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FIGHTING MALARIA: ANALYSING DATA FROM TEN HEALTH DISPENSARIES AND EVALUATING A COMMUNITY CASE MANAGEMENT PROGRAM IN KILIFI COUNTY, KENYA

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Summary

Abbreviations And Acronyms

ACT Artemisinin-Based Combination Therapy

AIDS acquired immunodeficiency syndrome

CCMm Community Case Management of malaria

CHEW Community Health Extension Worker

CHP Community Health Promoter

CHU Community Health Units

COVID-19 Coronavirus Disease

Global Fund Global Fund to Fight AIDS, Tuberculosis and Malaria

GTS Global technical strategy for malaria 2016–2030

IPTp Intermittent Preventive Treatment of Malaria in pregnancy

IRS Indoor Residual Spraying

ITN Insecticide-Treated Mosquito Net

KHIS Kenya Health Information System

KMIS Kenya Malaria Indicator Survey

LLIN Long-Lasting Insecticidal Net

MOH Ministry of Health

NMCP National Malaria Control Program

PPEs Personal Protective Equipment

R21 R21/Matrix-M

RDT Rapid Diagnostic Test

RTS,S RTS,S/AS01

SDG Sustainable Development Goal

SMC Seasonal Malaria Chemoprevention

UHC Universal Health Coverage

WHO World Health Organization

Abstract

Malaria remains a significant public health challenge, particularly in high-burden countries such as Kenya. Better tracking of malaria cases helps design interventions and monitor their effectiveness. One such intervention is Community-based malaria management which is an approach designed to combat the spread of the disease by involving community health volunteers to control transmission and improve health outcomes. This approach is already well-established in Kenya's Great Lakes region. "The Net - Community-based Malaria Control Program", promoted by World Friends Onlus, seeks to extend this strategy to Kenya's coastal area, specifically targeting Kilifi County, where malaria cases are endemic. The program aims to achieve this goal through interventions in three key areas: prevention and awareness, capacity building and community case management, and improvement in data collection and management. The objective of this study is to analyse malaria case management data from ten dispensaries in Kilifi County, focusing on trends and discrepancies across key indicators such as suspected, tested, confirmed, and treated malaria cases. Additionally, the study aims to examine initial insights regarding the introduction of CCMm as part of "The Net" project which began in November 2024. Early insights suggest optimism, as the program has the potential to alleviate the workload of dispensaries and reduce delays between malaria symptoms, testing, and treatment.

1. Introduction

1.1 Background

Malaria represents one of the most significant public health challenges facing low- and middle-income countries, with 90% of cases and deaths occurring in Africa. Although malaria incidence was declining at the beginning of the 21st century, progress was hindered by growing resistance to pesticides and drugs. The COVID-19 pandemic further exacerbated the situation, making it more challenging to restore a downward trend. Kenya, as an endemic country, has been implementing malaria eradication strategies to reduce the burden through both preventive measures and case management efforts. Community case management of malaria (CCMm) is a key component of case management strategies. It aims to strengthen the healthcare system by providing medical care directly to people where they live through Community Health Promoters (CHPs), rather than requiring individuals to travel to health dispensaries that are often difficult to access. CCMm has already been widely adopted in the lakes region of Kenya. The project "Net - Community-Based Malaria Programme", funded by the Italian Agency for Development Cooperation under the Global Fund 5% Initiative and implemented by the Italian NGO World Friends supports pilot implementation of CCMm in the Kenyan coastal area, specifically in Kilifi County. The programme's specific objective is to "strengthen community-based malaria eradication mechanisms within Kilifi County, Kenya, by 2024" through interventions in three key areas: prevention and awareness, capacity building and community case management, and improvement in data collection and management. While malaria incidence in Kilifi County is lower than in the lakes region, cases have increased due to the impacts of COVID-19.

I had the opportunity to collaborate with the World Friends team in Kilifi County. The field work period lasted from November 10 to November 28, 2024. My work involved assisting with data collection on suspected, positive, and treated malaria cases from the MOH 705 AB, 706, and 743 registers of health dispensaries participating in "The Net" project. I supported the quantitative analysis of malaria case trends from September 2023 to October 2024. Additionally, I conducted a qualitative analysis by interviewing key stakeholders to gather their initial impressions on the implementation of community case management phase of "The Net" project in the field, starting in November 2024.

This experience allowed me to better understand the process of data collection in a lower-middle income country context, where digitalization is not yet fully integrated into information gathering. The reliance on paper-based records often leads to data quality issues, due for example to the physical deterioration of the documents. In such contexts, the reliability of the data is not always guaranteed, posing significant challenges for conducting analyses. As a result, further investigation through qualitative methods, including interviews with key stakeholders, is often required to ensure a comprehensive understanding.

Figure 1.1 - Location of Kilifi County in Kenya

Source: Google Maps

1.2 Objectives of the study

The objective of this study is to analyse malaria case management data from ten dispensaries in Kilifi County, focusing on trends and consistency in key indicators such as suspected, tested, confirmed, and treated malaria cases across various sources of data. Additionally, the study aims to gather initial insights regarding the introduction of CCMm in this area.

This thesis is divided into three parts. The first discusses malaria epidemiology from a global perspective, in Kenya, and specifically in Kilifi County. It also provides an overview of the health system in Kenya and examines national protocols for malaria case management. The second section focuses on the assessment of malaria trends and on discrepancies such as the mismatches between the number of suspected, confirmed, and tested cases, based on data from ten dispensaries. Finally, the thesis discusses the views of stakeholders on the initial phase of the implementation of CCMm in the area.

2. Epidemiology of malaria

This chapter aims to provide a literature review on the epidemiological trends of malaria at the global, national (Kenya), and county (Kilifi) levels. Particular attention is given to the impact of the COVID-19 pandemic on progress in reducing malaria incidence and mortality rates.

2.1 Malaria Epidemiology from a Global Perspective

This section outlines global malaria trends. Early 21st-century progress in reducing incidence and mortality slowed over the past decade. COVID-19 reversed this downward trend, increasing cases and hindering progress toward SDGs.

According to the World Health Organization (WHO), malaria is caused by parasites of the *Plasmodium* family and transmitted by female *Anopheles* mosquitoes. There are four different human malaria species (*P. falciparum, P. vivax, P. malariae* and *P. ovale*), of which *P. falciparum* and *P. vivax* are the most prevalent and *P. falciparum* the most dangerous. Despite being preventable and treatable, malaria continues to represent a serious public health issue, with over 263 million cases worldwide and an incidence of 60.4 cases per 1000 population at risk in 2023, alongside an estimated 597,000 deaths and a mortality rate of 13.7 per 100,000 globally. The Africa Region continues to carry the heaviest burden of the disease, accounting for an estimated 94% of cases and 95% of deaths (WHO, 2024).

Efforts to eradicate malaria are aligned with Sustainable Development Goal (SDG) 3, which aims to “ensure healthy lives and promote well-being for all at all ages”. In particular, target 3.3 seeks to end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases, as well as combat other communicable diseases, including

hepatitis and waterborne illnesses, by 2030.[1] The Global Technical Strategy (GTS) for malaria 2016–2030 provides a roadmap with milestones to track progress towards malaria elimination. The GTS calls for a reduction in malaria case incidence and mortality rate of at least 40% by 2020, 75% by 2025 and 90% by 2030, from a 2015 baseline.

According to the World Malaria Report 2024, over the past decades, the global situation regarding malaria has improved significantly, with a notable reduction in cases and deaths. This progress has been driven by advancements in both preventive and treatment interventions. Preventive treatments focus on reducing the risk of malaria before an individual becomes infected. Among the most widely used preventive measures are Insecticide-Treated Nets (ITNs), whose ownership and use increased. In 2023, in sub-Saharan Africa, 73% of households had at least one ITN, with 52% of the total population and 59% of children under five, pregnant women, and girls sleeping under one. Indoor Residual Spraying (IRS) is another preventive measure, implemented in 42 malaria-endemic countries, yet only 1.6% of the at-risk population was protected. The coverage of those targeted for IRS, however, reached 88.4%. Seasonal Malaria Chemoprevention (SMC) is a preventive measure which involves administering antimalarial drugs to children during peak transmission seasons. In 2023, 19 countries implemented SMC, treating 53 million children, an increase from 49 million in 2022. Intermittent Preventive treatment in pregnancy (IPTp) is a preventive measure within antenatal care, aimed at reducing malaria in pregnant women, who are more vulnerable to severe outcomes. In the WHO African Region, 80% of pregnant women and girls attended antenatal care in 2023, the highest recorded. While the percentage receiving IPTp doses increased slightly, it still remains below the 80% target (WHO, 2024).

