Journal of Language and Health
Volume 6 No 2, June 2025
e-ISSN 2722-3965; p-ISSN 2722-0311
http://jurnal.globalhealthsciencegroup.com/index.php/JLH

WHY IS MALARIA STILL A CRITICAL ISSUE? A SYSTEMATIC REVIEW IN ASIA PARTICULARLY IN INDONESIA

Cri Sajjana Prajna Wekadigunawan[1], Ananda Farrell Rabbani[2]
[1]Universitas Esa Unggul, Jl. Arjuna Utara No.9, Duri Kepa, Kb. Jeruk, Jakarta Barat, Jakarta 11510, Indonesia
[2]Universitas Kristen Krida Wacana, Jl. Tanjung Duren Raya No.4, RT.12/RW.2, Tj. Duren Utara, Grogol petamburan, Jakarta Barat, Jakarta 11470, Indonesia
*weka.gunawan@esaunggul.ac.id

ABSTRACT

Malaria continues to be an important public health concern across many Asian nations, with Indonesia remaining one of the most affected country. Despite significant advancements in diagnostics, treatment, and vector control strategies, multiple challenges hinder Indonesia's goal of malaria elimination by 2030. This systematic review describes the epidemiological burden of malaria in Asia with a focus on Indonesia, outlines key challenges such as geographical, ecological, and socio-cultural-political barriers, and discusses comprehensive strategies to overcome these obstacles. A systematic literature search was conducted through electronic databases such as PubMed and Google Scholar, as well as official reports from the World Health Organization (WHO) and the Ministry of Health of the Republic of Indonesia (Kemenkes RI), using keywords like 'malaria', 'Indonesia', 'elimination', 'malaria challenges' and 'vector management'. The selection criteria prioritized scientific publication and official reports published between 2011 and 2025 to ensure the currency of the data. Strengthening surveillance, community empowerment, regional and cross-border cooperation, and innovation in control tools are essential to achieving malaria elimination in Indonesia and other endemic countries in Asia.

Keywords: asia; artemisinin resistance; elimination; health system; malaria; mosquito control; world health organization

INTRODUCTION

Malaria is a disease caused by the bite of a female Anopheles spp. mosquito infected with Plasmodium spp. Malaria remains a crucial issue to discuss in Indonesia and Asia in general. Malaria become a critical public health concern across many parts of Asia, specifically in tropical and subtropical regions. Much progress has been made, such as a decrease in Malaria incidents in some endemic areas, but several countries in Asia are still struggling to achieve 'zero Malaria' in the region. Numerous factor have been reported to influence Malaria incidence in Asia, including Indonesia. These factors embrace climate change, culture, social change, and the topography and geography of Malaria affected areas.

Asia is suffering losses due to Malaria cases within it. Asia is a home to almost 2 billion people at risk of malaria. According to the World Malaria Report 2023, countries such as India, Indonesia, Pakistan, and Myanmar account for the majority of malaria cases in the region (WHO, 2023). Despite a general decline in malaria incidence globally, the Asian region reports heterogeneous progress. For instance, while India has shown significant reductions, countries with vast forested or rural areas, like Indonesia, still face transmission challenges. Unpredictable climate change causes Malaria vectors such as mosquitoes to also adapt, many of them breed in humid air, stagnant water that occurs due to flooding that has hit several countries in Asia. The WHO South-East Asia region accounted that about 1.5% of global burden, with an estimated four million Malaria cases and 6000 malaria deaths. In the same year, lymphatic filariasis (LF), a neglected tropical disease, affected 657 million people, requiring preventive chemotherapy across 39 countries. This is down from 1.4 billion in 2000 due to mass drug administration (MDA) efforts.

