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TRENDS OF ADHERENCE TO MALARIA TESTING AND TREATMENT GUIDELINES BY COMMUNITY HEALTH VOLUNTEERS IN KAKAMEGA COUNTY, KENYA
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TRENDS OF ADHERENCE TO MALARIA TESTING AND TREATMENT GUIDELINES BY COMMUNITY HEALTH VOLUNTEERS IN KAKAMEGA COUNTY, KENYA

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ABSTRACT

Objectives: **The objective of this study was to identify the trends in adherence to testing and treatment guidelines for Community Case Management of malaria (CCMm) by community health volunteers in Kakamega County.**

Design: **This was a descriptive retrospective study design using data collected on CCMm as reported on the Kenya health information system. Trends of community case management of malaria were assessed between January 2019 and December 2022.**

Setting: **Community units implementing CCMm in Kakamega County, Kenya**

Outcome Measures: **Adherence to community case management of malaria guidelines by community units implementing community case management of malaria.**

Results: **Kakamega County has seen a rise in malaria cases managed at the community level, from 63,686 in 2018 to 133,614 in 2022. The annual testing ranged from 95% in 2018 to 18% in 2020, while treatment rates ranged from 104% to 97.5%. The mean testing rate was 57%, and treatment rates remained consistent throughout the months, except for over-treatment (104%) in December 2018. Testing rates vary across years and sub-counties with no significant variations in**

treatment rates. There are 31.5% community units implementing CCMm as at December 2022. The county has a community health volunteer's turnover of 7% between 2017 and 2022.

Conclusion: **There has been an increase in the number of malaria cases managed in the community in Kakamega County. There are variations in testing rates across the years and between sub-counties. There are no significant variations in the treatment rates.**

INTRODUCTION

The World Health Organization (WHO) report reveals that in 2021, approximately there were 247 million malaria cases globally and 619,000 mortalities due to malaria. Sub-Saharan Africa accounted for 95% of new infections and 96% of deaths globally. Four in five malaria deaths in the region were children under five. Four countries accounted for almost half of the malaria deaths globally – Nigeria (31%), the Democratic Republic of the Congo (13%), Niger (4%), and the United Republic of Tanzania (4%) (1)

Malaria remains a significant public health problem in Kenya, accounting for 13-15% of outpatient consultations, with 70% of the population at risk for malaria. The prevalence in Kenya has reduced from 8% in 2010 to 6% in 2020.(2). The Kenya Malaria Strategy 2019–2023 objective two on case management aims at ensuring that 100 percent of all suspected malaria cases presented to a health care provider are managed according to the Kenya malaria treatment guidelines. Extending appropriate malaria case management in hard-to-reach and remote areas is a significant challenge due to a need for more formally trained health professionals to travel long distances to health facilities, among other reasons. Diverse strategies have been developed to overcome these barriers, most notably those expressed in the Declaration of Alma Ata, which endorses Community Health Volunteers (CHVs) as essential healthcare providers in resource-limited settings (3)

WHO introduced CCMm in 2005 to address the high burden of malaria and the lack of access to healthcare for rural populations in malaria-endemic areas. In Kenya, CCMm was adopted by malaria-endemic counties in 2012. It is based on the evidence that well-trained and supervised CHVs can provide prompt and adequate treatment for uncomplicated malaria within 24 hours (4). CCMm involves training, supporting, and supplying CHVs with commodities to assess, test, and manage suspected uncomplicated malaria cases (5).

The CCMm strategy in Kenya utilizes trained CHVs. CHVs receive training on performing and interpreting malaria rapid diagnostic tests (mRDT) and prescription of Artemether Lumefantrine (AL) to confirmed, uncomplicated malaria cases. CHVs are trained to refer suspected malaria cases among pregnant women, suspected severe malaria cases, patients with negative malaria test results, and patients with persistent symptoms to health facilities for further management (6). From the study by Marita *et al*., it is evident that engaging CHVs in diagnosing malaria cases under the CCMm strategy yielded results that compared to qualified, experienced laboratory personnel. Emerging evidence highlights that CHVs can reliably diagnose malaria using RDTs in the community setting (6). The CHV's involvement in the

implementation of an integrated Community Case Management (iCCM) strategy has illustrated improved access to quality lifesaving interventions (7) and reduction in childhood morbidity (8).

