirectly (24). Existing scales that measure health provider motivation use Likert-style psychometric measures consisting of multiple items to capture different dimensions of motivation (43). These measures have mostly been developed for use in high-income countries and may not be appropriate for use context lower-and-middle income countries. This study applied previous measures of motivation to a diverse group of private providers in three countries in a malaria elimination context. The measures were developed from existing, validated tools developed to measure motivation of health care providers in low- and middle-income countries (LMICs). The scale developed by Lohman and colleagues in 2017 (26) is based on SDT and measures motivation composition (the relative contribution of different kinds of motivation to overall work motivation). SDT is recommended for supporting programs to determine how motivation of different origins and characteristics contributes to overall motivation and to understand how differences in the dimensions of motivation are associated with outcomes of interest. We also included measures from Bennet and colleagues (25), who developed scales drawing from published literature for constructs of motivational determinants, such as worker expectations, values/work ethic, work-related personality, and emotional personality in Jordan and Georgia. These measures were adapted for use within the GEMS malaria elimination program in Vietnam, Myanmar, and Lao PDR. These adaptations included slight wording changes and removal of redundant items, which were later pretested prior to study implementation.

As found by other research in different contexts (44), the GEMS private sector providers, who were believed to be financially motivated, were also motivated by other personal factors. Motivations varied by key characteristics of providers and were predictive of outcomes of importance. Maintaining or increasing provider motivation to test and treat in malaria case management is essential in the fight to eliminate malaria from the GMS, as it helps to ensure that providers continue to pursue this goal, even in a low incidence environment where cases may be rare and in which providers face financial pressure to focus on areas of health service provision other than malaria case management.

We have demonstrated in Myanmar and Vietnam (and to some extent in Lao PDR), that provider motivation has two similar dimensions across countries. The relationship between internal and external motivation was also similar in all 3 countries, meaning that across these contexts, providers who have a higher level of external motivation are also likely to have a higher level of internal motivation. Examining how motivation varies by provider characteristics, results were highly country-specific. This is unsurprising – Vietnam, Lao PDR and Myanmar are very different contexts, with differently structured health systems. While recent decades of underinvestment have weakened Myanmar's public health system, significant improvements have been made during the last five years. Myanmar remains the most permissive environment for the private sector, and all PSI providers – including informal private outlets and volunteers – are able to test and treat Pf and Pv malaria, including prescribing primaquine for radical cure of Pv.

Conversely, only private clinics are allowed to test and treat for malaria in Vietnam. In agreement with some provincial authorities, however, PSI has trained pharmacies, CMCs, and FMCG shops to test and refer malaria cases. These country-level differences may be reflective of the interplay between individual provider-level motivations and a unique relationship between organizational structure, culture, and societal culture (25).

When we examined several important outcome variables in the analysis (willingness to continue to report cases after the end of the PSI malaria program, and intention to acquire testing and treatment stocks post-PSI program), we found that in both Myanmar and Vietnam, higher provider internal and external motivation scores were associated with greater intent to continue these key aspects of malaria case management. This finding is timely as the program phases out and the private sector provider networks transition to public sector oversight in each country. Finding ways to better

motivate providers through intrinsic factors is therefore likely to have a substantive impact on the sustainability of these activities during and after the implementation of this program. We can speculate that a fruitful approach to driving greater project sustainability may therefore lie in targeted recruitment or stratifying providers within each project country and developing interventions that will appeal to their core motivations. This challenges the conventional wisdom that providers only care about money and financial incentives are their primary source of motivation (31). Further research is needed to assess the degree to which these different dimensions of provider motivation may be change through time, and therefore would have the potential to be increased through specific interventions. Similarly, it would be beneficial to know the degree to which this bidimensional structure of provider motivations might apply to other malaria service providers outside of the GMS. Further research should aim to identify interventions that increase internal and external motivations and to better understand the interplay between financial, internal, and external motivations and the value for money associated with interventions.

Limitations

The findings may not be generalizable to the private sector as a whole, as the study sample consisted only of private providers that engaged in the PSI GEMS program. Further, our results would need to be validated for use in other contexts and provider types. Participation in the PSI program could have led to response bias among study participants. Self-report bias could also have influenced results. The analysis was based on Likert-scale responses, which are imperfect and treated as continuous variables, an approach commonly used in the literature (24), despite being discrete. Likewise, the use of Likert scale-type questions may violate the assumption of normality under a maximum likelihood estimation method for the CFA models. For the financial analysis, the model was only an adequate fit, perhaps because the sample size was smaller and the model was more complex. We consider the findings indicative but interpret them with caution. Finally, the providers' reported outcomes were based on intentions, not observed actions, and further research might consider a longitudinal approach for examining associations between provider motivation and outcomes.

Conclusions

Conventional wisdom has long held that private sector providers are primarily motivated by financial incentives. Our results, however, show motivation to be multifaceted for this group. Our study consistently identified two dimensions: internal and external motivation, across three contexts and different types of providers (ranging from informal to medical professionals). Providers chose to join PSI's malaria program for a variety of reasons, including commitment to serving their community, boosting their reputation, having access to professional development opportunities, and receiving commodities.

