Papua New Guinea Institute of Medical Research

Papua New Guinea/The Global Fund Round 8 Malaria Control Program Evaluation 2009-2014:

Report of the Baseline Health Facility Survey 2010

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EXECUTIVE SUMMARY

The current National Malaria Control Program (NMCP), supported by a Round 8 grant from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), focuses on the large-scale free distribution of long-lasting insecticide treated mosquito nets (LLIN), the introduction of artemisinin-based combination therapy (ACT) for malaria, the strengthening of malaria diagnosis at all levels, and communication and advocacy to increase malaria awareness and understanding in the community and at the political level. The implementation of these interventions is planned for a period of five years, from 2009 to 2014.

The Papua New Guinea Institute of Medical Research (PNGIMR) is responsible for the overall evaluation of the GFATM supported NMCP. One component of the PNGIMR evaluation plan is to evaluate the outcome of the NMCP on malaria related service delivery in health facilities country wide. This evaluation, in the form of a Health Facility Survey (HFS), will take place four times over the five year period 2010 – 2014. The main outcome measures of the HFS are:

1. Proportion of health facilities with working microscopy or with malaria Rapid Diagnostic Tests (RDT) in stock
2. Proportion of health facilities with the new first-line anti-malarials (ACTs) in stock (for all age groups)
3. Proportion of health care providers trained in malaria case management (new treatment guidelines and use of RDTs)
4. Proportion of fever cases presenting to health facilities diagnosed and treated according to national guidelines

The HFS data were also used to assess the following outcome indicator which was not able to be assessed (as originally intended) via the National Health Information System (NHIS):

- Percentage of people presenting to a health care provider with parasitologically confirmed malaria who receive ACTs

This report presents the findings from the baseline PNGIMR HFS conducted in 2010. The 2010 HFS was completed prior to the introduction of the new National Malaria Treatment Protocol (NMTP) which stipulates the testing of all fever/suspected malaria patients for malaria infection by RDT or microscopy and the prescription of the ACT Artemether/Lumefantrine to all test confirmed malaria cases.

The 2010 HFS was carried out country-wide (all 20 provinces) in areas with endemic or potentially epidemic malaria. The study sample consisted of two health centres and up to four aid posts randomly selected from each province. A total of 79 health facilities were surveyed, 225 clinicians were interviewed, the clinical management of 468 fever or suspected malaria patients was observed, and 600 interviews were conducted with fever/suspected malaria patients.

A total of 15.2% (95% CI 8.1, 25.0) of the surveyed health facilities had unexpired RDTs in stock or working microscopy available. A further fourteen health facilities (16%) had expired RDT in stock or non-operational microscopy.

Artemether/Lumefantrine (AL), the first line anti-malarial in the new NMTP, was not in stock at any health facility included in the survey sample. However, the current recommended first line drugs for uncomplicated malaria (amodiaquine + sulphadoxine-pyrimethamine or chloroquine + sulphadoxine-pyrimethamine) were available in 78.5% (95% CI 67.8, 86.9) of health facilities surveyed and 84.8% (95% CI 75.0, 91.9) had sulphadoxine-pyrimethamine and either amodiaquine or chloroquine in stock. The current recommended first line drugs for complicated malaria (artemether injection + artesunate tablets + sulphadoxine-pyrimethamine) were available in 41.8% (95% CI 30.8, 53.4) of health facilities.

A total of 443 clinical staff members were employed in the 79 surveyed health facilities. Overall, 6% (29/443) of these clinical staff were reportedly trained in the new NMTP. Of the trained staff, 26 were employed at one of five health centres and three were employed at one of three aid posts.

No fever/suspected malaria patients were observed being diagnosed and treated according to the new NMTP at the time of the survey as it had not been implemented.

Of the 468 fever/suspected malaria patients observed receiving clinical care, 15% were tested for malaria infection by RDT and 3.6% by blood smear. Overall, 96.4% (451/468) were provided a prescription for an anti-malarial drug.

The type of anti-malarial(s) prescribed was recorded in 92% (414/451) of the cases. Of the 414 anti-malarial prescriptions recorded, 15.5% (64/414) were mono-therapies and 84.5% (350/414) were combination therapies. The recommended first line medications for uncomplicated malaria (amodiaquine + sulphadoxine-pyrimethamine or chloroquine + sulphadoxine-pyrimethamine) accounted for 70.8% of recorded prescriptions.

Of the 78 patients who were tested by RDT or blood smear, the test result was recorded in 69 (86%) cases. Of these 69 patients, 72% (50/69) tested negative for malaria infection, 15% (17/69) positive and the test result was invalid in 3% (2/69) of cases. An anti-malarial was subsequently prescribed to 84% (58/69) of these patients, including 41 out of the 50 patients who tested negative for malaria infection.

There were only 26 patients with parasitologically confirmed malaria in the 2010 HFS. Overall, 38.5% (10/26) of these patients received some form of ACT. The remaining patients received either an artemether injection or tablet only (8/26) or a non-artemisinin based anti-malarial(s) (8/26).

These findings strongly indicate that the new NMTP will require a substantial change in current clinical practice if it is to be correctly implemented and adhered to. Areas that will require the most change include the shift from presumptive to RDT/microscopy confirmed diagnosis, prescribing (or rather non-prescribing) of anti-malarials to patients who test negative for malaria infection, and the type of anti-malarial prescribed. The successful introduction and maintenance of the proposed changes to clinical practice, therefore, will likely necessitate a comprehensive clinician support program, possibly inclusive of 'booster' training opportunities and regular clinical supervision.

ABBREVIATIONS

ACT	Artemisinin-based Combination Therapy
AL	Artemether/Lumefantrine
AM	Anti-malarial
AP	Aid Post
BS	Blood Slide
CHW	Community Health Worker
CI	Confidence Interval
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HC	Health Center
HEO	Health Extension Officer
HF	Health Facility
HFS	Health Facility Survey
HMM	Home-based Management of Malaria
LLIN	Long-Lasting Insecticide treated mosquito Net
MD	Medical Doctor
MLA	Medical Laboratory Assistant
MRAC	Medical Research Advisory Committee
NDoH	National Department of Health
NHIS	National Health Information System
NIS	National Indicator Survey
NMCP	National Malaria Control Program
NMTP	National Malaria Treatment Protocol
NO	Nursing Officer
OR	Odds Ratio
PGK	Papua New Guinea Kina
PNG	Papua New Guinea
PNGIMR	Papua New Guinea Institute of Medical Research
PSI	Population Services International
RDT	Rapid Diagnostic Test
RLA	Rural Laboratory Assistant
SC	Sub-Health Centre
UC	Urban Clinic

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1. INTRODUCTION

1.1. The PNG/GFATM Malaria Control Program

The Government of Papua New Guinea (PNG) has been supported by the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) in the implementation of its malaria control program since 2004. The first round of GFATM funding for malaria (Round 3 malaria grant) focused on the large-scale free distribution of long-lasting insecticide treated mosquito nets (LLIN), the improvement of microscopic diagnosis in health centres and the introduction of Rapid Diagnostic Tests (RDT) for malaria in health facilities without microscopy.

In 2008, the National Department of Health (NDoH) submitted a successful proposal for a second five year malaria grant to GFATM (Round 8 malaria grant). The key objectives of the Round 8 grant build on the interventions initiated in Round 3 and cover the continued free distribution of LLIN, the introduction of artemisinin-based combination therapy (ACT) for malaria, the strengthening of malaria diagnosis at all levels, and communication and advocacy to increase malaria awareness and understanding in the community and at the political level. The implementation of these interventions is planned for a period of five years, from 2009 to 2014.

A comprehensive monitoring and evaluation component is an integral part of the Round 8 proposal submitted to the GFATM. As one of the sub-recipients of the Round 8 grant, the Papua New Guinea Institute of Medical Research (PNGIMR) is responsible for the overall evaluation of the outcomes and impact of the GFATM supported national malaria control program. The PNGIMR evaluation plan aims to assess key outcome and impact indicators against targets defined by the GFATM and the NDoH. It also aims to validate routine data reporting mechanisms and provide accurate, up-to-date information on different aspects of the changing malaria epidemiology in PNG. The major components of the PNGIMR evaluation plan are:

- National Indicator Surveys (NIS) at the level of (i) households and (ii) health facilities, in order to measure intervention coverage and parasitological indicators in a countrywide sample.

- Sentinel Site Surveillance in 7-8 sites across all four regions of PNG in order to follow disease patterns and mortality trends in detail over time while simultaneously assessing intervention coverage.

- Analysis and modelling of National Health Information System (NHIS) data in order to better understand and potentially predict nationwide morbidity and mortality trends and to validate routinely reported data

This report presents selected NIS health facility survey (HFS) data obtained by PNGIMR during the baseline HFS survey in 2010. Data from other PNGIMR research activities conducted in 2010 will be reported elsewhere.