[1] https://sdgs.un.org/goals/goal3 accessed on 30/01/2025

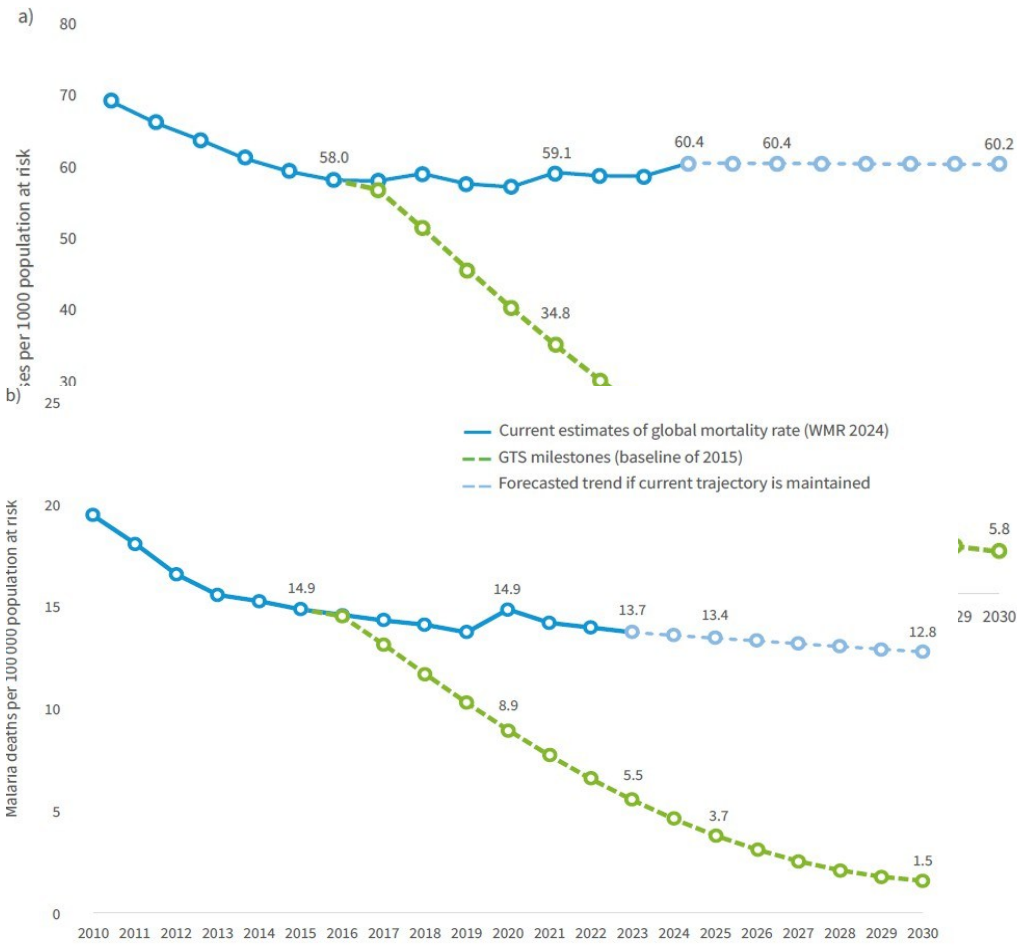
Treatment interventions, on the other hand, are designed to cure malaria after infection has occurred. These include the widespread distribution of Rapid Diagnostic Tests (RDTs) and Artemisinin-Based Combination Therapies (ACTs). The World Malaria Report 2024 reports that national programs distributed 345 million RDTs and 235 million ACTs in 2023, with ACTs use among children seeking care rising from 38% in 2005–2011 to 71% in 2017–2023. Finally, two malaria vaccines, RTS,S and R21, are now recommended in malaria-endemic areas, with a pilot in Ghana, Kenya, and Malawi leading to a 13% reduction in all-cause mortality and a 22% reduction in hospitalizations for severe malaria. By December 2024, 17 countries had introduced the malaria vaccine through routine childhood immunization, with more set to follow with support from Gavi, the Vaccine Alliance and WHO.

Since 2015, the decline in malaria cases has slowed, leading to a largely stagnant trend. Among the main challenges in malaria elimination are the emergence and spread of drug- and pesticide-resistant parasites, underperforming RDTs, lack of universal access to malaria prevention and treatment, and the absence of a highly effective vaccine (a challenge which is now being addressed) (Rogerson et al., 2020). Another key factor has been the COVID-19 pandemic, which led to widespread socio-economic consequences, including lockdowns and a global economic recession, and destabilized global health system. This health emergency disrupted essential healthcare services, also affecting malaria-related interventions. Rogerson et al. (2020) considered COVID-19 a serious threat that could even roll back the achievements of the past decades. WHO (2021) reported that the initial prediction of a doubling of malaria deaths did not occur, averting the worst predictions. However, Dr Matshidiso Moeti, WHO Regional Director for Africa, emphasised that although African countries

mitigated the worst impacts of COVID-19, its effects still led to significant malaria-related deaths.[2]

Figure 2.1 compare trends in malaria incidence per 1,000 at-risk individuals and mortality rates against the GTS milestones from 2010. Since the launch of the GTS in 2015, a divergence between the two trends has emerged and progressively widened. In 2020, a spike in both cases and deaths was registered. This setback has significantly hindered progress, creating a bottleneck in subsequent years and making it unlikely that the 2030 targets will be achieved.

Figure 2.1 - Comparison of global progress in a) malaria case incidence and b) malaria mortality rate with GTS milestone



Source: WHO estimates

[2] https://www.who.int/news/item/06-12-2021-more-malaria-cases-and-deaths-in-2020-linked-to-covid-19-disruptions accessed on 01/02/2025

2.2 Malaria Epidemiology in Kenya

This section examines malaria epidemiology in Kenya, noting a recent rise in cases partly linked to the COVID-19 pandemic because containment measures, such as lockdowns and curfews, disrupted malaria commodity supply chains, delayed interventions like ITNs distributions, and reduced case identification and treatment. Poor procurement planning and limited government investment during the pandemic further hindered program effectiveness. Health services were strained by staff reallocation and department closures, restricting access to testing, treatment, and prevention. Additionally, fear of COVID-19 altered care-seeking behaviour.

Kenya hosts all four species of *Plasmodium* parasites that infect humans. However, the *P. falciparum* parasite is responsible for over 99% of infections. The lake and coastal regions are the main endemic zones, where temperatures are conducive to malaria transmission, combined with the levels and seasonality of rainfall (Weiss, 2014). In Kenya, malaria trends reflect the global pattern. Between 2000 and 2015, malaria incidence and mortality rates showed significant declines. However, progress slowed after 2015, with incidence rates stabilizing. During the pandemic, the incidence of malaria in Kenya affected 62 people per 1,000 at-risk inhabitants, marking an increase compared to 2019. The incidence continued to rise until 2022, stabilizing at a level higher than pre-COVID. The COVID-19 containment measures implemented by the Kenyan government likely contributed to this setback. Since March 2020, a series of restrictions were imposed, including the closure of schools, the prohibition of flights, the implementation of curfews and lockdowns. These measures were initially implemented in response to a surge in

infections. As the pandemic evolved, the restrictions were gradually relaxed.[3]

The imposition of social distancing, the use of Personal Protective Equipment (PPEs), and consequently the introduction of curfews and lockdowns, disrupted the supply chains of medical equipment, such as PPEs and RDTs, making it difficult for health workers to safely test individuals without the risk of contracting infections. This resulted in reduced testing capacity, delayed diagnoses, and limited treatment availability (Kiriti-Ng'ang'a, 2021). The inadequacy of equipment and other medical supplies made Kenyans start local innovations to curb the spread of COVID-19. For example, students from Kenyatta University invented ventilators to aid in the fight against COVID-19 (Kenyatta University, April 2020). Textile factories that had been closed for decades started manufacturing PPEs, including masks.

The introduction of curfews and lockdowns hindered campaign-style interventions that targeted the most vulnerable communities, like ITNs distributions. Where the interruptions were prolonged, a new peak in prevalence emerged due to the accumulation of untreated cases during the malaria transmission season. This was particularly true in many Sub-Saharan African countries, including Kenya (Hoi AG et al., 2024).

The Kenyan national government created a COVID-19 contingency plan to facilitate pandemic preparedness, early detection and response. Meanwhile, USD 48 million had been allocated for the Communicable Disease Control sub-programme, an increase of 41% over 2019/20. The funds were used for the prevention and treatment of malaria, tuberculosis and AIDS through training of health workers to ensure better disease surveillance, purchase of drugs and awareness creation. Despite

[3] COVID-19 pandemic in Kenya - Wikipedia accessed on 27/10/2024

the increase in allocations, the budget for communicable disease control met only one third of the resource needs (Development Initiative, 2020).

Also, donor-funded programs suffered setbacks. During COVID-19, the Global Fund was the largest donor supporting malaria eradication in 2020, allocating approximately 61.7 million USD for the distribution of Long-Lasting Insecticide Nets (LLINs). However, challenges arose, particularly due to delayed adaptation to the pandemic, which led to ineffective scheduling and further delays, resulting in a 405-day postponement in LLIN delivery. Consequently, only 194,000 LLINs were distributed, far below the initially planned 12.9 million. This shortfall negatively affected the absorption of Global Fund grants, leading to suboptimal outcomes (Global Fund, 2022).

By the onset of COVID-19, Kenya did not have adequate health facilities to meet the internationally recommended workforce per 10,000 population, implying that the pandemic found Kenya in a state of unpreparedness in terms of workforce since in primary-level hospitals there were on average only 6 medical doctors compared to the recommended 16, and 10 clinical officers compared to the recommended 30. There was also a shortage of medical laboratory technologists who are crucial as they perform all laboratory tests, including the use of microscopes to detect the malaria parasite (Kiriti-Ng'ang'a, 2021). According to Barasa et al. (2021), COVID-19 affected the health workforce in two ways. First, 56% of facilities reduced staff dedicated to essential services due to the reallocation of personnel to support the COVID-19 response. Second, concerns among health workers about the risk of infection, driven by a scarcity of PPEs, led to the suspension of 52% of services.

During the COVID-19 emergency, healthcare facilities in Kenya experienced a significant decrease in patient volumes, with 97% of

healthcare workers reporting fewer visits (Barasa et al., 2021). Barriers preventing access to health facilities included physical restrictions such as lockdowns and curfews, as well as psychological factors like the fear of infection, impacting on the population's healthcare-seeking behaviour. As a result, many individuals resorted to self-medicating with drugs purchased from local chemists or shops. This behaviour often led to missed follow-ups, untreated conditions, medication non-adherence, and, in some cases, death, exacerbating the burden of the disease (WHO, 2020).

Measures to curb COVID-19 also disrupted essential preventive services, including those targeting maternal and child health, which are vital because pregnant women, particularly first-time mothers, and children under the age of 5 are more vulnerable to severe malaria in high-risk regions due to their reduced immunity. Riley et al. (2020) contends that a decline in coverage of antenatal and postnatal health care led to worsening implications for the lives of women and their new-borns. The Kenya Malaria Indicator Survey (KMIS) 2020 conducted in October 2020 registered a decrease in the percentage of women who took at least 3 doses of IPTp during their last pregnancy by the 15% for 1 dose, by 6% for 2 doses and by 1% for 3 doses. Similarly, the percentage of children under age 5 with a fever in the two weeks preceding the survey who received ACT decreased by 13% compared to the 2015 levels. Additionally, KMIS 2020 reported declines in the use of ITNs the night before the survey, with reductions of 9% among children and 7% among pregnant women relative to the 2015 levels.

2.3 Malaria Epidemiology in Kilifi County

This section examines malaria epidemiology in Kilifi County. It is noted that malaria cases have been on the rise, driven by the impacts of climate change, a weakened health system further strained by the COVID-19 pandemic.

