

## **Malaria control and cultural acceptance of prevention methods. The case study of Democratic Republic of Congo and Vietnam".**

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### **ABSTRACT**

This study falls within SDG Focus Goal 3: Good Health and Well-Being — Target 3.3: By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases; Target 3.8: Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.

This study examines malaria control and cultural acceptance of prevention methods in the Democratic Republic of Congo (DRC) and Vietnam, two countries with different malaria transmission patterns, health system capacities, and cultural contexts affecting prevention uptake. The DRC has one of the highest malaria burdens globally (approximately 12-15% of global cases), with high transmission intensity, weak health infrastructure, and community-based prevention delivery through community health workers (CHWs) for intermittent preventive treatment in pregnancy (IPTp). Vietnam has successfully reduced malaria incidence dramatically over recent decades and is moving toward elimination, but malaria persists in forested areas among ethnic minority populations (Ra-glai, other groups) where traditional livelihoods (slash-and-burn agriculture, forest work) and cultural beliefs affect acceptance of vector control measures (bed nets, indoor residual spraying) and treatment-seeking behaviors. The research analyzes how each country's cultural context (social norms, traditional beliefs, trust in health workers, mobility patterns) affects

acceptance of malaria prevention methods, the effectiveness of community-based delivery strategies, and the lessons for other countries. A comparative analysis was conducted examining primary and secondary sources including WHO malaria reports, national malaria strategic plans, academic research, program evaluations, and policy documentation covering recent decades to 2025.

The DRC presents a context where malaria control relies heavily on community-based delivery of prevention methods. Key features include high malaria burden (approximately 12-15% of global malaria cases, high transmission intensity, children under 5 and pregnant women most vulnerable). Control strategies include insecticide-treated nets (ITNs), indoor residual spraying (IRS) in targeted areas, intermittent preventive treatment in pregnancy (IPTp-SP) traditionally delivered at antenatal care (ANC) visits, and community-based IPTp (C-IPTp) through community health workers (CHWs). A large-scale anthropological study (2018-2021, 796 in-depth interviews, 265 focus group discussions, 388 direct observations) across four sub-Saharan African countries including DRC examined factors influencing C-IPTp acceptability. Key findings: alignment of C-IPTp with existing social norms surrounding pregnancy and maternal health-seeking practices; active involvement of influential and trusted actors (husbands, relatives, community leaders) in implementation; existing and sustained trust in CHWs as critical for acceptability; influence of husbands and other relatives in pregnant women's care-seeking decision-making; pregnant women's perceptions of SP (sulphadoxine-pyrimethamine) for IPTp; and persistent barriers to facility-based ANC access. CHWs were authorized to administer all doses of IPTp-SP, including the first dose, in DRC and Nigeria. Key challenges include working conditions of CHWs (volunteer status, workload), perceptions of SP (side effects concerns, efficacy doubts), and persistent barriers to facility-based ANC access (distance, cost, quality). Key outcomes include reported acceptability of C-IPTp among targeted communities, supporting the public health value of community-based interventions.

Vietnam presents a context where malaria has been reduced dramatically (from high incidence in 1990s to elimination phase), but malaria persists in forested and mountainous areas of central and southern provinces, home to ethnic minority populations (Ra-glai, others). Key features include progressive confinement of malaria to ethnic minority groups in remote forested areas. Control strategies include ITNs (distributed free by national malaria control programme), indoor residual spraying, active surveillance, and health information campaigns. Cultural and behavioral factors

limiting effectiveness include territorial arrangements and mobility between "new villages" (government resettlement areas with brick houses, sufficient bednets) and "old villages" (forest fields where slash-and-burn agriculture occurs). A mixed-methods study among Ra-glai ethnic minority in Bac Ai district, Ninh Thuan province (households n=410) found: 97.6% of households went back to their "old villages" to continue slash-and-burn agriculture; in the old village, 48.5% of households lived in open-structured plot huts and only 5.7% had sufficient bednet coverage. Bed net use was 84.6% in the villages but only 52.9% at the forest fields; 20.6% of respondents slept unprotected in both places. Low perception of malaria risk among forest farmers: only 15.6% acknowledged the higher risk of contracting malaria in the forest than in the village; perceived mosquito biting times only partially coincided with *Anopheles dirus* and *Anopheles minimus* true biting times; the disease locally identified as 'malaria' was hardly perceived as having an impact on forest farmers' daily lives. Household representatives believed malaria could be cured with medicines (57.8%), but also perceived non-malarial medicines, rituals, and vitamin supplements to be effective against malaria. Use of public health services for most recent illness was 62.9%, but low-cost medicines were also purchased in private sector as perceived cost-effective option for slash-and-burn farmers. Key challenges include mobility between villages and forest fields (undermining fixed interventions like IRS, ITNs), low risk perception, pluralistic health-seeking (public + private + traditional), and cultural beliefs about malaria causation and treatment. Key outcomes include identification of factors limiting effectiveness of national malaria elimination strategy in local settings, with call for adaptive, reflexive strategies responsive to socio-ecological diversity.