1.2. The Health Facility Survey (HFS)

The aim of the HFS is to evaluate the outcome of the National Malaria Control Program (NMCP) on malaria related service delivery in health facilities country wide. This evaluation will take place four times over the five year period 2010 – 2014. The primary objectives of the study are to assess the availability of diagnostic tools, medicines and human resources as well as the quality of malaria case management. The main outcome measures include:

1. Proportion of health facilities with working microscopy or with malaria Rapid Diagnostic Tests (RDT) in stock
2. Proportion of health facilities with the new first-line anti-malarials (ACTs) in stock (for all age groups)
3. Proportion of health care providers trained in malaria case management (new treatment guidelines and use of RDTs)
4. Proportion of fever cases presenting to health facilities diagnosed and treated according to national guidelines

The HFS data were also used to assess the following outcome indicator which was not able to be assessed (as originally intended) via the National Health Information System (NHIS):

- Percentage of people presenting to a health care provider with parasitologically confirmed malaria who receive ACTs

The secondary objectives of the study are to collect NHIS data from each participating health facility in order to verify NHIS data reports at the national level and to inform implementation and continued delivery of the new NMCP over the five year evaluation period.

1.3. Timing of the 2010 HFS and Subsequent Considerations

The 2010 HFS (reported herein) was originally timed to take place in the preparation/early implementation phase of the new national malaria treatment protocol (NMTP). During this phase it was anticipated that RDT and ACT stock would be arriving in health facilities country wide, training in the new NMTP would be completed and (during the latter stages of the survey) the first patients treated under the new NMTP observed. These expectations are reflected in the proposed NMCP performance targets for 2010 which included[1]:

- 20% of health facilities with working microscopy or with RDT in stock by end 2010.
- 80% of health facilities with first-line anti-malarials (ACTs) in stock (all age packs) by end 2010.
- 4500 health workers trained in malaria case management (100% of clinical workforce) by end 2010.

Unfortunately, RDTs and ACTs were not procured during 2010, the new NMTP was not implemented and health worker training – whilst still largely completed during the course of 2010 – was postponed to the latter part of the year (training had originally been planned for the first half of 2010). Thus, the 2010 HFS (whilst conducted during the scheduled time period) was effectively carried out pre-implementation and prior to any significant preparatory activity. The aforementioned targets were, therefore, largely unachievable and this is reflected in the reported findings to follow.

[1] No 2010 target was set for the 4th outcome measure: proportion of fever cases presenting to health facilities diagnosed and treated according to national guidelines.

2. METHODOLOGY

2.1. Study Sites

This study was carried out country-wide (all 20 provinces) in areas with endemic or potentially epidemic malaria. The study sample consisted of two Urban Clinics (UC), Health Centres (HC) or Sub-Health Centres (SC) (collectively referred to as HC in this report) and up to four Aid Posts (AP) selected from each province using a simple random sampling procedure. The sampling frame included all HC operational in March 2010 inclusive of government and mission administered health facilities (N = 689). Aid Posts were randomly selected on site at participating (i.e. randomly selected and consenting) HC. The sampling frame for aid posts was all operational aid posts under the supervision of the HC at the time of survey[2]. All health facilities subsequently included in the survey are listed in Appendix 1.

2.2. Survey Procedure

The HFS was carried out from June to November 2010 and was conducted by three trained field teams, each comprising three members, working simultaneously at different sites. The training program for field staff spanned 10 days and consisted of lectures on the project background, malaria facts and effects, survey methodology, and intensive instruction and practice on the survey instruments. Members of each survey team spent between three to five days at each participating HC and up to one day at each participating AP. Four distinct survey instruments were utilised (when possible) at each site: 1) a health facility checklist completed with the officer in charge of the health facility; 2) an interviewer administered questionnaire completed with clinical staff at each participating health facility; 3) an interviewer administered questionnaire completed with fever or suspected/confirmed malaria patients at the end of their clinical consultation; and 4) a clinical assessment instrument which involved non-participant observation of the clinical case management of fever or suspected

[2] Reliable records of the number of aid posts in operation at the time of the survey were not available. The number of operational aid posts supervised by each participating health facility was not recorded; however, in many instances no aid posts were in operation. Thus, the target of surveying four aid posts per province was not always achieved.

malaria patients. The health facility checklist was only completed once at each site whilst the remaining three instruments were completed as many times as possible. The clinician and patient questionnaires were available in English or *Tok Pisin* versions. Completed survey instruments were reviewed by a senior scientist during the course of data collection as a quality control measure and supervisory field visits were conducted with each team to ensure research protocols were adhered to.

Prior to any health facility visit, the respective provincial and district health authorities were informed of the study objectives, sites, and timetable. The provincial health authority was also asked to commission a health officer to accompany the field team. Upon arriving at each HC or AP, the field team conducted a *tok save* (information session) with the officer in charge and, following this, with the health facility staff. Once permission to proceed had been obtained, the team leader established in consultation with the officer in charge an acceptable process for survey completion. Oral informed consent was sought from the officer in charge at all participating health facilities and from all participating clinicians and patients prior to interview or clinical observation. A health facility was excluded from participation if voluntary consent by the officer in charge was not obtained (nil occurrence). Individual health workers or patients were excluded from the study if they asked for something in exchange for their participation or if voluntary consent was not obtained. The study was approved and granted ethical clearance by the Medical Research Advisory Committee of PNG (MRAC No. 10.12; 26 Feb 2010).

2.3. Survey Instruments

2.3.1. Health Facility Checklist

This instrument assessed the human resource capacity and the availability of supplies relevant to the treatment and management of malaria. Key questions included the number of clinical staff employed, the number of clinical staff trained in the new NMTP, the quantity of RDTs and artemether/lumefantrine (AL) in stock, the quantity of functional microscopes and availability of essential microscopy supplies, and the availability of a range of anti-malarial medications. Recorded numbers of clinical staff and staff trained in the new NMTP were based on figures provided by the officer

in charge. All reported RDT stock, microscopes, including microscopy supplies essential to operation – Giemsa stain, slides and (in the case of electric microscopes) power supply – anti-malarials, and other reported medical equipment or supplies were observed by the respective PNGIMR field team leaders. This instrument was designed to measure the following primary outcome indicators: proportion of health facilities with working microscopy or with malaria Rapid Diagnostic Tests (RDT) in stock; proportion of health facilities with the new first-line anti-malarials (ACTs) in stock (for all age groups); and the proportion of health care providers trained in malaria case management (treatment guidelines and RDTs).

2.3.2. Clinician Interview

This questionnaire contained a range of open and closed questions designed to elicit information regarding staff education, work experience and supervision as well as the type and utility of any malaria-related training he/she may have received (inclusive of NMTP training). This questionnaire also examined the knowledge, attitudes and practice of clinical staff members relevant to malaria case management and, if applicable, their experiences implementing the new NMTP[3].

2.3.3. Observation of Clinical Care

A checklist designed to assess the quality of malaria case management. The PNGIMR field team used this checklist to assess whether specified actions did or did not occur and to record the content of specific actions (e.g. whether an RDT was conducted or a referral was made and, if yes, what was the outcome?). This instrument was designed to measure the outcome indicator: proportion of fever cases presenting to health facilities diagnosed and treated according to national guidelines.

[3] For the purpose of this study, the definition of 'clinical staff members' included: medical doctors, health extension officers, nursing officers, community health workers, medical laboratory assistants, and rural laboratory assistants.

2.3.4. Patient Interview

This questionnaire contained a range of open and closed questions designed to elicit information regarding the patient's treatment experience, his or her retention of clinical information, treatment accessibility and cost, and pre-treatment behaviour.

2.4. Data Analysis

All data were double entered into DMSys version 5.1. Data analysis was performed using Intercooled Stata version 9. Univariable analysis was performed to describe the characteristics of the various samples. Outcome variables were examined by bivariable analyses including chi-square and equality of medians tests to compare categorical and non-normally distributed continuous data, respectively. Responses to open-ended questions were entered verbatim into DMSys and post-coded by a senior scientist prior to reporting.

3. RESULTS

3.1. Sample Characteristics

3.1.1. Health Facility Sample

A total of 79 health facilities were surveyed across all 20 provinces. Table 1 presents the number of health facilities by type and region.