Kilifi County, which is located within the coastal region of Kenya, has a lower incidence of malaria, compared to high-burden lake region. According to von Seidlein and Knudsen (2016), at the end of the 20th century, Kilifi endured a high malaria burden, but the first decade of the 21st century saw a decline in malaria-related morbidity and mortality. Key contributors to this decline included the widespread use of ITNs, rapid economic development, and the introduction of ACTs as the standard treatment for uncomplicated malaria. However, since hitting its lowest levels in 2009, malaria hospital admissions in Kilifi have gradually increased. This resurgence raised concerns about the effectiveness of control measures and the emergence of resistance to insecticides and drugs, threatening to reverse earlier gains. Another plausible explanation is that reduced malaria incidence resulted in lower childhood exposure to *Plasmodium falciparum*, diminishing acquired immunity, increasing in the average age of patients presenting with complications (von Seidlein and Knudsen, 2016). Climate change, characterized by long periods of drought followed by increasingly frequent flooding, further weakens the population's immune defences, especially among children and at-risk groups (the elderly, pregnant women), and contributes to the spread of malaria transmission in areas previously classified as low-risk (County Government of Kilifi, 2023).

Since the decentralization of the health sector to county governments in 2013, Kilifi County has steadily increased its healthcare workforce. However, the doctor-to-patient ratio remains low at 1:10,000,

far below the WHO-recommended 1:230. The nurse-to-patient ratio is 1:2,500, better than Kenya's national standard of 1:6,000 but still short of the WHO benchmark. The health sector also faces other challenges, such as unequal workforce distribution, high attrition in hard-to-reach areas, and out-migration. The COVID-19 pandemic further exposed systemic weaknesses, including inadequate training, shortages of malaria commodities, reduced access to essential services and limited bed capacity. The outbreak of the virus forced the county to redefine the priorities of the health sector and some preventive and promotional health services, such as malaria control (Onsomu et al., 2022).

In conclusion, this chapter highlighted the global, national, and county-level malaria epidemiological trends, emphasizing the disruptive impact of COVID-19 on the progress achieved in reducing malaria incidence and mortality. This setback was compounded by earlier challenges, such as the emergence of pesticide and drug resistance around 2015.

3. Organization of the Kenyan Health System and Malaria Case Management

The chapter examines Kenya's healthcare system and it covers the guidelines for malaria case management and malaria community case management in Kenya.

3.1 The Kenyan Health System

This section provides an overview of Kenya's health system, outlining the background of the Kenya Health Policy Framework and the general organization of healthcare services.

The Constitution of Kenya 2010 establishes a legal foundation guaranteeing a rights-based approach to healthcare delivery, stipulating that every individual has the right to the highest attainable standard of health, including reproductive health and emergency medical care. Within this framework, Kenya Vision 2030 aims to transform Kenya into "a globally competitive and prosperous country with a high quality of life by 2030"[4] including the achievement of Universal Health Coverage (SDG target 3.8). The Kenya Health Policy 2014–2030 outlines the long-term health objectives, while the Kenya Health Sector Strategic Plan 2018–2023 defines medium-term priorities (MOH, 2018).

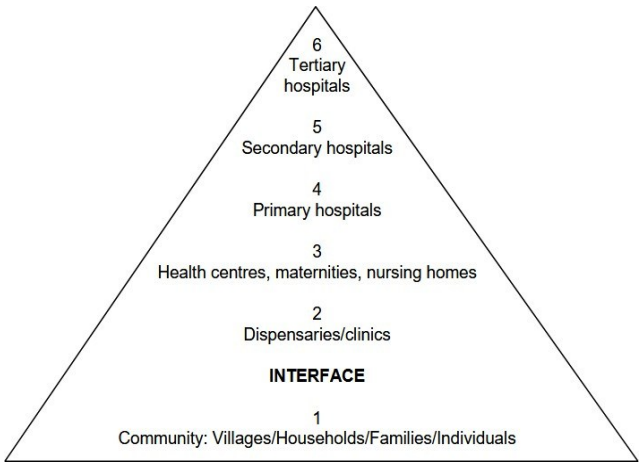
The 2010 Constitution established a decentralised health system comprising national and county levels. The national government oversees health policy, national referral hospitals, capacity building, and technical support to counties, while county departments of health are tasked with managing county health facilities, pharmacies, ambulance services, and promoting primary healthcare within the sub-counties (MOH, 2021).

Kenya's healthcare system is structured into a six-tier hierarchy, with services becoming progressively more specialized at higher levels.

[4] https://vision2030.go.ke/about-vision-2030/ accessed on 30/01/2025

Level 1 it is organised in Community Health Units (CHU) which cover a specific geographical area serving approximately 5,000 people (500-1,000 households). Each CHU is composed by a team of ten Community Health Promoters (CHPs), supervised by a Community Extension Workers (CHEWs). These community workers play a crucial role in community engagement, acting as a link to local health facilities and providing health promotion, disease prevention, basic care, and, when needed, referrals to specialized care. Additionally, the CHPs conducts annual household mapping to assess the needs of each family (MOH, 2021). Level 2 includes dispensaries and clinics in which there are nurses, public health technicians, and medical assistants, who provide basic outpatient care and antenatal services for simple medical issues. Nurses may also occasionally conduct normal deliveries. Level 3 comprises health centres, maternities, and nursing homes in which midwives, clinical officers, and sometimes doctors work, offering a wider range of services, including curative and preventive care, minor surgical procedures, and reproductive health services (Muga et al., 2005). Each CHU is linked to a dispensary or health centre, which is the referral sub-county facility for cases that cannot be handled at the CHU level. Level 4 consists of primary hospitals, which function as referral facilities for the lower levels. Level 5 includes secondary hospitals, also known as county referral hospitals, which provide comprehensive inpatient diagnostic, medical, surgical, habilitative, and rehabilitative care, including reproductive health services. Level 6 encompasses tertiary hospitals, which serve as national referral hospitals, offering the most advanced medical care, research, and training in the country (MOH, 2018). Figure 3.1 illustrates Kenya's healthcare system.

Figure 3.1 - Kenya's Healthcare System



Source: Ministry of Health

According to the Kenya Health Sector Strategic Plan 2018–2023, the Kenyan government, through the Ministry of Health, has prioritized primary healthcare, focusing on community level, with the aim to shift investments towards preventive and promotive healthcare. This strategy provides for the establishment of a Primary Care Network which is meant to play a pivotal role in expanding Universal Health Coverage in Kenya by providing person-centred services closer to communities in need, ensuring the quality, continuity, and sustainability of healthcare.

3.2 Case Management of Malaria in Kenya

This section focuses on malaria management in Kenya, covering the guidelines for diagnosis, treatment and prevention of malaria in Kenya, including for Community Case Management of malaria (CCMm). It also outlines the data reporting system.

The National Malaria Control Programme (NMCP) is the department within the Ministry of Health which is responsible for overseeing malaria program management at national and sub-national level. The NMCP ensures the coordination of technical units focused on key areas, including Case Management, Vector Control, Malaria in Pregnancy, Malaria Elimination, Surveillance and Research, and Social and Behaviour

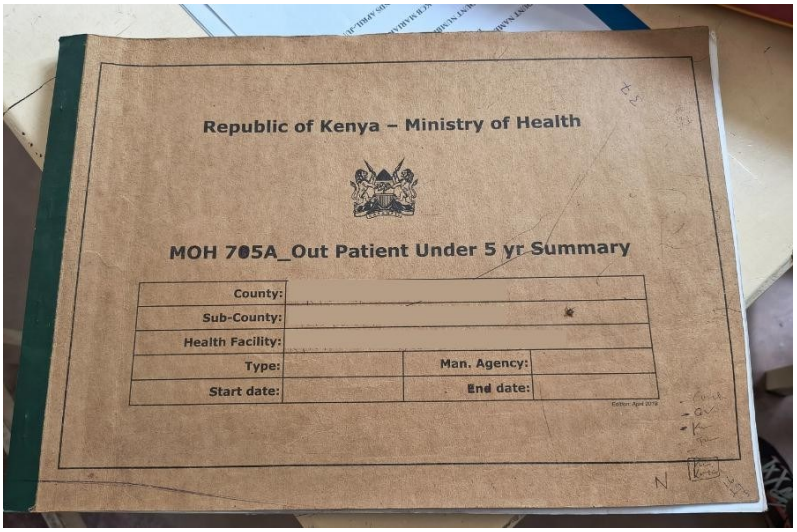
Change. To ensure proper coordination, the NMCP organizes a Committee of Experts to strengthen compliance with key programme functions. This committee includes representatives from various Ministry of Health departments, other government ministries, county representatives, multilateral and bilateral partners, research institutions, Civil Society Organization and Faith-Based Organizations. At the county level, the County Malaria Control Coordinators oversee malaria-related activities and ensure alignment with national strategies (MOH, 2019).

The NMCP has developed comprehensive guidelines for the diagnosis, treatment, and prevention of malaria at health facilities and at community level. When a suspected malaria case is presented at a health facility (e.g., dispensary, clinic, or health centre), the healthcare provider (nurse or clinical officer) checks the patient's temperature to determine if they have a fever, a common symptom of malaria. If the patient exhibits fever, a malaria test is conducted, either using a RDT or microscopy, depending on the laboratory capacity of the facility. If the patient tests positive for malaria, they are prescribed the recommended dose of ACT and instructed to complete the full dosage as directed. To prevent future infections, patients are advised to consistently use LLINs. Special attention is given to pregnant women in malaria-endemic areas. During antenatal care visits, healthcare providers administer IPTp and provide women with LLINs in order to prevent malaria.

The clinical officer in charge of a facility logs information about suspected, tested and confirmed malaria cases in a daily paper-based register. At the end of each month, they complete the Outpatient Morbidity Summary Register (MOH 705 AB), ensuring it aligns with the Laboratory Test Summary Report (MOH 706). They also compile the Summary Report for Malaria Commodities (MOH 743) which records the monthly

balance of commodities, comparing the initial stock to the final stock.[5] According to the guidelines for the diagnosis, treatment and prevention of malaria in Kenya, by the 5th of the following month, all health facilities must report to the Sub-County Management Team the information, including the MOH 705AB, 706, and 743 registers. By the 15th of each month, the Health Record Information Officer is responsible for entering the data into the Kenya Health Information System (KHIS) portal of the Ministry of Health, digitalizing the information for aggregate reporting and analysis (MOH, 2020).

