

Malaria Prediction - Based Early Warning System in TOGO

Integrated into DHIS2 | Using CHAP and Modelling App

Context

> 2M
CASES

~ 1k
DEATHS

(NMCP yearly report, TOGO 2024)

Key Active Interventions

SMC (Seasonal Malaria Chemoprevention) campaigns, nationwide LLIN distributions, introduction in 2025 malaria vaccine, and free testing and treatment at Health facilities.

The Risk

Despite these efforts, some districts continue to report high caseloads and recurrent transmission peaks

Tableau 15.18 : Répartition des cas de paludisme confirmés, région, 2024

Régions	Nombre de cas de paludisme confirmé		
	< 5 ans	5 ans et plus	FE
Grand Lomé	35 705	150 664	6 021
Maritime	89 339	265 165	7 593
Plateaux	154 277	356 277	17 963
Centrale	81 167	187 458	10 451
Kara	183 834	279 683	11 731
Savanes	103 568	231 471	10 304
Togo	647 890	1 470 718	64 063

The actual malaria surveillance system

STEP 01

Routine reporting in DHIS2

Health facilities report aggregate data into DHIS2 monthly
Sentinel sites report weekly.

STEP 02

Analysis

The analysis is done through dashboards at different levels

STEP 03 (SYSTEM LAG)

Outbreak detection

Alerts are often generated after observing an visible increase in cases number

STEP 04

Response

-  Field investigation
-  Case management
-  Commodity logistics
-  Community awareness

The surveillance gap

The fundamental issue is early detection.

All malaria case data is already logged within DHIS2 (NMDR), but left unexploited for future forecasting.

Shifting from reactive response to proactive, prediction-driven action is essential to avoid delays and prevent shortages of medical supplies.

The data already exists in DHIS2 —we just need to use it.

What we set out to build

"To establish a prediction -based early warning system integrated into DHIS2 that rapidly detects any abnormal increase in malaria cases likely to lead to an outbreak, in order to optimise the allocation of health resources"

Predict malaria cases across all 39 health districts months ahead

Specifics objectives



Prediction & Evaluation

Predict malaria cases using historical DHIS2 data. Evaluate the result .



Threshold Setup

Configure epidemic alert thresholds tailored to each level (district, region, national) based on historical baseline.



Surveillance

Monitor predictions through interactive dashboards. Automatically generate alerts when predictions exceed.



Decision Support

Empower decision -makers with live analytics to guide timely and optimised responses and ressources allocation

Implementation process



1. Data availability

Gathering all malaria data into National Malaria Data Repository (NMDR).



2. Data Quality

Data cleaning : data -imputation to handle outliers and fill missing values.



3. Modelling execution

Apply calibration (district -level residual, revised lag). Test, validate and deploy the best-performing model.



4. Threshold setup

Formulating district alerts based on the the 3rd quartile of historical data.



5. Dashboard integration

Designing spatial and temporal alerte system via dashboard in DHIS2.

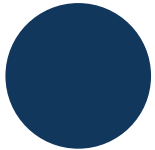
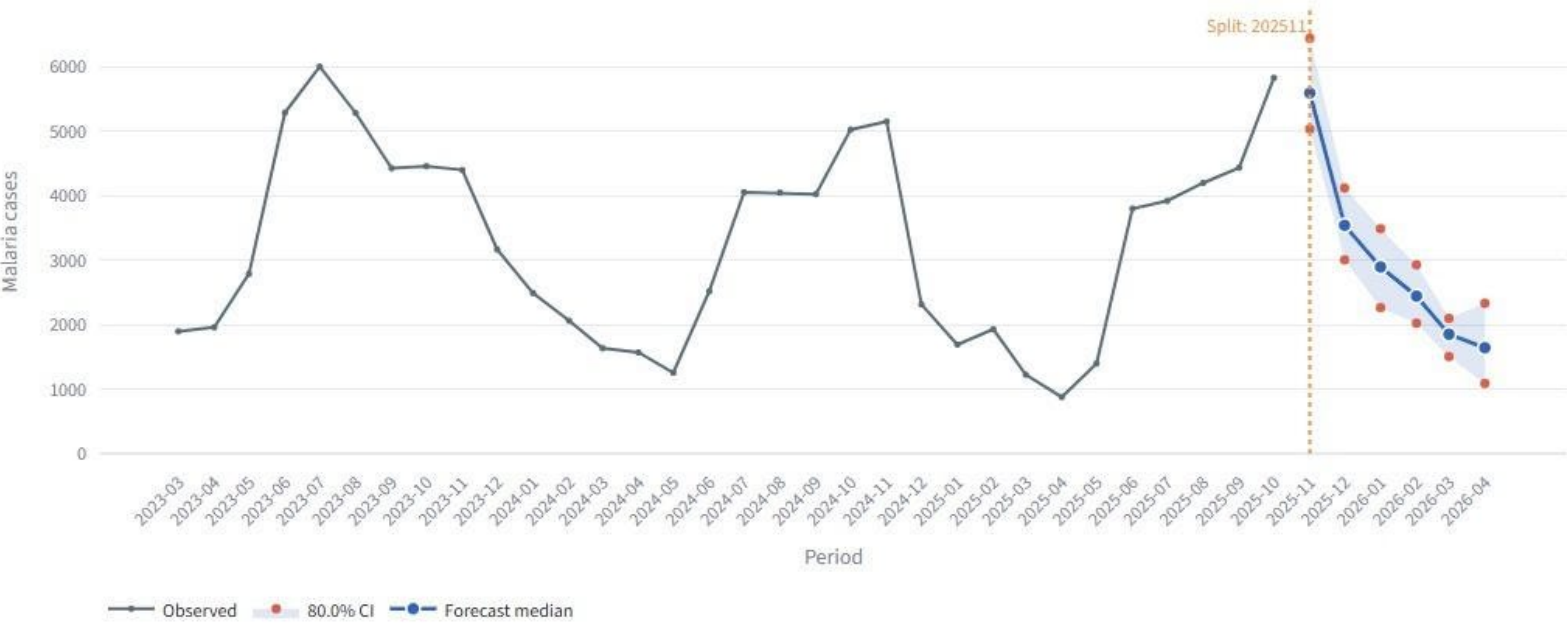