Table 1. Surveyed health facilities by type and region (n=79)

Health Facility Type	**Region**				**Total**
	Southern	Highlands	Momase	Islands	
Health Centres n (%)	12 (48)	10 (59)	8 (50)	10 (48)	40 (51)
Aid Posts n (%)	13 (52)	7 (41)	8 (50)	11 (52)	39 (49)
Total n (%)	25 (31)	17 (22)	16 (20)	21 (27)	79 (100)

3.1.2. Clinician Interview Sample

A total of 225 clinician interviews were completed, 83% (187/225) of whom were employed in a UC, HC or SC. The remaining 17% (38/225) were employed in an AP. Selected characteristics of the clinicians interviewed are presented in Table 2.

Table 2. Selected characteristics of the clinician interview sample by region (n=225)

Characteristic		**Region**				**Overall**
		Southern	Highlands	Momase	Islands	
Qualification n (%)	CHW	47 (70)	38 (63)	32 (82)	34 (60)	151 (68)
	NO	18 (27)	19 (32)	4 (10)	21 (37)	62 (28)
	HEO	2 (3)	2 (3)	3 (8)	2 (4)	9 (4)
	RLA	0 (0)	1 (2)	0 (0)	0 (0)	1 (<1)
Female n (%)		30 (45)	24 (40)	21 (51)	33 (58)	108 (48)
Years age (mean±sd)		37.5±9.2	40.3±10.6	39.4±9.2	41.4±9.2	39.6±9.6
Years clin. exper. (mean±sd)		15.8±10.7	17.7±13.4	16.8±11.5	17.3±10.2	16.9±11.4

CHW=Community Health Worker; NO=Nursing Officer; HEO=Health Extension Officer; RLA/MLA=Rural Laboratory Assistant/Medical Laboratory Assistant; clin. exper. = clinical experience

3.1.3. Clinical Observation Sample

A total of 605 clinical observations were completed. Patients who had been treated for fever or malaria infection within the past 14 days were removed from analysis to ensure the findings better represented initial malaria case management practice. This restriction resulted in a final sample of 468 patients, 96% (450/468) of whom were attending a UC, HC or SC at the time of observation. The remaining 4% (18/468) were attending an AP. Selected demographic characteristics of the observed patients are presented in Table 3.

Table 3. Sex and age of the patients in the clinical observation sample by region (n=468)

Characteristic		**Region**				**Overall**
		Southern	Highlands	Momase	Islands	
Female n (%)		64 (51)	50 (46)	56 (46)	51 (47)	221 (47)
Age n (%)	0-4 yrs	60 (48)	48 (46)	58 (48)	49 (45)	215 (47)
	5-15 yrs	31 (24)	14 (14)	30 (25)	35 (33)	110 (24)
	16+ yrs	35 (28)	41 (40)	32 (27)	24 (22)	132 (29)

3.1.4. Patient Interview Sample

A total of 600 patient interviews were completed, 95% (570/600) of whom had attended a UC, HC or SC. The remaining 5% (30/600) attended an AP. Selected demographic characteristics of the patients interviewed are presented in Table 4.

Table 4. Sex and age of the patient interview sample by region (n=600)

Characteristic		**Region**				**Overall**
		Southern	Highlands	Momase	Islands	
Female n (%)		83 (51)	71 (45)	79 (50)	58 (47)	291 (49)
Age n (%)	0-4 yrs	67 (41)	68 (45)	79 (50)	51 (41)	265 (45)
	5-15 yrs	42 (26)	24 (16)	42 (27)	43 (35)	151 (25)
	16+ yrs	53 (33)	60 (39)	36 (23)	29 (24)	178 (30)

3.2. Primary Outcome Measures

This section presents the analysis of the primary outcome measures PNGIMR are required to report to NDoH and GFATM. Where the required data were not available (due to delays in NMTP implementation) substitute analyses are presented.

3.2.1. Proportion of Health Facilities with Working Microscopy or with RDT in Stock

As shown in Table 5, a total of 15.2% of health facilities had unexpired RDT in stock or working microscopy available. Working microscopy was defined as the presence of a functional microscope, all essential supplies – Giemsa stain, slides and (in the case of electric microscopes) power – and a trained RLA or MLA in employment. All the unexpired RDT kits and working microscopy were observed in health centres (nil observed in aid posts). No health centre had both unexpired RDT kits and working microscopy at the time of survey.

Table 5. Percentage of health facilities with unexpired RDT in stock, working microscopy available, or either unexpired RDT/working microscopy

Diagnostic Test	**Health Centres** (n=40)		**Aid Posts** (n=39)		**Overall** (n=79)	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
RDT	17.5	(7.3, 32.8)	0	-	8.9	(3.6, 17.4)
Microscopy[a]	12.5	(4.2, 26.8)	0[b]	-	6.3	(2.1, 14.2)
RDT or microscopy	**30**	**(16.6, 46.5)**	**0**	**-**	**15.2**	**(8.1, 25.0)**

a= Working microscopy was defined as the presence of a functional microscope, all essential supplies – Giemsa stain, slides and (in the case of electric microscopes) power – and a trained RLA or MLA in employment. b= Working microscopy was not expected in aid post settings (i.e. '0' was the expected result).

The total number of unexpired RDT kits across the 8.9% (7/79) of health facilities in which they were present was 4089. The median number of RDT kits per health facility in which they were present was 368 (range 38-2500). A further seven health facilities (five health centres and two aid posts) had expired RDT in stock. Five of the health facilities with expired RDT in stock were in provinces with endemic malaria

transmission (Madang, Manus, Oro, and West Sepik). The total number of expired RDT kits in the seven health facilities was 1024 (median per health facility167; range 19-375). All RDT kits in stock (expired or current) were ICT Malaria Combo Test brand.

A further seven health facilities were observed to have a functional microscope available; however, all seven had no trained RLA or MLA's in employment, two had no Giemsa stain in stock and one (with an electric microscope) had no power supply. Overall, a total of 13 functional microscopes were observed by the PNGIMR field team, nine electric and four mirror. Only one health facility had more than one functional microscope. Twelve of the thirteen functional microscopes were observed in health centres, one in an aid post.

3.2.2. Proportion of Health Facilities with First-Line Anti-Malarials in Stock

Artemether/Lumefantrine (AL), the first line anti-malarial in the new NMTP, was not in stock at any health facility included in the survey sample. Accordingly, the following analyses are based on the availability of the recommended first-line anti-malarials current in the country at the time of data collection. The recommended treatment regimens were: amodiaquine (e.g. camoquine) + sulphadoxine-pyrimethamine (SP; e.g. fansidar) or chloroquine + SP for the treatment of uncomplicated malaria; and artemether injection + artesunate tablets + SP or, if artemether and artesunate are unavailable, quinine injection + quinine tablet + SP, for the treatment of complicated malaria.

As shown in Table 6, the three recommended first line drugs for uncomplicated malaria were available in 78.5% of health facilities surveyed and 84.8% had the capacity to provide any of the two recommended regimens. The preferred first line anti-malarial combination for treating complicated malaria (artemether injection + artesunate tablets + SP) was present in 41.8% of health facilities and 68.4% had the capacity to provide either the artemisinin- or the quinine-based combination therapy.

A lower proportion of aid posts than health centres had all three recommended anti-malarials for uncomplicated malaria available (85.0% vs. 71.8%), although this

difference did not reach statistical significance (x^2 = 2.039, p = 0.153). Differences by health facility type in the availability of the recommended artemisinin-based combination therapy for complicated malaria were marginal and did not reach statistical significance (51.5% in HC vs. 48.5% in AP; x^2 = 0.018, p = 0.894). However, the quinine-based combination for treating complicated malaria was available in a greater number of health centres than in aid posts (65.9% vs. 34.2%) and this difference was statistically significant (x^2 = 7.900, p <0.01).

Table 6. Percentage of health facilities with current first line anti-malarials in stock[4]

Malaria Diagnosis	**Medication**	**%**	**95% CI**
Uncomplicated	Amodiaquine (AQ)	89.9	(81.0, 95.5)
	Chloroquine (CQ)	88.6	(79.5, 94.7)
	Sulphadoxine/pyrimethamine (SP)	86.1	(76.5, 92.8)
	AQ + CQ + SP	78.5	(67.8, 86.9)
	AQ + SP or CQ + SP	84.8	(75.0, 91.9)
Complicated	Artemisinin injection (AI)[a]	51.9	(40.4, 63.3)
	Artemisinin mono-therapy tablets (AT)[b]	54.4	(42.8, 65.7)
	AI + AT + SP	41.8	(30.8, 53.4)
	Quinine injection (QI)	62.0	(50.4, 72.7)
	Quinine tablets (QT)	82.3	(72.1, 90.0)
	QI + QT + SP	51.9	(40.4, 63.3)
	AI + AT + SP or QI + QT + SP	68.4	(56.9, 78.4)

a. Any artemisinin-based injection; b. Any artemisinin-based tablet.