Indonesia is one of the countries in Southeast Asia with a significant malaria burden. As per Indonesia's Ministry of Health, in 2022 there were over 370,000 reported malaria cases, with provinces like Papua, West Papua, and East Nusa Tenggara showing the highest prevalence (Kemenkes RI, 2023). Indonesia has made a commitment to eliminate malaria by 2030, as one of SDGs (Sustainable Development Goals), however its archipelagic geography and diverse local health capacities complicate the response. Indonesia is working hardly towards Malaria elimination. As many as 79% of districts/cities have Malaria-free certificate and Indonesia is still struggling to achieve a national target of complete elimination by 2030. This commitment was reaffirmed at the Asia Pacific Leaders Summit on Malaria Elimination in Bali on June 2025, where at the meeting, the author also participated and contributed to the Focus Group Discussion (FGD) carried out by the organizers of the Leaders Summit. The country stated that it is focusing on strengthening its National Action Plan for Malaria Elimination (NAP-AMEI) and its bridging plan. The country emphasize its focus on areas like Papua and other eastern Indonesia where the majority of cases are concentrated. The World Health Organization (WHO) Country Office for Indonesia and the WHO Regional Office for South-East Asia are hosted the Indonesia and Timor-Leste joint Capacity Building Workshop on Malaria and Lymphatic Filariasis Elimination and Cross-border Collaboration in Timor Island on 11 – 14 February 2025 in Kupang – East Nusa Tenggara - Indonesia. The goal of the workshop was to increase cross-border collaboration and technical capacity among key health workers in both countries. It is ensuring vulnerable communities are better protected and elimination targets are achieved and sustained. (WHO, 2025). This systematic review describes the epidemiological burden of malaria in Asia with a focus on Indonesia, outlines key challenges such as geographical, ecological and socio-cultural-political barriers and discusses comprehensive strategies to overcome these obstacles.

METODE

This study employs a narrative systematic review method to identify, analyze, and synthesize relevant information regarding the status and challenges of malaria elimination in Asia, with a primary focus on Indonesia. A systematic literature search was conducted through electronic databases such as PubMed and Google Scholar, as well as official reports from the World Health Organization (WHO) and the Ministry of Health of the Republic of Indonesia (Kemenkes RI), using keywords like "malaria," "Indonesia," "elimination," "malaria challenges," and "vector management." The selection criteria prioritized scientific publications and official reports published between 2011 and 2025 to ensure the currency of the data. First, we found 4,200 articles with the keywords "Indonesia" and "Malaria." Then, we added the keyword "elimination," bringing the total to 255 articles. Then, we added the keywords "vector management" and "Malaria challenges," bringing the total to 29 articles. The collected information was then analyzed using a thematic synthesis approach, where data were grouped into major themes—including the disease burden, various challenges (geographical, resistance,socio-cultural, climate), and strategic solutions—to be presented in a narrative and coherent manner.

RESULT AND DISCUSSION

Aspek Challenges in Malaria Control and Elimination in Indonesia

a. Geographical Barriers

Indonesia consists of thousands of islands, around 17,000 of them. Many of these islands are difficult to reach by transportation, a few healthcare workers are willing to live on Indonesia's outermost and remote islands. Elyazar et al in 2011 stated that Indonesia's vast archipelago includes many remote and hard-to-reach areas, particularly in eastern provinces where malaria is endemic. These regions are experiencing low human resources, infrastructure, transportation, and sustainable health services. This vastness and fragmentation make it challenging to implement and sustain effective malaria control programs, reach all communities with interventions (like distributing insecticide-treated nets or providing diagnostic and treatment services), and conduct robust surveillance (WHO, 2022).

Many malaria-endemic areas are located in hilly, mountainous, or densely forested regions. These environments often have limited infrastructure (roads, health facilities) and provide abundant breeding grounds for Anopheles mosquitoes. Forested areas also harbor populations with specific occupational risks (e.g., forest workers, miners) who are highly exposed to mosquito bites (Istiana et al, 2022). There are a lot specific challenges in Eastern Indonesia (Papua, West Papua, East Nusa Tenggara). These provinces consistently report the highest proportion of malaria cases in Indonesia, largely due to their challenging geography, limited health infrastructure, and high rates of transmission (APLMA, 2023)

b. Mosquitoes experience resistance to larvicides

There is growing concern about resistance of Anopheles mosquitoes to commonly used insecticides, and Plasmodium falciparum to artemisinin-based combination therapies (ACTs) in parts of Asia, including Indonesia (Tun et al., 2015). Recent studies in Indonesia have indicated the emerging issue of larvicide resistance in malaria vectors, particularly Anopheles species. The overuse and improper application of chemical larvicides such as temephos (an organophosphate) and pyriproxyfen (a juvenile hormone analog) in vector control programs have contributed to the development of resistance mechanisms in mosquito populations. For example, research conducted in Kalimantan and Papua reported reduced susceptibility of Anopheles sundaicus and Anopheles aconitus to temephos, likely due to enhanced esterase activity and target site insensitivity (Hasyim et al., 2020; Pratama et al., 2022). This resistance threatens the sustainability of vector control interventions and underscores the need for integrated vector management (IVM) strategies that include rotation of larvicides, environmental management, and biological control agents to delay or mitigate resistance development. Monitoring larvicide efficacy and resistance profiles should therefore become a routine part of malaria vector surveillance in Indonesia's endemic regions.

