REPUBLIC OF KENYA

MONITORING OUTPATIENT MALARIA CASE MANAGEMENT UNDER THE 2010 DIAGNOSTIC AND TREATMENT POLICY IN KENYA
- progress during the first 18 months-

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ACRONYMS AND ABBREVIATIONS

AB	Antibiotic
ACT	Atemisinin-based Combination Therapy
AL	Artemether-lumefantrine
AM	Antimalarial
AQ	Amodiaquine
ART	Artemether
AS	Artesunate
CI	Confidence interval
CHW	Community Health Worker
DHA	Dihydroartemisinin
DHA-PPQ	Dihydroartemisinin-piperaquine
DOMC	Division of Malaria Control
GOK	Government of Kenya
HF	Health facility
HW	Health worker
IEC	Information, Education and Communication
IPTp	Intermittent preventive treatment in pregnancy
IQR	25%-75% inter-quartile range
KEMSA	Kenya Medical Supply Agency
KEMRI	Kenya Medical Research Institute
M&E	Monitoring and Evaluation
MOH	Ministry of Health
MOPHS	Ministry of Public Health and Sanitation
MQ	Mefloquine
NGO	Non-government organization
NMS	National Malaria Strategy
p	p-value
QN	Quinine
RDT	Rapid Diagnostic Test
Rx	Treatment
SP	Sulfadoxine-pyrimethamine

EXECUTIVE SUMMARY

Effective malaria case management based on confirmed parasitological diagnosis and artemisinin-based combination therapy (ACT) is the cornerstone of the 2009-2017 National Malaria Strategy (NMS) in Kenya. By 2013, the new NMS specified programmatic directions to ensure universal availability of ACTs and diagnostics, universal coverage of health facilities and health workers with health systems support activities and universal health worker's adherence to the new malaria case management guidelines. During the first 18 months of the new NMS (January 2010 - June 2011), the key malaria case management activities included revision, finalization and dissemination of the new national malaria case management guidelines (MOPHS 2010), dissemination of malaria case-management wall charts, national in-service training for front-line health workers on the new guidelines and strengthening of the diagnostic and supervisory capacities.

By the end of July 2011 three national health facility surveys were undertaken. The first, baseline survey, undertaken prior to the implementation activities under the new NMS, was carried out in January/February 2010. The second and the third follow up surveys were respectively undertaken in November/December 2010 and July/August 2011. In this report, we present progress in the key indicators referring to the availability of commodities and malaria case management practices. The main objectives of the surveys were assessments of the availability of malaria case management commodities and the quality of outpatient case management practices in accordance with new national guidelines for uncomplicated malaria recommending parasitological testing of febrile patients, treatment of only test positive results with a recommended ACT - artemether-lumefantrine (AL), and the provision of dispensing and counseling tasks for patients treated with AL.

The baseline and two follow-up surveys were respectively undertaken at 174, 176 and 174 facilities randomly sampled countrywide. At each facility data were collected over one survey day and included a range of quality of care methods. In addition to three physical surveys AL availability data were collected in the same period on monthly basis. To reflect guidelines

criteria for malaria testing and AL treatment, the analysis was restricted to febrile, non-pregnant patients weighing 5 kg and above, presenting for an initial outpatient visit without being referred or admitted for hospitalization. The primary outcome was a composite performance indicator including all of the following criteria: 1) patient tested for malaria, 2) if positive test result treated with AL, and 3) if negative test result not treated for malaria. The secondary indicators reflected individual components of the case management including testing, treatment, dispensing and counseling in various patients' subgroups. To reflect performance of the new case management policy practices are first analyzed at all health facilities regardless of the availability of the case management commodities. Then to assess health workers adherence the same analysis was restricted to the facilities where AL and diagnostics were in stock.

The results revealed that mean total AL stock-out over the monitoring period between January 2010 and July 2011 was 12% while monthly total stock-out variations were 3-20%. In the same period the mean stock-out of at least one AL pack was 42% and varied monthly between 28% and 59%. During all surveys over three quarters of facilities had various drug inventory materials however the quality of antimalarial drug recording and reporting was substantially lower. With respect to malaria diagnostics, there were minor changes between the baseline and the second follow up survey - availability of functional microscopy increased from 51% to 54% of facilities, non-expired RDTs from 8% to 13% while a decreasing trend from 47% to 41% was observed among facilities where both malaria microscopy and RDTs were absent prior to the surveys. Finally, at facilities with malaria diagnostics there was an increase from 9% to 17% of facilities having received a quality control visit on malaria microscopy while at facilities with RDTs there was also an increase in supervisory visits on the use of RDTs (5% to 21%). However, overall quality control activities were low for both diagnostic services.

By mid 2011 health facility and health worker coverage with guidelines, wall charts, in-service training and supervisory activities was variable. Compared to the baseline results when health workers were neither trained on the new case management recommendations nor had access

to new guidelines and wall charts, the results at the second follow up survey revealed that the coverage with the in-service training, national guidelines and new case-management wall charts increased to 25%, 48% and 19-56% respectively. With respect to the supervision, there was an increase from 42% to 61% of health workers who received any supervisory visit. Although the overall coverage was lower, there was also some increase in health workers who had received a visit that included any malaria case management activity (18% to 33%) and observation of consultations (7% to 11%).

At all study facilities case management practices were evaluated for 2,405, 1,456 and 1,208 febrile patients during the baseline and two follow up surveys respectively. At facilities with available diagnostics and AL, the practices were respectively evaluated at the same time points for 1,239, 861 and 634 patients. The results have shown improvement trends in the management of febrile patients in accordance with the composite performance indicator. By mid 2011, the policy performance evaluated at all study facilities increased from 16% to 25% while at facilities with available diagnostics and AL health workers' adherence increased from 28% to 40%. At these facilities, despite a low performance of the composite indicator, improvements were observed in the testing of febrile patients (43% to 57%) and withdrawal of antimalarial treatment for test negative patients (44% to 70%) however the use of recommended AL treatment for test positive patients has decreased from 83% to 75% despite a transitory improvement observed during the first follow up survey (89%).

With the respect to AL dosing, dispensing and counseling practices changes observed by mid 2011 were minor. However five out of eight measured tasks were performed for more than two thirds of the patients while the main dispensing and counseling tasks that require substantial improvements include administration of the first AL dose at health facility (38%), provision of advice on what to do in case of vomiting (5%) and weighing of patients (53%).

In conclusion, the findings of three rounds of national surveys revealed that most of the key indicators measured in this study have shown some improvement by the mid 2011 however the

differences were smaller than expected. Importantly most of the key indicators are still well below the 2013 targets. To effectively reduce the gap towards the universal 2013 targets in reasonable time the following eight recommendations that can be drawn from the findings of this study are provided:

1. Implementation of RDTs must be urgently scaled up as part of the existing national RDT implementation plan containing comprehensive package of case management interventions.
2. Quality control and assurance system for malaria microscopy and RDTs supported by field supervision and monitoring should be urgently implemented in line with the national policy guidelines for parasitological diagnosis of malaria.
3. The future malaria case management trainings for health workers should be aligned with RDT implementation while routine supervisory activities at district level that include malaria case management component need to be quantitatively increased and qualitatively improved in line with already existing supervisory manuals.
4. The new national malaria case management guidelines and wall charts should be repeatedly disseminated to the peripheral health facilities.
5. Drug management activities should focus on strengthening of logistic management information systems and development of district capacities to respond to stock out warnings by redistributing antimalarial drugs between peripheral facilities.
6. Innovative ways reporting real-time stock data using mobile health technologies should be piloted and their impact on AL stock outs should be evaluated.
7. Distribution of SP tablets should be discontinued to areas outside of Coast, Western and Nyanza Provinces.
8. Further emphasis should be placed on the following 5 case management messages during the in-service training, supervisory visits and mass IEC campaigns targeting health workers: 1) all febrile patients should be tested, 2) test negative patients should not be treated for malaria, 3) all patients should be weighed, 4) the first AL dose should be administered at facilities even in the absence of food, and 5) patients should be advised to return for replacement dose to complete full treatment course in case of vomiting.

1. INTRODUCTION AND JUSTIFICATION

Effective malaria case management based on confirmed parasitological diagnosis and artemisinin-based combination therapy (ACT) is the cornerstone of the 2009-2017 National Malaria Strategy (NMS) in Kenya (MOPHS 2009a). The new NMS launched in November 2009, specified programmatic directions to ensure continuous availability of ACTs, malaria diagnostics and effective case management based on the use of malaria microscopy or rapid diagnostic tests (RDT) for all febrile patients and subsequent treatment of only test positive patients with nationally recommended first-line ACT, artemether-lumefantrine (AL).

The key activities planned during this 7-year period include strengthening of the procurement and supply management of ACTs, improving quality and quantity of microscopy services, large scale introduction of RDTs to peripheral health facilities, dissemination of revised malaria case management guidelines and support job aids, in-service training for front-line health workers, and strengthening of supervisory malaria case management activities.

During the first 18 months of the new NMS (January 2010 - June 2011), the key malaria case management activities included revision, finalization and dissemination of the new national malaria case management guidelines (MOPHS 2010), dissemination of malaria case-management wall charts, national in-service training for front-line health workers on the new guidelines and strengthening of the diagnostic and supervisory capacities.

Alongside the NMS, the national Malaria Monitoring and Evaluation (M&E) Plan 2009-2017 has also been developed and it has specified that, by 2013, 100% of health facilities should have ACTs and malaria diagnostics and 100% of fever cases who present to health workers should receive parasitological diagnosis and effective treatment (MOPHS 2009b). As part of the new NMS and M&E plan, nationally representative monitoring surveys undertaken on biannual basis are deemed critical to capture case-management indicators and timely inform national policy makers, and donor organizations, on the progress of the new NMS. By the end of July 2011 three national health facility surveys were undertaken. The first, baseline survey, undertaken

prior to the implementation activities under the new NMS, was carried out in January/February 2010. The second and the third follow up surveys were respectively undertaken in November/December 2010 and July/August 2011. The detailed report of the methodologies is presented previously (Memusi et al. 2010; Nyandigisi et al. 2011). In this report, we present progress in the key indicators referring to the availability of commodities and malaria case management practices.

