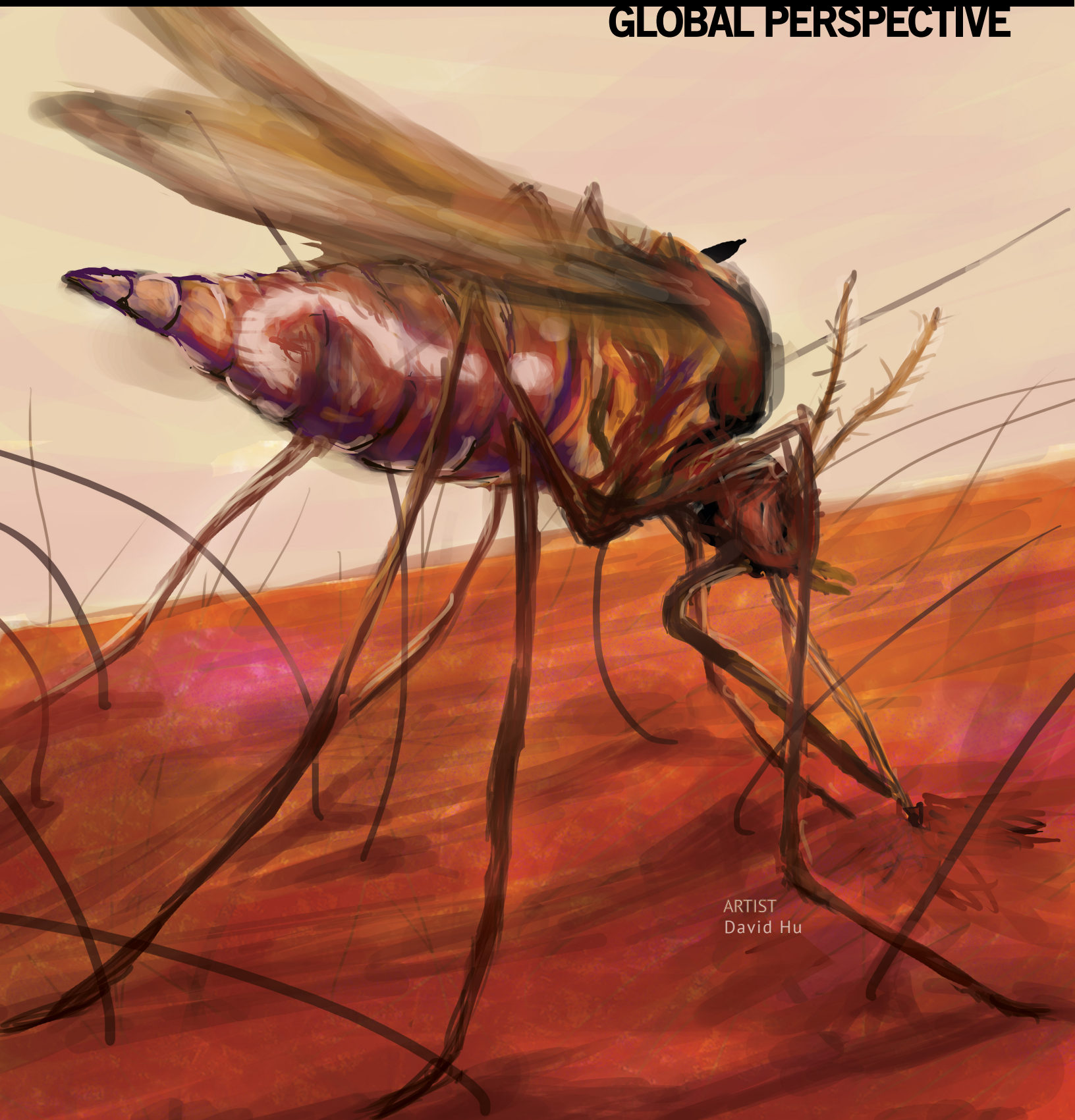


The Implications of Antimalarial Overprescription

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GLOBAL PERSPECTIVE



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INTRODUCTION

The issue of antimalarial overprescription has been a decade-long concern in Ghana.¹ I was able to observe this phenomenon firsthand during a three month trip to rural Wa while pursuing a Global Health specialization in the Bachelor of Health Sciences Program. There, I volunteered with True Vision Ghana, a non-governmental organization working with youths affected by HIV/AIDS, in an administrative role in the Adolescent Health Clinic. I was responsible for completing insurance forms and documenting patient visits. After observing numerous patient visits, I soon noticed an overprescription of antimalarials after the use of Rapid Diagnostic Tests (RDTs) to diagnose malaria.