c. Equity and Equality in Health System

In Indonesia, efforts to eliminate malaria are challenged not only by biomedical and ecological factors but also by systemic issues of equity and equality within the health system. While significant progress has been made in reducing malaria incidence in western Indonesia, eastern provinces such as Papua and West Papua continue to experience disproportionately high malaria burdens, revealing a persistent inequality in health outcomes (Kementerian Kesehatan RI, 2022). These disparities are largely due to geographic remoteness, limited infrastructure, shortage of trained health personnel, and socioeconomic marginalization. Equity in the malaria response demands that resources and interventions be distributed based on need, yet funding and program implementation are often concentrated in more accessible and developed regions, neglecting the hardest-hit communities. For example, communities in high-endemic areas frequently lack access to diagnostic tools, effective treatment, and vector control, exacerbating the cycle of disease and poverty (Fitriani et al., 2023). To address this, Indonesia's malaria elimination strategy must prioritize equity-driven health policies, including community-based surveillance, mobile health services, and tailored interventions that reach vulnerable and indigenous populations. Inequities in healthcare access, diagnostics, treatment availability, and human resources impact the ability to deliver timely malaria interventions, especially in eastern Indonesia (Ginting et al., 2020).

d. Socio-anthropology Factors

Socio-anthropological factors play a critical role in shaping malaria transmission and control efforts in Indonesia, particularly in remote and endemic regions. Cultural beliefs, local knowledge systems, and community behaviors often influence how malaria is perceived, prevented, and treated. For instance, in parts of Papua and Nusa Tenggara, malaria is still sometimes interpreted through spiritual or traditional lenses, leading individuals to seek help from shamans or traditional healers before visiting formal health facilities (Yotopoulos et al., 2021). Sleeping habits, housing structures, and work patterns—such as farming or forest-related activities—expose certain groups to higher mosquito contact, particularly at dusk and nighttime when Anopheles mosquitoes are most active (Elyazar et al., 2021). Moreover, migration patterns, distrust in government health workers, and limited health literacy can reduce community compliance with control interventions such as insecticide-treated nets (ITNs) and indoor residual spraying (IRS). Understanding these socio-cultural dynamics is essential for designing community-centered malaria programs that respect local values while promoting effective prevention and treatment practices. Integrating anthropological approaches into malaria control can thus improve engagement, reduce resistance to interventions, and enhance long-term sustainability. Gender literacy, poverty, low education, lack capacity of cadres, low infrastructures and limited community engagement are major social determinants that affect malaria control. In indigenous or rural communities, traditional beliefs may also influence health-seeking behaviour.

e. Climate and Environmental Change

Climate change poses a significant challenge to malaria elimination efforts in Indonesia by altering the ecology of malaria vectors and the seasonality of transmission. Rising temperatures, increased humidity, and

shifts in rainfall patterns have been shown to expand the geographical range of Anopheles mosquitoes, allowing them to survive and breed in higher altitudes and previously non-endemic areas, particularly in parts of Sulawesi, Kalimantan, and Papua (Caminade et al., 2019; Anwar et al., 2022). Extended rainy seasons and increased flooding also create more stagnant water bodies, which serve as ideal breeding sites. These environmental changes complicate vector control strategies and increase the risk of outbreaks in regions that may lack preparedness or historical immunity. Moreover, extreme weather events can disrupt healthcare infrastructure and vector surveillance systems, leading to delayed responses. Indonesia's malaria elimination roadmap must therefore integrate climate adaptation measures, including climate-informed surveillance, early warning systems, and community resilience building, especially in climate-vulnerable provinces. Without addressing these environmental determinants, malaria may re-emerge in areas already declared free or nearing elimination. Deforestation, agricultural expansion, and climate variability alter mosquito habitats and can increase malaria transmission in previously unaffected areas (Parham & Michael, 2010).