2. OBJECTIVES

2.1. General objective

- To monitor progress in achieving NMS targets in the availability of malaria case management commodities and the quality of outpatient malaria case management practices at public health facilities.

2.2. Specific objectives

- To determine the levels and trends in the national availability of recommended and non-recommended antimalarials and malaria diagnostics in public health facilities.
- To determine the levels and trends in health workers' adherence to outpatient guidelines for malaria diagnosis, treatment, counseling, and drug dispensing for patients below and above 5 years of age in public health facilities nationwide.

3. METHODS

The same methodologies applied to all surveys. The detailed presentation of all methodological aspects was provided in the previous reports (Memusi et al. 2010; Nyandigisi et al. 2011) while in this report the methods are summarized in the following three subsections (3.1-3.3).

3.1. Indicators, sample size and sampling

The study design were cross-sectional health facility surveys in public health facilities, measuring the levels and temporal changes in key indicators on a) availability of malaria case

management commodities and b) quality of outpatient malaria case management practices in accordance with national guidelines.

The primary indicators at health facility level refer to the proportions of facilities with recommended, non-expired AL and malaria diagnostics in stock on the survey day and in the 3 months prior to the survey. The primary indicators at patient level refer to the basic standard under the new diagnostic and ACT policy recommending that all febrile outpatients should be tested for malaria and patients with positive test result should be treated with AL while patients with negative test result should not receive an antimalarial treatment (MOPHS 2010). Secondary indicators at this level address individual components of the case management including testing, treatment, dispensing and counseling in various patients' subgroups (test positive, test negative, having AL prescribed and having AL dispensed). The list of the key health systems support and case management indicators is presented in the Annex 1-3.

The sample size was calculated to detect statistically significant difference of at least 15 percentage points between any two survey points during the monitoring period. For the measurements of case management adherence at the health worker-patient level, the sample size was adjusted to take into consideration clustering effect at the health facility level and the likelihood of practices at facilities with unavailable case management commodities. Therefore, in order to detect 15% difference in primary case management indicator (from conservative estimates of 50% to 65%) with the level of confidence of 5%, power of 80%, design effect of 2, and assumption that 50% of facilities will not have ACTs and malaria diagnostics in stock, the estimated sample size was 680 patients in each age group (below and above 5 years of age) during the each survey. Assuming that on average a minimum of 4 eligible patients will be recruited in each age group at each facility over one survey day, the minimum required number of surveyed facilities was 170 (680/4).

A national representativeness was assured drawing a stratified random sample from the universe of public health facilities and taking into consideration within-country distribution of

facilities and administrative boundaries, type of facilities and their ownership. The following facilities were excluded from the survey: 1) facilities from Nairobi province, 2) tertiary hospitals, and 3) facilities run by other than MOH and local authorities. Therefore 28 strata were formed and from each stratum a simple random sample proportional to the number of facilities in the stratum was drawn.

3.2. Survey personnel, training and data collection

The health facility surveys were conducted with ten teams each composed of three data collectors. In each team one senior nurse or pharmaceutical technologist acted as a team leader and performed health facility assessment and interviews with health workers. The other two team members were student nurses who carried out exit interviews with outpatients. The training of data collectors was undertaken over five days in Nairobi. The training consisted of the general introduction on the purpose of the survey, instruction and practice of performing health facility assessment, interviewing caretakers, adult patients and health workers, collecting data from patient-held records and taking informed consent. Throughout the training role plays with patients and health workers were carried out. On the last day of the training, a field trial of the study procedures was conducted in health facilities that were not included in the survey.

At each of the survey facilities data were collected over one survey day. Data were collected using three methods. First, all patients presenting to the outpatient departments underwent rapid screening when they were ready to leave the facility. Upon obtaining written informed consent, non-referred and non-pregnant patients presenting for an initial visit with fever weighing 5kg and above proceeded with interview during which information was collected from patient-held cards about malaria diagnostics requested, results reported and medications prescribed. During the interviews information was also collected about patients' age, weight, sex, temperature, duration of fever, main complaints, prior use of antimalarial drugs, and the basic assessment, drug dispensing and counseling tasks performed during the facility visit.

Second, each facility was assessed to determine the availability of expired and non-expired, recommended and non-recommended antimalarial drugs, RDTs, and functional malaria

microscopy service on the survey day. The stock out duration of recommended antimalarials and RDTs in the past 3 months was also determined as well as the absence of functional microscopy in the same period. Finally, the availability of weighing scales, case management guidelines, job-aids and medicine inventory materials was also established.

Third, at the end of the working day all health workers who attended recruited patients on the survey day were interviewed to collect information on their demographics, pre-service training, access to guidelines, and retrospective exposure to in-service training and supervision. Informed written consent was obtained for all health workers. Finally, following completion of the health facility surveys, monthly phone calls have been made to each of the surveyed facilities to track availability of AL and ensure 6 months continuity of the data. Therefore, in this report 19 follow up rounds of AL availability data combining physical and phone call surveys are presented.

3.3. Statistical analysis and approaches

Data entry and management was undertaken using Access (Microsoft, USA). All forms were entered twice by independent data entry clerks. The analysis was performed using STATA, version 11 (StataCorp, College Station, Texas). Level estimates are presented for each survey as proportions. Percentage change in indicators between the baseline and the second follow up survey was also measured. Statistical significance of the change was assessed using chi-square test adjusted at patient level analysis for clustering at health facility. Hypothesis testing and CI estimations were done with an alpha level of 0.05.

The analytical approach reflected the main objective of the study, i.e. to provide national level data. The primary objective of the case management analysis was to compare the current practices with the new national malaria case management guidelines reflecting the new policy and recommending that across all age groups 1) "*all patients with fever or history of fever should be tested for malaria and only patients who test positive should be treated for malaria*" and that 2) *"the recommended first line treatment for uncomplicated malaria in Kenya is artemether-lumefantrine"* (MOPHS 2010).

The analysis was performed at four levels. First, to assess the baseline performance of the new case management policy practices are analyzed at all health facilities regardless of the availability of case management commodities. Second, to assess health workers adherence to the guidelines the same analysis was restricted to the facilities where AL and diagnostics were in stock on the day of the survey. Third, at facilities with available AL, the quality of AL dosage prescriptions, and the quality of dispensing and counseling practices was respectively restricted to patients who had AL prescribed and to those who had both, AL prescribed and dispensed at facility. Finally, results were stratified for patients below and above 5 years of age.

4. RESULTS

4.1. Sample description

The baseline and the first follow up surveys were respectively undertaken at 174 health facilities in January/February 2010 and at 176 facilities in November/December 2010. The detailed sample description of the 2010 surveys was provided previously (Memusi et al. 2010; Nyandigisi et al. 2011) while here the results are presented in comparison to the second follow up survey which was undertaken between 25 July and 12 August 2011 at 174 facilities.

During the second follow up survey, from the initial list of 176 facilities, 2 facilities were not surveyed and were not replaced due to lack of time to complete the survey for the particular teams. Further 14 facilities from the initial list were not surveyed but were replaced by the nearest facility. The reasons for replacement were the following: 7 were not operational either permanently or temporarily, 4 could not be physically accessed, 2 were private facilities and 1 had computerized filing system that could not be accessed. Finally, 4 facilities changed the level of care status compared to the initial list – 3 facilities were upgraded from the dispensaries to health centres and 1 was downgraded from hospital to health centre.

Administrative distribution of the surveyed facilities between surveys was nearly equal, however with minor differences with the respect to the level of care and ownership. In comparison to the baseline survey, during the two follow up surveys 3.6% and 6.3% less

dispensaries were surveyed while during the same two surveys 5.4% and 3.4% more GoK facilities were surveyed compared to the baseline survey (Table 1).

Table 1: Comparison of facilities between surveys by province, level of care and ownership

Stratification	Baseline N=174		Follow-up 1 N=176		Follow-up 2 N=174	
	n	%	n	%	n	%
Province						
Central	23	13.2	22	12.5	22	12.6
Coast	15	8.6	16	9.1	16	9.2
Eastern	33	19.0	34	19.2	33	19.0
North Eastern	7	4.0	8	4.6	8	4.6
Nyanza	28	16.1	29	16.5	29	16.7
Rift Valley	54	31.0	53	30.1	52	29.9
Western	14	8.1	14	8.0	14	8.1
Level of care						
Dispensary	122	70.1	117	66.5	111	63.8
Health Centre	32	18.4	38	21.6	43	24.7
Hospital	20	11.5	21	11.9	20	11.5
Ownership						
GoK	127	73.0	138	78.4	133	76.4
Faith-based	45	25.9	34	19.3	39	22.4
NGO	2	1.2	4	2.3	2	1.2

During the second follow up survey health worker interviews were undertaken with all 233 health workers who saw recruited patients on survey days at 171 health facilities. At 3 facilities no outpatient consultations took place during the survey days. Overall, 2,516 outpatients were screened on the exit. Of 2,516 screened outpatients, the practices were evaluated for 1,208 non-pregnant febrile patients weighing 5kg and above and presenting for an initial outpatient visit. The remaining 1,308 patients were patients referred or admitted for hospitalization (60), pregnant women (71), follow up visits (296), weighing less than 5 kg (36) and presenting without history of fever (1039). Of 1,208 febrile patients, 535 (44.3%) were below 5 years of age and 673 (55.7%) were 5 years and older. At 91 (52.3%) facilities malaria diagnostics and AL were available on the survey day. At these facilities, health workers' adherence to the new policy was evaluated for 634 patients, of which 301 (47.5%) patients were below 5 years of age and 333 (52.5%) were 5 years and older.

