IAA Journal of Biological Sciences 13(2):124-128, 2025 www.iaajournals.org
©IAAJOURNALS ISSN:2636-7254
https://doi.org/10.59298/IAAJB/2025/132124128 IAAJB132

# Community-Based Testing Versus Facility-Based Diagnosis for Early Malaria Detection in Rural Populations: An Outcome-Focused Narrative Review

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## ABSTRACT

Malaria continues to be a leading cause of morbidity and mortality in rural regions of sub-Saharan Africa, Southeast Asia, and parts of South America, where timely diagnosis remains a critical yet often unattainable goal due to structural and logistical barriers. This narrative review critically examined the comparative effectiveness of community-based testing (CBT) and facility-based diagnosis (FBD) in achieving early malaria detection in underserved populations. A narrative methodology was utilized to synthesize findings from empirical studies, implementation reports, and program evaluations across diverse endemic settings. The review focused on four core outcome domains: diagnostic timeliness, case detection rates, treatment initiation, and community-level health impact. Findings reveal that CBT, through the deployment of trained community health workers using rapid diagnostic tests, significantly outperforms FBD in reducing diagnostic delays, increasing malaria case detection, and accelerating the initiation of treatment. Moreover, CBT is associated with broader public health benefits, including reductions in severe malaria cases and under-five mortality rates. Despite its demonstrated advantages, CBT faces challenges such as community health workers (CHW) retention, supply chain constraints, and sustainability concerns. Conversely, FBD, while offering procedural rigor, often lacks accessibility in rural contexts. The review concluded by advocating for integrated, outcome-oriented diagnostic strategies that prioritize equity, access, and early intervention to enhance malaria control in rural populations.

**keywords:** Community-Based Testing, Facility-Based Diagnosis, Early Malaria Detection, Rural Health Access, Diagnostic Timeliness.

## INTRODUCTION

Malaria remains a formidable public health burden, particularly in rural and resource-limited settings across sub-Saharan Africa, Southeast Asia, and parts of South America [1–3]. The World Health Organization (WHO) reports that early detection and prompt treatment are central to reducing malaria-related morbidity and mortality [4]. However, geographic, infrastructural, and socioeconomic barriers significantly hinder timely access to diagnostic services in rural areas. Facility-based diagnosis (FBD), traditionally the gold standard in malaria detection, typically involves patients traveling to health centers equipped with microscopy or rapid diagnostic tests (RDTs). While effective in theory, this model often fails in practice due to delayed presentation, healthcare worker shortages, and logistic constraints.

In response, community-based testing (CBT) models have emerged as a pragmatic alternative [5]. CBT deploys trained community health workers (CHWs) equipped with RDTs directly into communities, thereby extending the reach of diagnostic services to remote populations [6]. This approach not only shortens the time from symptom onset to diagnosis but also enhances treatment initiation rates and reduces the risk of severe disease progression and transmission.

This narrative review evaluates and contrasts the effectiveness of CBT and FBD in facilitating early malaria detection in rural populations. Drawing from empirical studies, program evaluations, and implementation research, the review synthesizes outcomes across four key domains: diagnostic timeliness, case detection rates, treatment



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initiation, and community-level health impact. In addition, it explores the operational challenges and enabling factors that influence the success of each model. The aim is to provide evidence-based insights that can guide public health policy, resource allocation, and implementation strategies tailored to endemic rural settings. Ultimately, this review advocates for an outcome-oriented approach that prioritizes timely diagnosis, equitable access, and sustainable delivery models. As malaria eradication efforts intensify, optimizing detection strategies in underserved regions will be paramount to achieving global health targets.

## Historical Overview and Diagnostic Paradigms

Malaria diagnosis has historically relied on facility-based microscopy, considered the definitive standard for species identification and parasite quantification [7, 8]. However, the logistics of maintaining microscopy infrastructure, coupled with the need for skilled personnel, limits its applicability in rural settings. The advent of rapid diagnostic tests (RDTs) in the early 2000s transformed malaria detection by providing a point-of-care solution with minimal training requirements.

Facility-based diagnosis gained institutional support for its controlled environments, procedural standardization, and integration into broader healthcare services [9]. However, its reliance on patient self-referral to health centers presents significant access barriers in rural communities, where distances to facilities can exceed 10 km, and transport may be unavailable or unaffordable.

Community-based testing emerged as a response to these access inequities. Programs such as integrated community case management (iCCM) trained CHWs to use RDTs and administer first-line antimalarials [10]. The decentralization of diagnostic capacity redefined healthcare delivery by bringing services closer to the point of need. Over time, this model gained empirical validation and policy endorsement as a viable strategy for improving early detection.