Strategies and Solutions

a. Maximizing Surveillance

Improving malaria surveillance systems with real-time data, especially through digital tools and GIS, can help target interventions more effectively (WHO, 2022). Effective malaria surveillance is crucial for achieving malaria elimination in Indonesia, a country with diverse geographical and epidemiological profiles. To maximize surveillance, Indonesia must strengthen its case detection systems by integrating both passive and active surveillance, particularly in high-risk and hard-to-reach areas such as Papua and East Nusa Tenggara. The use of digital tools and real-time reporting platforms can improve data accuracy and timeliness, enabling rapid response to outbreaks. Cross-sectoral collaboration—including the involvement of local health workers, military personnel in border areas, and private health providers—can enhance case finding and follow-up. Moreover, community-based surveillance, supported by health education, helps identify asymptomatic carriers that often sustain transmission. The World Health Organization emphasizes that quality surveillance systems are "the backbone of malaria elimination" and recommends regular data audits and capacity building at district and village levels (WHO, 2021). Integrating malaria surveillance into the broader health information system, aligned with Indonesia's Satu Data policy, can further ensure sustainability and national ownership.

b. Integrated Vector Management

Integrated Vector Management (IVM) is a comprehensive, evidence-based approach to controlling disease vectors that aims to optimize the use of resources and minimize environmental impact. In the context of malaria control, IVM combines multiple strategies such as insecticide-treated nets (ITNs), indoor residual spraying (IRS), larval source management (LSM), biological control, and personal protective measures, tailored to local ecological and epidemiological conditions (WHO, 2012). IVM also emphasizes community participation, intersectoral collaboration, and capacity building to ensure sustainable and effective vector control. In Indonesia, where malaria transmission varies widely across its diverse geography, IVM is particularly relevant. For instance, larval control in urban and peri-urban areas, combined with IRS and health education in rural endemic zones, has shown better outcomes than single-intervention methods (Syafruddin et al., 2020). Importantly, IVM promotes resistance management by rotating insecticides and integrating non-chemical approaches, which is crucial in addressing the rising insecticide resistance observed in some Anopheles species. As Indonesia moves toward malaria elimination, scaling up IVM with strong policy support and decentralized implementation is vital for long-term success. Enhanced distribution of insecticide-treated bed nets (ITNs), indoor residual spraying (IRS), and larval source management must be adapted to local ecology and insecticide resistance profiles (WHO, 2019).

c. Community Engagement

Behaviour change communication (BCC), health-education campaigns, and community health workers play a strong role in encouraging early diagnosis, adherence to treatment, and preventive measures (Alonso et al., 2011). Community engagement plays a pivotal role in the success of malaria elimination efforts in Indonesia, particularly in endemic and remote regions. Involving communities ensures better acceptance and sustainability of interventions such as the use of insecticide-treated nets (ITNs), indoor residual spraying (IRS), and timely treatment-seeking behavior. Community health workers (CHWs), known locally as kader kesehatan, are essential in health promotion, distributing preventive tools, and supporting surveillance

activities like case reporting and follow-up. Tailoring communication strategies to local cultures, languages, and beliefs—especially in provinces like Papua and East Nusa Tenggara—is vital to build trust and increase participation. The World Health Organization and Indonesia's Ministry of Health highlight that empowering communities fosters ownership, increases health literacy, and accelerates behavioral change needed for malaria prevention and control. Collaborative models that include village leaders, schools, religious institutions, and civil society organizations have proven effective in enhancing the reach and impact of malaria programs across diverse Indonesian contexts.

d. Cross-sectoral and Cross-border Collaboration

Given that malaria doesn't respect national borders, regional cooperation in Southeast Asia—especially in migrant populations—should be prioritized. The Asia Pacific Malaria Elimination Network (APMEN) is a key platform for collaboration. Cross-sectoral and cross-border collaboration is essential in Indonesia's malaria elimination efforts, especially given its archipelagic geography and proximity to malaria-endemic countries like Papua New Guinea and Timor-Leste. Within Indonesia, effective coordination among sectors such as health, education, military, local governance, and environmental agencies enhances the reach and efficiency of malaria interventions. For instance, the military has been instrumental in vector control and logistical support in remote border areas, while the education sector promotes awareness through school-based health programs. Cross-border cooperation is equally critical, particularly in Papua, where malaria transmission remains high along the Indonesia–Papua New Guinea border. Bilateral agreements, synchronized vector control activities, and shared surveillance data between nations help prevent cross-border reintroduction of cases. The World Health Organization stresses that malaria elimination in border areas requires "harmonized interventions and real-time data sharing" to be effective. Indonesia's national malaria strategy also emphasizes regional partnerships as part of the broader Asia Pacific Malaria Elimination Network (APMEN), reflecting the need for united efforts across geopolitical boundaries.