The Table 2 presents numbers of assessed facilities, interviewed health workers and evaluated outpatient consultations for patients who met inclusion criteria stratified by baseline and follow up surveys. Notably, despite nearly equal number of facilities between surveys the turnout of febrile outpatients as well as the proportion of fevers among screened patients (78.2% vs 58.9% vs 48.2%) had shown a declining trend between baseline and follow up surveys.

Table 2: Number of health facilities assessed, health worker interviews performed and outpatient consultations assessed for enrolled patients at all facilities and facilities with diagnostics and AL in stock - stratified by baseline and two follow up surveys

Survey	HFs assessed	HWs interviewed	Outpatient consultations at all HFs		Outpatient consultations at HFs with diagnostics and AL in stock	
			<5 years	≥5 years	<5 years	≥5 years
Baseline	174	224	1,070	1,335	591	648
Follow-up 1	176	237	675	781	420	441
Follow-up 2	174	233	535	673	301	333

4.2. Health systems support

The results presented in this section compare the key health facility and health worker characteristics considered important for the performance of adequate malaria case management between three surveys.

4.2.1. Availability of basic equipment and malaria diagnostics on survey days

Four different types of functional weighing scales were found at health facilities and the majority of facilities had each type of weighing scale during the all surveys (Table 3). At least one type of weighing scale was available at nearly all facilities during all surveys (100% vs 99% vs 98%). Similarly at least one functional thermometer was present at the large majority of facilities during all surveys (91% vs 90% vs 93%). No significant change in overall capacities of health facilities to provide parasitological diagnosis of malaria was observed between baseline and second follow-up survey (55.2% vs 58.6%; p=0.516), neither in provision of malaria microscopy (50.6% vs 54.0%; p=0.520) nor RDTs (7.5% vs 12.6%; p=0.109).

Table 3: Availability of basic equipment and malaria diagnostics

	Baseline N=174	Follow-up 1 N=176	Follow-up 2 N=174	% change B vs FU2	*P*-value
Availability of weighing scales					
Salter hanging scale	58.1	61.4	64.9	+6.8	0.186
Infant scale	83.9	80.1	79.3	-4.6	0.260
Bathroom scale	75.9	69.9	69.0	-6.9	0.150
Balance scale	50.6	50.6	54.0	+3.4	0.520
Availability of functional thermometer	90.8	90.3	93.1	+2.3	0.431
Availability of malaria diagnostics					
Functional microscopy	50.6	53.4	54.0	+3.4	0.520
Any malaria RDT (non-expired or expired)	10.3	8.5	13.8	+3.5	0.415
Non-expired malaria RDT	7.5	8.5	12.6	+5.1	0.109
Expired malaria RDTs	3.5	0.6	1.2	-2.3	0.091
Any functional diagnostics	55.2	58.0	58.6	+3.4	0.516

4.2.2. Retrospective absence of diagnostic services

Data on retrospective availability of malaria diagnostic services were collected for 3 months period prior to the surveys. The new malaria policy recommends universal parasitological diagnosis, using either malaria microscopy or RDTs. Therefore, comparing all facility results between baseline and follow up surveys, the results show minor decrease trend (46.6% vs 42.1% vs 40.8%; $p_{(BvsFU2)}$=0.195) in the absence of malaria diagnostic service (both RDTs and microscopy) in duration of least 7 consecutive days in 3 months prior to the surveys.

Among health facilities which had functional microscopy on survey days, there was no decrease in the absence of this service prior to three surveys (9.1% vs 5.3% vs 9.6%). Finally, at facilities providing malaria microscopy services there was an increase in the quality control visits that took place in 3 months prior to the surveys (from 9.1% at baseline to 17.0% at the second follow up [p=0.114]). Similarly at facilities providing RDT testing, there was also an increase in the proportion of facilities which had received a supervisory visit on the use of RDTs (5.3% vs 20.8%; p=0.143).

Highlight: Malaria diagnostic capacities

KEY FINDINGS:
By mid 2011, 59% of facilities had malaria diagnostic capacities, largely through malaria microscopy (54%) while RDTs were rarely available (13%). At facilities with malaria diagnostics there was an increase from 9% to 17% of facilities having received a quality control visit on malaria microscopy. At facilities with RDTs there was also an increase in supervisory visits on the use of RDTs (5% to 21%). However, overall quality control activities were low for both diagnostic services.

POLICY IMPLICATIONS:
To ensure universal access to malaria diagnostic services, RDTs should be procured in sufficient quantities and distributed to peripheral health facilities. The QC and QA system for malaria microscopy and RDTs should be scaled-up in line with the national policy guidelines for parasitological diagnosis of malaria.

4.2.3. Availability of antimalarial drugs on survey days

Availability of antimalarial drugs was assessed at all health facilities during the physical surveys and thereafter these data were collected monthly at the same facilities by phone interviews. The availability of non-expired AL pack was relatively high during the baseline and the first follow up survey. Yet, during the second follow up survey a decline in the AL availability was observed. Compared to baseline results, the availability of at least one AL pack in stock decreased from 94.3% to 89.1% ($p=0.049$) while simultaneous availability of all four AL packs decreased from 64.9% to 45.4% of facilities ($p<0.001$).

It should be, however, noted that the physical surveys were cross-sectional, therefore limiting interpretation of the stock-out findings only to data collection periods. Trend analysis combining monthly AL availability data from physical and phone call surveys provides more comprehensive picture. The Figure 1 shows monthly proportions and trends in stock-outs of at least one AL pack and simultaneous stock-out of all four AL packs (total AL stock-out). Mean of the proportion of health facilities with total AL stock-out across the study period was 11.6% (median 10.9%; monthly range: 3-20%) while mean stock-out of at least one AL pack was substantially higher - 41.3% (median 38.3%; monthly range: 28-59%). AL stock-outs had shown a fluctuating pattern however overall changes in AL stock-outs during the monitoring period

were minor. Over this period monthly decrease of total AL stock was only 0.005% (95% CI: -0.5 to +0.5; p=0.983) while monthly decrease in the stock-out of at least one AL pack was 0.7% (95% CI: -1.5 to +0.3; p=0.058). With respect to the stock-outs of individual AL packs, mean of the proportion of stocked-out facilities ranged between 20.6% for AL 6 pack (median 19.7%; monthly range: 9-39%) and 27.9% for AL 18 pack (median 27.1%; monthly range: 14-43%). The mean stock out of AL 12 and 24 packs was respectively 27.7% (median 27.3%; monthly range: 14-48%) and 22.6% (median 21.9%; monthly range 13-32%).

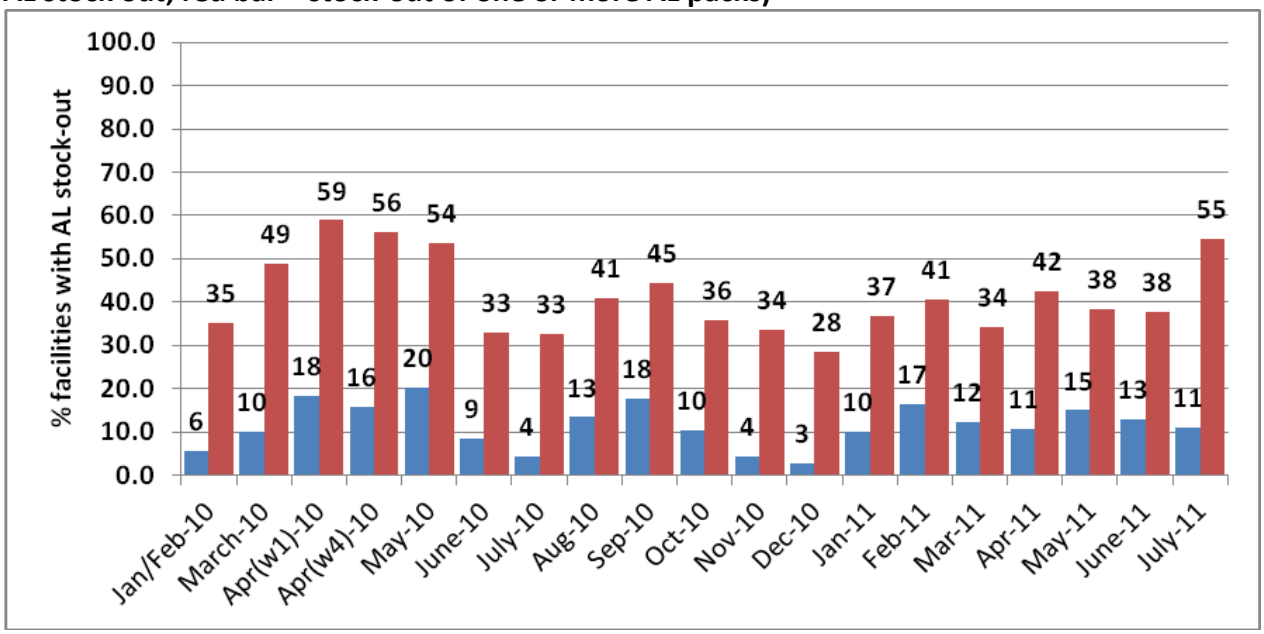
With respect to other antimalarials, the availability of SP declined from 88.5% at baseline to 73.6% at the second follow up survey (p<0.001). Interestingly, during the second follow up survey SP was found at 90.0% of facilities in IPTp implementation districts but also at 68.7% of facilities in districts where IPTp was discontinued during 2010. Furthermore, there was some improvement trend in the availability of quinine tablets (69.0% vs 84.6% vs 80.5) while availability of quinine injections have not changed between baseline and the second follow up survey (77.6% vs 78.6%; p=0.795). During the second follow up survey only 5 facilities (2.9%) stocked DHA-PPQ and only 2 (1.2%) facilities stocked injectable artesunate, the respective treatments nationally recommended during 2010 (but not yet supplied) for the management of AL treatment failures and severe malaria. Notably, further downward trend from 23.6% at baseline to 11.4% and 2.9% at respective follow up surveys was observed in the availability of amodiaquine, an antimalarial drug whose supply was discontinued in 2007. Finally, during all survey rounds, expired antimalarial drugs were uncommon, though an increase trend in any expired AL pack was however observed (2.9% vs 7.4% vs 10.4%).