Figure 3.2 – MOH 705A register



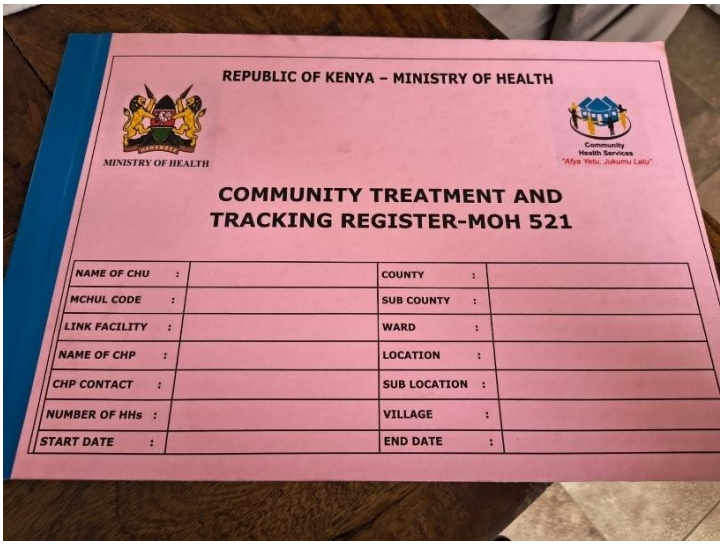
Source: Kilifi County Health Department

At the community level, CHPs play a critical role. They conduct household visits, attend community meetings, and disseminate messages about malaria prevention, diagnosis, and treatment. Fever is highlighted as a key sign of malaria, and community members experiencing fever are urged to seek treatment within 24 hours of onset at a health facility. The CHPs record the services provided to the community using various reporting tools, such as the Daily Activity Register (MOH 648) or the Community Treatment and Tracking Register (MOH 521). The CHPs submit the data they collect to the CHEWs, who compiles it into the

[5] Dispensary clinical officer interview, November 2024

Monthly Summary Register MOH 515 and forwards it to the designated facility-in-charge who aggregates the information from all CHUs and submits the reports by the 5th of the following month to the Sub-County health records officer (MOH, 2021). The data reporting system is summarized in Figure 3.4.

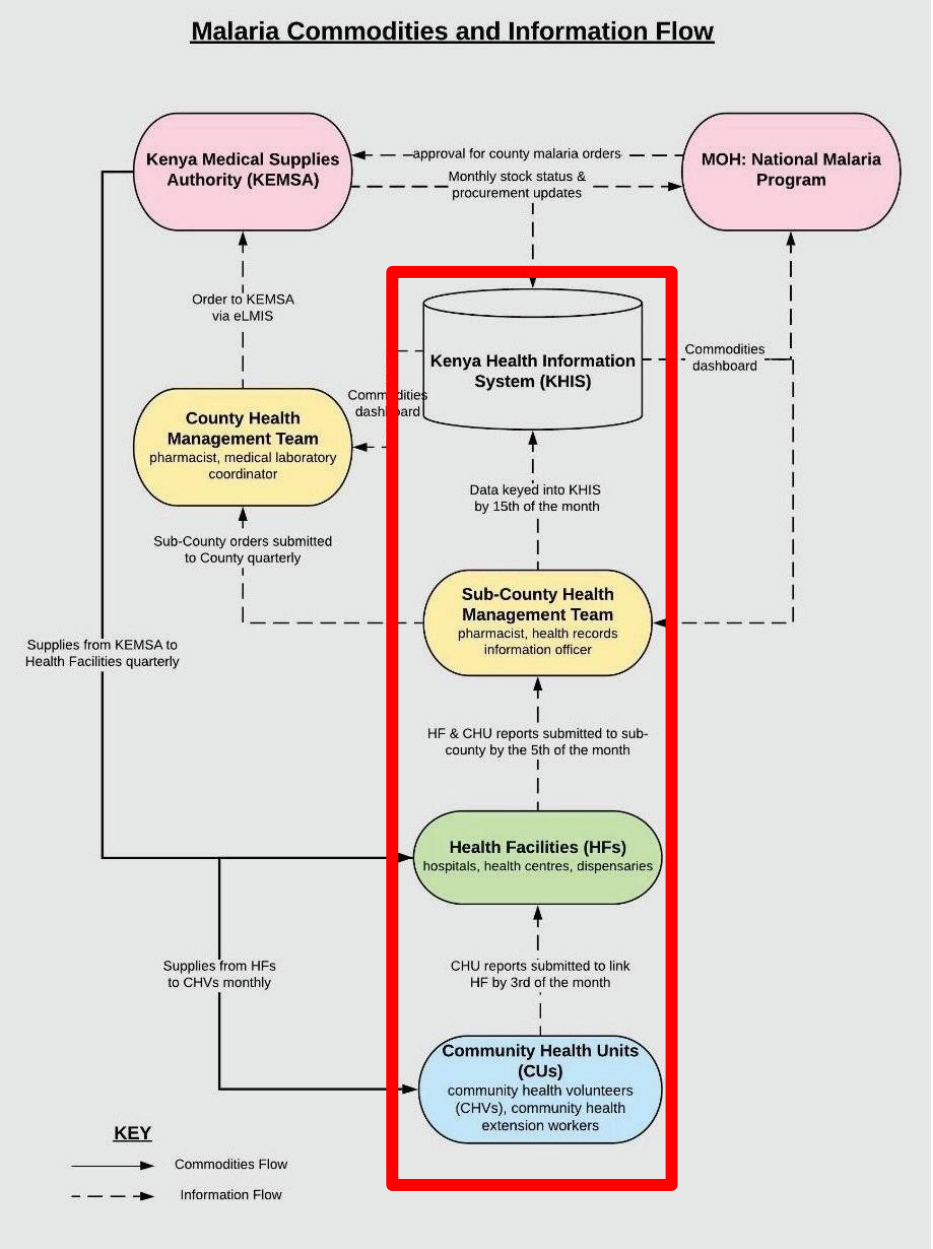
Figure 3.3 – MOH 521 register



Source: Kilifi County Health Department

In conclusion, the chapter explored the structure of Kenya's healthcare system, characterized by a pyramidal organization with increasing specialization at higher levels. It also examined the guidelines for malaria case management and community case management in Kenya, which form the foundation for addressing the disease effectively.

Figure 3.4 - Data reporting system



Source: Ministry of Health

4. Assessment of Malaria Trends in Kilifi County

This chapter analyses trends in malaria cases to identify epidemiological patterns and assess consistency across register records in malaria case management within Kilifi County from September 2023 to October 2024.

4.1 Methodology for Data Collection

The study employs a panel data design, analysing longitudinal data collected monthly across multiple dispensaries. Ten rural dispensaries identified as "Malaria hotspots" were analysed. Malaria hotspots are defined as geographical areas within a broader transmission zone where transmission intensity is significantly higher than in surrounding areas. The decision to focus on these dispensaries aligns with the strategy of the community case management project "The Net" which followed guidance from the Kilifi County Health Department to implement targeted interventions in high-risk areas. This approach is further supported by existing literature, which highlights that targeted control interventions in malaria hotspots are often more effective and efficient than untargeted strategies, ultimately benefiting the entire community (Kangoye et al., 2016).

The type of data collected is secondary and it comes from registers compiled monthly by the clinical officer in charge of the facility, which is subsequently submitted to the health record officer and published within the KHIS. The time frame extends from September 2023 to October 2024, corresponding to 13 monthly observations.

The registers considered for this analysis include:

- MOH 705 AB Outpatient Morbidity Summary: this register contains a list of all possible illnesses that a patient visiting a dispensary may have. It includes the category "suspected malaria" for patients exhibiting malaria symptoms, "tested for malaria" for those who did the test and "confirmed

malaria" for cases where a microscopy or RDT result is positive. Data are collected separately for children under 5 years old (form A) and persons over 5 years old (form B).

- MOH 706 Laboratory Test Summary Report: this register includes the number of microscopy tests and RDTs conducted, along with their results (positive or negative).

- MOH 743 Summary Report for Malaria Commodities: this register provides an inventory of all malaria commodities available at the facility, such as ACTs (Artemisinin-based Combination Therapies), LLINs (Long-Lasting Insecticidal Nets) and RDTs at the start and end of each month.

The data were collected during visits to the dispensaries with project staff, involving the digitization of information from paper registers, supported by photographs. At the office, the data were transferred into an Excel spreadsheet, focusing solely on relevant categories such as suspected, tested, confirmed, and treated malaria cases. Cross-checks were performed using the KHIS, in which the data are regularly inputted by the county health record officer. Using STATA software, a panel dataset was created to incorporate both temporal and spatial variables. The introduction of the STATA software allowed me to support the World Friends team in the data analysis process of the project, which was initially only based on Excel. The main strengths of using this software are the ease of data cleaning and the immediacy of the analysis. In addition, the dataset created is easily updated with new data.

The main challenge encountered during data collection was the reliance on paper-based registers, which introduced several limitations. Many of the register sheets were physically worn, faded, or poorly maintained, making them difficult to read and interpret. This deterioration in the records increased the likelihood of transcription errors or

misinterpretations during data entry. Furthermore, handwritten entries often varied in style and legibility among different staff members at the dispensaries, adding another layer of complexity to the process. In addition, issues arose when cross-checking data on the KHIS portal that did not clearly differentiate between a missing entry and a true zero value, creating significant difficulties in data cleaning and analysis.

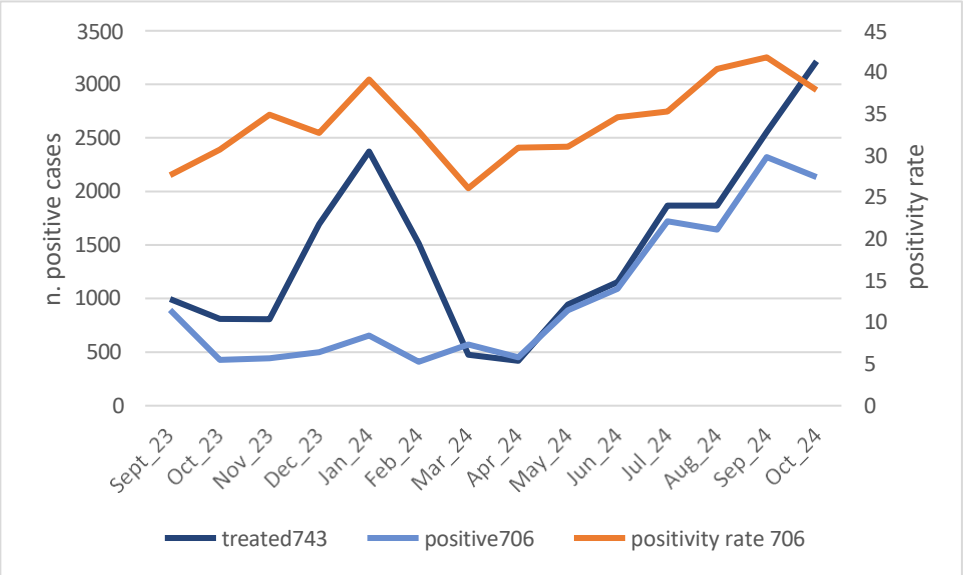
Another difficulty encountered was finding data on the population covered by the dispensaries from the KHIS. In fact, it was not possible to create indicators on the incidence of malaria at the dispensary level as the only data available are at the county level where the ten project dispensaries represent a small part considering that the number of second level facilities in Kilifi County is 118 (MOH, 2023). Therefore, there is a data disaggregation issue that does not allow for a detailed assessment on the impact of the project.

