Australia Awards

Australian Alumni Research Grant Round 5

RESEARCH TITLE:

Development of a climate-based early warning system for dengue fever: a predictive longitudinal study

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IMPLEMENTATION PERIOD:
2025-2026

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RESEARCH QUESTIONS

1.What are the quantitative associations between specific climate variables (e.g., average temperature, relative humidity, precipitation) and the incidence of dengue fever in targeted geographic regions?

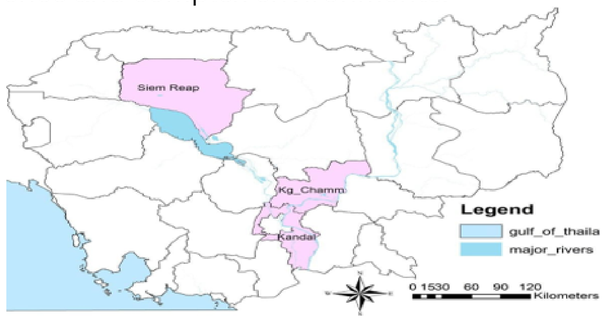
2.Can a longitudinal predictive model that incorporates these climatic factors accurately forecast dengue cases with sufficient lead time for intervention?

3.Can the existing climate data from the Ministry of Water Resources and Meteorology be effectively used to predict dengue incidence?

RESEARCH METHODOLOGY

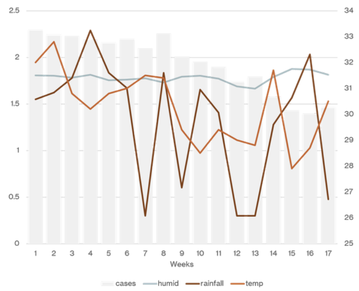
•The study used a prospective, longitudinal design.
•It ran for 4 months, from September to December 2025.
•Daily weather was recorded using mobile devices at selected sites.
•These data were compared with four years of program records to find long-term trends and immediate correlations.
•Work was done in phases: training and equipment setup (June–July 2025), field deployment and monitoring (September–December 2025), and final analysis and reporting (January 2026).
•Study sites were Kandal, Siem Reap, and Kampong Cham. Sites were chosen for high dengue incidence and complex environments.

Project sites

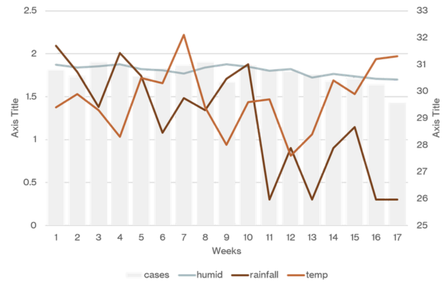


•Data validity was ensured through triangulation
•Sources included National Dengue Control Programme (NDCP) weekly dengue incidence and daily data recorded from weather stations.
•Analyses were done in Stata 17.
•Dengue case counts showed over-dispersion.
•Negative Binomial Regression was used instead of Poisson models to estimate IRR.
•Univariate and multivariate GLMs were built for each province.
•Time lags of 0–5 weeks were applied to reflect reporting delays.
•Models were selected using the lowest AIC and highest Pseudo-R^2.
•Multicollinearity between rainfall and humidity was checked to ensure reliability.

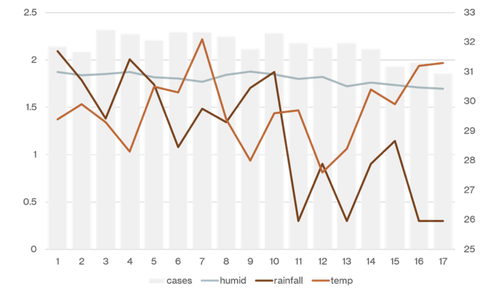
Dengue burden vs. climate attributes



Siem Reap



Kampong Cham



Kandal

RESEARCH KEY FINDINGS

- Climatic drivers of dengue transmission differed across provinces.
- In Kandal, higher temperature was associated with increased dengue incidence approximately three weeks later.
- In Kampong Cham, dengue transmission was influenced by both temperature and humidity, with warning periods of one to three weeks.
- In Siem Reap, higher local humidity was associated with increased dengue incidence approximately four weeks later.
- The results show that the climatic predictors and warning periods are not uniform across Cambodia.
- Dengue early-warning models should therefore be adapted to the specific climatic patterns of each province rather than applying one model nationwide.

KEY RECOMMENDATIONS

- Integrate province-specific climate–dengue prediction models into national climate adaptation and dengue preparedness planning.
- Continue community-managed weather monitoring, with strong participation of women to support reliable data collection.
- Further research with one full year to compare the local device and the MOREM local data.