Table 4: Facilities with recommended, non-expired antimalarial drugs in stock

	Baseline N=174	Follow-up 1 N=176	Follow-up 2 N=174	% change B vs FU2	*P*-value
Any AL pack	94.3	97.2	89.1	-5.2	0.049
All AL packs	64.9	71.6	45.4	-19.5	<0.001
AL 6 pack	81.0	89.2	78.2	-2.8	0.347
AL 12 pack	79.9	86.4	59.8	-20.1	<0.001
AL 18 pack	79.3	81.8	66.7	-12.6	0.005
AL 24 pack	86.2	86.9	73.6	-12.6	0.003
SP tablets	88.5	88.0[a]	73.6	-14.9	<0.001
Quinine tablets	69.0	84.6[a]	80.5	+11.5	0.014
Quinine injections	77.6	84.5[b]	78.6	+1.0	0.795

[a] Denominator does not include 1 health facility without information
[b] Denominator does not include 2 health facilities without information

Figure 1: Monthly trend (Jan 2010-July 2011) in stock-outs of non-expired AL (blue bar – total AL stock out; red bar – stock-out of one or more AL packs)



4.2.4. Retrospective stock-out of antimalarial drugs

Retrospective stock-out data of recommended antimalarials were collected for 3 months periods between the baseline (October-December 2009) and two follow up surveys (August-October 2010 and April-June 2011 respectively). For this indicator the stock-out of at least 7 consecutive days over 3 months period was used as the criterion for the presence of the stock out. There was a declining stock-out trend observed in the measurement of this indicator (Table

5). Simultaneous stock-out of all four AL tablet packs decreased from 27.2% at baseline to 6.3% at the second follow up (p<0.001), stock out of at least one AL pack from 59.5% to 44.8% (p=0.007) and stock outs of four specific AL packs ranging prior to baseline from 37.6-52.0% decreased to 19.5-31.6% prior to the second follow up survey. No significant changes in the trend were observed in the retrospective stock-outs of SP and quinine tablets (Table 5). Among facilities experiencing retrospective stock-out the median number of stock-out days in past 3 months without any AL was higher at baseline (35 days [IQR: 25–31]) compared to the second follow up (11 days [IQR: 5-68]). A similar downward pattern was observed for stock-out durations of AL 18 pack (59 days [IQR: 30-83] vs 48 days [IQR: 24-91]) and AL 24 pack (46 days [IQR: 29-70] vs 24 days [IQR: 13-50]) however an increase in stock-out durations was observed for AL 6 pack (41 days [IQR: 25-66] vs 59 days [IQR: 29-91]) and AL 12 pack (55 days [IQR: 27-79] vs 75 days [IQR: 32-91] days).

Table 5: Stock-outs of antimalarial drugs in 3 months prior to the surveys

Stock out of at least 7 consecutive days in 3 months prior to the surveys	Baseline N=174 (%)	Follow-up 1 N=176 (%)	Follow-up 2 N=174 (%)	% change B vs FU2	*P*-value
All AL packs	27.2[a]	20.6	6.3	-20.9	<0.001
AL 6 pack	37.6	30.1	19.5	-18.1	<0.001
AL 12 pack	43.9	32.4	31.6	-12.3	0.015
AL 18 pack	52.0	42.1	27.6	-24.4	<0.001
AL 24 pack	39.3	35.2	19.5	-19.8	<0.001
Any AL pack	59.5	52.3	44.8	-14.7	0.007
SP tablets	14.4	9.1	16.1	+1.7	0.654
Quinine tablets	25.4[a]	22.2	16.1	-9.3	0.025
Quinine injections	20.8[a]	20.5	17.2	-3.6	0.492

[a] Denominator does not include one facility where information was not available

4.2.5. Availability and completeness of antimalarial drug management records

During three surveys, the availability of all three antimalarial drug management inventory materials was relatively high, ranging from 74.7% to 86.2% (Table 6). However updating and completing of the inventory materials was less common. This was particularly marked for stock cards and AL dispenser books. While 66.7% of facilities had AL dispenser book updated for the last one month prior to the baseline survey, less than half (47.7%), however, had it fully updated for one month prior to the second follow up survey (p=<0.001) (Table 6).

Table 6: Availability and quality of antimalarial drug management records

	Baseline N=174 (%)	Follow-up 1 N=176 (%)	Follow-up 2 N=174 (%)	% change B vs FU2	*P*-value
Stock cards available	86.2	77.3	74.7	-11.5	0.007
Stock cards updated (1 month)	44.8	38.6	44.3	-0.5	0.914
AL dispenser book available	89.7	86.9	85.6	-4.1	0.254
AL dispenser book updated (1 month)	66.7	45.5	47.7	-19.0	<0.001
Monthly summary form available	81.5[a]	76.1	79.9	-1.6	0.787
Summary form completed (3 months)	65.9[a]	59.1	69.0	+3.1	0.493

[a] Denominator does not include one facility with missing value

Highlight: Availability of antimalarial medicines and antimalarial drug management

KEY FINDINGS:

The mean of facilities with total AL stock-out over the monitoring period between January 2010 and July 2011 was 11.6% and monthly variations were 3-20%. In the same period the mean stock-out of at least one AL pack was 41.6% and varied monthly between 28% and 59%. When stock-outs occurred, facilities stayed in this status for a substantial period which was longer for individual packs than for simultaneous stock-out of all four packs. SP was available at 69% of facilities in areas where IPTp was discontinued in 2010. A worsening trend in the quality of antimalarial drug recording was observed.

POLICY IMPLICATIONS:

Future drug management activities should focus on improving routine recording and reporting, and strengthening of district capacities to respond to stock-outs. Distribution of SP should be discontinued outside of Coast, Western and Nyanza Provinces. Innovative ways reporting real-time stock data using mobile phone technologies should be piloted and their impact on AL stock-outs should be evaluated. Elimination of AL stock-outs must be viewed alongside the implementation of the new case management policy promoting the rational use of antimalarial drugs based on universal deployment of malaria diagnostics.

4.2.6. Availability of guidelines and job aids

The new national malaria guideline for health workers was officially launched in September 2010 and subsequently disseminated nationwide. The wall chart on malaria outpatient algorithm specifying new malaria diagnostic recommendations was finalized in 2010 and disseminated in the first half of 2011. The coverage of health facilities with new guidelines increased from 5.7% at the first follow up to 47.7% at the second follow up survey (p<0.001) while the coverage of health facilities with the new diagnostic algorithm charts reached 19.0% at the second follow up survey. The availability of AL dosing and dispensing chart, which was produced prior to the launch of the new policy, increased from 36.8% at baseline to 56.3% at

the second follow up survey (p<0.001). Simultaneously, some decline trend was observed in the availability of obsolete guidelines and wall charts. The proportion of facilities having displayed old algorithm charts promoting presumptive treatment in children decreased from 44.8% to 30.5% (p=0.006) and the availability of old malaria guidelines providing the same presumptive recommendations decreased from 69.5% to 56.9% (p=0.014).

Highlight: Availability of new case management guidelines and wall charts

KEY FINDINGS:
By mid 2011, 48% of facilities were found with new malaria case management guidelines. AL dosing and dispensing charts were displayed at 56% of facilities, however the charts with the new diagnostic algorithms were available at only 19% of facilities. Old guidelines and wall charts are still available at substantial proportion of health facilities.

POLICY IMPLICATIONS:
The coverage with new national malaria case management guidelines and wall charts has significantly increased however it is still far below the targets. These job aids should be repeatedly disseminated to the peripheral health facilities through the channels such as in-service training for health workers and distribution of medicines through KEMSA. The obsolete guidelines and wall charts should be removed from health facilities.

4.2.7. Characteristics of health workers

General characteristics of outpatient health workers who saw patients on survey days were nearly equal (Table 7). During all surveys the majority of health workers were female, health workers not in-charge of facilities and by cadre nurses followed by clinical officers (Table 7).

Table 7: Characteristics of health workers who saw patients on survey days

	Baseline N=224 (%)	Follow-up 1 N=237 (%)	Follow-up 2 N=233 (%)
Male	47.3	46.8	47.2
Facility in-charge	46.4	42.6	43.4
Cadre			
Doctor	0.9	1.7	0.9
Clinical officer	31.3	28.3	29.6
Nurse	63.0	64.1	65.2
Other	4.9[a]	5.9[b]	4.3[c]

[a] Includes 5 CHWs, 3 support staff, 1 nurse aid, 1 patient attendant and 1 pharmaceutical technician
[b] Includes 7 CHWs, 3 student nurses, 1 support staff, 1 nurse aid, 1 patient attendant and 1 laboratory technician
[c] Includes 5 CHWs, 2 students, 1 subordinate staff, 1 midwife and 1 patient attendant

4.2.8. Health workers' exposure to in-service training and supervision

The main case-management activity undertaken between the baseline and the first follow up survey was nationwide, in-service training for front-line health workers on the new malaria case management policy. In the period between the first and the second follow up survey the main activity was the nationwide strengthening of the routine supervisory activities focusing on malaria related activities according to the recently developed supervisory manuals. The results of the first follow up survey show that 21.5% of health workers were trained on the new case management policy and, expectedly in absence of the major trainings between the first and the second follow up surveys, this coverage has not substantially improved (24.9%).

