AN ECO-BIO-SOCIAL APPROACH
TO ASSESS DENGUE TRANSMISSION DYNAMICS
IN THAILAND

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ABSTRACT

This study integrates ecological, biological, and socio-demographic dimensions to assess dengue transmission dynamics. By employing two-stage random sampling, a total of 1,200 households (12 clusters; 100 each) situated in urban and semi-urban areas in 4 districts of the Chachoengsao Province were selected for cross-sectional longitudinal eco-bio-social interdisciplinary surveys. Cluster background, household, and entomological surveys, along with GIS mapping, were carried out by multidisciplinary teams during the rainy season, 2007 and the dry season, 2008. Laboratory mosquito blood meal analysis to assess dengue herd immunity in human populations was performed in 2009. Additionally, a stakeholder analysis was undertaken in 2010, so that the results could be triangulated with household and dengue vector survey data for contextualized eco-bio-social system analysis. In order to predict risks for *Aedes* vector abundance and dengue transmission, the study focused on four different ecotopes in urban and semi-urban areas: 1) Densely Populated Urban Residential Area or DENPURA 2) Commercial Area or C 3) Mixed Residential (with Commercial or RC) and 4) Mixed Residential (C plus DENPURA or RCDENPURA). Urban and semi-urban areas as predictors posed neither risks for an increase in vector density nor dengue transmission. In contrast, settings with high dengue endemicity corroborated a risk for dengue transmission but not for *Aedes* vector abundance, with RCDENPURA manifesting the highest risk. Entomological survey results revealed that 50-400L jars and cement bath basins were the two most productive container types. These key containers were significantly associated with their locations (inside the house and shaded area) and household usage (tap water and without intervention/cover). RC possessed the highest number of pupae per person (PP) in both seasons. The highest PPs were found in RCDENPURA during the wet season and DENPURA during the dry season. Mosquito blood meal analysis showed that the percentage of DENV IgM and IgG positive blood meals did not significantly differ between urban and semi-urban localities, but they were significantly associated with the degree of transmission. The highest risk for active dengue transmission was found in DENPURA during the wet season and RCDENPURA during the dry season. A seasonal pattern of DENV IgM and IgG seroprevalences demonstrated higher seropositivity rates during the dry season than the wet season. When blood meal analysis was linked with actual transmission, the number of positive DENV IgM correlated well with the number of reported dengue cases during the same period. This study is the first time that blood meal has been used to compare active dengue transmission among ecotopes. Social science research in relation to quantitative socio-demographic parameters showed housing structures with concrete/stone/brick in conjunction with improper garbage management and poor water storage practices as possible causes of increased vector density and dengue transmission, while “movement during the last 3 months” and “years of schooling longer than 5 years” also played a role in dengue transmission, especially in RCDENPURA. Stakeholder qualitative analysis, in light of their functions and interests, provided much more insight into the vector control problems and the persistence of dengue in the study area. In summary, a great variety of eco-bio-social determinants should be taken into consideration when formulating effective local dengue prevention/control programs.

KEYWORDS: DENGUE / ECOTOPE / BLOOD MEAL ANALYSIS / DENGUE HERD IMMUNITY / ECO-BIO-SOCIAL INTERDISCIPLINARY APPROACH
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Chapter 3

The three most common symptoms of dengue fever are fever, vomiting, and rash. Fever is the most common symptom, with a temperature of 39°C or higher. Vomiting is also common, occurring in about 30% of patients. Rash is less common, but it can be a helpful symptom in diagnosing dengue fever.