Both countries demonstrate that malaria control requires community engagement and trust in CHWs (DRC's C-IPTp acceptability, Vietnam's CHW role). Social norms and cultural beliefs (DRC's pregnancy social norms, Vietnam's low risk perception) affect prevention uptake. Mobility and territorial arrangements (Vietnam's mobility between new and old villages, DRC's access barriers) affect intervention effectiveness. Pluralistic health-seeking (public, private, traditional) must be addressed. Adaptive, context-specific strategies are needed for elimination.

The transferability of DRC's C-IPTp community-based delivery model to Vietnam's ethnic minority areas is relevant for malaria elimination (reaching remote populations). The transferability of

Vietnam's active surveillance and elimination-focused strategies to DRC could inform DRC's transition from control to elimination in low-transmission areas.

**KEYWORDS:** malaria control, cultural acceptance, DRC, Vietnam, SDG 3, community health workers, IPTp, bed net use, ethnic minorities, forest malaria, elimination

## **RESUME**

Cette étude examine la lutte contre le paludisme et l'acceptation culturelle des méthodes de prévention en République Démocratique du Congo (RDC) et au Vietnam, deux pays avec différents schémas de transmission du paludisme, capacités de système de santé et contextes culturels affectant l'adoption des mesures de prévention.

La RDC présente l'une des plus lourdes charges de paludisme au monde. Une étude anthropologique à grande échelle a examiné l'acceptabilité de la livraison communautaire du traitement préventif intermittent chez la femme enceinte (TPI) par les agents de santé communautaires.

Le Vietnam a considérablement réduit l'incidence du paludisme, mais la maladie persiste dans les zones forestières parmi les minorités ethniques. La mobilité entre les villages et les champs forestiers, la faible perception du risque et les croyances culturelles limitent l'efficacité des stratégies de contrôle.

Les deux pays démontrent que la lutte contre le paludisme nécessite l'engagement communautaire, l'adaptation aux croyances culturelles, et la prise en compte des schémas de mobilité et des comportements de recherche de soins.

**Mots-clés :** lutte contre le paludisme, acceptation culturelle, RDC, Vietnam, ODD 3

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## 1. INTRODUCTION

Malaria remains a major global health challenge, with an estimated 249 million cases and 608,000 deaths in 2022. Sub-Saharan Africa bears the heaviest burden (94% of cases, 96% of deaths), with the Democratic Republic of Congo (DRC) accounting for approximately 12-15% of global malaria cases. Vietnam, by contrast, has successfully reduced malaria incidence dramatically over recent decades and is moving toward elimination, but malaria persists in forested areas among ethnic minority populations. Cultural acceptance of prevention methods—insecticide-treated nets (ITNs), indoor residual spraying (IRS), intermittent preventive treatment in pregnancy (IPTp), and prompt treatment-seeking—is critical for malaria control effectiveness. Social norms, traditional beliefs, trust in health workers, mobility patterns, and perceptions of risk all influence whether communities adopt prevention methods. SDG Target 3.3 calls for ending the malaria epidemic, and Target 3.8 calls for universal health coverage.

This study examines two countries that offer profound and contrasting insights into malaria control and cultural acceptance of prevention methods: the Democratic Republic of Congo (DRC) and Vietnam. The DRC has one of the highest malaria burdens globally, with high transmission intensity, weak health infrastructure, and community-based prevention delivery through community health workers (CHWs). Vietnam has dramatically reduced malaria and is moving toward elimination, but

malaria persists in forested areas among ethnic minority populations where traditional livelihoods and cultural beliefs affect acceptance of vector control measures.