The variables of interest are suspected cases, tested cases, positive cases and treated cases that were derived from data in the three registers. The positivity rate was calculated as the ratio of positive cases to tested cases, using MOH 706 as the reference. Additionally, the total number of RDTs and microscopic tests performed each month at each dispensary were considered.

4.2 Analysis of Malaria Trends Across Dispensaries

The aim of the analysis is to investigate trends in malaria cases over time referring to the seasonal incidence of malaria.

Figure 4.1 – Trends in positive and treated malaria cases and positivity rate

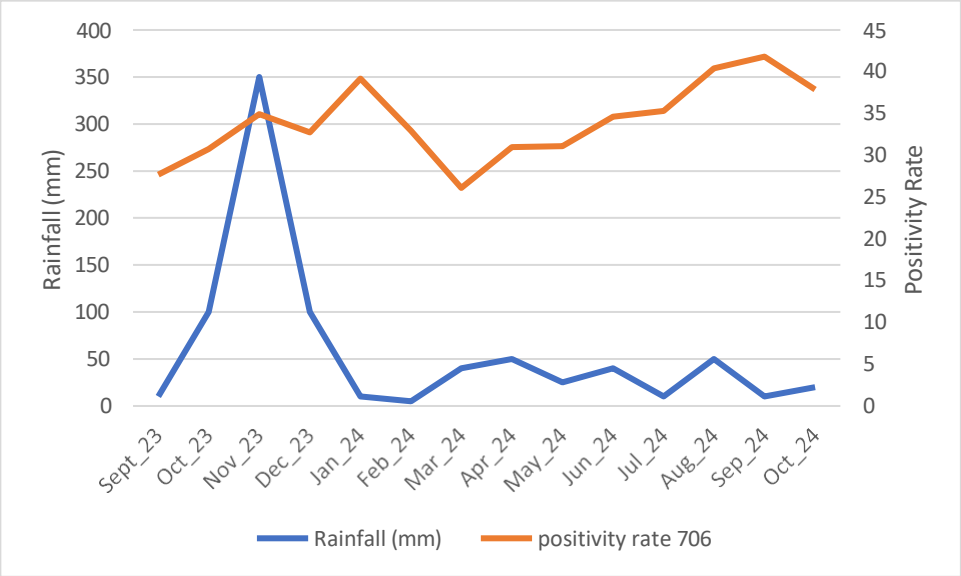


Author's Analysis of Kilifi County Health Department Data

In Figure 4.1, the trend of positive malaria cases recorded in MOH 706 shows a decline in September 2023, followed by small increase in January 2024 and a period of stability until April 2024, after which it begins to rise steadily, peaking in September 2024 before declining in October 2024. Looking at the trend in the number of people receiving treatment from the MOH 743 register, after a slight decline in September and October 2023, there is a rapid increase with a peak in January, which is much more pronounced than the number of registered positive cases. This discrepancy, as will be explained in more detail later, may be due to a lack of available RDTs in the dispensaries. From January there is a rapid decline, with a trough in April 2024, followed by a steady increase in the number of people being treated from May onwards. Comparing this last trend with the positivity rate over time suggests several observations. From September 2023, the positivity rate increases, peaking in January 2024, mirroring the trend of treated cases. It then declines until March,

followed by a steady rise until September 2024, before experiencing a slight decrease in October. Overall, the treated and the positivity rate show a consistent pattern. The only exception occurs between September and November 2023, when the number of treated cases is relatively low, yet the positivity rate remains high.

Figure 4.2 – Average Rainfall in Kilifi County and positivity rate from MOH 706

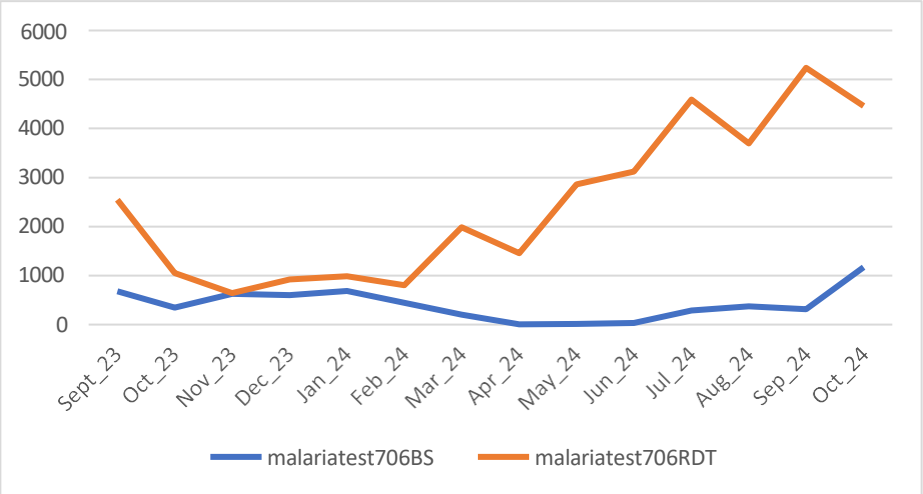


Author's Analysis of Kilifi County Health Department Data and National Drought Management Authority

The literature identifies a connection between rainfall patterns and malaria transmission, with transmission peaking during the rainy seasons. The short rainy season, from October to December, is linked to a transmission peak that tends to shift between November and December. Conversely, the long rainy season, spanning from March to June, is associated with a time-shifted transmission peak typically occurring between May and June (U.S. President's Malaria Initiative, 2023). Figure 4.2 shows the positivity rate and the average rainfall pattern observed in Kilifi County. Since September 2023, there has been a notable increase in rainfall, reaching a peak in November 2023 during the short rainy season. The substantial rainfall contributed to a high positivity rate (and the increase in the number of treated cases seen in Figure 4.1), with the highest rate recorded in January 2024. In February 2024, rainfall dropped to its lowest level,

mirrored by a decrease in the positivity rate, which reached its lowest point in March 2024. Starting in March 2024, rainfall increased again with the onset of the long rains, although at a lower volume than in previous months, and fluctuated until October 2024. In contrast, there is a steady increase in the rate of positivity from March 2024 to September 2024, after which there is a slight decline.

Figure 4.3 - Trends in RDT and Microscope Testing from MOH 706



Author's Analysis of Kilifi County Health Department Data

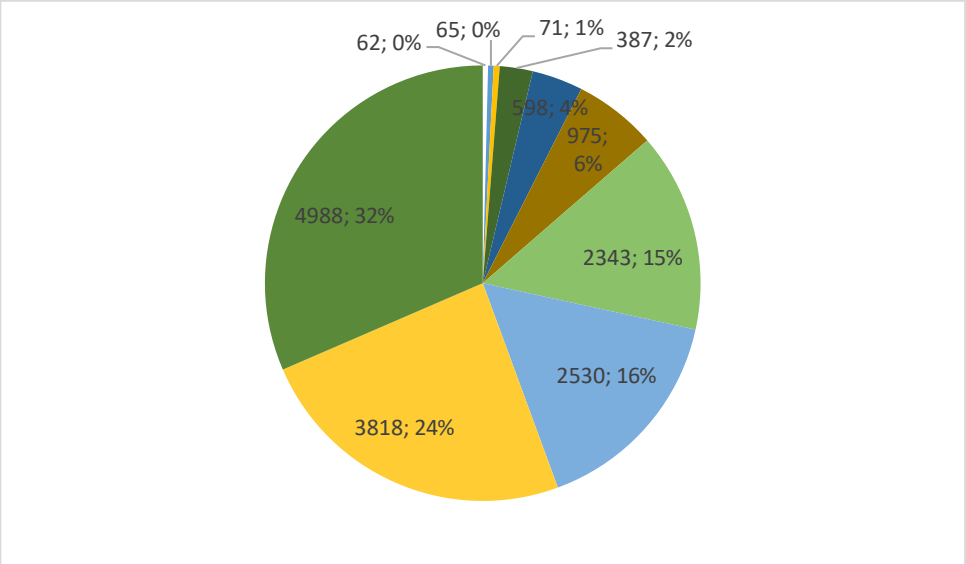
Figure 4.3 compares the use of RDTs and microscopy tests, showing that RDTs are more widely used. In September 2023, their use declined and remained low until February 2024, when it increased significantly. Large fluctuations likely reflect inconsistent availability over time. In contrast, microscopy tests are used less frequently, primarily because not all dispensaries have laboratory facilities. In September 2023, microscopy testing saw a slight decline, followed by an increase in November 2023, coinciding with the provision of microscopes under the project to the Kilifi County Department of Health[6].

Figure 4.4 shows the distribution of the total number of positive malaria cases reported in the MOH 706 across 10 dispensaries over a 13-month period. The distribution reveals significant disparities across the

[6] https://www.facebook.com/share/p/1K3NvhzvN3/ accessed on 03/02/2025

dispensaries in terms of malaria burden, despite all being considered malaria hotspots. One dispensary accounts for the largest number of cases (4,988 cases; 32%), contributing nearly one-third of all positive cases. An additional 40% of cases were recorded in two additional dispensaries (in one case, 3,818 cases; 24%, in the other, 2,530 cases; 16%). This indicates that a few facilities handle the majority of the malaria caseload. The remaining dispensaries report fewer cases, some as few as 62 to 71 cases (0–1%). Clearly there is a significant variation even across areas identified as malaria hot-spot, and disaggregated data can contribute to directing resources and efforts where they are needed the most.

