time-averaged reproduction number ($\langle \mathcal{R}_0 \rangle$) of the associated time-varying model showed a significant sensitivity to key parameters such as infection rates, quarantine rate, vaccine coverage rate, and recovery rates, supported by numerical simulations. These simulations validate theoretical findings and explore the impact of seasonal contact rate, imperfect quarantine, isolation, imperfect vaccination, and other parameters on the dynamics of measles transmission. The results show that increasing the rate of immunization, improving vaccine management, and raising public awareness can reduce the incidence of the epidemic. The study highlights the importance of understanding these patterns to prevent future periodic epidemics.

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Malaria dynamics with bimodality of incubation period in hosts in a seasonal environment

Mahmoud A. Ibrahim[1,2,3], Dénes Attila[1,2], Röst Gergely[1,2]

[1]Szegedi Tudományegyetem, Bolyai Intézet

[2]Szegedi Tudományegyetem, Egészségbiztonság Nemzeti Laboratórium

[3]Department of Mathematics, Faculty of Science, Mansoura University, Mansoura, Egypt

To describe the bimodal distribution of the incubation time of *P. vivax* malaria in Korea corresponding to empirical observations, we present a periodic compartmental model of delay differential equations for malaria transmission dynamics with two distinct exposed classes in the human population and including time-dependent parameters for mosquito birth and death rates as well as biting rates. The short-term incubation period is modelled by exponential distribution, while the long-term incubation is assumed to be of fixed length. We identify the basic reproduction number as the spectral radius of a linear operator and show that it is a threshold parameter for the global dynamics of the model. We apply the model to data from South Korea.

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