With respect to the supervision, there was a significant increase from 41.5% of health workers receiving any supervisory visit in 3 months prior to the survey to 61.4% prior to the second follow up (p<0.001). Although the overall coverage was lower, there was also a significant increase in health workers who had received a supervisory visit that included malaria case management activity (17.9% vs 33.1%; p<0.001). Similarly, there was also some increase in the coverage of health workers who received supervisory activity that included malaria case management with observation of consultations (6.7% vs 11.2%; p=0.092).

Table 8: Health workers exposure to in-service training and supervision

	Baseline N=224 (%)	Follow-up 1 N=237 (%)	Follow-up 2 N=233 (%)	% change B vs FU2	*P*-value
In–service training					
Trained on new case management policy	0	21.5	24.9	+24.9	<0.001
Supervision					
Any supervisory visit in past 3 months	41.5	51.9	61.4	+19.9	<0.001
Any visit including malaria CM	17.9	13.9	33.1	+15.2	<0.001
Had visit including observations	6.7	6.8	11.2	+4.5	0.092

Highlight: Coverage with in-service training and malaria related supervision

KEY FINDINGS:
The coverage of outpatient clinicians trained on the new case-management policy is 25%. There is an improvement trend in the coverage of health workers receiving a supervisory visit that includes malaria case management, however the overall coverage by mid 2011 is still low (33%) and in particular for visits including observation of consultations (11%).

POLICY IMPLICATIONS:
The coverage of trained health workers on the new case management policy should be increased and the opportunity lies in the forthcoming large scale implementation of RDTs. Routine supervisory activities at district level that include malaria case management component need to be quantitatively increased and qualitatively improved in line with recently produced supervisory manuals for malaria.

4.3. Malaria case management

This section presents results on the case management practices for febrile, non-pregnant patients weighing 5 kg and above, presenting for an initial outpatient visit without being referred or admitted for hospitalization. The presentation of the results followed the multi-level analytic approach of the study. First, to assess the performance of the new case management policy the results are presented from all health facilities regardless of the availability of case management commodities. Second, to assess health workers adherence to the new guidelines the same results were restricted to the facilities where AL and diagnostics were in stock on the day of the survey. Third, at facilities with available AL, the quality of ACT dosage prescriptions, and the quality of dispensing and counseling practices was respectively restricted to patients who had ACTs prescribed and to those who had both, ACTs prescribed and dispensed at facility. Finally, case management results were stratified for children below 5 and above 5 years of age.

4.3.1. Main patients' characteristics

Main patients' characteristics were similar between three surveys and no significant difference had been observed in frequencies of patients' age, weight, duration of illness, body temperature and prior use of antimalarial drugs (Table 9).

Table 9: Main characteristics of febrile patients across age groups

	Baseline N=2,405 (%)	Follow-up 1 N=1,456 (%)	Follow-up 2 N=1,208 (%)
Female	56.1	53.8	55.3
Age			
<1 year	12.0	13.7	9.3
1-4 years	32.5	32.6	35.0
5-14 years	21.1	18.1	18.8
≥15 years	34.4	35.5	36.9
Weight[a]			
5-14 kg	41.0	41.4	39.1
15-24 kg	17.1	17.3	16.8
25-34 kg	5.0	4.3	4.2
≥35 kg	37.0	36.7	38.9
Duration of illness[b]			
1-2 days	32.6	36.0	32.4
3-4 days	41.0	46.5	46.9
5-6 days	9.8	8.0	7.3
≥7 days	16.6	9.8	13.5
Temperature ≥37.5ºC[c]	26.3	31.1	30.9
Prior use of any AM	5.0	4.6	4.6
Prior use of AL	1.9	1.5	2.4
Prior use of full AL dose	0.5	0.6	1.2

[a] Denominator does not include 2 patients with missing values during the follow up 1 survey
[b] Denominator does not include 4 patients with missing values at the baseline and 1 patient at the follow-up 1 survey
[c] Denominator does not include 1 patient with missing value during the follow-up 1 survey

4.3.2. Performance of the new diagnostic and treatment policy

The new national case management guidelines recommend that 1) "*all patients with fever or history of fever should be tested for malaria and only patients who test positive should be treated for malaria*" and 2) *"the recommended first line treatment for uncomplicated malaria in Kenya is artemether-lumefantrine"* (MOPHS 2010). We considered composite case management performance in accordance with national guidelines if the following three criteria were met: 1) febrile patient was tested for malaria; 2) if positive test result was reported patient was treated with AL, and 3) if negative test result was reported patient was not treated for malaria.

Overall, at all study facilities composite performance increased from 15.7% at the baseline to 25.1% at the second follow up survey (p=0.004). The same trend was observed in children

below 5 years of age (increase from 11.8% to 21.5%; p=0.003) and in patients 5 years and older (increase from 18.9% to 27.9%; p=0.021). A similar upward trend was observed in testing rates of febrile patients – from 23.9% at the baseline to 36.8% at the follow up survey (p=0.003). Testing rates in children below 5 years of age increased from 20.5% to 31.0% (p=0.018) while performance of the same task for patients 5 years and older increased from 26.7% to 41.5% (p=0.004).

Stratified analysis by the result of malaria test provides further light on the case-management practices. First, recommended AL treatment for test positive patients has significantly decreased, from 82.7% at the baseline to 69.8% at the second follow up survey (p=0.056), and this occurred despite a transitory improvements observed during the first follow up survey (89.2%). For the same patients' category, the treatment with the combination of AL and quinine that was nearly non-existent (0.9%) during the first follow up survey became common (12.2%) during the second follow up survey, similarly as it was observed during the baseline survey (10.2%). Moreover, the treatments with quinine monotherapy increased from 4.1% at baseline to 12.7% at the second follow up survey (p=0.009). The practice of combining AL and quinine was particularly common among children below 5 years of age where 16.2% were prescribed this treatment, but it was also substantial among patients 5 years and older (9.9%). More positively, among patients with negative test result, significantly less patients were treated for malaria during the second follow up survey compared to the baseline (30.3% vs 52.1%; p=0.003). The decline in this practice was pronounced in both age groups – in children below 5 years of age (decrease from 56.7% to 31.3%; p=0.003) and in patients 5 years and older (decrease from 48.8% to 29.4%; p=0.016). Notably, in this patient group nearly all antimalarial treatments included AL at the second follow up survey while only 2.5% of patients were treated with SP compared to 11.4% at the baseline (Table 10).

Table 10: Performance of the new case management policy - diagnostic and treatment practices for febrile patients presenting to all health facilities regardless of the availability of commodities

	Baseline N=2,405 (%)	Follow-up 1 N=1,456 (%)	Follow-up 2 N=1,208 (%)	% change B vs FU2	*P*-value
Composite performance	15.7	22.1	25.1	+9.4	0.004
Malaria test performed	23.9	30.9	36.8	+12.9	0.003
Rx practice among test positives	**N=295**	**N=212**	**N=205**		
AL	82.7	89.2	69.8	-12.9	0.056
AL+QN	10.2	0.9	12.2	+2.0	0.711
QN	4.1	3.3	12.7	+8.6	0.009
Other AM[a]	2.4	3.8	2.9[d]	+0.5	0.614
No AM prescribed	0.7	2.8	2.4	+1.7	0.101
AB prescribed	62.0	60.9	58.1	-3.9	0.536
Rx practice among test negatives	**N=280**	**N=238**	**N=239**		
AL	34.6	39.9	24.3	-10.3	0.106
SP	11.4	3.4	2.5	-8.9	0.012
AL+QN	2.9	0	1.3	-1.6	0.349
QN	1.8	0.4	1.7	-0.1	0.920
Other AM[b]	1.4	0.8	0.4[e]	-1.0	0.911
No AM prescribed	47.9	55.5	69.8	-21.9	0.003
Any AM prescribed	52.1	44.5	30.3	-21.8	0.003
AB prescribed	85.4	76.5	86.6	+1.2	0.991
Rx practice when test not done	**N=1,830**	**N=1,006**	**N=764**		
AL	59.8	55.4	48.2	-11.6	0.014
AL+QN	3.1	1.5	2.8	-0.3	0.841
SP	2.9	1.4	2.5	-0.4	0.788
QN	1.6	1.1	2.9	+1.3	0.240
Other AM[c]	0.5	0.5	0.3[f]	-0.2	0.026
No AM prescribed	32.2	40.2	43.3	+11.1	0.015
Any AM prescribed	67.8	59.8	56.8	-11.0	0.015
AB prescribed	76.0	81.3	81.9	+5.9	0.028

[a] Other antimalarial treatments include SP (5), AS+AQ (5), DHA-PPQ (4), QN+SP (2), DHA (2), ART (1), AS+MQ (1) and AL+SP (1).
[b] Other antimalarial treatment include AQ (3), AS+AQ (1), AL+SP (1), DHA-PPQ (1) and AS+MQ (1).
[c] Other antimalarial treatments include AQ (5), QN+SP (2), DHA-PPQ (2), QN+AQ (1), AL+SP (1), DHA (1), AS+MQ (1) and AS+AQ (1).