3.2.3. Proportion of Health Care Providers Trained in Malaria Case Management

A total of 443 clinical staff members were reportedly employed in the 79 surveyed health facilities. Overall, six percent (29/443) of clinical staff were reportedly trained in the new NMTP. Of the trained staff, 26 were employed at one of five health centres and three were employed at one of three aid posts. Table 7 presents the number of

[4] The quantity of each medication was not accounted for in this analysis; rather, the data represent the percentage of health facilities that had at least one vial or container (inclusive of a single, opened container) of the respective anti-malarial in stock.

clinical staff employed and the respective number and percentage trained in the new NMTP.

Table 7. The number and percentage of clinical staff employed in the surveyed health facilities who had been trained in the new NMTP

Position	**No. Employed**	**Trained in NMTP**	
		n	%
MD	3	0	0
HEO	16	1	6.3
Nurse	144	9	6.3
CHW	263	19	7.2
RLA/MLA	17	0	0
Total	**443**	**29**	**6.5**

NMTP=National Malaria Treatment Protocol; MD=Medical Doctor; HEO=Health Extension Officer; CHW=Community Health Worker; RLA/MLA=Rural/Medical Laboratory Assistant

3.2.4. Proportion of Fever Cases Presenting to Health Facilities Diagnosed and Treated According to National Guidelines

No fever/suspected malaria patients were observed being diagnosed and treated according to the new NMTP at the time of the survey. The observed diagnostic and prescription practice is reported below.

Diagnostic Practice

Table 8 lists the percentage of fever/suspected malaria patients observed discussing a specified topic or receiving a specified procedure during the initial clinical consultation. As can be seen, the topics most likely to be discussed during the clinical consultation were the presence or recent experience of fever (96.5% of cases), the duration of reported symptoms (90.5% of cases) and the presence or recent experience of cough (78.8% of cases). The topics least likely to be discussed included pregnancy status (only 16% of females aged between 15-40 years were questioned about it), current use of any medication (38.9% of cases) and the presence or recent experience of chills (39.2% of cases). The three most frequently observed procedures included

the examination of the patient's health card (92% of cases), measuring body temperature (86.8% of cases) and measuring body weight (76.6% of cases). The other specified procedures were observed in fewer than 17% of cases. In only 15% of cases was an RDT carried out and in only 3.6% a blood smear taken. The average number of specified topics discussed and specified procedures performed per observation was six out of a possible total of nine (range 0-9) and three out of a possible total of eight (range 0-7), respectively[5].

Table 8. Percentage of fever/suspected malaria patients observed discussing a specified topic or receiving a specified procedure during initial clinical consultation

Topic of Discussion/ Performed Procedure		**n**[a]	**Occurrence (%)**	**95% CI**
Discussion	Current use of any medication	453	38.9	(34.3, 43.5)
	Concurrent illness/existing condition	452	74.3	(70.0, 78.3)
	Pregnancy status[b]	50	16.0	(7.2, 29.1)
	Presence/recent experience of fever	457	96.5	(94.4, 98.0)
	Presence/recent experience of cough	453	78.8	(74.8, 82.5)
	Presence/recent experience of head/body ache/pain	449	56.6	(51.8, 61.2)
	Presence/recent experience of nausea/vomiting	453	63.4	(58.7, 67.8)
	Presence/recent experience of diarrhoea	453	60.5	(55.8, 65.0)
	Presence/recent experience of chills	444	39.2	(34.6, 43.9)
	Duration of current symptoms	455	90.5	(87.5, 93.1)
Procedure	Health card examination	465	92.0	(89.2, 94.3)
	Body temperature measurement	463	86.8	(83.4, 89.8)
	Body weight measurement	462	76.6	(72.5, 80.4)
	Blood pressure measurement	455	4.6	(2.9, 7.0)
	Abdomen palpation	461	16.9	(13.6, 20.7)
	Eyes examination	460	16.3	(13.0, 20.0)
	Palms examination	459	3.3	(1.8, 5.3)
	Blood slide taken or referral made	468	3.6	(2.1, 5.8)
	RDT conducted or referral made	468	15.0	(11.8, 18.5)

a. Each specified topic/procedure was scored 'observed', 'no observed' or 'don't know'. All 'don't know' responses were excluded from the analyses, hence the variation in reported numbers. b. Sample limited to females 15 – 40 years of age.

[5] Pregnancy status was not included in the topics discussed calculation and blood slide and RDT were collapsed into a single 'diagnostic test' category in the procedures performed calculation.

Prescription Practice

Overall, 96.4% (451/468) of the observed fever/suspected malaria cases were provided a prescription for an anti-malarial drug. Regional differences in the percentage of observed fever/suspected malaria patients receiving anti-malarial medication were negligible and not statistically significant (Southern 98.4%, Highlands 93.6%, Momase 96.7%, Islands 96.3%; $x^2 = 3.901$, p = 0.28).

The first dose of the prescribed medication was ingested at the respective health facility in 50.3% (227/451) of the cases. The patient was instructed to return to the health facility for a subsequent dose in 39.7% (179/451) of cases and 'take home' medication was provided in 64.5% (291/451) of cases.

Table 9. The number and percentage of mono-/combination-therapies provided by medication type

Therapy Type		**n**	**%**
Mono	Amodiaquine/Chloroquine	50	12.1
	Artemisinin[a]	10	2.4
	Other[b]	4	1.0
Combination	Amodiaquine + SP/Chloroquine + SP	293	70.8
	Artemisinin[c]	15	3.6
	Other[d]	42	10.1

SP = sulphadoxine/pyrimethamine. a.Includes artemether (n=7) artesunate (n=3); b. Includes quinine (Q) (n=3) or SP (n=1); c. Includes artemether + primaquine (PQ) (n=7), Artemether + SP (n=5), artesunate + SP (n=1), artemether + amodiaquine (AQ) (n=1), Artemether + chloroquine (CQ) + SP (n=1); d. Includes CQ+SP+PQ (n=20), Q + SP (n=9), AQ + PQ (n=3) CQ+SP+doxycycline (n=3), AQ + CQ (n=2), CQ + PQ (n=1), PQ + SP (n=1), CQ + Q (n=1), CQ+SP+Q (n=1), AQ+SP+doxycycline (n=1).

The type of anti-malarial(s) prescribed was recorded in 92% (414/451) of the cases. Of the 414 anti-malarial prescriptions recorded, 15.5% (64/414) were mono-therapies and 84.5% (350/414) were combination therapies. Table 9 presents the number and percentage of the recorded mono- and combination therapies provided by medication type. A break down of prescription by diagnosis (uncomplicated vs. complicated malaria) was not possible as the latter was not reliably reported. However, 95%

(429/451) of patients receiving an anti-malarial prescription were sent home at the end of the initial consultation suggesting a likely diagnosis of uncomplicated malaria[6].

Of the 78 patients who were tested by RDT or blood smear, the test result was recorded in 69 (86%) cases. Of these 69 patients, 72% (50/69) tested negative for malaria infection, 15% (17/69) positive and the test result was invalid in 3% (2/69) of cases. An anti-malarial was subsequently prescribed to 84% (58/69) of these patients, including 41 out of the 50 patients who tested negative for malaria infection. The blood smear or RDT result was available at the time of anti-malarial prescription in 83% (57/69) of these cases including 39 out of the 41 patients who tested negative for malaria infection and were subsequently prescribed anti-malarials.

3.2.5. Percentage of People Presenting to a Health Care Provider with Parasitologically Confirmed Malaria who Receive ACTs

Out of 605 clinical observations of fever or suspected malaria patients, the results of a malaria blood smear or malaria RDT were available at the time of anti-malarial prescription in 83 cases. The test result indicated malaria infection in 26 out of these 83 cases. These 26 patients were the only cases of parasitologically confirmed malaria in the 2010 HFS. Overall, 38.5% (10/26) of these patients received some form of ACT. The ACT in question was either an artemether injection/tablet and primaquine in nine cases and an artemether injection and camoquine in one case. The remaining patients received either an artemether injection/tablet only (8/26) or a non-artemisinin based anti-malarial(s) (8/26).

3.3. Additional Findings

This section presents secondary findings from the 2010 HFS. They further highlight current malaria case management practices, as well as the patient experience, and may usefully inform the implementation of the NMTP.

[6] 13 patients were referred elsewhere, 4 were admitted and an 'outcome' was not recorded in the remaining 5 cases.

3.3.1. Additional Anti-Malarial Medications in Stock

The availability (of any quantity) of four additional anti-malarial medications was also examined in the surveyed health facilities. The medications and their respective availability included: atovaquone-proguanil (3.9%; (95% CI 0.8, 11.0)); dihydroarteminisinin-piperaquine (2.5%; (95% CI 0.3, 8.8)); doxycycline (70.9%; (95% CI 59.6, 80.6)); and primaquine (73.1%; (95% CI 61.8, 82.5)).