By understanding how motivation varies according to provider characteristics, malaria elimination programs can better target continuing professional development, adapt incentive structures, and update training and routine communication with providers to build on factors that may improve internal and external motivation. Programs must examine motivation within their contexts to best establish incentives and nudges that will work locally.

Organizations need to look at providers not just as business owners and public servants, but also as nuanced actors with multiple sources of motivation. Individual characteristics are important to how private providers should be trained, recruited, and engaged to ensure long term success and sustainability. Future research should aim to better understand how motivation varies in different contexts and its effects on outcomes in the health system.

List Of Abbreviations

AMTR Artemisinin Monotherapy Replacement Program

CFA Confirmatory Factor Analysis

CMC Community Malaria Champion

CHSP Community Health Service Provider

CHW Community Health Worker

FMCG Fast Moving Consumer Goods

GEMS Greater Mekong Subregion Elimination of Malaria through Surveillance

GMS Greater Mekong Subregion

ICMV Integrated Community Malaria Volunteers

KMO Kaiser-Meyer-Olkin

LMIC Low Middle Income Countries

MMW Mobile malaria workers

PO Non-Formal Private Outlet

PPM Public private mix

PSI Population Services International

RDT Rapid diagnostic test

SEM Structural equation modeling

SQH Sun Quality Health Network

SRMR Standardized root mean squared

Declarations

Ethics Approval and Consent to Participate

This study was approved by the PSI Research and Ethics Board (REB), as well as local boards in all four countries: National Ethics Committee for Health Research (Lao PDR), the Department of Medical Research Ethical Review Committee (Myanmar), and the Hanoi School of Public Health (Vietnam).

Consent for Publication

Not applicable

Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

MB contributed to study design, conducted the initial analysis, and contributed to the background, methods, results, discussion and conclusion sections. PB conducted the EFA and CFA analyses and contributed to the background, methods, results, discussion and conclusion section. KT was responsible for oversight of the study and contributed to the background, discussion and conclusions sections. JW contributed to study design, provided guidance on the analysis and structure of the paper, and contributed to the background, methods, results, discussion and conclusion sections. All authors read and approved the final manuscript.

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Figures

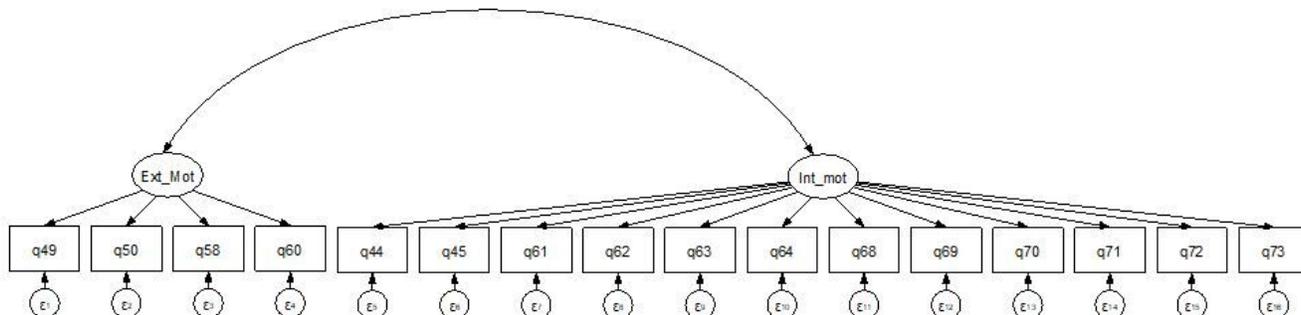


Figure 1

final confirmatory factor analysis path diagram

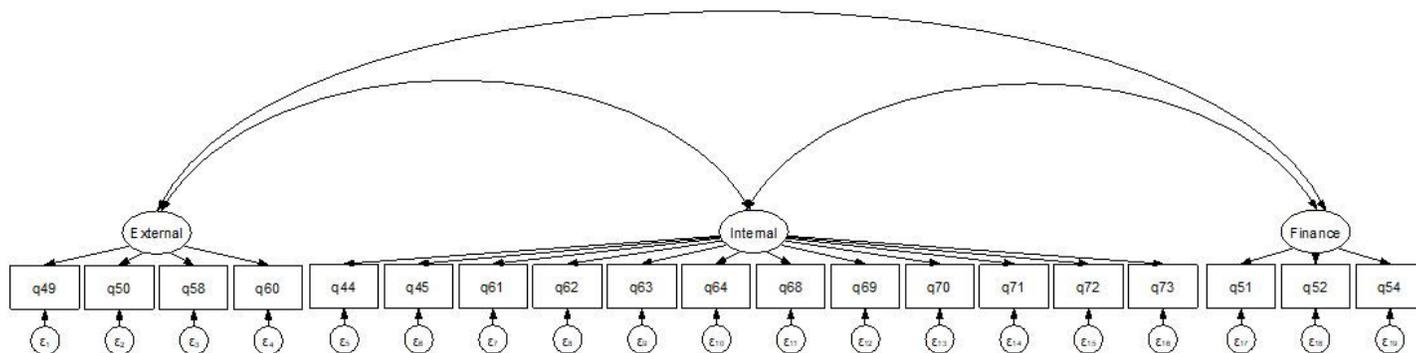


Figure 2

CFA path diagram for model including financial motivation

Supplementary Files

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