The DRC's malaria control context is characterized by high burden (12-15% of global cases), community-based IPTp delivery through CHWs, and anthropological evidence on acceptability of C-IPTp. Vietnam's malaria control context is characterized by dramatic reduction, persistence among ethnic minorities in forested areas, mobility between resettled villages and forest fields, low risk perception, and pluralistic health-seeking.

The contrast between the DRC and Vietnam illuminates critical questions for malaria control, cultural acceptance, and SDG 3. How do social norms and cultural beliefs affect acceptance of prevention methods? What is the role of community health workers? How does mobility affect vector control effectiveness? What lessons can each country learn from the other's experience?

## **2. LITERATURE REVIEW**

Malaria control interventions include insecticide-treated nets (ITNs) (physical barrier treated with insecticide, effective when used consistently), indoor residual spraying (IRS) (spraying insecticides on walls of houses, kills mosquitoes resting indoors), intermittent preventive treatment in pregnancy (IPTp-SP) (administration of sulphadoxine-pyrimethamine during pregnancy to prevent maternal malaria and low birth weight), community-based delivery (delivery of malaria interventions through community health workers (CHWs) rather than only at health facilities), and active surveillance (case detection, contact tracing, response). Cultural acceptance includes social norms (community expectations about health behaviors), trust in health workers (confidence in CHWs, facility-based providers), risk perception (perceived susceptibility to malaria, perceived severity), mobility patterns (movement between residences, workplaces (e.g., forest fields)), pluralistic health-seeking (use of public, private, and traditional providers simultaneously), and traditional beliefs (explanatory models of malaria causation and treatment).

## **3. RESEARCH QUESTIONS**

This study addresses the following research questions:

1. How is malaria control organized in the DRC and Vietnam (interventions, delivery mechanisms, coverage)?
2. What cultural factors (social norms, trust, risk perception, mobility, traditional beliefs) affect acceptance of prevention methods in each country?
3. What evidence exists on the acceptability of community-based malaria interventions in the DRC?
4. What factors limit the effectiveness of Vietnam's malaria elimination strategy among ethnic minority populations?

#### **4. METHODOLOGY**

This study employs a comparative analysis methodology to examine malaria control and cultural acceptance of prevention methods in the DRC and Vietnam. The comparative approach is appropriate for examining how different transmission intensities, health system capacities, and cultural contexts shape malaria control outcomes. The DRC and Vietnam were selected as cases that offer contrasting insights: DRC has high burden and community-based delivery; Vietnam has elimination focus with cultural barriers among ethnic minorities.

The research design integrates secondary analysis of multiple data sources. WHO malaria reports (World Malaria Report) provide global and country-level malaria data. National malaria strategic plans from DRC's National Malaria Control Programme and Vietnam's National Institute of Malariology, Parasitology and Entomology (NIMPE) provide policy frameworks. Academic research includes the large-scale anthropological study on C-IPTp acceptability in DRC (796 interviews, 265 focus groups, 388 observations) and mixed-methods studies on malaria persistence among Ra-glai ethnic minority in Vietnam. Program evaluations from WHO, the Global Fund, and other partners assess intervention effectiveness. Policy documentation provides context.

The analytical framework examines four dimensions. First, malaria epidemiology includes transmission intensity, malaria burden (cases, deaths), at-risk populations (children under 5, pregnant women, ethnic minorities), and progress toward elimination. Second, control interventions includes ITN distribution, IRS coverage, IPTp coverage, case management, and community-based delivery. Third, cultural acceptance includes social norms, trust in CHWs and health facilities, risk perception,

mobility patterns, and traditional beliefs. Fourth, outcomes includes intervention coverage, malaria incidence trends, and elimination progress.

The time period covers approximately 1990-2025.