Figure 4.4 – Distribution of Positive Malaria Cases Across 10 Dispensaries from MOH 706



Author's Analysis of Kilifi County Health Department Data

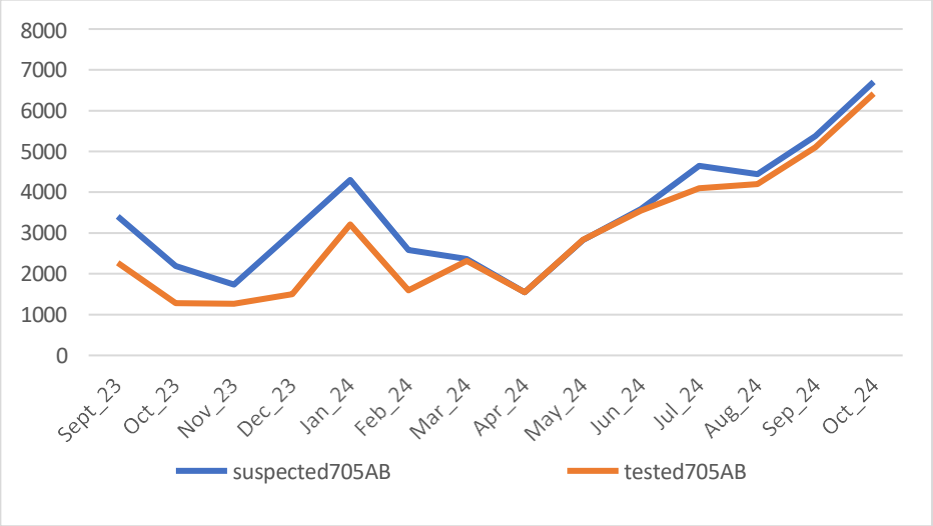
In conclusion, the trends in positive cases, treated cases, and the positivity rate indicate an overall increase in malaria cases over time, aligning with seasonal patterns and peaking during the short and long rains. The trend for RDTs increased over time after an initial decline due to a stock-out of materials. The distribution of malaria burden across the ten dispensaries is uneven, with three dispensaries accounting for about 70% of the total positive cases. Observations of dispensary operations indicate that health dispensaries are overburdened, as they must manage not only malaria

cases but also other illnesses. This results in long wait times for medical examinations, which are available only on weekdays.

4.3 Analysis of Consistency Across Registers

Government procedures stress that people with malaria symptoms should be tested. Aggregating all ten dispensaries, in Figure 4.5 the number of people suspected of malaria recorded in Register MOH 705AB is higher than the number of people tested over time. The most significant difference can be observed in the first months up to April 2024, after which the difference seems to narrow.

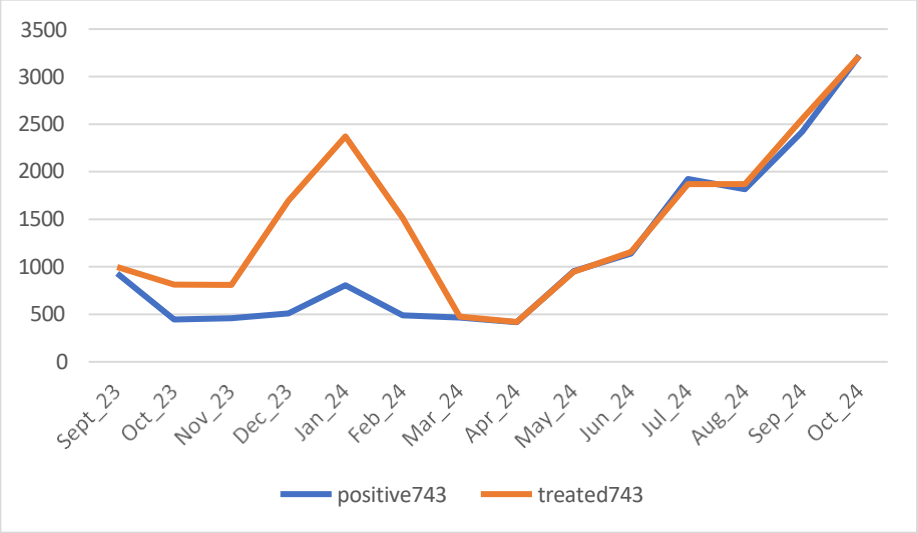
Figure 4.5 – Trend in Suspected and Tested Malaria Cases from MOH 705AB



Author's Analysis of Kilifi County Health Department Data

Figure 4.6 shows that the aggregate trend in the number of treated persons exceeds the number of positive persons in the first months with a significant peak around January 2024. The gap narrows until it disappears around March 2024.

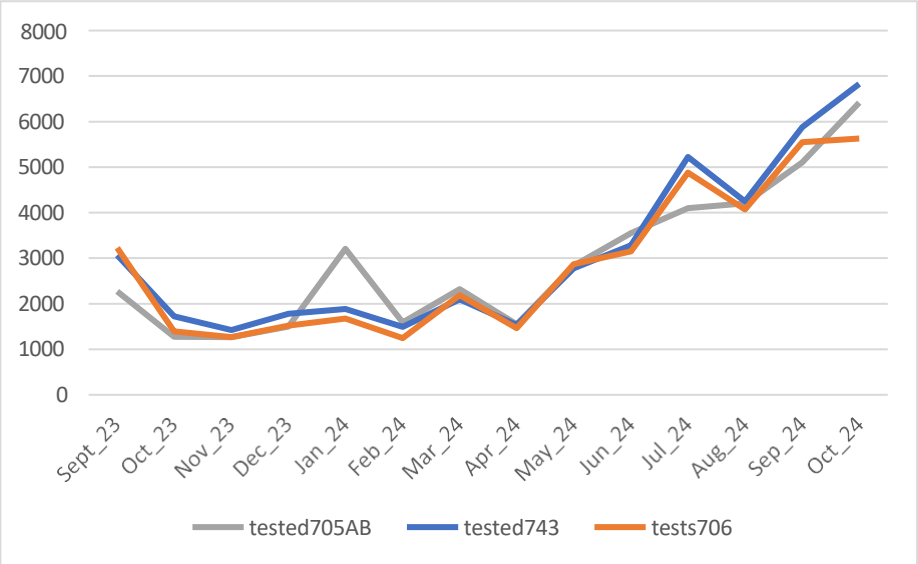
Figure 4.6 – Trends in Treated and Positive Malaria Cases from MOH 743



Author's Analysis of Kilifi County Health Department Data

Figure 4.7 compares the number of people tested across the three registers, it can be seen that, although it follows the same trend, there is a gap between MOH 705AB and the other two registers in particular in January 2024 (more cases in MOH 705AB) and July 2024 (fewer cases).

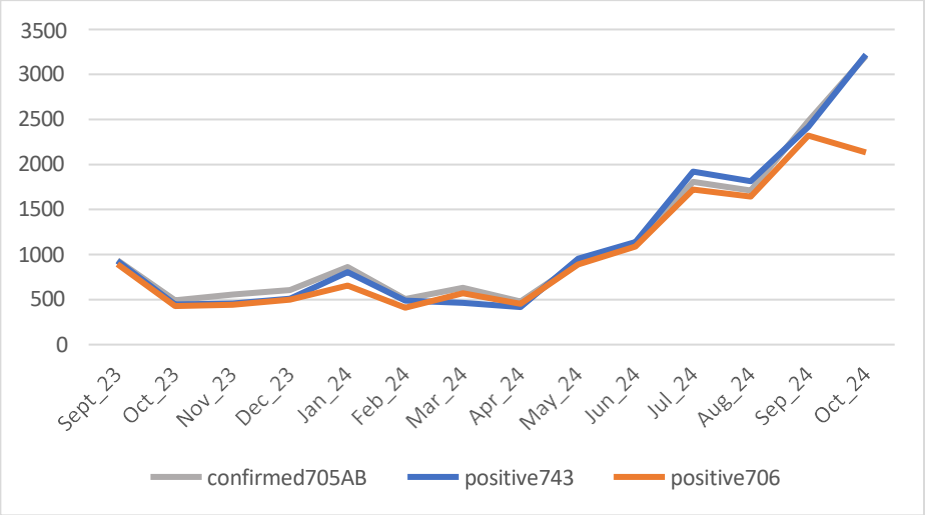
Figure 4.7 – Trends in Malaria Testing across the three registers



Author's Analysis of Kilifi County Health Department Data

Figure 4.8 shows the number of positive malaria cases the data from the three registers showing greater alignment. The only exception is observed during the period from September 2024 to October 2024, where there is a mismatch between Register MOH 706 and the other two registers.

Figure 4.8 – Aggregate Trends in Malaria Positives across the three registers



Author's Analysis of Kilifi County Health Department Data

Several key observations emerge from the graphs. Firstly, there is a discrepancy between suspected and tested cases, particularly in the early months of the analysed period. This was likely due to a low supply of RDTs, prompting individuals with malaria symptoms to seek testing elsewhere (e.g., pharmacies or private clinics) before returning to the dispensary with a positive result to request ACTs. In the worst-case scenario, patients may have received treatment without proper testing, increasing the risk of overtreatment. This explains the positive discrepancy between treated and positive cases observed in Figure 4.6. Around February, an increase in RDT availability led to better alignment between suspected and tested cases and, consequently, between positive cases and treatments. As the number of tests performed increased, the number of detected positive cases also rose. In this context, this trend is a positive development, as it suggests improved malaria case tracking.

Regarding consistency across the three registers, MOH 743 and MOH 706 appear more reliable, as they are closely linked to the use of malaria commodities. For instance, in MOH 706, each test performed corresponds to an RDT or microscopy slide recorded in the register, facilitating accurate documentation of test results. Similarly, MOH 743

tracks the balance of malaria commodities at the beginning and end of the month, further reinforcing data reliability. In contrast, MOH 705AB, an outpatient summary, is completed at the end of a patient's visit. In some cases, clinicians may record only the test result (if positive) without noting that a test was conducted, or they may directly dispense ACTs to patients who arrive with an external test result. Additionally, the reliance on paper records complicates data management, a challenge that could be mitigated by direct entry into the KHIS to streamline bureaucratic processes.

