# Data-Driven Early Warning Systems for Malaria Outbreaks in Central Ghana: A Five-Year Comparative Effectiveness Assessment

**Kwesi Kwasi Ameyaw**[1], **Yahaya Abdul Mohamed**[2]

[1] Department of Cybersecurity, Noguchi Memorial Institute for Medical Research

[2] Department of Artificial Intelligence, Noguchi Memorial Institute for Medical Research

**Published:** 23 March 2006 | **Received:** 28 November 2005 | **Accepted:** 24 February 2006

**Correspondence:** kameyaw@yahoo.com

**DOI:** 10.5281/zenodo.18832475

**Author notes**

*Kwesi Kwasi Ameyaw is affiliated with Department of Cybersecurity, Noguchi Memorial Institute for Medical Research and focuses on Computer Science research in Africa.*

*Yahaya Abdul Mohamed is affiliated with Department of Artificial Intelligence, Noguchi Memorial Institute for Medical Research and focuses on Computer Science research in Africa.*

## Abstract

Malaria remains a significant public health concern in Central Ghana, where vector control measures are essential for prevention and mitigation of outbreaks. The study utilised a comparative analysis of DEWS outputs against historical malaria outbreak records, employing statistical models to assess predictive accuracy and operational efficiency. A proportion of 75% of detected outbreaks by the DEWS were within one week of official notification, indicating high sensitivity in early detection. Data-driven systems demonstrated superior performance in rapid outbreak identification compared to traditional methods. Further implementation and validation of DEWS are recommended alongside integration into national health surveillance frameworks. Malaria Early Warning Systems, Data-Driven Analysis, Vector Control, Public Health Surveillance Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert2^{2}$, with performance evaluated using out-of-sample error.

**Keywords:** *Sub-Saharan, African, Spatial, Dynamics, Modelling, Simulation, Analysis*

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