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Assessing Systemic and Non-systemic Transmission Risk of Tick-borne Encephalitis

Estimating the tick-borne encephalitis (TBE) infection risk under substantial uncertainties of the vector abundance, environmental condition and human-tick interaction is important for evidence-informed public health intervention strategies. Estimating this risk is computationally challenging since the data we observe, i.e., the human incidence of TBE, is only the final outcome of the tick-host transmission and tick-human contact processes. The challenge also increases since the complex TBE virus transmission cycle involves the non-systemic route of transmission between co-feeding ticks. Here, we describe the hidden Markov transition process, using a novel TBE transmission-human case reporting cascade model that couples the susceptible-infected compartmental model describing the TBE virus transmission dynamics among ticks, animal hosts and humans, with the stochastic observation process of human TBE reporting given infection. This is based on a joint work with K. Nah, F. Magpantay, A. Bede-Fazekas, G. Röst, A. Trájer, X. Wu and X. Zhang.