RESEARCH PROGRAM:
Climate, environment and health (SG-CEH)

Policy Brief | Project SG-CEH-05

Climate-Sensitive Early Warning System for the Dengue Virus and Its Transmitting Vector, with Community Action

Country: Cuba
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The challenge

Dengue fever remains one of the leading public health threats in the Americas, and its transmission is increasingly influenced by climate variability and change. In Cuba, although well-established surveillance systems exist, they operate primarily in a reactive manner, with limited capacity to anticipate outbreaks at the local level. In response to this, the need arose to integrate climate, entomological, epidemiological, and socio-environmental information to strengthen prevention and decision-making.

What was done

- Time series of climate, entomological, epidemiological, and socio-environmental data were compiled (2019–2025).
- Climate variability indices and risk thresholds were constructed.
- Spatial models were developed to estimate vector density and viral circulation.
- Risk maps and hotspots were generated to target interventions.
- A community forecasting system with a 1- to 3-month horizon was implemented.
- Bulletins, response protocols, and public education activities were designed with community participation.

Main findings

- There is a consistent relationship between climate variability, an increase in the vector population, and the emergence of dengue cases.
- Bioclimatic indices make it possible to predict transmission peaks about one month in advance.
- Spatial analysis identified persistent high-risk clusters.
- Community engagement strengthened the detection of breeding sites and the adoption of preventive measures.

The approach

The SAT-DENCLIM project developed a bioclimatic early warning system that combines climate analysis, spatial modeling, epidemiological surveillance, and community participation. Through a transdisciplinary approach, the system makes it possible to identify high-risk areas and periods, generate tiered alerts, and translate scientific evidence into concrete preventive actions.

Impact and application

The project made it possible to implement an operational and participatory early warning system, improve the targeting of interventions, and optimize resources based on risk levels. In addition, it strengthened communication between authorities and the community and achieved a reduction of up to 60% in infestation rates and dengue cases compared to previous periods.

Key lessons

- Integrating climate, health, and geography is essential for anticipating outbreaks.
- Climate forecasting enhances traditional epidemiological surveillance.
- Community participation is a key component of sustainability.
- The model has the potential to be replicated in other regions and for other arboviral diseases.

Key message

SAT-DENCLIM demonstrates that it is possible to shift from reactive surveillance to proactive dengue management through climate data, spatial analysis, and community action, offering a replicable model for the health sector's adaptation to climate change.

Dissemination

https://www.paho.org/en/stories/early-warning-dengue-cuba-strengthens-prevention-community-level

https://www.paho.org/es/publicaciones/cuba-informe-anual-pais-2025

Sistema de alerta temprana para el control del dengue en la comunidad desde la acción climática, PAHO TV https://www.youtube.com/watch?v=75V11scJEjM

Learn more about this research program and access more briefs at: http://bit.ly/4u2qxhY

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