Community health workers have demonstrated excellent adherence to the treatment guidelines in other settings, such as Nigeria (9). Adherence reduces the number of unnecessary and expensive treatments, improves access to care, and reduces the risk for severe disease, but it also allows community health workers to focus on the other illnesses previously confused with malaria (10).

Previous studies have identified challenges that could undermine the sustainability of CCMm, including data quality issues and adherence to testing and treatment guidelines(11). To optimize coverage and impact of CCMm, understanding the trends in adherence to testing and treatment guidelines, retention of trained CHV workforce, and coverage of training on CCMm will provide valuable information on the implementation of CCMm in Kakamega county. Therefore, this study aims at identifying the trends in adherence to testing and treatment guidelines by community health volunteers in Kakamega County, the Variations in adherence to testing and treatment guidelines at the sub-county level and the turnover rate of trained community health volunteers.

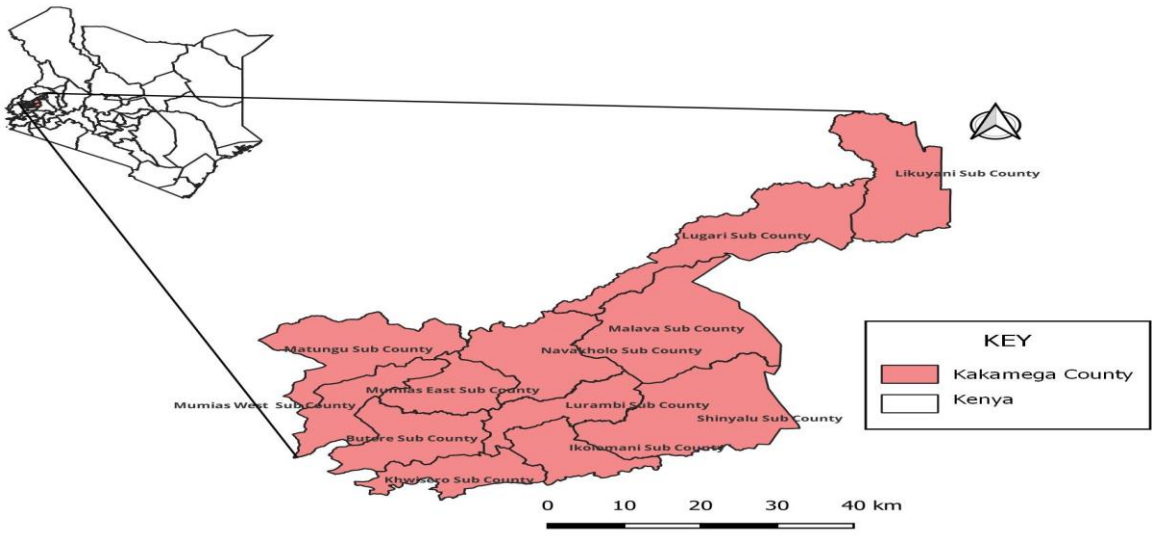
METHOD

Study design

This is a descriptive retrospective study using routine monthly aggregate data collected on CCMm and reported through the Kenya Health Information System (KHIS).

Study Setting

Kakamega is a County in the Western part of Kenya. The county has 12 sub-counties, 60 wards, 187 village units, 400 community administrative areas, and a projected population of 2,094,804(12).



Source: Kenya Health Information System

Malaria prevalence in Kakamega County stands at 15.2% (2) and is the second most common cause of outpatient cases, accounting for 25% of outpatient morbidity in 2022(13). Health services are provided in one County referral hospital (level 5), four County hospitals (level 4), 13 sub-county hospitals, 58 Health Centers, 120 Dispensaries, 104 private clinics, and 425 community health units. Out of 425 community units, 134(31.5%) purposively selected community units based on distance to health facilities and available funding are implementing CCMm. They are supported by 1,340 Community health volunteers trained in CCMm. While CCMm was first implemented in Kakamega County in 2012, reporting started in 2017. Due to inadequate registers and reporting tools at the community, data started reflecting on Kenya's health information system in 2018.

Study population

All suspected malaria cases were managed by community health volunteers between 2019 and 2022.

Study variables

The study's primary outcome is adherence to the community's malaria testing and treatment guidelines.

Indicator 1: The proportion of suspected malaria cases that received a parasitological test at the community level. The numerator is the total suspected malaria cases (fever cases) tested by CHVs. The denominator is the total suspected malaria cases that CHVs encounter.