## Diagnostic Timeliness

Timely diagnosis is a critical determinant of malaria outcomes, particularly in children and pregnant women who face higher morbidity and mortality risks [11, 12]. Studies have consistently demonstrated that CBT significantly reduces the time between symptom onset and diagnostic confirmation compared to FBD.

In rural Uganda, a randomized evaluation found that households with access to CHWs reported diagnostic intervals of less than 24 hours in over 80% of febrile episodes, compared to just 45% in facility-dependent households. Similar findings were reported in Burkina Faso and Zambia, where CHW-based interventions led to earlier treatment-seeking behavior and reduced progression to severe malaria.

The proximity of CHWs, their familiarity with community members, and their availability outside of standard facility hours contribute to the observed improvements in diagnostic timeliness [13]. Conversely, FBD often results in diagnostic delays due to travel time, facility congestion, and inconsistent staffing.

## Case Detection Rates

CBT has demonstrated superior performance in identifying malaria cases within underserved populations [14]. Because CHWs actively engage in outreach and education, they often detect cases that would otherwise go unreported due to geographic isolation or socio-cultural barriers.

Evidence from Ethiopia's Health Extension Program revealed that malaria case detection nearly doubled in intervention districts utilizing CBT compared to FBD-only districts. In Nigeria, community-directed interventions in hard-to-reach areas led to a 30% increase in confirmed malaria diagnoses over a six-month period [15].

Facility-based models, by contrast, suffer from passive surveillance and selective attendance, whereby only the most symptomatic or resource-equipped individuals seek care. This contributes to underreporting and hampers accurate disease burden estimation, especially in remote regions.

## Treatment Initiation and Adherence

Beyond diagnosis, timely initiation of effective antimalarial therapy is essential for reducing disease severity and transmission [16]. CBT models show clear advantages in expediting treatment initiation, as CHWs often provide immediate treatment following a positive diagnosis.

A multi-country analysis of iCCM programs in Malawi, Mozambique, and the Democratic Republic of Congo demonstrated that 85-92% of RDT-positive individuals received treatment within 24 hours under CBT schemes. In contrast, FBD settings reported lower rates due to delays in drug dispensing, stock-outs, and long wait times.

Moreover, CHWs play a crucial role in educating patients about medication adherence and follow-up, particularly among populations with limited health literacy [17]. Their continuous presence within the community allows for follow-up visits, enhancing adherence and identifying treatment failures.


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## Community-Level Health Impact

The broader health impact of CBT is reflected in population-level reductions in malaria morbidity and mortality. Longitudinal studies indicate that CBT implementation is associated with decreases in severe malaria cases, hospitalizations, and all-cause under-five mortality.

In Sierra Leone, deployment of CHWs with RDTs in rural chiefdoms led to a 35% reduction in under-five malaria mortality within two years [18]. In Tanzania, communities served by CHWs showed a sustained decline in malaria prevalence as measured by community-wide surveys.

By contrast, FBD models often fail to achieve comparable impact in rural areas due to limited coverage and delayed case management [19]. While facility settings may offer higher diagnostic accuracy in ideal conditions, their population-level effectiveness is constrained by low accessibility.

## Operational Challenges and Enablers

Despite its benefits, CBT faces several implementation challenges, including CHW retention, supervision, and supply chain logistics. Ensuring consistent availability of RDTs and antimalarial drugs remains a recurrent hurdle. Furthermore, CHWs require regular training, performance monitoring, and motivational incentives to sustain quality care [20].

Community trust and engagement are critical enablers of CBT success [21]. Programs with strong community ownership, participatory planning, and alignment with local health systems tend to perform better. Integration with national malaria control strategies and electronic reporting tools can also enhance scalability and accountability.

FBD, while logistically centralized, is similarly affected by staffing shortages, stock-outs, and infrastructural limitations. However, its integration into broader health systems allows for co-management of comorbidities and referral of complicated cases.

## Policy Implications and Strategic Recommendations

Policy frameworks should prioritize the expansion of CBT as a frontline strategy for early malaria detection in rural settings [22, 23]. National malaria control programs should allocate resources toward CHW training, logistical support, and supply chain optimization. Additionally, performance-based incentives and community health financing mechanisms can enhance program sustainability.

Hybrid models that leverage both CBT and FBD such as task-shifting diagnostics to CHWs while maintaining referral pathways for severe cases offer a balanced approach. Investment in mobile health technologies can further bridge communication gaps between CHWs and formal health facilities, enabling data-driven decision-making and real-time surveillance.

Strategic use of CBT can also facilitate outbreak response, targeted interventions during seasonal peaks, and delivery of integrated health services including immunizations and maternal care.

