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Spatiotemporal causal modeling for the management of Dengue Fever

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Increasing climatic extremes have caused growing concerns about the health effects and disease outbreaks. The association between climate variation and the occurrence of epidemic diseases play an important role on a country's public health systems. Part of the impacts are direct casualties associated with the increasing frequency and intensity of typhoons, the proliferation of disease vectors and the short-term increase of clinic visits on gastro-intestinal discomforts, diarrhea, dermatosis, or psychological trauma. Other impacts come indirectly from the influence of disasters on the ecological and socio-economic systems, including the changes of air/water quality, living environment and employment condition. Previous risk assessment studies on dengue fever focus mostly on climatic and non-climatic factors and their association with vectors' reproducing pattern. The public-health implication may appear simple. Considering the seasonal changes and regional differences, however, the causality of the impacts is full of uncertainties. Without further investigation, the underlying dengue fever risk dynamics may not be assessed accurately. The objective of this study is to develop an epistemic framework for assessing dynamic dengue fever risk across space and time. The proposed framework integrates cross-departmental data, including public-health databases, precipitation data over time and various socio-economic data. We explore public-health issues induced by typhoon through literature review and spatiotemporal analytic techniques on public health databases. From those data, we identify relevant variables and possible causal relationships, and their spatiotemporal patterns derived from our proposed spatiotemporal techniques. Eventually, we create a spatiotemporal causal network and a framework for modeling dynamic dengue fever risk.