Indicator 2: The proportion of malaria cases treated using first-line antimalarial (ALs) in the community. The numerator is the total mRDTs that tested positive at the community level, and the denominator is the total mRDTs that tested positive at the community level.

Additionally, the study reported the percentage of Community Health Volunteers who left community units between 2017- 2022 after training. The numerator is the Number of trained CHVs leaving Community units, and the denominator is the total number of trained CHVs.

Sources of data

CCMm data is collected by the CHVs using the community unit daily activity register for malaria commodities (MoH 648), Annex 3. Data is summarized monthly on the Community health extension worker monthly form (MoH 748), Annex 4. The summaries are submitted to the link health facility and finally uploaded in the KHIS at the sub-county. Annex 5 Complementary administrative data from the CHV database on training status, deployment, and attrition were used.

Analysis and statistics

Data from KHIS for years 2018 to 2022 was downloaded, summarized, and analyzed using Microsoft Excel. Descriptive statistics were used summarized the data and displayed testing and treatment trends for CCMm between 2018 and 2022 and adherence to the testing and treatment guidelines across the sub-counties. A description of the distribution, deployment of CHVs trained, and the proportion of those leaving community units post-training. Trainings for CHVs were held in December 2017 and February 2022.

Ethics consideration

The study was approved by the Maseno University Scientific and Ethics Review Committee ref no MUSERC/01234/23.

RESULTS

Overall, there has been an increase in the number of malaria cases managed at the community unit level from 63,686 in 2018 to 133,614 in 2022. The annual testing rate ranged from 95% in 2018 to 18% in 2020, while the treatment rate ranged from 104% to 97.5%. There were low reported malaria cases

managed in the community in the years 2020 and 2021. Table 1

Table 1

Annual malaria cases reported in the community, in Kakamega County from 2018 to 2022

Year	Total Suspected	Total Tested Malaria Cases (Annual testing rate %)	Total Malaria Positive Cases	Total positive cases treated (Annual treatment rate %)
2018	63,686	60190 (95)	38,019	39593 (104)
2019	86,026	71430 (83)	48,879	49562 (101)
2020	53,898	9741 (18)	7,105	6929 (97.5)
2021	58,098	24889 (43)	15,990	15936 (99.6)
2022	133,614	125283 (94)	72,350	72406 (100.1)

Source: Kenya Health Information System (KHIS) Accessed 24th April 2023

The county reported a low testing rate between December 2019 and December 2021 at 9% and 20% respectively. The mean testing rate registered over the period of review was 57%. Almost all positive malaria cases identified in the community were treated, with the treatment rate being consistent throughout the months with slight variations in December 2019 with overtreatment of 160%. Figures 1