5. The NET Project: Community Case Management of Malaria in Kilifi County

5.1 The NET Project: Mission, Objectives and Interventions

The “Net - Community-Based Malaria Programme” is a project funded by the Italian Agency for Development Cooperation under the Global Fund 5% Initiative, which reserves 5% of Italy’s contribution to the Global Fund to Fight AIDS, Tuberculosis and Malaria to initiatives implemented by civil society organizations, research institutions, and universities. The project is implemented by the Italian NGO World Friends in collaboration with the Kilifi County Department of Health and the Centro Salute Globale of the Tuscany Region.

The project was developed in alignment with the Global Fund Strategy 2023-2028 and the Kenya Malaria Strategy 2019-2023. These strategic documents provided a framework to turn identified priorities, recommendations, and gaps into specific objectives, with a key focus on placing communities at the centre and addressing their health needs. Bringing healthcare into the community can overcome barriers to facility-based care, such as distance, transportation costs, and limited hours. This approach involves training Community Health Promoters (CHPs) to diagnose and treat uncomplicated malaria cases. According to Otambo et al. (2023), the ability of CHPs to build and maintain trust with the communities they serve is critical to their success in providing healthcare services. More experienced CHPs may have a better understanding of the community’s needs, preferences, and cultural beliefs. As a result, they may be more effective in providing community members with relevant health promotion information, advice, and support on malaria prevention and treatment activities The project also addresses critical challenges, including the impact of COVID-19, which has exacerbated malaria cases

and adversely affected supply chains, healthcare personnel, and infrastructure (Global Fund, 2021).

In this context, the project's mission is to contribute to the achievement of two key SDG targets: 3.3 ("By 2030, end the malaria epidemic") and 3.8 ("Achieve Universal Health Coverage"). The programme's specific objective is to "Strengthen community-based malaria eradication mechanisms within Kilifi County, Kenya, by 2024". The project introduces an innovative approach by implementing Community Case Management of malaria (CCMm), a method successfully piloted in other endemic zones like the lakes region, within the coastal context of Kilifi County. The approach will enable CHPs to visit patients, conduct RDTs and administer ACTs directly in communities. The project's goal will be achieved through interventions in three key areas. The first focuses on prevention and awareness-raising to foster community engagement and reduce malaria transmission. The second emphasizes capacity building and community case management to enhance local health systems' ability to manage and treat malaria cases effectively. The third involves strengthening data collection tools at the community level and improving county monitoring mechanisms through the KHIS. According to the project's entry in the AICS open-access database *Openaid*, activities would be implemented in ten dispensaries located across five sub-counties in Kilifi County, which were identified as malaria hotspots by local health authorities. The direct beneficiaries are the CHPs, who are assigned to a specific Community Health Unit (CHU), and the Community Health Extension Workers (CHEWs), who are linked to the referral facility in the sub-county and supervise the work of the CHPs; the indirect beneficiaries are all those living in the areas covered by the ten dispensaries, who would face in the future a lower risk of contracting malaria and more timely care if they did.

The project officially started on November 1st, 2022, following its approval, with implementation commencing in June 2023 due to a delay caused by changes in guidelines at the Department of Health. The first activity implemented was sensitization. Both the CHPs and CHEWs received education on malaria prevention and malaria case management. Specifically, one CHEW and ten CHPs in each selected dispensary were trained, resulting in a total of ten CHEWs and 97 CHPs (with three CHPs dropping out). The training covered recognizing common malaria symptoms, measuring fever, using RDTs, and administering ACTs, enabling CHPs to provide early diagnosis and care to community members. Additionally, the CHPs were trained on how to document their activities in two registers: the Daily Activity Register (MOH 648) and the Community Treatment and Tracking Register (MOH 521). The first register records the number of people visited, their temperature levels, the number of RDTs performed (including invalid ones), and the dosage of ACTs administered. The second register also contains this information but provides additional details on other illnesses through symptoms, which is useful when test results are negative, serving as a reference for further assessments at the dispensary. To support their work, CHPs receive a monthly incentive of approximately 3.72 euros and cell phone network connection time, enabling them to stay in contact with their supervisors for guidance and to communicate with community members when malaria cases are suspected. CCMm implementation began in early November 2024, and health authorities are currently conducting supervision visits with project staff to ensure the registers are completed accurately and consistently.

5.2 Methodology for Qualitative Analysis

This chapter outlines the methodological approach employed to gather and analyse qualitative data on stakeholder perspectives regarding the implementation of CCMm.

The purpose of getting stakeholders involved follows the principle of Results-Based Management. This means that all stakeholders share the responsibility for processes, products and services that are aimed at achieving results. At the same time, stakeholders are also the recipients of monitoring activities. This enables alternative assessments based on the information and evidence collected (UNDP, 2011). Integrating quantitative analysis of malaria trends with qualitative data is useful in providing a comprehensive understanding of malaria case management at the dispensary and community level. It is also valuable in capturing stakeholders' initial impressions of the CCMm implementation. A variety of stakeholders are involved in the implementation, including CHPs, CHEWs, dispensary clinical officers, sub-county malaria control coordinators, county malaria control coordinator. They intervene at various levels within the programme. CHPs are the direct stakeholders in the project as they carry out the visits within the communities with the support of CHEWs. The clinical officers are the contact persons within the dispensary to which negative or complicated malaria cases are referred. The sub-county malaria coordinators belong to the Kilifi County Health Department and provide support in supervising the work of the CHPs. The county malaria coordinator, on the other hand, is responsible for the project at the aggregate level, transmitting the results to the national level.

The qualitative phase took place during a field mission held in November 2024 and included several activities, including taking testimonies from CHPs, CHEWs and clinical officers in focus groups discussions in dispensaries in collaboration with the team of sub-county malaria

coordinators during supervisions visits. The sub-county health department team was composed of the sub-county malaria control coordinator, sub-county medical laboratory coordinator and sub-county pharmaceutical facilitator. In total we attended five focus groups in five dispensaries, reaching:

- 46 CHPs;
- 5 CHEWs;
- 2 clinical officers;
- 2 sub-county malaria control coordinators;
- 2 sub-county malaria laboratory coordinators;
- 2 sub-county pharmaceutical facilitators.

In addition, semi-structured interviews were conducted with three sub-county malaria control coordinators and one county malaria control coordinator. The interviews were recorded on paper and later transcribed into a Word document. A challenge encountered during these activities was communication, as while most sub-county and dispensary staff spoke English, the CHPs only spoke their local dialect, different from the main language (Swahili). However, this issue was resolved with the help of project staff, who could translate conversations held in local languages. The analysis of the information collected was based on OECD evaluation criteria[7] that offer complementary perspectives about the development of the intervention:

- Relevance;
- Coherence;
- Efficiency;

[7] https://www.oecd.org/en/topics/sub-issues/development-co-operation-evaluation-and-effectiveness/evaluation-criteria.html accessed on 03/02/2025

- Impact;
- Sustainability.

5.3 Perspectives from stakeholders on CCMm Implementation

This section highlights key stakeholders' initial impressions of the CCMm approach launched in November 2024. Their perspectives were gathered based on criteria addressing relevance, coherence, efficiency, impact, and sustainability.

The relevance of the project is in line with malaria prevalence trends, as it targets hotspot areas. Stakeholders highlighted the critical role of CCMm in addressing the specific needs of the community by facilitating access to healthcare. Unlike dispensary-based care, where community members must travel to health facilities, often located far from their homes and requiring resources they may lack for transportation, CCMm brings healthcare directly to their homes. This is particularly beneficial for vulnerable groups such as pregnant women, children, and the elderly. Another significant limitation of dispensaries is that they are not always open (for example, they are closed on weekends), they are understaffed (with only two staff per facility), and serve very large areas, resulting in long waiting times. CCMm helps overcome these barriers by enabling early screening of malaria cases and timely treatment, which reduces the transmission window and overall case numbers. A key aspect of the program is the empowerment of CHPs. Beyond receiving training on CCMm, CHPs gain in-depth knowledge about malaria control and prevention, which they use to raise awareness within the community. This is especially important given persistent misconceptions, particularly regarding the use of ITNs, which are often considered unnecessary. The recognition and trust CHPs receive from their communities are also vital to the program's success. This trust stems from the fact that CHPs are elected by the community itself. Most CHPs are women aged 45–50 or

older with a primary school education and an average of over 15 years of experience in their roles. Otambo et al. (2023) found that CHPs are often female, over 52 years of age, with more than ten years of experience, secondary education and more than ten trainings in community health work. Despite differences in educational background, in Kilifi County there is significant alignment with studies carried out in the lakes region in terms of demographic and experiential profiles. Their advanced age and strong ties to the community make them particularly effective in engaging the women and children entrusted to their care, who are particularly vulnerable to malaria, fostering trust and participation in health initiatives.

CCMm is recognized as a coherent intervention as it aligns with national health policies and guidelines, particularly complementing the Universal Health Coverage (UHC) initiative, which aims to make healthcare accessible and affordable for everyone. The service is free, further supporting its affordability. In this regard, CCMm contributes significantly to the achievement of UHC goals. In addition, CCMm is integrated with other services that support the programme. One example is Community Environment Sanitation, which aims to clean stagnant water, remove bushes and tidy up houses to have a healthier environment and reduce mosquito breeding. Another community service is mosquito larvicide during the rainy season and LLIN distribution in July. Another complementary service is the antenatal care provided to pregnant women to ensure the health and well-being of the mother and child. Finally, CCMm is part of an integrated community case management system that also addresses respiratory illnesses, nutrition, and diarrheal diseases, although it is still in the implementation phase.

In terms of efficiency, the common perception is that the human and material resources allocated to this intervention are insufficient to achieve its objectives. Firstly, there is a coverage issue: the ratio is approximately

one CHP for every 200 families on average, which is particularly challenging considering that CHPs must reach community members on foot, often in remote areas. There is a need to allocate additional workforce, as the current number of CHPs is considered insufficient to cover the CHU. Moreover, increased supervision from CHEWs is necessary. Feedback from supervision rounds conducted by project staff revealed that some CHPs struggled with accurately completing registers due to insufficient hands-on practice. On average, it takes a CHP 45 minutes to an hour to record a patient visit. Material resources continue to be a significant concern. The supply of essential commodities, such as RDTs and ACTs, is inadequate to meet demand. This issue is further exacerbated by reliance on a centralized supply chain that provides supplies only three times a year, requiring the sharing of commodities in the event of stock-outs.