MALARIA AND RAPID DIAGNOSTIC TESTS

Malaria is a life-threatening infectious disease caused by Plasmodium protozoans, which are most commonly transmitted through the saliva of female Anopheles mosquitoes.² One bite can transmit motile sporozoites of Plasmodium that navigate through the bloodstream to infect hepatocytes in the liver.² These sporozoites subsequently multiply asexually and are released through the rupturing of their host cells to infect neighbouring erythrocytes.² Complications from malaria such as respiratory distress and encephalopathy give rise to a morbidity rate of 10%.¹

Despite significant measures taken to reduce this endemic, including insecticide-treated nets and indoor residual sprays, malaria's prevalence remains as high as ten cases in every 1000 persons in Ghana.¹ Patients often visited the Adolescent Health Clinic with symptoms suggestive of malaria, such as nausea, chills, and fever. I noticed that when patients with these symptoms arrived, the nurses used RDTs as the standard diagnostic tool. This test required pricking the patient's finger and pipetting a small amount of blood onto a glass slide.³ Two lines on a test would indicate a positive result for malaria, whereas a single line indicated a negative result.³ To my surprise, the patient would be prescribed malaria medication regardless of the RDT result. When I questioned this, the nurses attributed the practice to the test being inaccurate.

Due to the nurses' lack of confidence in the RDT, I used a microscopy test from a nearby lab in addition to an RDT to test myself regularly for malaria. During my experience in Wa, I contracted malaria twice. The second time, my RDT result indicated a false negative whereas my lab result indicated a true positive. I consequently found myself wondering if false negatives were a common occurrence when using RDTs, which would explain the nurses' practice of invariably prescribing antimalarials.

After further research however, I found that my assumption was incorrect. RDTs are reported to have a 93% sensitivity and a 90% specificity in malaria diagno-

sis, meaning that 93% of diseased individuals will test positive while 90% of non-diseased individuals will test negative.⁴ In fact, RDTs have been found to be more accurate than microscopy tests.⁴ The problem evidently does not lie within the testing technology. Rather than diagnostic test inaccuracy, the overprescription of antimalarials may be due to the healthcare professionals' unwillingness to adhere by the test's highly accurate results

$$\text{SENSITIVITY} = \frac{\text{TRUE POSITIVES}}{\text{TRUE POSITIVES} + \text{FALSE NEGATIVES}}^3$$

HEALTHCARE PERSONNEL ADHERENCE

Despite the high sensitivity of RDTs, healthcare professionals frequently disregard their results. A negative RDT result has a 50% adherence rate in Ghana.⁴ In a qualitative study pertaining to southern Ghana, one patient said, "Even though the test result shows I had no malaria, because of the way I was feeling, the doctor said they should give me some malaria drugs."⁵

One possible reason for this lack of adherence could be the fear of not detecting false negatives. However as only 7% of RDT negative results are false, healthcare adherence should be improved.⁴ This is feasible as studies have shown that sustained training and supervision, though potentially costly in the short-run, can increase adherence among healthcare professionals.⁴