e. Research and Innovation

Investment in new tools such as vaccines (e.g., RTS,S/AS01), improved diagnostics (like LAMP or PCR in field settings), and next-generation insecticides is crucial for sustainable control and elimination. Research and innovation are crucial drivers in advancing Indonesia's malaria elimination program, particularly as the country faces challenges such as drug resistance, asymptomatic carriers, and vector adaptation. Recent innovations in diagnostic tools, such as highly sensitive rapid diagnostic tests (hsRDTs) and loop-mediated isothermal amplification (LAMP) techniques, have improved detection of low-density parasitemia, especially important in pre-elimination settings. Indonesia has also invested in genomic surveillance to monitor Plasmodium species diversity and resistance markers, especially in high-transmission areas like Papua. In addition, operational research on community behavior, insecticide resistance, and effectiveness of interventions such as long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS) provides localized evidence to optimize control strategies. The Eijkman Institute for Molecular Biology, along with various academic institutions and global partners, has played a significant role in research initiatives. According to WHO and the Ministry of Health, integrating research findings into national policy and fostering innovation through public–private partnerships is essential to sustain momentum toward malaria elimination

CONCLUSION

The prevention and elimination of Malaria is possible when early diagnosis, appropriate treatment, vector management and systematic surveillance systems including epidemiology investigations are organically linked. Indonesia stands at a crucial crossroads in the battle against malaria. With tailored interventions, stronger health systems, and inclusive community participation, malaria elimination is within reach. However, sustained political will, regional collaboration, and equitable resource distribution are necessary to overcome the persistent challenges

REFRENCES

Alonso, P. L., Brown, G., Arevalo-Herrera, M., et al. (2011). A research agenda to underpin malaria eradication. PLOS Medicine, 8(1), e1000406. https://doi.org/10.1371/journal.pmed.1000406

Anwar, R., Syafruddin, D., & Elyazar, I. R. F. (2022). Climate variability and malaria incidence in

Indonesia: A multi-province time-series analysis. Environmental Health Perspectives, 130(6), 67002. https://doi.org/10.1289/EHP10345

Asia Pacific Malaria Elimination Network (APMEN). (2020). Advancing regional malaria elimination through partnerships. https://apmen.org/resources/publications

Asia Pacific Leaders Malaria Alliance (APLMA). (n.d.). Indonesia rolls out national roadmap for malaria elimination and prevention of re-establishment. Diakses 23 Juli 2025, dari https://aplma.org/blog/indonesia-national-roadmap-for-malaria-elimination-and-prevention-of-reestablishment

Caminade, C., Kovats, S., Rocklov, J., Tompkins, A. M., Morse, A. P., Colón-González, F. J., ... & Lloyd, S. J. (2019). Impact of climate change on global malaria distribution. Proceedings of the National Academy of Sciences, 111(9), 3286–3291. https://doi.org/10.1073/pnas.1302089111

Eijkman Institute for Molecular Biology. (2021). Genomic surveillance and malaria elimination: Annual report. Eijkman Institute.

Elyazar, I. R. F., Hay, S. I., & Baird, J. K. (2011). Malaria distribution, prevalence, drug resistance and control in Indonesia. Advances in Parasitology, 74, 41–175. https://doi.org/10.1016/B978-0-12-385897-9.00002-1

Elyazar, I. R. F., Hay, S. I., & Baird, J. K. (2021). Malaria distribution, prevalence, drug resistance and control in Indonesia. Advances in Parasitology, 113, 1–61. https://doi.org/10.1016/bs.apar.2021.03.001

Farchi, I., Syafruddin, D., et al. (2018). Strengthening malaria surveillance system in Indonesia: A call for an integrated and responsive strategy. Malaria Journal, 17(1), 225. https://doi.org/10.1186/s12936-018-2371-1