4.3.1. Health workers adherence to the new diagnostic and treatment guidelines

While previous section reported changes in indicators from all health facilities regardless of the availability of case management commodities, in this section we report changes in health workers case management practices only from facilities where, both diagnostics and AL were in stock during the surveys (Table 11). At these facilities, the performance of the same composite case-management indicator increased from 28.1% at the baseline to 40.2% during the second follow up survey (p=0.007), while testing rates for febrile patients increased from 42.5% to

56.9% (p=0.006). In children below 5 years of age the composite performance increased from 19.3% to 32.6% (p=0.007) while testing rates increased from 33.3% to 46.8% (p=0.033). In patients 5 years and older composite performance improved from 36.1% to 47.2% (p=0.037) while testing rates increased from 50.8% to 66.4% (p=0.006).

Since respectively only 5.7% and 10.9% of facilities during the baseline and the second follow up survey did not have any AL in stock, changes in the key indicators of treatment practices for test positive and test negative patients were similar to the overall and age-specific pattern reported at all facilities. In summary, at these facilities AL treatment for test positive patients decreased from 83.3% to 75.3% (p=0.280) and antimalarial treatment for test negative patients decreased from 52.8% to 30.2% (p=0.005) (Table 11). During the second follow up survey as high as 14.9% of test positive patients were still treated with combination of AL and quinine while fewer patients in this category were treated with quinine monotherapy compared to the practices at all health facilities (5.2% vs 12.7%) (Table 11).

Table 11: Health workers adherence to guidelines - diagnostic and treatment practices for febrile patients presenting to facilities where malaria diagnostic services were available and AL was in stock

	Baseline N=1,239 (%)	Follow-up 1 N=861 (%)	Follow-up 2 N=634 (%)	% change B vs FU2	*P*-value
Composite performance	28.1	35.5	40.2	+12.1	0.007
Malaria test performed	42.5	49.5	56.9	+14.4	0.006
Rx practice among test positives	**N=276**	**N=201**	**N=154**		
AL	83.3	89.6	75.3	-8.0	0.280
AL+QN	10.5	1.0	14.9	+4.4	0.495
QN	4.0	3.5	5.2	+1.2	0.739
Other AM[a]	1.5	3.5	2.0[d]	+0.5	0.568
No AM prescribed	0.7	2.5	2.6	+1.9	0.113
AB prescribed	63.8	61.2	55.2	-8.6	0.185
Rx practice among test negatives	**N=250**	**N=225**	**N=205**		
AL	35.6	40.4	23.9	-11.7	0.098
SP	10.8	2.7	2.9	-7.9	0.033
AL+QN	3.2	0	1.5	-1.7	0.375
QN	2.0	0.4	1.5	-0.5	0.661
Other AM[b]	1.2	0.4	0.5[f]	-0.7	0.282
No AM prescribed	47.2	56.0	69.8	+22.6	0.005
Any AM prescribed	52.8	44.0	30.2	-22.6	0.005
AB prescribed	84.8	77.8	86.8	+2.0	0.570
Rx practice when test not done	**N=713**	**N=435**	**N=275**		
AL	55.3	42.3	36.7	-18.6	0.020
AL+QN	3.2	1.2	1.1	-2.1	0.106
SP	3.0	1.6	0.7	-2.3	0.041
QN	1.5	0.7	1.1	-0.4	0.634
Other AM[c]	0.7	0	0.4[g]	-0.3	0.112
No AM prescribed	36.3	54.3	60.0	+23.7	0.002
Any AM prescribed	63.7	45.8	40.0	-23.7	0.002
AB prescribed	73.9	82.5	82.2	+8.3	0.064

[a] Other antimalarial treatment include SP (3), DHA-PPQ (3), AS+AQ (2), DHA (2), QN+SP (2), ART (1) and AL+SP (1).
[b] Other antimalarial treatment include AQ (3), DHA-PPQ (1) and AL+SP (1).
[c] Other antimalarial treatment include AQ (4), DHA-PPQ (1) and DHA (1).

Highlight: Case management policy performance and health workers adherence

KEY FINDINGS:

A) The composite case management performance - measured at all facilities regardless of the availability of the commodities as an indicator of the policy performance - increased from 16% to 25%. The changes in individual case management components were as follows: 1) testing rates increased from 24% to 37%, 2) treatment of test positive patients with AL decreased from 83% to 70%, and 3) antimalarial treatment of test negative patients decreased from 52% to 30%.

B) The same composite performance - measured at facilities where malaria diagnostics and AL are available as an indicator of the health workers adherence - increased from 28% to 40%. At these facilities the changes in individual case management components were as follows: 1) testing rates increased from 43% to 57%, 2) treatment of test positive patients with AL decreased from 83% to 75%, and 3) antimalarial treatment of test negative patients decreased from 53% to 30%.

POLICY IMPLICATIONS:

Despite an improvement trend observed by mid 2011, the composite performance of the new policy is still low. The primary reason for low policy performance is absence of diagnostics at health facilities. The secondary reasons are low testing rates and some non-adherence to both test positive and test negative results. To bridge the gap by 2013 the future activities should focus on 1) deployment of diagnostics to all health facilities and 2) reinforcement of clinical practices during the in-service training, supervisory visits and IEC campaigns targeting health workers to increase testing of febrile patients and treatment adherence to test results.

4.3.1. Correctness of AL dosing

The correctness of AL dosage prescriptions was assessed in accordance with dosage recommendations for four weight-specific AL categories and was classified into three categories: 1) recommended (one tablet twice a day over three days for a 5–14 kg patient; two tablets twice a day over three days for a 15–24 kg patient; three tablets twice a day over three days for a 25–34 kg patient; and four tablets twice a day over three days for a patient 35 kg and above), 2) overdosed, and 3) underdosed prescriptions. The baseline values for AL prescribing in recommended weight-specific dose were high (89%). Yet an increase trend in the correct dosing was observed (Table 12). During the second follow up survey 92.8% of patients were correctly dosed for their weight - the proportion similar in children below 5 years of age (93.4%)

and patients 5 years and older (92.3%). Finally, we also observed a decline in overall prescriptions of AL below recommended dose (7.2% vs 3.7%; p=0.004) (Table 12).

Table 12: Correctness of weight-specific AL dosing for patients who had AL prescribed

	Baseline N=1,328[a] (%)	Follow-up 1 N=839 (%)	Follow-up 2 N=569[c] (%)	% change B vs FU2	*P*-value
Recommended dose	89.2	92.4	92.8	+3.6	0.017
Underdose	7.2	4.4	3.7	-3.5	0.004
Overdose	3.7	3.2	3.5	-0.2	0.874

[a] Denominator does not include 107 incomplete AL prescriptions
[a] Denominator does not include 2 incomplete AL prescriptions

Highlight: Correctness of AL dosing

KEY FINDINGS:
An improvement trend was observed in AL prescribing in accordance with weight-specific recommendations. Yet, during all survey rounds the large majority (89-93%) of patients had AL prescribed in accordance with recommendations while underdosed and overdosed prescriptions were rare (3-7%).

POLICY IMPLICATIONS:
Correct weight-based dosing is a critical pre-requisite to ensure high rates of AL treatment success. The optimistic findings observed by mid 2011 should be regularly monitored.

4.3.2. Dispensing and counseling practices

The quality of AL dispensing and counseling was evaluated for 7 tasks specified in national malaria guidelines and malaria case management training manuals. There was no significant change in the performance of any of the 7 tasks between baseline and the second follow up survey (Table 13). The similar pattern was observed in both age groups apart from administration of the first dose at health facility which decreased from 35.7% to 31.0% (p=0.546) in children below 5 years of age and increased from 29.2% to 42.2% (p=0.105) in patients 5 years and older. Overall, of 7 tasks measured during the second follow up survey 4 were performed for more than two-thirds of the patients (advice on dosing (94.4%), advice on the second dose after 8 hours (78.2%), advice on taking AL after the meal (68.4%) and advice on completing all doses (85.4%)) while the other 3 tasks were less commonly performed (weighing

of patients (52.5%), administration of the first dose at health facility (37.5%), and advice on vomiting (4.6%)) (Table 13).

Table 13: Dispensing and counseling practices among patients who had AL dispensed

	Baseline N=1,408 (%)	Follow-up 1 N=797 (%)	Follow-up 2 N=478 (%)	% change B vs FU2	*P*-value
Weight measured	51.8	53.6[a]	52.5	+0.7	0.898
First dose given at facility	32.1	26.9	37.5	+5.4	0.471
Dosage explained	96.2	92.8	94.4	-1.8	0.178
Told to take 2nd dose after 8 hrs	76.0	64.7	78.2	+2.2	0.586
Told to take drugs after the meal	66.9	60.5	68.4	+1.5	0.692
Told what to do in case of vomiting	6.3	5.9	4.6	-1.7	0.407
Told to complete all doses	80.3	82.4	85.4	+5.1	0.057

[a] Denominator does not include 2 observations with missing values

Highlight: AL dispensing and counseling practices

KEY FINDINGS:

By mid 2011 no significant improvement was observed in the performance of dispensing and counseling tasks. The main tasks that require substantial improvements include provision of advice on what to do in case of vomiting (5%), administration of the first AL dose at the facility (38%) and weighing of the patients (53%).

POLICY IMPLICATIONS:

The performance of recommended AL dispensing and counseling tasks is important to ensure high rates of patients' adherence and eventual treatment success. The future in-service training, supervisory and IEC activities should focus on these tasks.

5. DISCUSSION

The main objective of this report is to provide progress data focusing on the coverage of health systems support activities and delivery of outpatient malaria case management following the rollout of the implementation activities under the new National Malaria Strategy. The progress between baseline and follow up surveys is also discussed in comparison with 2013 mid-term targets specified by the national M&E plan of the new NMS (2010-2017) (MOPHS 2010b).

5.1. Coverage with health systems support activities

The key health systems support activities which are necessary pre-requisites to implement new malaria case management recommendations include 1) availability of antimalarial drugs and malaria diagnostics, and 2) health workers' exposure to in-service training, guidelines, wall charts and supervision. With respect to each of these activities, the universal 100% coverage at health facility level was specified as national M&E target to be achieved by 2013 (MOPHS 2010b).