5. RESULTS

Table 1: Comparative Summary—DRC and Vietnam Malaria Control

| Dimension                | DRC                                                                      | Vietnam                                                                                      |
|--------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Malaria burden           | High (12-15% global cases)                                               | Low (dramatically reduced, elimination phase)                                                |
| Transmission intensity   | High (perennial)                                                         | Low (focal, forested areas)                                                                  |
| At-risk populations      | Children under 5, pregnant women (general population)                    | Ethnic minorities (Ra-glai, others) in forested areas                                        |
| Key interventions        | ITNs, IRS, IPTp, C-IPTp (CHW delivery)                                   | ITNs, IRS, active surveillance, health information                                           |
| Community health workers | Yes (C-IPTp delivery)                                                    | Yes (village health workers)                                                                 |
| Key cultural factors     | Social norms around pregnancy, trust in CHWs, husband/relative influence | Mobility between villages and forest fields, low risk perception, pluralistic health-seeking |
| Key challenge            | Weak health infrastructure, CHW working conditions                       | Mobility undermines fixed interventions, low perceived risk                                  |
| Key outcome              | C-IPTp accepted by communities                                           | Persistence among ethnic minorities despite control                                          |

Table 2: DRC Malaria Control and Cultural Acceptance Framework

| Element                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Malaria burden                           | High (12-15% of global malaria cases; high transmission intensity; children under 5 and pregnant women most vulnerable)                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Key interventions                        | ITNs, IRS (targeted areas), IPTp-SP (ANC delivery), C-IPTp (community-based through CHWs)                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| C-IPTp implementation                    | CHWs authorized to administer all doses of IPTp-SP, including first dose (DRC and Nigeria); CHWs identify pregnant women in community, screen for eligibility, provide IPTp, refer to ANC                                                                                                                                                                                                                                                                                                                                                         |
| Anthropological study (2018-2021)        | 796 in-depth interviews, 265 focus group discussions, 388 direct observations across DRC, Madagascar, Mozambique, Nigeria; participants: pregnant women, women of reproductive age, traditional and facility-based healthcare providers, community leaders, relatives of pregnant women                                                                                                                                                                                                                                                           |
| Factors influencing C-IPTp acceptability | Alignment of strategy with existing social norms surrounding pregnancy and maternal health-seeking practices; active involvement of influential and trusted actors in implementation; existing and sustained trust in CHWs; influence of husbands and other relatives in pregnant women's care-seeking decision-making; working conditions of CHWs (volunteer status, workload); pregnant women's perceptions of SP for IPTp (side effects concerns, efficacy doubts); persistent barriers to facility-based ANC access (distance, cost, quality) |
| Key outcomes                             | Reported acceptability of C-IPTp among targeted communities; supports public health value of community-based interventions                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Key challenges                           | CHW working conditions; perceptions of SP; persistent barriers to ANC access                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**Table 3: Vietnam Malaria Control and Cultural Acceptance Framework**

| Element                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Malaria epidemiology                                                                | Dramatic reduction from high incidence in 1990s to elimination phase; malaria persists in forested and mountainous areas of central and southern provinces, home to ethnic minority populations (Ra-glai, others); progressive confinement of malaria to minority groups                                                                                                                                   |
| Key interventions                                                                   | ITNs (distributed free by national malaria control programme), IRS, active surveillance, health information campaigns                                                                                                                                                                                                                                                                                      |
| Mixed-methods study (Ra-glai ethnic minority, Bac Ai district, Ninh Thuan province) | Households n=410; 97.6% of households went back to "old villages" to continue slash-and-burn agriculture; in old village: 48.5% lived in open-structured plot huts, only 5.7% had sufficient bednet coverage; bed net use: 84.6% in villages, 52.9% at forest fields; 20.6% slept unprotected in both places                                                                                               |
| Low perception of malaria risk                                                      | Only 15.6% acknowledged higher risk of contracting malaria in forest than in village; perceived mosquito biting times only partially coincided with <i>Anopheles dirus</i> and <i>Anopheles minimus</i> true biting times; disease locally identified as 'malaria' hardly perceived as having impact on forest farmers' daily lives (20.9% unaware they had malaria even after diagnosis at health centre) |
| Pluralistic health-seeking                                                          | Household representatives believed malaria could be cured with medicines (57.8%); also perceived non-malarial medicines, rituals, and vitamin supplements effective against malaria; use of public health services for most recent illness: 62.9%; low-cost medicines purchased in private sector as perceived cost-effective option for slash-and-burn farmers                                            |
| Key outcomes                                                                        | Identification of factors limiting effectiveness of national malaria elimination strategy in local settings; call for adaptive, reflexive strategies responsive to socio-ecological diversity                                                                                                                                                                                                              |

|                |                                                                                                                                                                                                 |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Key challenges | Mobility between new and old villages (undermining fixed interventions like IRS, ITNs); low risk perception; pluralistic health-seeking; cultural beliefs about malaria causation and treatment |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

