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Modelling Dengue Disease With Climate Variables Using Geospatial Data For Mekong River Delta Region of Vietnam

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Abstract : Mekong River Delta region of Vietnam is recognized as one of the most vulnerable to climate change due to flooding and seawater rise and therefore an increased burden of climate change-related diseases. Changes in temperature and precipitation are likely to alter the incidence and distribution of vector-borne diseases such as dengue fever. In this region, the peak of the dengue epidemic period is around July to September during the rainy season. It is believed that climate is an important factor for dengue transmission. This study aims to enhance the capacity of dengue prediction by the relationship of dengue incidences with climate and environmental variables for Mekong River Delta of Vietnam during 2005-2015. Mathematical models for vector-host infectious disease, including larva, mosquito, and human being were used to calculate the impacts of climate to the dengue transmission with incorporating geospatial data for model input. Monthly dengue incidence data were collected at provincial level. Precipitation data were extracted from satellite observations of GSMaP (Global Satellite Mapping of Precipitation), land surface temperature and land cover data were from MODIS. The value of seasonal reproduction number was estimated to evaluate the potential, severity and persistence of dengue infection, while the final infected number was derived to check the outbreak of dengue. The result shows that the dengue infection depends on the seasonal variation of climate variables with the peak during the rainy season and predicted dengue incidence follows well with this dynamic for the whole studied region. However, the highest outbreak of 2007 dengue was not captured by the model reflecting nonlinear dependences of transmission on climate. Other possible effects will be discussed to address the limitation of the model. This suggested the need of considering of both climate variables and another variability across temporal and spatial scales.

Keywords : infectious disease, dengue, geospatial data, climate
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