## CONCLUSION

In conclusion, community-based testing offers substantial advantages over facility-based diagnosis in the early detection and management of malaria in rural populations. Its capacity to reduce diagnostic delays, increase case detection, improve treatment initiation, and enhance community health outcomes positions it as an indispensable strategy in malaria control. While facility-based diagnosis remains vital for managing severe cases and ensuring diagnostic accuracy, its limitations in accessibility and timeliness underscore the need for complementary CBT approaches. Operational challenges in CBT can be mitigated through strategic investments, robust policy frameworks, and community engagement. As global health initiatives aim for malaria elimination, a shift toward decentralized, community-centered diagnostic models will be essential. Embracing CBT not only advances health equity but also accelerates progress toward universal health coverage and Sustainable Development Goals.

## REFERENCES

1. Alum, E.U., Ugwu, O.P.-C., Egba, S.I., Uti, D.E., Alum, B.N.: Climate Variability and Malaria Transmission: Unraveling the Complex Relationship. INOSR Scientific Research. 11, 16–22 (2024). https://doi.org/10.59298/INOSRSR/2024/1.1.21622
2. Ogbonnia Egwu, C., Aloke, C., Chukwu, J., Agwu, A., Alum, E.U., Tsamesidis, I., M Aja, P., E Offor, C., Ajuka Obasi, N.: A world free of malaria: It is time for Africa to actively champion and take leadership of elimination and eradication strategies. Afr Health Sci. 22, 627–640 (2022). https://doi.org/10.4314/ahs.v22i4.68
3. Elimination, T. malERA R.C.P. on T. for M.: malERA: An updated research agenda for diagnostics, drugs, vaccines, and vector control in malaria elimination and eradication. PLoS Med. 14, e1002455 (2017). https://doi.org/10.1371/JOURNAL.PMED.1002455



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4. Omary, H., Chombo, S., Luoga, P., Mbishi, J.V., Paulo, H.A., Andrew, J., Zacharia, A., Addo, I.Y.: Towards promoting timely treatment: Uncovering the determinants of prompt malaria care seeking behavior among febrile children under-five years in Tanzania. PLoS One. 20, e0319913 (2025). https://doi.org/10.1371/JOURNAL.PONE.0319913
5. Mayaka, M., Croy, W.G., Wolfram Cox, J.: A dimensional approach to community-based tourism: Recognising and differentiating form and context. Ann Tour Res. 74, 177–190 (2019). https://doi.org/10.1016/J.ANNALS.2018.12.002
6. Skjefte, M., Cooper, S., Poyer, S., Lourenço, C., Smedinghoff, S., Keller, B., Wambua, T., Oduor, C., Frade, S., Waweru, W.: Use of a health worker-targeted smartphone app to support quality malaria RDT implementation in Busia County, Kenya: A feasibility and acceptability study. PLoS One. 19, e0295049 (2024). https://doi.org/10.1371/JOURNAL.PONE.0295049
7. Alum, E. U., Tufail, T., Agu, P. C., Akinloye, D. I., & Obaroh, I. O. Malaria pervasiveness in Sub-Saharan Africa: Overcoming the scuffle. *Medicine*, *103*(49), e40241. (2024) doi: 10.1097/MD.0000000000040241. PMID: 39654176
8. Thwing, J., Ba, F., Diaby, A., Diedhiou, Y., Sylla, A., Sall, G., Diouf, M.B., Gueye, A.B., Gaye, S., Ndiop, M., Cisse, M., Ndiaye, D., Ba, M.: Assessment of the utility of a symptom-based algorithm for identifying febrile patients for malaria diagnostic testing in Senegal. Malar J. 16, 1–11 (2017). https://doi.org/10.1186/S12936-017-1750-Y/TABLES/4
9. Alamsyah, A., Setiawan, I.P.S.: Enhancing privacy and traceability of public health insurance claim system using blockchain technology. Frontiers in Blockchain. 8, 1474434 (2025). https://doi.org/10.3389/FBLOC.2025.1474434/BIBTEX
10. Guenther, T., Sadruddin, S., Finnegan, K., Wetzler, E., Ibo, F., Rapaz, P., Koepsell, J., Khan, I.U.H., Amouzou, A.: Contribution of community health workers to improving access to timely and appropriate case management of childhood fever in Mozambique. J Glob Health. 7, 010402 (2017). https://doi.org/10.7189/JOGH.07.010402
11. Kungu, E., Inyangat, R., Ugwu, O.P.C. and Alum, E. U. Exploration of Medicinal Plants Used in the Management of Malaria in Uganda. Newport International Journal Of Research In Medical Sciences 4(1):101-108. (2023).
12. Alum, E. U. Phytochemicals in Malaria Treatment: Mechanisms of Action and Clinical Efficacy. KIU J. Health Sci., 4(2):71-84. (2024). https://doi.org/10.59568/KJHS-2024-4-2-06.
13. Guenther, T., Sadruddin, S., Finnegan, K., Wetzler, E., Ibo, F., Rapaz, P., Koepsell, J., Khan, I.U.H., Amouzou, A.: Contribution of community health workers to improving access to timely and appropriate case management of childhood fever in Mozambique. J Glob Health. 7, 010402 (2017). https://doi.org/10.7189/JOGH.07.010402
14. Singh Brar Id, A., Hedt-Gauthier, B.L., Hirschhorn, L.R., Jai, M., Maternal, K., Centre, C.H.: Mixed Methods Lot Quality Assurance Sampling: A novel, rapid methodology to inform equity focused maternal health programming in rural Rajasthan, India. PLoS One. 16, e0250154 (2021). https://doi.org/10.1371/JOURNAL.PONE.0250154
15. Ajayi, I.O., Oyewole, O.E., Ogah, O.S., Akinyemi, J.O., Salawu, M.M., Bamgboye, E.A., Obembe, T.A., Olawuwo, M., Sani, M.: Development and evaluation of a package to improve hypertension control in Nigeria [DEPIHCON]: study protocol for a cluster randomized controlled trial. (2021). https://doi.org/10.21203/RS.3.RS-917452/V1
16. Bastaki, H., Carter, J., Marston, L., Cassell, J., Rait, G.: Time delays in the diagnosis and treatment of malaria in non-endemic countries: A systematic review. Travel Med Infect Dis. 21, 21–27 (2018). https://doi.org/10.1016/J.TMAID.2017.12.002
17. Justvig, S.P., Li, J., Caravella, G., Chen, M., Wang, H., Benz Scott, L.A., Pati, S.: Improving Adherence to Care Recommendations Using a Community Health Worker (CHW) Intervention with the Pediatric Medical Home. J Community Health. 42, 444–452 (2017). https://doi.org/10.1007/S10900-016-0275-6/METRICS
18. Ishizumi, A., Sutton, R., Mansaray, A., Parmley, L., Eleeza, O., Kulkarni, S., Sesay, T., Conklin, L., Wallace, A.S., Akinjeji, A., Toure, M., Lahuerta, M., Jalloh, M.F.: Community Health Workers' Experiences in Strengthening the Uptake of Childhood Immunization and Malaria Prevention Services in Urban Sierra Leone. Front Public Health. 9, 767200 (2021). https://doi.org/10.3389/FPUBH.2021.767200/BIBTEX
19. Ntawukuriryayo, J.T., VanderZanden, A., Amberbir, A., Teklu, A., Huda, F.A., Maskey, M., Sall, M., Garcia, P.J., Subedi, R.K., Sayinzoga, F., Hirschhorn, L.R., Binagwaho, A.: Inequity in the face of success:

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understanding geographic and wealth-based equity in success of facility-based delivery for under-5 mortality reduction in six countries. BMC Pediatr. 23, 1–12 (2024). https://doi.org/10.1186/S12887-023-04387-2/TABLES/3
20. Ndambo, M.K., Munyaneza, F., Aron, M.B., Nhlema, B., Connolly, E.: Qualitative assessment of community health workers' perspective on their motivation in community-based primary health care in rural Malawi. BMC Health Serv Res. 22, 1–13 (2022). https://doi.org/10.1186/S12913-022-07558-6/FIGURES/1
21. Klim-Conforti, P., Levitt, A.J., Cheung, A.H., Loureiro, R., Fefergrad, M., Schaffer, A., Niederkrotenthaler, T., Sinyor, M., Zaheer, J.: Youth voices and experiences regarding a school-based cognitive behavioral therapy skills intervention: lessons for future engagement and adaptation. BMC Public Health. 22, 1–14 (2022). https://doi.org/10.1186/S12889-022-14058-Z/FIGURES/2
22. Ridley, M., Rao, G., Schilbach, F., Patel, V.: Poverty, depression, and anxiety: Causal evidence and mechanisms. Science (1979). 370, (2020). https://doi.org/10.1126/SCIENCE.AAY0214/SUPPL_FILE/SCIENCE.AAY0214_SM.V1.PDF
23. Monteiro, N.M.: Addressing Mental Illness in Africa: Global Health Challenges and Local Opportunities. Community Psychology in Global Perspective CPGP. 1, 78–95

**CITE AS: Winniefred Nankya (2025). Community-Based Testing Versus Facility-Based Diagnosis for Early Malaria Detection in Rural Populations: An Outcome-Focused Narrative Review. IAA Journal of Biological Sciences 13(2):124-128. https://doi.org/10.59298/IAAJB/2025/132124128**


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