3.3.2. Availability of Medical Equipment and Resources

As shown in Table 10, there was a wide range in the availability of various medical resources relevant to malaria case management. The most commonly available resource was a working thermometer (97.5%), whilst the least commonly available resource was an infant blood pressure machine (11.4%).

Table 10. The percentage of health facilities with various medical equipment or resources relevant to malaria case management in stock

Equipment/Resource	**%**	**(95% CI)**
Working Thermometer	97.5	(91.2, 99.7)
Working body weight scale - infant	60.8	(49.1, 72.6)
Working body weight scale - adult	84.8	(75.0, 91.9)
Working blood pressure machine- infant	11.4	(5.3, 20.5)
Working blood pressure machine – adult	55.7	(44.1, 66.9)
RDT user guide (wall chart)	15.2	(8.1, 25.0)
10 step IMCI checklist (wall chart)	54.4	(42.8, 65.7)
Standard treatment manual (child)	94.9	(87.5, 98.6)

IMCI=Integrated Management of Childhood Illnesses

3.3.3. Frequency and Type of Clinical Supervision in the Past 6 Months

Among the clinicians interviewed, 25% (57/225) reported receiving some form of supervision in the six months prior to interview. In 73% (42/57) of these cases it was reported that the supervision included observation and feedback on a clinical

consultation (19% of the total sample). In 88% (37/42) of these cases it was reported that the supervised clinical consultation included a fever or suspected malaria patient (16% of the total sample).

3.3.4. Clinician's RDT Experience and Knowledge

Among the clinician interview participants, 56% (125/225) reported that they had used an RDT to diagnose malaria. When subsequently tested, 77% (96/125) of these participants correctly identified where the blood and buffer should be inserted on an RDT, 68% (84/123) correctly indicated the 15 minute time lapse required before reading the RDT, 89% (111/125) correctly identified a positive RDT, 67% (83/124) correctly identified a negative RDT, and 64% (79/124) correctly identified an invalid RDT.

3.3.5. Clinician's Malaria Case Management Attitudes

The clinician interview participants were presented with a series of nine statements and were then asked to indicate whether they 'agreed' or 'disagreed' with each statement or whether they 'did not know'. Table 11 presents the nine statements and the participant response. The answer to each statement (i.e. agree or disagree) that is considered consistent with the new NMTP is listed in bold font.

As shown as Table 11, more than half of all participants responded to seven of the nine statements in a manner consistent with the new NMTP. The two statements in which fewer than half of participants responded in a manner consistent with the new NMTP were "fever patients who test negative for malaria infection should still be provided with anti-malarial medication as a precautionary measure" (24% of participants disagreed) and "in most cases, chloroquine is an effective treatment for uncomplicated malaria infection" (32.4% of participants disagreed).

The mean 'NMTP consistency' score (calculated as the number of statements, out of a total of nine, that were answered in a manner consistent with the new NMTP) was six (range 2 – 9). Only one participant responded to all nine statements in a manner consistent with the new NMTP.

Table 11. Nine malaria case management attitude statements and the percentage of participants who responded 'agree', 'disagree' or 'don't know' (DK) to each (n=225)

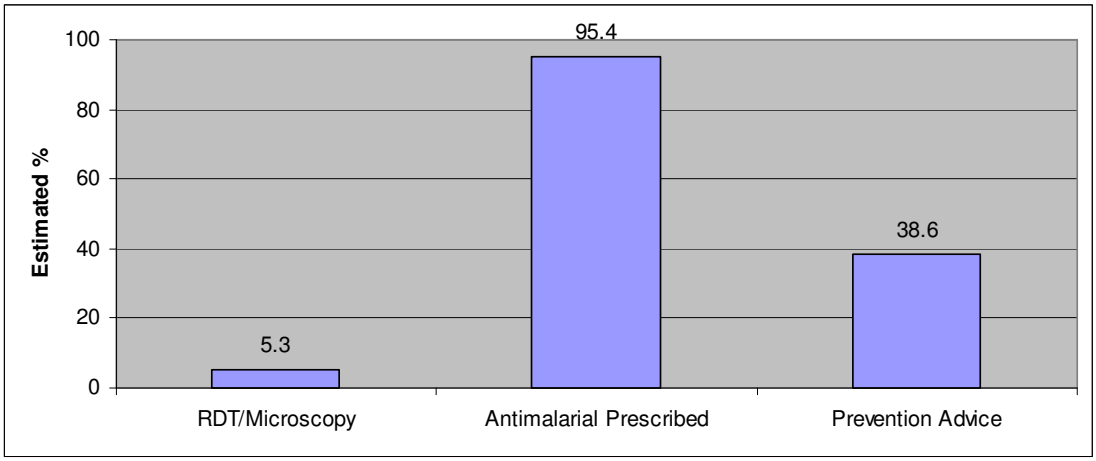
Statement	**Response**[a]		
	agree	disagree	DK
All patients who present with fever or suspected malaria should be tested for malaria infection by microscopy or RDT	**89.3**	9.8	0.9
In most cases, chloroquine is an effective treatment for uncomplicated malaria infection	67.6	**32.4**	0
Advising patients how best to avoid mosquito bites is a good use of clinical time	**85.7**	12.1	2.2
In most cases, clinical diagnosis is just as accurate as microscopy or RDT in detecting malaria infection	40.4	**58.2**	1.3
Fever patients who test negative for malaria infection should still be provided with anti-malarial medication as a precautionary measure	74.7	**24.0**	1.3
It is important to distinguish between vivax and falciparum infection when treating uncomplicated malaria	**81.7**	11.2	7.1
Telling patients when to take their medication is less important if written instructions are provided	27.7	**71.1**	0.9
In most cases, combination therapy is the most effective treatment for malaria infection	**54.9**	9.8	35.3
Malaria patients are less likely to complete their medication if the importance of doing so is not clearly communicated to them	**88.0**	12.0	0

a. Responses in bold are considered most consistent with the new National Malaria Treatment Protocol.

3.3.6. Clinician's Self Reported Malaria Case Management Practice

Among the clinician interview participants, 91% (204/225) reported providing clinical care to at least one fever/suspected malaria patient in the past 14 days. These 204 clinicians estimated that they had case managed a total of 8099 fever/suspected malaria patients during this period. The median estimated number of patients case managed by each clinician was 20 (range 1 – 300). Figure 1 presents the clinician estimates of the percentage of these 8099 patients tested by RDT or microscopy for malaria infection, prescribed an anti-malarial or given malaria prevention advice (e.g. sleep under an LLIN).

Figure 1. Clinician estimates of the percentage of fever/suspected malaria patients treated in the past 14 days tested by RDT/microscopy, prescribed an anti-malarial and given prevention advice. [a]



a= proportion calculated among the 8099 fever/suspected malaria patients clinicians estimated to have provided clinical care to during the 14 day period prior to the interview.

3.3.7. Clinician's LLIN Provision Experience and Knowledge

Among the clinician interview participants, 44.9% (101/225) reported that they had provided a patient with an LLIN. When subsequently tested: 79.2% (80/101) of these participants correctly reported that everyone in a household should sleep under an LLIN; 93.1% (94/101) correctly reported at least one group of people who should be prioritised for mosquito net use if there are not enough nets in the house; 38.6% (39/101) correctly reported how often an LLIN should be washed; 56.4% (57/101) correctly reported what an LLIN should be washed with; and 51.5% (52/101) correctly reported how long the insecticide in an LLIN will remain effective if the net is well cared for.

3.3.8. Clinician Feedback on NMTP Training

Among the clinician interview participants, 9% (20/225) had received training in the new NMTP at the time of interview. When asked 'in your own words could you please describe the content of the NMTP training?', 16/20 mentioned RDT/microscopy, 16/20 mentioned anti-malarial drugs/treatment, 9/20 mentioned malaria facts, 5/20 mentioned malaria prevention, and 1/20 mentioned integrated

management of childhood illnesses. No individual mentioned all five of the aforementioned topics.

Of the 20 participants who reported having received NMTP training, 35% (7/20) reported some dissatisfaction with the training received and 85% (17/20) felt further training was required. Reported areas of dissatisfaction included: the length of the training (too short; n=6), the absence of any opportunity to practice using an RDT during the training (n=1) and the perceived inability of the trainer to answer important questions (n=1). Reported further training needs included: ACT drugs, dosage regimen and potential side effects (n=10), the use of RDT (n=8), malaria facts (n=5), microscopy (n=3), and 'practical skills' (n=1).