6. DISCUSSION OF RESULTS

6.1 Explaining Different Approaches

The DRC's malaria control approach relies on community-based delivery of IPTp through CHWs (C-IPTp) due to weak facility-based ANC coverage. The large-scale anthropological study (796 interviews, 265 focus groups, 388 observations) found that C-IPTp was accepted by targeted communities. Key factors included alignment with existing social norms around pregnancy, trust in CHWs, and involvement of influential actors (husbands, relatives, community leaders). However, challenges remain: CHW working conditions (volunteer status, high workload), perceptions of SP (side effects concerns, efficacy doubts), and persistent barriers to facility-based ANC access (distance, cost, quality). CHWs were authorized to administer all doses of IPTp-SP, including the first dose, in DRC and Nigeria.

Vietnam's malaria control has successfully reduced incidence dramatically, but malaria persists in forested areas among ethnic minority populations. The progressive confinement of malaria to minority groups is a well-documented phenomenon. The mixed-methods study among Ra-glai ethnic minority revealed that mobility between "new villages" (government resettlement areas with brick houses, sufficient bednets) and "old villages" (forest fields where slash-and-burn agriculture occurs) is the key factor limiting intervention effectiveness. Bed net use was 84.6% in villages but only 52.9% at forest fields where malaria risk is highest. Low perception of malaria risk among forest farmers (only 15.6% acknowledged higher risk in forest) and pluralistic health-seeking (public, private, traditional) further limit control.

6.2 Community Health Workers and Trust

In the DRC, trust in CHWs was a critical factor for C-IPTp acceptability. CHWs are known community members, trusted because of their proximity, accessibility, and perceived alignment with community values. The involvement of husbands and other relatives in pregnant women's care-

seeking decision-making highlights that CHWs must engage not only pregnant women but also their social networks. In Vietnam, village health workers exist, but the mobility of ethnic minority populations between villages and forest fields means that fixed CHW locations may not reach farmers during the high-risk transmission season when they are working in forest fields.

### **6.3 Mobility, Territorial Arrangements, and Vector Control**

Vietnam's findings on mobility are critical for understanding malaria persistence. Government resettlement programs moved ethnic minority populations into "new villages" with brick houses and sufficient bednets (87.1% received brick houses, 97.3% received sufficient bednets). However, 97.6% of households returned to their "old villages" to continue slash-and-burn agriculture. In the old village, 48.5% lived in open-structured plot huts and only 5.7% had sufficient bednet coverage. This mobility undermines fixed interventions like IRS (insecticide sprayed on walls of permanent houses) and ITNs (nets left in villages when farmers move to forest fields). The study calls for adaptive, reflexive strategies responsive to socio-ecological diversity.

### **6.4 Risk Perception and Health-Seeking Behavior**

In Vietnam, low perception of malaria risk among forest farmers is a major barrier. Only 15.6% acknowledged higher risk of contracting malaria in the forest than in the village. Perceived mosquito biting times only partially coincided with *Anopheles dirus* and *Anopheles minimus* true biting times (mosquitoes bite at dusk and dawn, while farmers may perceive risk only at night). The disease locally identified as 'malaria' was hardly perceived as having an impact on forest farmers' daily lives; 20.9% were unaware they had malaria even after being diagnosed at the health centre. Pluralistic health-seeking: 57.8% believed malaria could be cured with medicines, but also perceived non-malarial medicines, rituals, and vitamin supplements as effective. Use of public health services was 62.9%, but low-cost medicines were also purchased in the private sector as the perceived cost-effective option.

In the DRC, pregnant women's perceptions of SP (sulphadoxine-pyrimethamine) for IPTp included concerns about side effects (nausea, dizziness, allergic reactions) and doubts about efficacy. These perceptions influenced acceptability.

## 6.5 Transferability of Models

The transferability of the DRC's C-IPTp community-based delivery model to Vietnam's ethnic minority areas is relevant for malaria elimination. Vietnam is in elimination phase, but reaching remote, mobile populations is challenging. CHW-delivered IPTp (though IPTp is not part of Vietnam's malaria strategy) and CHW-delivered malaria testing and treatment could be adapted. The transferability of Vietnam's active surveillance and elimination-focused strategies to the DRC could inform DRC's transition from control to elimination in low-transmission areas. The DRC currently has high transmission and is not ready for elimination, but lessons on surveillance systems and targeted responses could be adapted.