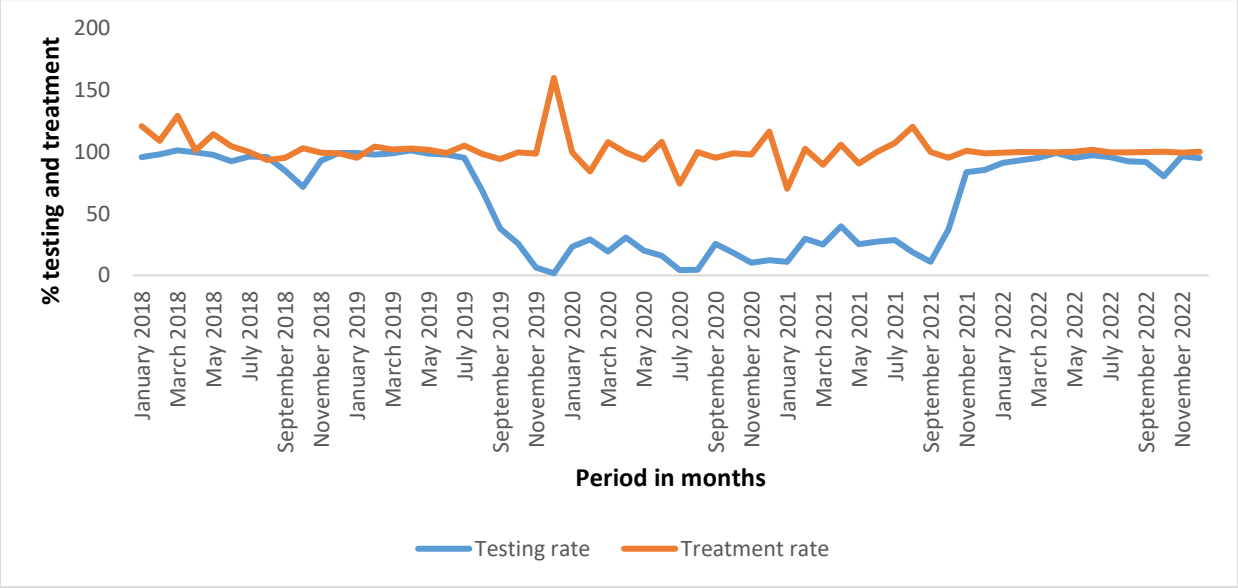


Figure 1:Monthly trends for testing and treatment rates for community case management of malaria in Kakamega county 2018 to 2022

Variations in testing rates were observed over time and between sub-counties. The highest community testing rate was reported in the Lurambi sub-county in the year 2022 at 100% and the lowest by the Lugari sub-county at 2% in the year 2020. There are missing reports for testing for Butere and Ikolomani sub-counties in 2020. Overall, there were improvements in

testing rates over time, with the highest testing rates reported in 2022. In the years 2020 and 2021, the sub-counties reported the lowest testing rates. Figure 3.

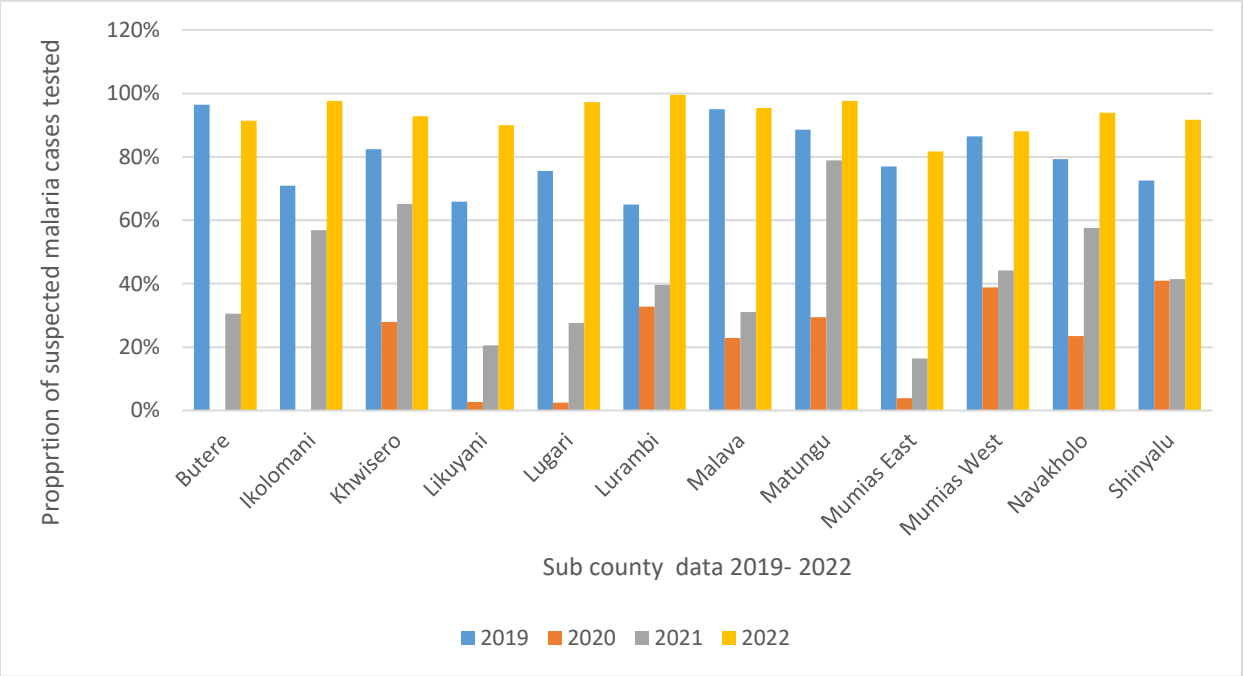


Figure 2: Variations in sub county community malaria testing in Kakamega County 2019 to 2022

There are no significant variations in sub-county community case management treatment rates. Butere sub-county reported a treatment rate of 100% across the years. Navakholo sub-county reported the lowest treatment rate in the year 2020 at 74%. There was an improvement in treatment rates in the year 2022, with sub-counties treating all positive malaria cases by the community health volunteers.