3.3.9. Observed RDT Practice

An RDT was completed in 82 out of the 605 clinical observations of fever/suspected malaria patients. Table 12 presents the percentage of cases in which each of eight recommended steps involved in administering a malaria RDT were observed as well as the percentage of cases in which all eight steps were observed. All observed RDT were ICT Malaria Combo Tests.

Table 12. Percentage of cases in which each of eight recommended steps involved in administering malaria RDT were observed (n=82)

Activity	**Observed Cases (%)**
Use of unexpired RDT	68%
Provider put on a new pair of gloves	51%
Patient name written on test	53%
Patient's finger cleaned with alcohol swab	98%
Blood drawn from patient's finger (or heel if baby)	100%
Blood applied to RDT test prior to buffer	98%
Blood and buffer applied to appropriate sections of RDT test	95%
RDT test read 15 minutes after buffer applied	84%
All steps observed	**30%**

3.3.10. Observed Treatment Counselling Practice

Table 13 displays the proportion of patients observed to have been provided with each of six particular clinical instructions by their respective clinician(s). The sample was restricted to patients who had been prescribed anti-malarial medication.

Table 13. Observed provision of instructions

Instruction	**n**[a]	**Provided (%)**	**(95% CI)**
Purpose of medication	435	63.4	(58.7, 68.0)
Dosage/regimen	441	75.7	(71.5, 79.7)
Dietary	449	6.2	(4.2, 08.9)
Possible adverse effects	449	1.1	(0.3, 2.6)
Health facility re-engagement[b]	447	27.7	(23.6, 32.1)
Prevention advice	448	10.3	(7.6, 13.5)

a. Each instruction was scored 'provided', 'not provided' or 'don't know'. All 'don't know' responses were excluded from the analyses, hence the variation in reported numbers. b. In which patients are advised to return to the health facility if current symptoms persist or deteriorate.

3.3.11. Treatment Satisfaction

Among the patient interview participants, 52% (313/600) answered 'yes' to the question: was there anything about your visit to the health facility today that you would like to be different if you were to come back again?

When asked 'what would you like to be different', these 313 participants variously reported: improvement in the knowledge, attitude or practice of clinical staff (n=113), provision of a more effective anti-malarial medication (n=79), renovation or extension of the health facility building (n=56), no anti-malarial stock outs (n=40), improvement in health facility resources, inclusive of water and power supply (n=34), employment of more staff (n=31), employment of doctors (n=8), provision of staff housing (n=6), provision of anti-malarial medication to take home (n=5), reduction in the bitterness of chloroquine (n=3), only pay once for initial consultation and not for subsequent treatment reviews (n=1), having someone available who speaks the local language

(n=1), proper seating arrangements (n=1), employment of more female staff members (n=1), and the introduction of a chewable tablet (n=1).

Overall, 79% (473/600) of participants reported previously attending the same health facility for fever or malaria treatment. When asked how the service received during the interview visit compared with the service received during the prior visit, 86% (406/473) of participants reported 'much the same', 11% (50/473) reported 'better than last time' and 4% (17/473) reported 'worse than last time'.

3.3.12. Health Care Access

The median travelling time from home to health facility was 0.5 hours (range 2 minutes – 72 hours).

Overall, 37% (219/600) of participants reported experiencing some difficulty in reaching the health facility. The most widely reported difficulties were: distance and/or difficulty of the route to the health facility or lack of available transport (n=183); difficulty of travelling to the health facility when ill (n=26); and the cost of transport to access the health facility (n=19).

Overall, 40% (237/600) of participants reported paying a service fee. The median fee was 1.00PGK (range 0.05 – 16.00PGK).

The median delay between the first sign of illness and the current treatment seeking episode was 23 hours (range 1 – 720 hours). There was a statistically significant variation in treatment seeking time according to age (x^2 = 12.811, df = 2, $p < 0.01$). The median times by age were 21 hours for patients less than five years of age, 22 hours for patients aged between five and 15 years, and 36 hours for patients aged more than 15 years. A statistically significant difference in the median treatment seeking time was also observed between patients who reported difficulty in accessing the health facility and those who did not (x^2 = 10.813, df = 1, $p < 0.01$); the median times were 34 hours and 22 hours, respectively.

4. DISCUSSION & RECOMMENDATIONS

4.1. Findings from the Primary Outcome Measures

4.1.1. Proportion of Health Facilities with Working Microscopy or with RDT in Stock

The result of the first outcome measure – the proportion of health facilities with working microscopy or with RDT in stock – at 15.2% was below the 2010 target of 20%. Of further note were the findings that no aid post had working microscopy or unexpired RDT in stock, that as many health facilities (seven) had expired RDTs in stock as compared to health facilities with unexpired RDTs, and that a number (seven) of health facilities had functional microscopes, but lacked the supplies or personnel to operate them. These findings suggest that diagnostic testing was unavailable in aid post settings during the survey period, that confirmatory diagnosis via RDT was not routinely conducted in health centres that had the capacity to do so[7], and that the current stock of microscopes could be better utilised (i.e. the availability of microscopic diagnosis could be increased by facilitating a more efficient use of current microscope stock).

4.1.2. Proportion of Health Facilities with First-Line Anti-Malarials in Stock

The result of the second outcome measure – the proportion of health facilities with the new first line anti-malarials (ACTs) in stock – at 0% was short of the 2010 target of 80%. This result was expected given the delay in ACT procurement. Stock availability of the current first-line anti-malarials ranged from 78.5% for the uncomplicated malaria regimen (amodiaquine + SP or chloroquine + SP) to 41.8% for the preferred complicated malaria regimen (artemisinin injection + artemisinin tablet + SP). These findings suggest that the proposed target of 80% coverage is potentially achievable when the ACTs arrive in country; however, they also suggest that stock outs are common in the current procurement system. The fact that amodiaquine, chloroquine and SP were in stock at most health facilities during the survey period suggests the current distribution system may be adequate, but the required medications may not always be available for supply (i.e. the current distribution

[7] This, of course, assumes the RDTs expired due to non-use rather than over-supply or the supply of already expired RDT.

system may be adequate, but the procurement system may not be). Having said this, as the quantity of first line anti-malarial supply was not taken into account, it remains possible that many of the health facilities with the first line anti-malarials in stock may still have been considered in short supply (and restricted prescription as a result).

4.1.3. The Proportion of Health Care Providers Trained in Malaria Case Management (new NMTP)

The result of the third outcome measure – the proportion of health care providers trained in malaria case management (according to the new NMTP) – at 6.3% fell well short of the 2010 target of 100%. This result, too, was expected as training in the new NMTP had been postponed due to the delays in program implementation.

4.1.4. Proportion of Fever Cases Presenting to Health Facilities Diagnosed and Treated According to National Guidelines

The fourth outcome measure – proportion of fever cases presenting to health facilities diagnosed and treated according to (the new) national guidelines – was indeterminable due to the delay in implementation of the new NMTP. Nevertheless, analyses of current diagnostic and anti-malarial prescription practices were conducted. The subsequent findings that only 15% and 3.6% of fever/suspected malaria patients were tested for malaria infection by RDT or microscopy, respectively, and that 96.4% were prescribed an anti-malarial (including 41/50 patients who tested negative for malaria infection by RDT or blood slide) indicate that a substantial change in clinical practice will be required when the new NMTP is implemented[8].

In addition to confirming the lack of diagnostic testing in current malaria case management, the study findings also suggest that presumptive diagnosis is often a far from exhaustive process. Questions that could reasonably be expected to be a mandatory component of a thorough clinical assessment were rarely asked and procedures such as palpating the abdomen or examining the patients' eyes or palms were rarely conducted. Thus, it would appear that most malaria diagnoses are

[8] Under the new NMTP all fever or suspected malaria patients are required to be tested for malaria infection by RDT or microscopy and anti-malarials only prescribed to positive cases.

currently made presumptively, simply on the basis of the presence of fever without a thorough clinical examination and use of diagnostic tests.

The near universal prescription of anti-malarial medication to fever patients is of concern, as is the practice of prescribing anti-malarials to patients who have tested negative for malaria infection by RDT or microscopy. However, the findings pertaining to prescription practice indicate that over 70% of prescriptions conform with the current guidelines for the first line treatment of uncomplicated malaria. This is a positive finding and suggests most clinicians are generally aware of and comply with recommended prescription practice. Of concern, too, is the observation that nearly 15% of anti-malarial prescriptions were of a mono-therapy and relatively few prescriptions were an ACT. The latter indicates that the introduction of AL in the new NMTP will represent a substantial change in prescription practice for most clinicians in PNG.