Ginting, J., Sihombing, R., et al. (2020). Health system challenges for malaria elimination in Indonesia. Malaria Journal, 19, 227. https://doi.org/10.1186/s12936-020-03302-w

Hasyim, H., Nurfadillah, N., & Anwar, M. (2020). Insecticide resistance status of Anopheles spp. in malaria-endemic areas in Indonesia: A systematic review. Malaria Journal, 19, 254. https://doi.org/10.1186/s12936-020-03331-6

Istiana, I., Hadi, U., Dachlan, Y. P., & Arwati, H. (2021). Malaria at forest areas in South Kalimantan, Indonesia: Risk factors and strategies for elimination. Open Access Macedonian Journal of Medical Sciences, 9(B), 1437–1440. https://oamjms.eu/index.php/mjms/article/download/7012/6459/62527

Karunungan, K., & Anwar, E. (2022). Cross-sectoral approaches to malaria elimination in Indonesia: Policy lessons and local innovations. Asian Pacific Journal of Tropical Medicine, 15(3), 123–129. https://doi.org/10.4103/1995-7645.341269

Kementerian Kesehatan Republik Indonesia. (2020). Strategic Plan for Malaria Elimination 2020–2024.

Kementerian Kesehatan Republik Indonesia. (2023). Profil Kesehatan Indonesia 2022. https://pusdatin.kemkes.go.id

Parham, P. E., & Michael, E. (2010). Modeling the effects of weather and climate change on malaria transmission. Environmental Health Perspectives, 118(5), 620–626. https://doi.org/10.1289/ehp.0901256

Pratama, N. R., Ahmad, R. A., & Syafruddin, D. (2022). Resistance status of Anopheles mosquitoes to insecticides used in malaria control programs in eastern Indonesia. PLOS ONE, 17(4), e0266575. https://doi.org/10.1371/journal.pone.0266575

Syafruddin, D., Elyazar, I. R. F., & Baird, J. K. (2020). Integrated vector management in Indonesia: Challenges and progress in malaria-endemic regions. Malaria Journal, 19, 367. https://doi.org/10.1186/s12936-020-03465-7

Syafruddin, D., et al. (2020). Research and innovation for malaria elimination in Indonesia: A roadmap toward zero malaria. Malaria Journal, 19, 207. https://doi.org/10.1186/s12936-020-03264-3

Tun, K. M., Imwong, M., et al. (2015). Spread of artemisinin-resistant Plasmodium falciparum in Myanmar: A cross-sectional survey of the K13 molecular marker. The Lancet Infectious Diseases, 15(4), 415–421. https://doi.org/10.1016/S1473-3099(15)70032-0

Wahid, I., et al. (2021). Community participation and its role in the malaria elimination program in Eastern Indonesia: A qualitative study. BMC Public Health, 21, 872. https://doi.org/10.1186/s12889-021-10892-z

World Health Organization. (2012). Handbook for Integrated Vector Management. https://apps.who.int/iris/handle/10665/44768

World Health Organization. (2019). Eliminating malaria: Cross-border collaboration is key. https://www.who.int/news-room/feature-stories/detail/eliminating-malaria-cross-border-collaboration-is-key

World Health Organization. (2020). Community engagement: A health promotion guide for universal health coverage in the hands of the people. https://www.who.int/publications/i/item/9789240010522

World Health Organization. (2021). Global technical strategy for malaria 2016–2030 (update 2021). https://www.who.int/publications/i/item/9789240031350

World Health Organization. (2021). Malaria surveillance, monitoring & evaluation: A reference manual. https://www.who.int/publications/i/item/9789240017613

World Health Organization. (2022). World Malaria Report 2022. https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2022

World Health Organization. (2023). World Malaria Report 2023. https://www.who.int/publications/i/item/9789240076792

World Health Organization. (n.d.). "Zero malaria starts with me": History of malaria elimination in Indonesia helps to shape a malaria-free future. Diakses 23 Juli 2025, dari https://www.who.int/indonesia/news/feature-stories/detail/zero-malaria-starts-with-me-history-of-malaria-elimination-in-indonesia-helps-to-shape-a-malaria-free-future

Yotopoulos, A., Widyastuti, U., & Siregar, A. Y. M. (2021). Community perceptions and socio-

cultural factors influencing malaria control in eastern Indonesia. Malaria Journal, 20, 55. https://doi.org/10.1186/s12936-021-03579-8