Kakamega County has 425 community units (100% coverage) with a t total of 4,250 CHVs (10 Community health volunteers per community unit). Of these, only 134 community units are implementing community case management, translating to 31.5% coverage. In 2017, 1,340 community health volunteers from target sub-counties and community units were trained on community case management for malaria. Between 2017 and 2022, 97 CHVs left the system, giving a turnover rate of 7.2%. The highest CHVs turnover was reported in Malava at 26%, followed by Ikolomani at 17% and Mumias West and Khwisero at 10%. Butere and Likuyani sub-county reported no turnover. Annex 2

DISCUSSION

The study aimed at identifying the trends in adherence to testing and treatment guidelines by community health volunteers in Kakamega County, the variations in adherence to testing and treatment guidelines at the sub-county level and the turnover rate of trained community health volunteers.

Overall, the findings of this work highlight a good uptake of CCMm in Kakamega County among the sub-counties and Community units implementing CCMm. There was a high level of adherence to test and treat guidelines with

near 100% compliance, although over-treatment was noted. These findings are consistent with broader literature, including from Kenya, where CHVs have been shown to be compliant with guidelines and, hence, are valuable resources for increasing access and coverage to high-quality care.(9) In fact, they are argued to be a critical workforce towards universal health coverage (14) and the current government approach now includes deploying community health promoters (referred to as CHVs in this paper). While there is good uptake and adherence to guidelines, the implementation of CCMm is in 31.5% of the community units, therefore scale up towards 100% coverage should be considered.

Our data illustrate reductions in testing and treatment in the years 2020 and 2021, which coincide with the COVID pandemic and reflect reduced access to health services, including at health facilities reported in other literature (15),(16) which might have resulted from restrictions in movement and social interactions. According to Kerr *et al*., understanding and integration of strategies may limit future disruptions in service delivery(15).

The variations noted across sub-counties might reflect socio and behavioral adoption practices assumed by not only the communities but also the CHVs and warrant qualitative data to explore these varying practices despite standardized community case management of malaria guidelines in Kenya.

The turnover of CHVs can be a barrier to providing sustainable and quality healthcare to the population. Government reports have described the turnover as a challenge to the success of community health services as a primary driver for primary health care (17). The low attrition and turnover of CHVs in Kakamega county (7%) present an excellent opportunity for continuity of care as the CHVs develop a better understanding of the community they work in, gain trust from community members, and suggest an intrinsic motivation towards contributing to the society they live despite little compensation they receive for their time as a monthly stipend.

This work needs to be interpreted in light of the following limitations: the data on commodity availability (RDTs and drugs) was limited and hence undermines our ability to triangulate whether the over-/under-treatment was a result of the availability of commodities, including the low testing rates during COVID-19. However, national malaria program data and reports have not highlighted instances where these were unavailable. Second, CHVs are now engaged in the management of other illnesses through Integrated Community Case Management (iCCM) and, therefore, cannot confirm if these might have affected their practice.

CONCLUSION AND RECOMMENDATIONS

Routine data from Kenya's health information system indicates progress in community malaria case management in Kakamega County. There is a need to scale up the coverage of CCMm in the county to ensure accessibility to a larger population. A better understanding and integration of different strategies may limit future disruptions in service delivery not only for malaria but other interventions in the event of pandemics, while harnessing One Health approaches.

The variations noted across sub-counties warrant qualitative data to explore the social behavioral practices assumed by both the community health volunteers and the community members.

The turnover of CHVs can be a barrier to the provision of sustainable and quality healthcare to the population. Government reports have described the turnover as a challenge to the success of community health services as a primary driver for primary health care and universal health coverage. There is a need for documentation of the understanding of the magnitude and the reasons for the turnover of community health volunteers for effective, evidence-based planning for and the retention of CHVs in Kakamega County.