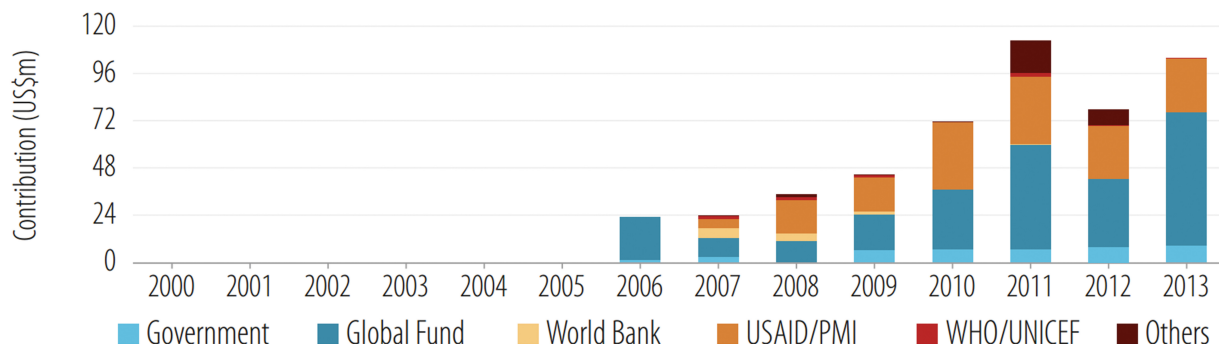
IMPLICATIONS OF NON-ADHERENCE

Lack of adherence to RDT results among healthcare professionals has its long-term ramification. By frequently disregarding RDT results, the funds used to purchase the diagnostic tests are not allocated appropriately. The World Health Organization (WHO) has reported various sources of funding in 2013 for the malaria problem in Ghana, as shown in the figure on the next page.¹

In 2013, the President's Malaria Initiative aimed to "procure approximately 4.75 million RDTs" in Ghana.⁶ Each RDT ranges from \$0.55 to \$1.50 USD, which results in a multi-million dollar expenditure (2.6 to 7.1 million USD) on inappropriately used tests.³ Moreover, patients being wrongly diagnosed for malaria must then use out-of-pocket funds to buy unneeded antimalarials. From my experience in Wa, I recall the costs for antimalarials ranging from \$4.00 to \$8.00 USD. While this might not appear to be a high price, take into account that the Gross National Income per capita in Ghana was \$1544 USD in 2011 and the price for antimalarials will no longer seem trivial.⁷ Thus, in addition to the ineffective utilization of third party monetary resources, poor adherence also takes an unnecessary financial toll on misdiagnosed patients.

III. Financing

Sources of financing



More importantly, there are also health implications of over-diagnosing malaria. If a patient without malaria is misdiagnosed, then the true cause of their symptoms will not be identified. Interestingly, the WHO has presented limited evidence that malaria cases decreased in Ghana despite the implementation of various preventative measures.⁸ The lack of decrease may be attributed to an overestimation of malaria cases, leaving other diseases undiagnosed. This is especially concerning as malaria has generic symptoms that are congruent to an array of illnesses, including meningitis and pneumonia.⁹ In addition, given the degree of overprescribed medications, antimalarial drug resistance has become a growing concern among clinicians. For example, one study reported that increased prescription of the antimalarial sulphadoxine pyrimethamine led to more genetic mutations in the targeted strain of malaria which conferred greater resistance to this drug.¹⁰ These genetic mutations enabled the strain to be increasingly resistant to the sulphadoxine pyrimethamine treatment.¹⁰ This phenomenon has also been reported in other antimalarial drugs, such as artemisinin, indicating that the over usage of antimalarials increases risk of drug resistance in patients.¹

CONCLUSION

It is important for policymakers to review the full scope of issues related to malaria, including healthcare workers' adherence to diagnostic tests. Policymakers should urge the government to enforce stricter adherence to tests with high sensitivities. This would increase cost-effectiveness, reduce possible health complications, and slow the process of drug resistance. However, one potential downfall is that strict adherence could potentially cause the few false negative cases to remain untreated. Therefore, it remains important for additional tests, such as microscopy tests, to be used in conjunction with RDTs to ensure malaria cases are accurately diagnosed.

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REVIEWED BY DR. LAWRENCE MBUAGBAW

This Global Perspectives piece has been peer-reviewed by Dr. Lawrence Mbuagbaw, an Assistant Professor in the Department of Clinical Epidemiology & Biostatistics at McMaster. Dr. Mbuagbaw is a member of the Canadian Coalition for Global Health Research, as well as the International Epidemiology Association. His primary research interests include health systems research and using biostatistics and epidemiology to improve international health outcomes.

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