National Institute of Environmental Health Sciences

Effects of the El Nino-Southern Oscillation on dengue epidemics in Thailand, 1996-2005

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Abstract:

Background: Despite intensive vector control efforts, dengue epidemics continue to occur throughout Southeast Asia in multi-annual cycles. Weather is considered an important factor in these cycles, but the extent to which the El Nino-Southern Oscillation (ENSO) is a driving force behind dengue epidemics remains unclear. Methods: We examined the temporal relationship between El Nino and the occurrence of dengue epidemics, and constructed Poisson autoregressive models for incidences of dengue cases. Global ENSO records, dengue surveillance data, and local meteorological data in two geographically diverse regions in Thailand (the tropical southern coastal region and the northern inland mountainous region) were analyzed. Results: The strength of El Nino was consistently a predictor for the occurrence of dengue epidemics throughout time lags from 1 to 11 months in the two selected regions of Thailand. Up to 22% (in 8 northern inland mountainous provinces) and 15% (in 5 southern tropical coastal provinces) of the variation in the monthly incidence of dengue cases were attributable to global ENSO cycles. Province-level predictive models were fitted using 1996-2004 data and validated with out-of-fit data from 2005. The multivariate ENSO index was an independent predictor in 10 of the 13 studied provinces. Conclusion: El Nino is one of the important driving forces for dengue epidemics across the geographically diverse regions of Thailand; however, spatial heterogeneity in the effect exists. The effects of El Nino should be taken into account in future epidemic forecasting for public health preparedness.

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Resource Description

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

El Nino Southern Oscillation, Meteorological Factors, Meteorological Factors, Meteorological Factors, Temperature, Other Exposure

Temperature: Fluctuations

Other Exposure: sea surface temperature; cloudiness

Geographic Feature: ☒

resource focuses on specific type of geography

Mountain, Ocean/Coastal, Tropical

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: Other Asian Country

Other Asian Country: Thailand

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Dengue

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content