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ANNEX 1: *Sub County community case management of malaria treatment rates 2019 to 2022*

Sub county	**Treatment rate**			
	2019	2020	2021	2022
Butere	100	100	100	100
Ikolomani	100	0	99	100
Khwisero	98	100	101	100
Likuyani	102	270	99	100
Lugari	97	93	100	101
Lurambi	101	101	100	100
Malava	101	91	89	100
Matungu	101	108	106	100
Mumias East	106	100	99	100
Mumias West	101	100	89	99
Navakholo	114	74	106	100
Shinyalu	99	102	98	100

ANNEX 2: *Coverage of community case management of malaria in Kakamega county per sub county 2017 to 2022*

Sub county	No of CUs	CUs implementing CCMm	Total no of expected CHVs	Total number of CHVs implementing CCMm	Total number of CHVs trained on CCMm - 2017	Number of CHVs leaving community units post training between 2017- 2022	Turnover %
Likuyani	28	11	280	110	110	0	0
Lugari	40	17	400	170	170	2	1
Malava	51	14	510	140	140	37	26
Navakholo	32	9	320	90	90	3	3
Mumias East	30	7	300	70	70	2	3
Matungu	35	10	350	100	100	1	1
Mumias west	34	9	340	90	90	9	10
Butere	43	10	430	100	100	0	0
Khwisero	26	11	260	110	110	11	10
Ikolomani	26	12	260	120	120	20	17
Shinyalu	41	15	410	150	150	8	5
Lurambi	39	9	390	90	90	4	4
County	425	134	4250	1340	1340	97	7

Annex: 3: *Community Health Unit Daily Activity Register for Malaria commodities (MoH 648)*

MOH 648

COMMUNITY HEALTH UNIT DAILY ACTIVITY REGISTER FOR MALARIA COMMODITIES																
Name of Community Health Unit:												Artemether-Lumefantrine Doses				mRDT Tests
Name of Commuity Health Volunteer:												AL 6s	AL 12s	AL 18s	AL 24s	
Balance brought forward from previous page: (A)																
Receipt Date:																
Total Stock of AL and RDTs Available: [C] = A + B																
Date	Patient Name	Age (Yrs)	"Temp (°C)"	Suspected Casses				Weight/ Age Category Only for Pts given AL (Tick)								
				RDTs			Not Tested	"5 to <15 kg (< 3 yrs)"	"15 to <25kg (3 to <7yrs)"	"25 to <35kg (8 to <12 yrs)"	"≥35kg (≥ 12 yrs)"	"Quantities Used/ Dispensed (indicate quantity e.g. 1, 2, 3 etc.)"				
				Positive	Negative	Invalid										
Total [D]																
Balance/ Closing SOH [E] = C - D																

Annex 4: *Community Health Unit monthly summary report for malaria commodities (MoH 748)*

MINISTRY OF HEALTH

MOH 748

COMMUNITY HEALTH UNIT MONTHLY SUMMARY REPORT FOR MALARIA COMMODITIES

Name of Community Health Unit: _____ **Link Health Facility:** **HF Name:** _____

Sub-County: _____ **MFL Code:** _____

County: _____ **Period:** _____

Drug Name	Basic Units	Beginning Balance	Quantity Received this period	Total Quantity Dispensed	Losses (Excluding Expiries)	Balance/ Closing SOH *(Physical Count)*	Number of days out of stock
		A	**B**	**C**	**D**	**E**	**F**
Artemether-Lumefantrine 20/120 tabs	6s						
Artemether-Lumefantrine 20/120 tabs	12s						
Artemether-Lumefantrine 20/120 tabs	18s						
Artemether-Lumefantrine 20/120 tabs	24s						
Malaria Rapid Diagnostic Tests (RDTs)	Test						

Summary for Weight Band/ Age Category

5 to <15 kg *(<3 yrs)*		15 to <25 kg *(3 to <7 yrs)*		25 to <35 kg *(8 to <12 yrs)*		≥ 35 kg *(≥ 12 yrs)*	

Comments (including explanations of losses):

_____

_____

_____

Suspected Cases		
	<5 Yrs	≥ 5 Yrs
No. positive		
No. negative		
No. not tested		
Total		
No. invalid		