Regarding the availability of commodities, the following patterns were observed during the monitoring period. First, despite a declining trend for some of AL stock-out indicators, the stock-out problem is still substantial and of particular concern for simultaneous absence of all four AL packs which precludes case-management with AL. Second, when stock-outs occurred facilities stayed in this status for a substantial period of time. Third, despite three quarters of facilities having drug inventory materials the suboptimal recording and reporting was common and indeed, there was a worsening trend observed between baseline and follow-up surveys in completing AL dispensing books. Finally, despite some decline in the absence of malaria diagnostic services there was still a significant gap in the proportion of facilities which are not able to provide parasitological diagnosis. This was particularly low for malaria RDTs where the coverage of facilities providing RDT services has reached only 13% by mid 2011.

To eliminate AL stock-outs by 2013 we would like to re-emphasize that further improvements must be viewed in the context of the new case management policy where implementation of the rational use of antimalarial drugs based on universal deployment of malaria diagnostics should be an utmost priority (Memusi et al. 2010). In this context, the priority for drug management activities should be strengthening of the facility and district level logistic management information systems including not only antimalarial drugs but also malaria diagnostics. The focus of these activities should be proper recording and reporting which is able to raise stock-out warnings to allow redistribution of commodities between peripheral facilities facing stock-outs and those where sufficient quantities of drugs and diagnostics are available.

Innovative ways of reporting real-time stock data using m-health technologies should also be explored. Acknowledging this, our findings observed during the first 18 months of the monitoring period are not surprising. Despite the fact that a significant input in terms of in-service training on new malaria case management recommendations was delivered to front-line health workers it should be however recognized that this was not yet accompanied with the large scale distribution of malaria RDTs. Finally, at variance with years prior to 2010, the integration of drug management and case-management in-service training during 2010 may have resulted in diverted attention from drug management activities. If further improvements towards elimination of AL stock outs are to be achieved the pre-requisites must include large scale deployments of malaria diagnostics and strengthened emphasis on drug management activities at peripheral level.

Furthermore, the change of case-management policy in 2010 to recommend universal testing and adherence to guidelines requires a package of health systems support activities necessary to implement, reinforce and maintain health workers' practices up to the standards defined in national guidelines. These activities include provision of in-service training, guidelines and importantly, strengthening of supervisory activities.

Compared to the baseline results we observed that the coverage of trained health workers increased from none to 25% - the latter proportion corresponding to 5,000 trained health workers in 2010 within the universe of approximately 20,000 health workers countrywide. There was no provision of large scale in-service trainings for health workers in 2011, however in the first half of the same year the main implementation activities included nationwide distribution of the new case-management guidelines, wall charts and scaling up of supportive supervision that included malaria case-management activities. Compared to the baseline results this has been reflected in a substantial increase in the coverage of facilities having new guidelines (0% to 48%), AL dosing and dispensing charts (37% to 56%), new diagnostic algorithm charts (0 to 19%) and importantly in an increase of health workers exposed to supervisory activities including malaria case-management (18% to 33%). However less improvement (7% to

11%) was observed in the coverage with supervisory visits that included observation of consultations. During the same period, there was also some increase in the quality control visits at facilities with malaria microscopy (9% to 17%) and RDTs (5% to 21%). Finally, while these improvement trends are encouraging it should be however acknowledged that substantial coverage gaps remain to be bridged by 2013, the time of mid-term evaluation of the new national malaria strategy.

Highlight: Coverage with health systems support activities

Health systems support activities are basic pre-requisite for delivery of effective case management. Despite an improvement trend in some indicators, our findings 18 months after the beginning of the implementation activities revealed an important gap in the availability of diagnostics, antimalarial drugs, quality of antimalarial drug recording and reporting, and health workers coverage with the in-service training, guidelines, job aids and malaria related supervisory activities. To reduce the gaps towards 2013 targets, in-service training should be a prioritized activity but only as an activity aligned with the large scale deployment of RDTs. National guidelines and wall charts should be repeatedly disseminated to the peripheral health facilities through the channels such as in-service training for health workers and distribution of medicines through KEMSA. Routine supervisory activities at district level that include malaria case management component need to be quantitatively increased and qualitatively improved in line with supervisory manuals.

5.2. Case management practices

Our findings revealed that during the first 18 months of the implementation the policy performance increased from 16% to 25% of febrile patients managed according to the new guideline which was measured as the composite indicator including all of the following criteria: 1) patient tested for malaria, 2) if positive test result treated with AL, and 3) if negative test result not treated for malaria. While low performance rate at all study facilities can be explained by the absence of diagnostics or AL in nearly half of the facilities, at the facilities with available diagnostic services and AL, the performance of the same indicator, despite an increase of 12% over 18 months period, remained however low (40%).

There are three levels of discordance contributing to the non-adherent case management practices resulting in poor performance of the composite indicator. First, the major discordance

is related to suboptimal testing practices. An increase in testing rates from 43% during the baseline survey to 57% at the second follow up survey presents an improvement, however, still resulting in 43% of the febrile patients who are incorrectly managed. Second, despite a decline from 53% to 30% of patients with negative test results who are treated with an antimalarial, nearly one third of the patients are still incorrectly managed in this patient category. Finally, despite a transitory improvement observed during the first follow up survey there was however an overall declining trend in test positive patients who are treated with recommended AL monotherapy (83% to 75%) resulting in one quarter of patients in this category treated in discordance with national recommendations.

Although not yet optimal, the decline in antimalarial treatments for test negative patients, observed equally in children below 5 years of age (57% to 31%) and in patients 5 years and older (48% to 29%), is an encouraging finding that deserves a special attention. This traditionally widespread practice has been one of the major stumbling blocks compromising effective malaria case-management in Kenya. What remains to be seen during the future evaluations is whether this positive finding is indeed a long term trend suggesting a paradigm shift in clinical practices compared to previous years or we had observed only a transitory finding during mid 2011. We are cautious with interpretations of clinical practices since during 2011 we had also observed a negative reverse trend in treatment practices for test positive patients. The practices of combining AL and injectable quinine or prescribing quinine monotherapy at facilities where AL is available was nearly abandoned during 2010 however it became common again as similarly observed prior to the roll out of the new policy. This was particularly pronounced in children below 5 years of age where as high as 28% of test positive children were treated with non-recommended therapies.

Finally, the performance of recommended AL dosing, dispensing and counseling tasks is important to ensure high rates of patients' adherence and treatment success. While the performance of the majority of these tasks was relatively high during the baseline survey it is worth noting that no major improvement was revealed in the performance of any dispensing

and counseling task between baseline and follow up surveys. The main tasks that require substantial improvements in the future include administration of the first AL dose at health facility (38%), provision of advice on what to do in case of vomiting (5%) and weighing of patients (53%). The future training, supervisory and IEC activities should focus on the performance of these tasks as well as on the further strengthening of testing and treatment practices in concordance with test results.

Highlight: Case management practices

Quality of care and health workers adherence to diagnostic and treatment guidelines will ultimately determine the success of the case-management component of the new National Malaria Strategy in Kenya. Assuming that the coverage with health systems support activities would substantially increase, the critical requirement for the case management success will be to ensure high quality of the implementation process, which over time should be translated into routine activities at the district level. Specifically, any future in-service training must include post-training follow up, be aligned with the distribution of diagnostic commodities, dissemination of guidelines and job aids, and supported with on-going supportive supervision and monitoring which must include malaria case management component. Furthermore, IEC approaches targeting health workers that have potential to reach large number of health workers in short time should be piloted to complement traditional health systems interventions. Failure to deliver comprehensive package of case management interventions would risk not bridging the gap towards the universal targets.

6. CONCLUSION AND RECOMMENDATIONS

The findings of three rounds of national surveys revealed that most of the key indicators measured in this study have shown some improvement by the mid 2011 however the differences were smaller than expected. Moreover most of the key indicators are still well below the 2013 targets aiming at universal availability of malaria case management commodities, universal coverage of health facilities and health workers with malaria related health systems support activities and universal health worker's adherence to national outpatient guidelines for malaria diagnosis, treatment, counseling, and drug dispensing (Annex 1-3). To effectively reduce the gap towards universal 2013 targets in reasonable time the following eight recommendations that can be drawn from the findings of this study are provided:

1. Implementation of RDTs must be urgently scaled up as part of the existing national RDT implementation plan containing comprehensive package of case management interventions.
2. Quality control and assurance system for malaria microscopy and RDTs supported by field supervision and monitoring should be urgently implemented in line with the national policy guidelines for parasitological diagnosis of malaria.
3. The future malaria case management trainings for health workers should be aligned with RDT implementation while routine supervisory activities at district level that include malaria case management component need to be quantitatively increased and qualitatively improved in line with already existing supervisory manuals.
4. The new national malaria case management guidelines and wall charts should be repeatedly disseminated to the peripheral health facilities.
5. Drug management activities should focus on strengthening of logistic management information systems and development of district capacities to respond to stock out warnings by redistributing antimalarial drugs between peripheral facilities.
6. Innovative ways reporting real-time stock data using mobile health technologies should be piloted and their impact on AL stock outs should be evaluated.
7. Distribution of SP tablets should be discontinued to areas outside of Coast, Western and Nyanza Provinces.
8. Further emphasis should be placed on the following 5 case management messages during the in-service training, supervisory visits and mass IEC campaigns targeting health workers: 1) all febrile patients should be tested, 2) test negative patients should not be treated for malaria, 3) all patients should be weighed, 4) the first AL dose should be administered at facilities even in the absence of food, and 5) patients should be advised to return for replacement dose to complete full treatment course in case of vomiting.