## 6.6 Implications for SDG 3

Malaria control and cultural acceptance of prevention methods are central to SDG Target 3.3 (ending the malaria epidemic). The DRC demonstrates that community-based delivery of IPTp through CHWs is acceptable to communities when aligned with social norms, trust exists, and influential actors are involved. However, CHW working conditions and perceptions of SP remain challenges. Vietnam demonstrates that even with effective control strategies, malaria persists among ethnic minority populations due to mobility, low risk perception, and pluralistic health-seeking. Elimination strategies must be adaptive and reflexive to socio-ecological diversity. The international community should support community health worker programmes, culturally adapted interventions, active surveillance for mobile populations, and research on risk perception and health-seeking behavior.

## 7. CONCLUSION

This comparative analysis reveals that malaria control and cultural acceptance of prevention methods require community engagement and trust in CHWs (DRC's C-IPTp acceptability, Vietnam's CHW role), attention to social norms and cultural beliefs (DRC's pregnancy social norms, Vietnam's low risk perception), adaptation to mobility and territorial arrangements (Vietnam's mobility between new and old villages, DRC's access barriers), understanding of pluralistic health-seeking (public, private, traditional), and adaptive, context-specific strategies. The DRC has high malaria burden with community-based IPTp delivery through CHWs; anthropological evidence demonstrates C-IPTp

acceptability, but CHW working conditions and perceptions of SP remain challenges. Vietnam has dramatically reduced malaria and is moving toward elimination, but malaria persists in forested areas among ethnic minority populations due to mobility between resettled villages and forest fields, low risk perception, and pluralistic health-seeking.

Several cross-cutting insights emerge. Community health workers are essential for reaching populations that cannot access facility-based care. Trust in CHWs is critical for intervention acceptability. Mobility undermines fixed vector control interventions (IRS, ITNs). Risk perception influences prevention behavior; low perceived risk reduces uptake. Pluralistic health-seeking (public, private, traditional) must be addressed, not ignored. Elimination strategies must be adaptive to local socio-ecological diversity.

For the DRC, priorities include strengthen CHW programmes (training, supervision, incentives, working conditions). Address perceptions of SP (side effects, efficacy) through community education. Strengthen ANC access (distance, cost, quality). Sustain C-IPTp delivery. Learn from Vietnam's active surveillance for elimination phase (for when DRC reduces transmission).

For Vietnam, priorities include develop adaptive strategies for mobile populations (farmers moving between villages and forest fields). Address low risk perception through targeted health education (emphasizing forest malaria risk). Address pluralistic health-seeking through engagement with private and traditional providers. Strengthen active surveillance for ethnic minority areas. Learn from DRC's community-based delivery model for reaching remote populations.

For the international community, the lessons are clear. Malaria control must be culturally adapted, not one-size-fits-all. Community health workers are essential for reaching remote populations. Mobility and territorial arrangements must be understood and addressed. Elimination requires adaptive strategies responsive to socio-ecological diversity. The ultimate measure of success is whether malaria is eliminated, and whether all populations, including ethnic minorities and mobile populations, have access to effective prevention and treatment.

## **8. LIMITS OF THE STUDY**

This study has several limitations including reliance on secondary sources, data comparability challenges (DRC's data less complete), and speculative transferability. The DRC anthropological study included multiple countries (DRC, Madagascar, Mozambique, Nigeria) but findings specific to DRC may not be isolated. Vietnam studies focus on Ra-glai ethnic minority in specific provinces; findings may not generalize to all ethnic minorities. Despite these limitations, the comparative analysis provides valuable insights.

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## **10. AUTHOR CONTRIBUTIONS**

The author conceived the study, designed the methodology, conducted the literature review and document analysis, synthesized findings, and drafted the complete manuscript.

## **11. COMPETING INTERESTS**

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential competing interest. No funding was received from organizations with interests in this sector or related sectors.

## **12. FUNDING INFORMATION**

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## **13. DATA AVAILABILITY**

All sources are publicly available documents and the primary sources are cited in the bibliography and accessible through the referenced publications and organizations.

## 14. DISCLAIMER

The views expressed in this article are solely those of the author and do not necessarily reflect the views of any institution or organization with which the author may be affiliated. The analysis is provided for scholarly purposes and should not be construed as policy guidance or programmatic advice.

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