4.1.5. Percentage of People Presenting to a Health Care Provider with Parasitologically Confirmed Malaria who Receive ACTs

The additional outcome measure - Percentage of people presenting to a health care provider with parasitologically confirmed malaria who receive ACTs – was 38.5%. However, this finding should not be generalised too broadly as only 26/605 (4.3%) clinical observations of fever/suspected malaria patients were parasitologically confirmed malaria cases in the 2010 HFS. The findings from the next (2011) HFS when RDTs will be more widely available will likely provide a more meaningful assessment.

4.2. Additional Findings of Potential Relevance to Program Implementation

4.2.1. Clinician Practice

A large proportion (44%) of interviewed clinicians reported no prior experience using an RDT. Many (as much as a third) of the 56% who reported some experience demonstrated significant knowledge gaps in RDT administration and interpretation. Of the observed RDTs conducted (n=82), five of the eight recommended steps (and, arguably, the five most important steps) were correctly followed in 84% or more of

cases; however, in only 30% of cases were all eight steps observed suggestive of substantial room for improvement in RDT administration. The observed quality of treatment counselling was poor. For example, the purpose of the prescribed medication was not explained to patients in 36% of cases, dosage/regimen instructions were not provided in 25% of cases, the possibility of adverse effects and what they might look like were virtually never discussed, instructions on when to return to the health facility (if needed) were only provided in 28% of cases, and advice on how to prevent malaria transmission was only provided in 10% of cases. As RDT utilisation is an essential component of the new NMTP and thorough patient counselling will be required given the change in treatment practice, then these findings are of some concern. The low rate of fever/malaria-related supervision received by the clinicians over the preceding 6-months (16%) was also of concern in this regard, especially if plans are not in place to increase supervision opportunities when the new NMTP is introduced.

Although only 6% of the 225 clinicians interviewed reported receiving training in the new NMTP, it was of note that 35% reported some dissatisfaction with the training received and 85% felt further training was required. It is difficult to generalise these findings given the low sample size, although it suggests that the quality and sufficiency of the training provided needs to be closely monitored and the possibility of follow-up or 'booster' training considered. In fact, several of the findings presented in this paper – from the low rates of diagnostic testing, to the high rates of anti-malarial prescription, observed knowledge gaps, and the poor quality of treatment counselling practice – all suggest that the successful introduction of the new NMTP will require substantial changes to current clinical practice. A comprehensive support program, inclusive of regular supervision and training opportunities, will likely be required given the scale of the change in clinical practice required and the relative dearth of highly trained clinical staff (MDs or HEOs) to support implementation at the health facility level. Current treatment attitudes appear largely consistent with the new NMTP, which suggests clinicians are likely to support the new treatment protocol if adequately trained to deliver it. Nevertheless, strong support for providing anti-malarials to patients who test negative for malaria infection as a 'precautionary' measure was evident as was a belief in the effectiveness of chloroquine for treating uncomplicated malaria. Prescribing anti-malarials as a precautionary measure and/or

the prescription of chloroquine will be problematic if these practices continue following the introduction of the new NMTP.

Clinicians are expected to provide reliable malaria prevention advice under the new NMTP and promoting the regular use and proper care of an LLIN is perhaps some of the best advice that could be offered. The findings in this report suggest clinicians are not well informed in this regard, especially with respect to the proper care of LLIN. For example, among the 44.9% of clinician interviewees who reported that they had provided a patient with an LLIN, only 38.6% correctly reported how often an LLIN should be washed and just over a half (51.5%) correctly reported how long the insecticide in an LLIN will remain effective if the net is well cared for. Given that millions of LLIN are being distributed free of charge to households across PNG as part of the NMCP, and given that the health workforce is well placed to encourage regular use and proper care of LLIN, improving clinician knowledge in this area presents as a worthwhile activity.

4.2.2. Patient Experience

Over half (52%) of all patients interviewed indicated that there was at least one thing they would like to be different if they were to come to the respective health facility again. The vast majority of subsequently suggested changes pertained to the knowledge, attitude or practice of clinical staff, the provision of more effective anti-malarials, or improvements to the health facility. As 86% of interviewed patients indicated that their current visit to the health facility was 'much the same' as a previous visit, then it is likely that these sentiments have persisted for some time. The suggested improvements indicate a desire for appropriate and effective medication provided by professional clinical staff in a clean and functional environment. These would generally be considered basic expectations of a well run health service and patient satisfaction is unlikely (and quite rightly) to improve until improvements have been made in these areas. The new NMTP should usefully address one of these concerns – the effectiveness of medication – but will do little to change the others. Questions to consider going forward, therefore, may be whether the relatively high level of dissatisfaction in areas fundamental to quality health service provision reduce or delay treatment seeking for fever/suspected malaria and whether the pending

improvement in malaria medication will increase patient satisfaction and, more importantly, result in earlier and greater rates of help-seeking.

The median travelling time from home to health facility was 30 minutes, less than half (40%) of fever/suspected malaria patients reported paying a service fee and the median fee amongst those who did was one kina, the median delay between the first sign of illness and seeking treatment from the respective health facility was 23 hours ('delay' time), and the median delay time was lowest amongst members of one of the most vulnerable groups (patients lower than five years of age). All of these findings are positive 'treatment access' indicators, although they are tempered by the fact that they were obtained from individuals who had already sought treatment assistance from the health facility (and, therefore, may not be representative of the general population). On the less positive side, 37% of patients reported some difficulty travelling to the health facility, a difficulty that resulted in a statistically significant increase in the median treatment delay time (compared to patients who reported no difficulties). Similarly, the median treatment delay time increased with age suggesting that adult fever/suspected malaria patients are less inclined to seek medical treatment promptly relative to their younger counterparts.

4.3. Study Limitations

The study was designed to collect data representative at a national level. Accordingly, the reported findings should not be generalised to the provincial level and the reported regional data should be treated with some caution. The study was conducted during a period of low malaria transmission (June-November, 2010) in those provinces with seasonal variation. Thus, the number of malaria patients presenting to health facilities and the subsequent pressure on resources (e.g. RDT kits, anti-malarial medication) may have been lower during the survey period as opposed to peak transmission periods. Participating clinicians were aware that they were being observed and may have altered their clinical practice accordingly (i.e. the observed treatment practice may not have been representative of routine treatment practice). The majority of the clinical observation data (96%) were obtained from health centres and the field team spent three to five days in each of these settings as opposed to a single day in the surveyed aid posts. This three to five day time frame may have reduced the impact of

any observation-related bias as clinical staff in the respective settings would have become increasingly comfortable with the presence of the PNGIMR field team and, as such, may have been more likely to provide treatment as they routinely do. The expected effect of any such bias would be towards perceived 'better' practice. Clinician and patient interviewees may also have been subject to some form of social desirability bias when responding to their respective questionnaires, i.e. providing a response socially acceptable as opposed to a more honest response. To minimise this source of potential bias the PNGIMR field team members stressed participant confidentiality and the importance of providing honest responses; however, the possibility of bias still remains especially in the more sensitive lines of questioning, e.g. clinician's self reported treatment practices.

4.4. Recommendations

4.4.1. Maintenance of 2011 Performance Targets

Primarily due to the previously explained delays in implementing the new NMTP the 2010 performance targets (outlined on page 3) were not achieved. However, the data presented in this report suggest that the proposed 2011 performance targets – 26% of health facilities with working microscopy or with RDT in stock by end 2011; 90% of health facilities with first-line anti-malarials (ACTs) in stock (all age packs) by end 2011; and 4500 health workers trained in malaria case management (100% of clinical workforce) by end 2011[9] - remain realistically achievable, assuming the new NMTP is implemented by mid-2011. This appraisal is made on the basis that RDT/working microscopy is already available in 15.2% of health facilities, that the most widely used first line anti-malarials currently available (amodiaquine, chloriquine and SP) were present in nearly 80% of health facilities, and that clinician training in the new NMTP was substantially scaled-up during the end of the 2010 HFS and is expected to have been completed by mid-2011.

[9] A 2011 target was not originally proposed for this measure, as all training was planned for 2010.

4.4.2. Development and Implementation of an Intensive NMTP Training and Support Program

The data presented in this report strongly indicates that the new NMTP will require a substantial change in current clinical practice if it is to be correctly implemented and adhered to. Areas that will require the most change include the shift from presumptive to RDT/microscopy confirmed diagnosis, prescribing (or rather non-prescribing) of anti-malarials to patients who test negative for malaria infection, the type of anti-malarial prescribed, and thorough treatment counselling. The successful introduction and maintenance of the proposed changes to clinical practice, therefore, will likely necessitate a comprehensive clinician support program, possibly inclusive of 'booster' training opportunities and regular clinical supervision. The need for such a program is further reinforced by the scarcity of highly trained medical staff (MDs or HEOs) at the health facility level and the possible inadequacy of the initial NMTP training already provided (or planned). The delay between the delivery of the initial training and the date of implementation is also likely to be problematic if further support is not provided.