7. REFERENCES

Memusi D, Nyandigisi A, Mbithi A, Shieshia M, Muturi A, Zurovac D, Juma E. *Monitoring outpatient malaria case management under the 2010 diagnostic and treatment policy in Kenya-baseline results.* Division of Malaria Control, Ministry of Public Health and Sanitation, June 2010.

MOPHS (2009a). *National Malaria Strategy 2009-2017*. Ministry of Public Health and Sanitation, Division of Malaria Control, Nairobi.

MOPHS (2009b). *Kenya Malaria Monitoring and Evaluation Plan 2009-2017*. Ministry of Public Health and Sanitation, Division of Malaria Control, Nairobi.

MOPHS (2010). *National Guidelines for Diagnosis, Treatment and Prevention of Malaria for Health Workers*. Ministry of Public Health and Sanitation, Division of Malaria Control, Nairobi.

Nyandigisi A, Memusi D, Mbithi A, Ang'wa N, Shieshia M, Muturi A, Sudoi R, Githinji S, Juma E, Zurovac D (2011). Malaria case-management following change of policy to universal parasitological diagnosis and targeted artemisinin-based combination therapy in Kenya. PloS One 6(9): e24781

Annex 1: Summary of key health systems support M&E indicators

Health systems support M&E indicators	2010 Rd 1	2010 Rd2	2011 Rd 3	2011 Rd 4	2012 Rd 5	2012 Rd 6	Target 2013
% of facilities with AL stock out on survey day							**0**
All AL packs	**5.7**	**2.8**	**10.9**				**0**
AL 6 pack	**19.0**	**10.8**	**21.8**				**0**
AL 12 pack	**20.1**	**13.6**	**40.2**				**0**
AL 18 pack	**20.7**	**18.2**	**33.3**				**0**
AL 24 pack	**13.8**	**13.1**	**26.4**				**0**
Any AL pack	**35.1**	**28.4**	**54.6**				**0**
% of facilities with stock out of AL for 7 or more consecutive days in past 3 months							
All AL packs	**27.2**	**21.0**	**6.3**				**0**
AL 6 pack	**37.6**	**30.1**	**19.5**				**0**
AL 12 pack	**43.9**	**32.4**	**31.6**				**0**
AL 18 pack	**52.0**	**42.1**	**27.6**				**0**
AL 24 pack	**39.3**	**35.2**	**19.5**				**0**
Any AL pack	**59.5**	**52.3**	**44.8**				**0**
% of facilities with stock out of recommended antimalarials for 7 or more consecutive days in past 3 months							
Quinine tablets	**25.4**	**22.2**	**16.1**				**0**
Quinine injections	**20.8**	**20.5**	**17.2**				**0**
% of facilities without any malaria diagnostic support (RDT or microscopy) for 7 or more consecutive days in past 3 months	**46.6**	**42.1**	**40.8**				**0**
% of facilities having national malaria case management guideline	**0**	**5.7**	**47.7**				**100**
% of HWs trained on new malaria case management policy	**0**	**21.5**	**24.9**				**100**
% of HWs who had at least one supervisory visit in past 3 months that included observation of malaria case management	**6.7**	**6.8**	**11.2**				**100**
% of facilities which had at least one visit in past 3 months that included quality control of malaria microscopy[a]	**9.1**	**18.1**	**17.0**				**100**
% of facilities which had at least one visit in past 3 months that included use of malaria RDTs[a]	**5.3**	**6.7**	**20.8**				**100**

[a] The indicator includes only facilities which provide these services on survey days

Annex 2: Summary of key malaria case management M&E indicators

Malaria case management M&E indicators	2010 Rd 1	2010 Rd2	2011 Rd 3	Target 2013
Indicators showing overall performance of the new case management policy - all facilities regardless the availability of the commodities				
% of febrile patients who are managed according to national guidelines (tested for malaria AND only positive test results are treated with AL)	**15.7 ($11.8_{<5}$,$18.9_{\geq5}$)**	**22.1 ($18.7_{<5}$,$25.0_{\geq5}$)**	**25.1 ($21.5_{<5}$,$27.9_{\geq5}$)**	**100**
% of febrile patients who are tested with RDT or microscopy	**23.9 ($20.5_{<5}$,$26.7_{\geq5}$)**	**30.9 ($25.6_{<5}$,$35.5_{\geq5}$)**	**36.8 ($31.0_{<5}$,$41.5_{\geq5}$)**	**100**
% of febrile patients with positive test result who are treated with AL	**82.7 ($74.8_{<5}$,$86.7_{\geq5}$)**	**89.2 ($90.9_{<5}$,$88.2_{\geq5}$)**	**69.8 ($70.3_{<5}$,$69.5_{\geq5}$)**	**100**
% of febrile patients with negative test result who are not treated for malaria	**47.9 ($43.3_{<5}$,$51.3_{\geq5}$)**	**55.5 ($58.3_{<5}$,$53.5_{\geq5}$)**	**69.8 ($68.7_{<5}$,$70.6_{\geq5}$)**	**100**
Indicators showing health workers adherence to guidelines – facilities where malaria diagnostics and AL are available				
% of febrile patients who are managed in accordance with national guidelines (tested for malaria AND only positive test results treated with AL)	**28.1 ($19.3_{<5}$,$36.1_{\geq5}$)**	**34.6 ($29.0_{<5}$,$41.7_{\geq5}$)**	**40.2 ($32.6_{<5}$,$47.2_{\geq5}$)**	**100**
% of febrile patients who are tested with RDT or microscopy	**42.5 ($33.3_{<5}$,$50.8_{\geq5}$)**	**49.5 ($38.8_{<5}$,$59.6_{\geq5}$)**	**56.9 ($46.8_{<5}$,$66.4_{\geq5}$)**	**100**
% of febrile patients with positive test result who are treated with AL	**83.3 ($75.3_{<5}87.4_{\geq5}$)**	**89.6 ($91.8_{<5}$,$88.3_{\geq5}$)**	**75.3 ($71.9_{<5}$,$77.3_{\geq5}$)**	**100**
% of febrile patients with negative test result who are not treated for malaria	**47.2 ($42.3_{<5}$,$50.7_{\geq5}$)**	**56.0 ($61.1_{<5}$,$52.6_{\geq5}$)**	**69.8 ($67.1_{<5}$,$71.7_{\geq5}$)**	**100**
Indicators showing quality of AL prescribing, dispensing and counseling – febrile patients with AL prescribed and dispensed				
% of patients with AL prescribed in recommended weight-specific dose	**89.2 ($88.7_{<5}$,$89.6_{\geq5}$)**	**92.4 ($93.8_{<5}$,$91.3_{\geq5}$)**	**92.8 ($93.4_{<5}$,$92.3_{\geq5}$)**	**100**
% of patients with AL dispensed who had weight measured	**51.8 ($60.0_{<5}$,$45.1_{\geq5}$)**	**53.6 ($71.4_{<5}$,$39.4_{\geq5}$)**	**52.5 ($57.3_{<5}$,$50.8_{\geq5}$)**	**100**
% of patients with AL dispensed who had first dose given at facility	**32.1 ($35.7_{<5}$,$29.2_{\geq5}$)**	**26.9 ($29.3_{<5}$,$24.9_{\geq5}$)**	**37.5 ($31.0_{<5}$,$42.2_{\geq5}$)**	**100**
% of patients with AL dispensed who were explained on dosing at home	**96.2 ($96.2_{<5}$,$96.1_{\geq5}$)**	**92.9 ($92.4_{<5}$,$93.2_{\geq5}$)**	**94.4 ($93.2_{<5}$,$95.3_{\geq5}$)**	**100**
% of patients with AL dispensed who were advised what to do if vomiting occurs	**6.3 ($7.8_{<5}$,$5.0_{\geq5}$)**	**5.9 ($6.5_{<5}$,$5.4_{\geq5}$)**	**4.6 ($5.0_{<5}$,$4.4_{\geq5}$)**	**100**

Annex 3: AL monitoring data – time trends in the availability of non-expired AL

% facilities with AL in stock		Jan[a]	Feb	Mar	Apr[b]	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Any AL pack	2010	94.3		89.9	81.6	79.9	91.5	95.8	86.6	82.3	89.7	95.7	97.2
	2011	89.9	83.5	87.7	89.4	85.0	87.0	89.1					
	2012												
AL 6 pack	2010	81.0		72.0	60.7	64.0	89.0	90.9	84.2	78.1	87.8	87.8	89.2
	2011	78.1	78.2	84.1	83.3	80.2	80.3	78.2					
	2012												
AL 12 pack	2010	79.9		71.4	52.4	54.9	79.3	85.5	74.4	67.7	79.4	84.8	86.4
	2011	80.0	72.9	79.4	69.7	67.7	69.1	59.8					
	2012												
AL 18 pack	2010	79.3		70.8	60.7	57.3	80.5	81.2	72.0	65.2	72.7	81.1	81.8
	2011	76.3	70.0	74.7	74.2	71.3	74.7	66.7					
	2012												
AL 24 pack	2010	86.2		80.4	73.2	72.6	78.1	81.2	71.3	67.7	78.8	86.0	86.9
	2011	77.6	72.9	77.7	78.8	72.5	74.1	73.6					
	2012												
All AL packs	2010	64.9		51.2	41.1	46.3	67.1	67.3	59.2	55.5	64.2	66.5	71.6
	2011	63.3	59.4	65.9	57.6	61.7	62.4	45.4					
	2012												

[a] Data in 2010 collected from 18 January – 12 February

[b] Additional end of April 2010 values are: any AL pack = 84.2%; AL 6 pack = 62.2%; AL 12 pack = 55.5%; AL18 pack = 62.2%; AL 24 pack = 80.5%; all AL packs = 43.9%