The consensus among stakeholders is that CCMm could have a positive impact on malaria control, particularly in reaching hard-to-access communities and reducing the time between symptom onset and treatment, particularly among vulnerable groups such as pregnant women and children under five. The educational component of CCMm also holds promise for long-term social behaviour change. As CHPs educate their communities on malaria prevention and treatment, it is expected that practices such as the use of LLINs and seeking timely treatment will become ingrained in local health practices. By decentralising malaria case management to the community level, the aim is to lighten the workload at the dispensary level, allowing dispensary staff to concentrate their efforts on other types of care. If this happened, one would expect a lower number of suspected, tested and positive malaria cases in the MOH 705AB, 706, 743 dispensary registers and a higher number recorded in the MOH 648

and 521 CHPs registers. Data from November 2024 onwards would be needed to test this hypothesis.

Stakeholders emphasise the need for continued support from the local and county health systems. The long-term sustainability of the project depends on continuous supervision of CHPs and a reliable supply of essential commodities. Without this support, especially with growing populations and limited resources, the programme may find it difficult to maintain its impact.

In conclusion, the insights gathered from various stakeholders reveal that while the CCMm implemented under this project promises clear benefits in terms of accessibility, community engagement, and impact on malaria prevalence, it faces several challenges, including resource shortages and the need for sustained government support if it decides to extend the program to the entire county.

Conclusions

This study began by reviewing the epidemiological trends of malaria at the global, national (Kenya), and county (Kilifi) levels and examining the organization of the Kenyan healthcare system as well as the national guidelines for malaria management, both at healthcare facilities and within communities. National malaria management guidelines stress the importance of testing all suspected cases and beginning treatment immediately when malaria is confirmed; they also identify preventive interventions, including the distribution of treated bed-nets. In some malaria hotspots, a community-based malaria management program is being implemented. Availability of good data is essential to reliably study trends, identify hotspots, and assess the impact of interventions.

Malaria cases in ten “hot-spot” dispensaries in Kilifi County were then analysed to review data quality and assess recent trends at the local level. Data from Ministry of Health dispensary registers, specifically 705AB, 706 and 743, covering 13 months from September 2023 to October 2024 were included in the analysis. Despite being compiled according to national protocols, the registers reveal some issues. A comparative analysis of the registers highlights inconsistencies between the data recorded in the 705AB register (outpatient summary) and the other two registers related to the use of malaria commodities. This is likely due to incomplete recording in Register 705 AB, where outpatient visits are tracked by busy dispensary staff. Data from the other two registers appear to be a more reliable data source. Discrepancies between the number of suspected malaria cases and those tested, as well as between the number of individuals tested and those treated in the early part of the period can be explained by a lack of testing kits at dispensaries, which meant that people with symptoms sought testing elsewhere, but came back to receive their (free) therapy. In general, beyond the particular reasons that may

explain some of the discrepancies, paper-based registers pose challenges in ensuring the availability of high-quality data, as entries are often hard to read and registers can easily get damaged.

Turning to malaria trends, over the 13-month period considered (September 2023 – October 2024) the data show an increasing trend in positive cases over time, largely consistent with seasonal patterns of malaria transmission. The data thus indicate that malaria remains a persistent issue in the coastal area under study, which justifies the implementation of new strategies such as Community Case Management of Malaria (CCMm). CCMm places Community Health Promoters (CHPs) at the core of the program: they conduct visits directly at community households rather than requiring people with symptoms to go to the nearest dispensary, which may be far from the village. If a person shows symptoms, a RDT is conducted and, if it turns positive, the CHP administers the treatment. This strategy helps to reduce the time between the onset of symptoms and treatment, thereby lowering transmissibility and incidence within the community.

CCMm was already implemented in the lake region of Kenya and was introduced for the first time in the coastal region of Kilifi County through "The Net - Community Based Malaria Programme" led by the Kilifi County Health Department with financial support from the Italian Agency for Development Cooperation and implementation support from the NGO World Friends. Initial perspectives gathered from project stakeholders highlight some challenges, such as an erratic supply of RDTs and insufficient human resources. However, they express an initial positive assessment of CCMm implementation in terms of accessibility of care, community involvement, expected impact on malaria prevalence and social behaviour change toward malaria prevention. If this initial application of CCMm proves to have a positive impact on malaria spread

and to be economically sustainable (in terms of the costs of training and mobility of CHPs and potentially of supplies) and manageable in terms of human resources (in other words, if the workload of CHPs remains appropriate), the County Health Department may consider expanding its implementation to all dispensaries. In this respect, the work conducted in this study offers some promising early insights.

References

AICS (2023). Projects #XM-DAC-6-4-012596-01-4 (The Net - Community-Based Malaria Programme) https://openaid.aics.gov.it/LOD/page/Projects/XM-DAC-6-4-012596-01-4 accessed on 08/01/2025

Barasa, E. W., et al. (2021). Indirect health effects of the COVID-19 pandemic in Kenya: A mixed methods assessment. *BMC Health Services Research, 21, 740*. https://doi.org/10.1186/s12913-021-06726-4

County Government of Kilifi. (2023). *Kilifi County Participatory Climate Risk Assessment (PCRA, 2023)*. May 2023.

Development Initiative. (2020). *Kenya's Covid-19 budget: Funding for health and welfare*. devinit.org, July 2020.

Division of National Malaria Programme (DNMP) [Kenya] & ICF. (2021). *Kenya Malaria Indicator Survey 2020*. Nairobi, Kenya and Rockville, Maryland, USA: DNMP and ICF.

Global Fund. (2021). *Fighting Pandemics and Building a Healthier and More Equitable World: Global Fund Strategy (2023-2028)*.

Global Fund. (2022). *Global Fund grants in the Republic of Kenya* (GF-OIG-22-005). Geneva, Switzerland.

Hoi, A. G., N'Tcha, L. K., Duguay, C., Accrombessi, M., Akinro, B., Feng, C., et al. (2024). Health systems impacts of the COVID-19 pandemic on malaria control program implementation and malaria burden in Benin: A mixed-method qualitative and mathematical modelling study. *PLOS Global Public Health*, *4*(2), e0002197. https://doi.org/10.1371/journal.pgph.0002197

Kangoye, D., et al. (2016). Malaria hotspots defined by clinical malaria, asymptomatic carriage, PCR, and vector numbers in a low transmission

area on the Kenyan Coast. *Malaria Journal, 15*, 213. https://doi.org/10.1186/s12936-016-1260-3

Kenyatta University. (2020). *KU makes ventilators*, 11th April 2020. http://www.ku.ac.ke/component/k2/item/1655-k-u-makes-ventilators

Kiriti Ng'ang'a, T. (2021). *Impact of COVID-19 measures on Kenya's health system*. *AERC Working Paper - COVID-19_012*. African Economic Research Consortium, Nairobi.

Ministry of Health Kenya. (2018). *Health Sector Strategic Plan: Transforming Health Systems: Achieving Universal Health Coverage by 2022*, July 2018–June 2023.

Ministry of Health. (2020). *Guidelines for the diagnosis, treatment and prevention of malaria in Kenya* (6th edition, revised). Nairobi, Kenya.

Ministry of Health. (2020). *Kenya Community Health Strategy 2020 - 2025*. Nairobi, Kenya.

Ministry of Health. (2021). *Primary Health Care Network Guidelines*. May 2021.

Ministry of Health. (2023). *Kenya Health Facility Census*. September 2023.

Muga, R., Kizito, M., Mbayah, T., & Gakuruh, R. (2005). Chapter 2: Overview of the health system in Kenya. *In Health Systems in Kenya: The Challenges of Access and Quality of Health Care*.

National Malaria Control Programme (NMCP), Kenya National Bureau of Statistics (KNBS), & ICF International. (2016). *Kenya Malaria Indicator Survey 2015*. NMCP, KNBS, & ICF International.

National Malaria Control Programme, Ministry of Health. (2019). *Kenya Malaria Strategy 2019–2023*. Nairobi, Kenya.

Onsomu, E., Ngugi, R., Kihiu, E., Muleli, M., Gachanja, J., Musamali, R., Lutta, P., Omanyo, D., Chemnyongoi, H., Mwatu, S., Mwongera, N., Odhiambo, P., Musili, B., Nyabaro, V., Kathenge, J., Ngeno, H., & Khaemba, E. (2022). *Socio-Economic Status of Kilifi County with COVID-19*. Kenya Institute for Public Policy Research and Analysis.

Otambo, W. O., Ochwedo, K. O., Omondi, C. J., et al. (2023). Community case management of malaria in Western Kenya: Performance of community health volunteers in active malaria case surveillance. *Malaria Journal, 22*, 83. https://doi.org/10.1186/s12936-023-04523-4

Riley, T., Sully, E., Ahmed, Z., & Biddlecom, A. (2020). Estimates of the potential impact of the COVID-19 pandemic on sexual and reproductive health in low- and middle-income countries. *International Perspectives on Sexual and Reproductive Health, 46*, 73–76. https://doi.org/10.1363/46e9020

Rogerson, S. J., et al. (2020). Identifying and combating the impacts of COVID-19 on malaria. *BMC Medicine, 18*, 239. https://doi.org/10.1186/s12916-020-01710-x

U.S. President's Malaria Initiative (PMI). (2023). *Kenya Malaria Profile* (Last updated: 06/20/2023).

United Nations Development Group. (2011). *Results-Based Management Handbook*. October 2011.

von Seidlein, L., & Knudsen, J. (2016). Malaria epidemiology in Kilifi, Kenya during the 21st century: What next? *PLOS Medicine, 13* (6), e1002048. https://doi.org/10.1371/journal.pmed.1002048

Weiss, D. J., Bhatt, S., Mappin, B., Van Boeckel, T. P., Smith, D. L., Hay, S. I., & Gething, P. W. (2014). Air temperature suitability for *Plasmodium falciparum* malaria transmission in Africa 2000–2012: A high-resolution

spatiotemporal prediction. *Malaria Journal, 13*, 171. https://doi.org/10.1186/1475-2875-13-171

World Health Organization. (2020). *The potential impact of health service disruptions on the burden of malaria: A modelling analysis for countries in sub-Saharan Africa*. Geneva. Licence: CC BY-NC-SA 3.0 IGO.

World Health Organization. (2021). *Global technical strategy for malaria 2016–2030, 2021 update*. Geneva. Licence: CC BY-NC-SA 3.0 IGO.

World Health Organization. (2024). *World malaria report 2024: Addressing inequity in the global malaria response.* Geneva.