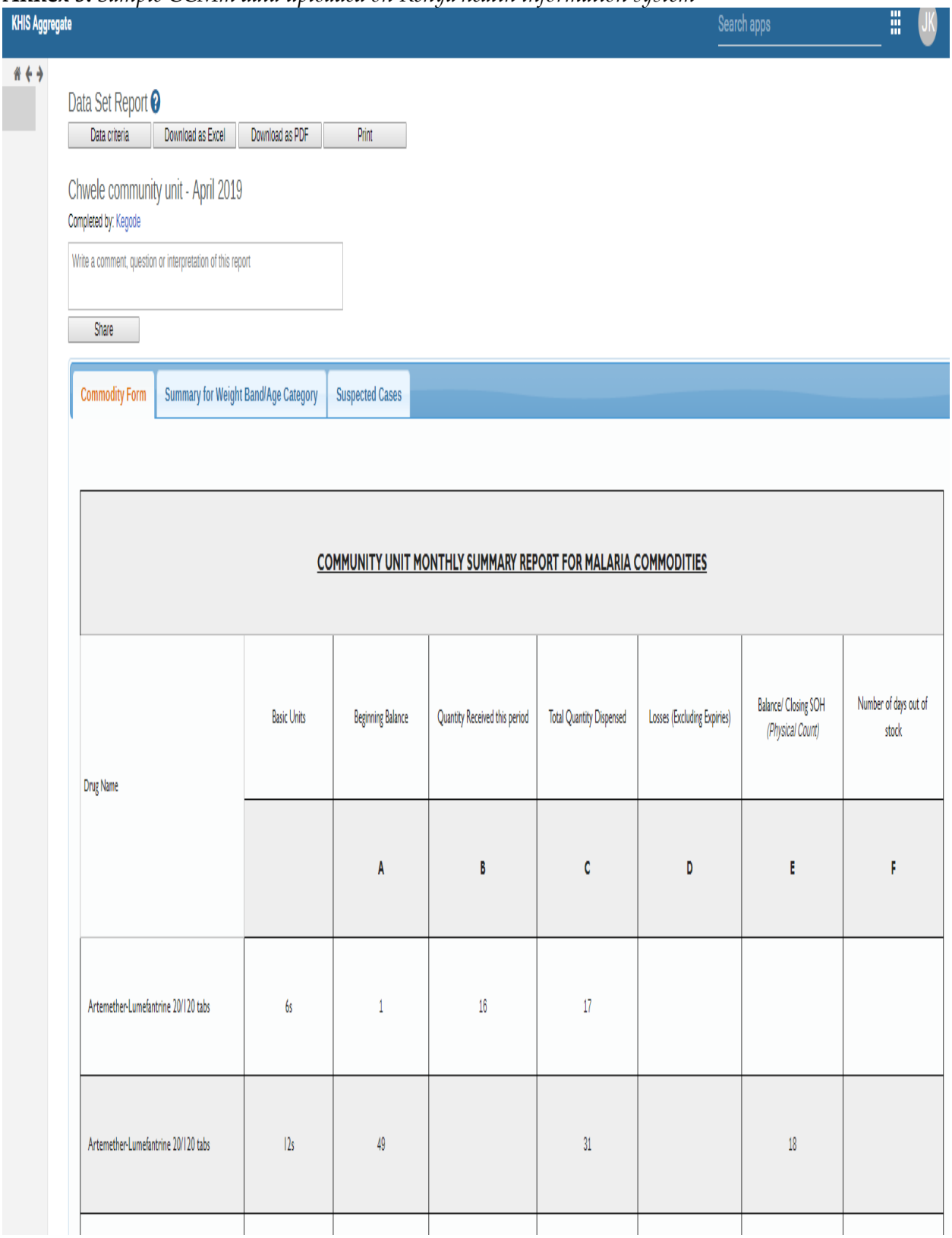
Reporting Officer *Name:* _____ **Designation:** _____

Signature: _____ **Mobile No:** _____

Reviewed by *Name:* _____ **Designation:** _____

Signature: _____ **Mobile No:** _____ **Date Submitted:** dd-mmm-yyyy

Annex 5: *Sample CCMm data uploaded on Kenya health information system*



COMMUNITY UNIT MONTHLY SUMMARY REPORT FOR MALARIA COMMODITIES

Drug Name	Basic Units	Beginning Balance	Quantity Received this period	Total Quantity Dispensed	Losses (Excluding Expiries)	Balance/ Closing SOH *(Physical Count)*	Number of days out of stock
		A	B	C	D	E	F
Artemether-Lumefantrine 20/120 tabs	6s	1	16	17			
Artemether-Lumefantrine 20/120 tabs	12s	49		31		18	