6. Automating notifications

Automate notifications to specifics users

District - level forecast

BINAH — forecasts from split 202511



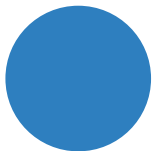
Observed

Historical case counts up to the split point (March 2025).



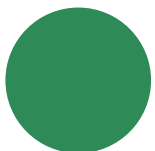
Forecast Median

Model prediction for subsequent months.



80% CI Band

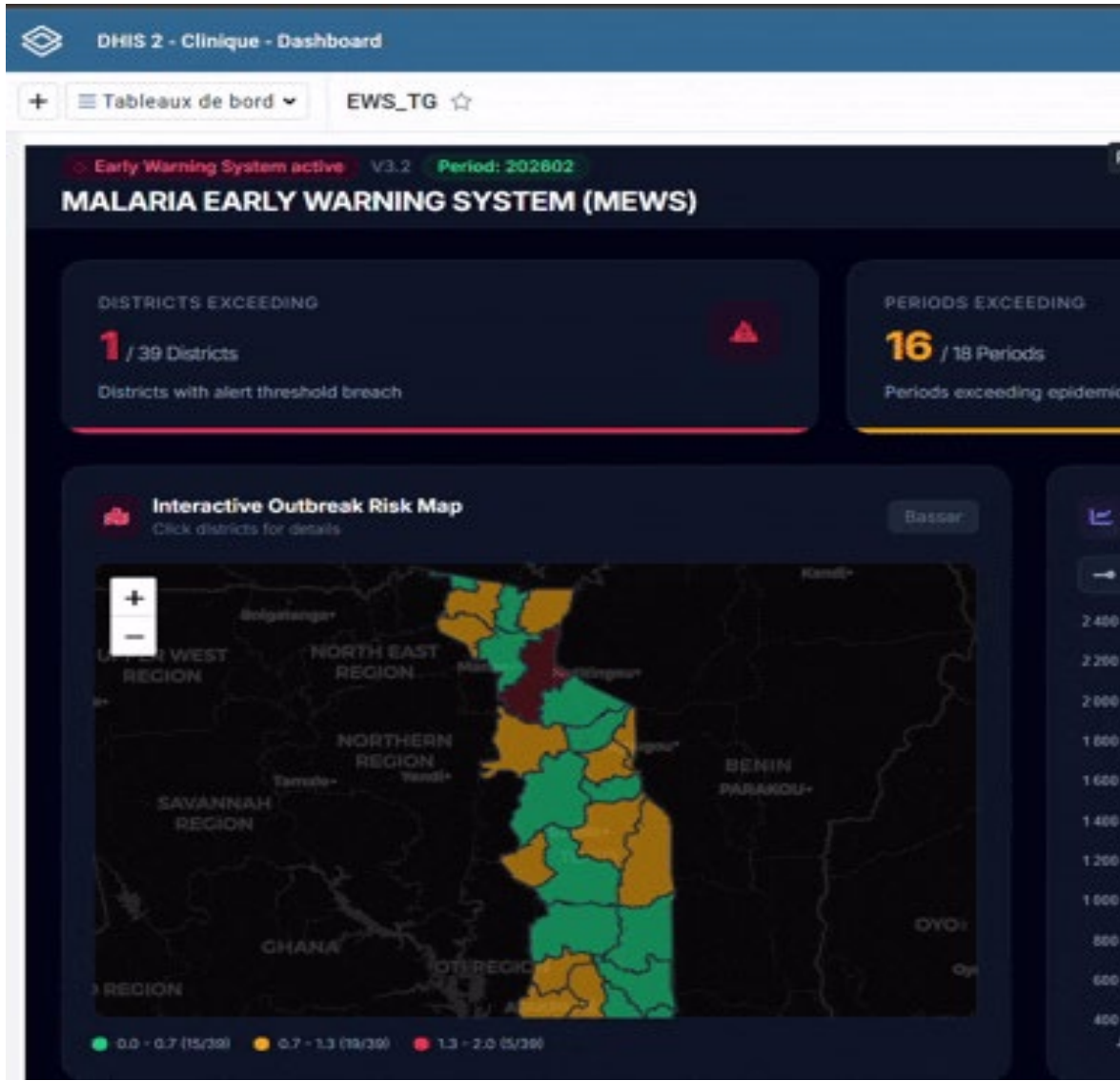
Uncertainty range — wider band = more volatile period.



Calibration

Model coverage vs theoretical — closer to the reference line = better calibrated uncertainty.

Early warning dashboard



Expected impacts

District level

- ✓ Improved preparedness of health facilities
- ✓ More efficient use of available resources at the operational level.

Central level

- ✓ High-precision district prioritization for rapid administrative planning.
- ✓ Proactive relocation of critical diagnostic and healthcare gear.
- ✓ Strengthened epidemiological capabilities across the public sector.
- ✓ Dynamic deployment of operational containment and response forces.

Thank you

The model is open-source and available to the wider DHIS2 community.



<https://github.com/orgs/chap-models/repositories>