Population Services International (PSI) has developed job aids that will usefully support clinician compliance with the new NMTP. However, thought may also need to be given to identifying a set of key messages that could be targeted towards and continuously promoted among the health workforce. Possible message lines might include: 1) RDT results are reliable; a patient with a negative test result is unlikely to have malaria; 2) Anti-malarials should only be prescribed to patients with RDT or microscopy confirmed malaria infection; 3) ACT is the most effective anti-malarial available; and 4) thorough patient counselling improves treatment outcomes. These messages may form the basis of a comprehensive training and support program

4.4.3. Conducting a Health Facility Survey in 2012

The second HFS is scheduled to commence in June 2011 and – assuming continued funding from GFATM is obtained – the third HFS is scheduled to commence in 2013. As current indications are that the new NMTP will be implemented in health facilities countrywide in July 2011 then, in addition to conducting the 2011 HFS as planned, the proposed 2013 HFS should be brought forward 12 months to commence in 2012.

In this way relevant data will be obtained immediately following the implementation of the new NMTP and one year post implementation. This proposed scheduling change will ensure the new NMTP is closely monitored in the early stages of implementation and will highlight any associated issues in a timely manner (relative to 2013).

4.4.4. Proceed with Introduction of the new NMTP

The study findings support the need to introduce the new National Malaria Treatment Protocol. Current malaria case management practices, especially the absence of test confirmed diagnosis, the often limited scope of clinical (or presumptive) diagnosis and the near universal prescription of anti-malarials to fever patients should be of considerable concern to the health authorities and general public. This level of concern should further increase when one considers that the preferred medication regimen for complicated malaria is available in fewer than 50% of health facilities country wide and that there is known to be widespread parasite resistance to the antimalarials most commonly prescribed (amodiaquine and chloroquine) at present. The new NMTP will address many of these issues and cannot be introduced soon enough.

4.4.5. Strive to Improve the Treatment Experience in all Areas

Many patients surveyed during the course of this study expressed the reasonable desire for adequate health care facilities, effective medications and professional service provision. The new NMTP will introduce an effective anti-malarial to health facilities across the country and the routine use of RDT or microscopy to test for malaria infection will represent a substantial improvement in the quality of service provision. However, the new NMTP will offer no improvement in health care infrastructure and the influence (if any) on clinician attitudes and behaviours towards their patients' remains to be seen. The study findings reported herein may, therefore, serve to remind us that no matter how effective the medication on offer at a health facility, if the health facility staff are considered discourteous or unprofessional or if the facilities themselves are not valued, then many malaria patients may continue to delay or forego treatment. These are considerations that warrant ongoing attention.

4.4.6. Tailor Treatment Seeking Messages to Adults and Improve the Availability of Malaria Treatment

The findings presented in this report indicate individuals aged 16 years or older are more likely to delay treatment seeking at health facilities for fever or suspected malaria when compared to younger age groups. As children and young adolescents are unlikely to seek formal treatment on their own (i.e. they would normally be accompanied by an older parent, family member or caregiver), this would suggest that adults are more motivated to seek prompt treatment for those they care for relative to themselves. Behaviour Change Communication strategies designed to encourage prompt treatment seeking for cases of fever or suspected malaria may, therefore, need to be developed that specifically target older (16+) age groups.

On a similar note, those patients that reported difficulty in travelling to their respective health facilities were also more likely to delay formal treatment seeking when compared to patients who did not report such difficulties. Thus, thought should be given to improving access to effective malaria treatment over and above simply improving the quality of malaria treatment in existing health facilities. The planned pilot of a home-based management of malaria (HMM) program is one possibility, although other means to improve access to effective malaria treatment are available. Restoring to full (or at least improved) capacity the aid post network would be a further option as would facilitating private sector retail and promotion of ACT and the simultaneous phase out of less effective antimalarials (e.g. chloroquine, amodaiquine).

APPENDIX 1: SURVEYED HEALTH FACILITIES

PROVINCE	DISTRICT	HEALTH FACILITY	HF TYPE	DATE[a]
WESTERN	MIDDLE FLY	NOMAD	HC	20/09/10
		HONINABI	AP	21/09/10
	NORTH FLY	NINGERUM	HC	27/09/10
GULF	KEREMA	MURUA	SC	04/10/10
	KIKORI	KAPUNA	HC	11/10/10
		MAIPENAIRU	AP	13/10/10
		MAPAIO	AP	13/10/10
MILNE BAY	MILNE BAY	DOGURA	HC	19/07/10
		BOROWAI	AP	21/07/10
		SAGARAI	HC	26/07/10
		GELEMALAIYA	AP	27/07/10
		VIDIA	AP	28/07/10
NCD	MORESBY NTH WST	ST THERESE	UC	20/09/10
	MORESBY NTH EST	6 MILE	UC	20/09/10
CENTRAL	ABAU	KUPIANO	HC	19/07/10
		KOKOLANCE	AP	21/07/10
		PARAMANA	AP	22/07/10
	KAIRUKU - HIRI	SOGERI	SC	26/07/10
		GOLDIE BARRACKS	AP	27/07/10
		KAILAKI	AP	28/07/10
ORO	IJIVITARY	ORO BAY	HC	05/07/10
		EMBOGO	AP	07/07/10
		HANAU	AP	08/07/10
		AKO	SC	12/07/10
		BEREBONA	AP	14/07/10
SOUTHERN HIGHLANDS	NIPA - KUTUBU	NIPA	HC	14/06/10
		PURIL	AP	15/06/10
		OMDOL/ KEMBIL	AP	16/06/10
	KAGUA ERAVE	KAGUA	HC	21/06/10
ENGA	WAPENAMANDA	UNDA	SC	05/07/10
	KOMPIAM AMBUM	AIYOKOS	SC	12/07/10
		KAEPLYAM	AP	14/07/10
		WAPAI	AP	15/07/10
WESTERN HIGHLANDS	TAMBUL NEBILYER	TOGOBA	HC	19/07/10
	DEI	NUNGA	SC	26/07/10
		KINJPI	AP	27/07/10
CHIMBU	KUNDIAWA-GEMBOLG	KANGIR	SC	14/06/10
	KEROWAGI	KENDINE	SC	21/06/10
		BURUMBA	AP	23/06/10
		GALG	AP	24/06/10
EASTERN HIGHLANDS	OKAPA	OKAPA	HC	31/05/10
	LUFA	GOUNO	SC	31/05/10
MOROBE	FINCHAFEN	KITOC	SC	30/08/10
		HELDSBACH	AP	02/09/10
		SIBIBIA	AP	02/09/10
	MARKHAM	MUTZING	HC	06/09/10
		AITAUNAS	AP	07/09/10
		GARAM	AP	08/09/10

MADANG	BOGIA	KAIYOMA	HC	16/06/10
	SUMKAR	KULUBOB	HC	23/08/10
EAST SEPIK	WEWAK	DAGUA	HC	01/11/10
		BOIKIN	AP	02/11/10
	WOSERA - GAWI	BURUWI	HC	08/11/10
WEST SEPIK	TELEFOMIN	YAPSIE	SC	09/08/10
		SKONGA	AP	15/08/10
	NUKU	ANGUGANAK	HC	15/11/10
		BAIRAP	AP	18/11/10
		LAINGIM	AP	18/11/10
MANUS	LORENGAU	LAKO	HC	14/06/10
		MOUK	AP	15/06/10
		SONE	AP	15/06/10
		LORENGAU EAST	HC	15/11/10
		MOKORENG	AP	17/11/10
		LUNDRET	AP	17/11/10
NEW IRELAND	NAMATANAI	NAMATANAI	HC	21/06/10
		SOUHUN	AP	24/06/10
		LABUR	AP	25/06/10
	KAVIENG	UMBUKUL	SC	28/06/10
EAST NEW BRITAIN	GAZELLE	NAPAPAR	SC	09/08/10
	POMIO	UVOL	HC	16/08/10
		MASO	AP	16/08/10
		KOWRO	AP	17/08/10
WEST NEW BRITAIN		UNEA	HC	27/09/10
		NIGHILANI	AP	29/09/10
		AMIO	SC	04/10/10
AUTONOMOUS REGION OF BOUGAINVILLE	NTH BOUGAINVILLE	GAGAN	SC	23/08/10
		PORORAN	AP	24/08/10
	STH BOUGAINVILLE	MOROTANA	SC	30/08/10
		KUNEKA	AP	01/09/10

a= date of first contact at listed health facility; duration of each contact varied from one to five days. UC=Urban Clinic, HC=Health Centre, SC=Sub Health Centre, AP=Aid Post.