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The Effect of Environmental Variability and Periodic Fluctuations on Disease Outbreaks in Stochastic Epidemic Models.

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Abstract: Seasonality and contact patterns due to environmental fluctuations and social behavior affect the dynamics of disease outbreaks. Recent studies applied to deterministic epidemic models with periodic environments have shown that the average basic reproduction number is not sufficient to predict an outbreak. We extend these studies to stochastic epidemic models with periodic environments to investigate the combined effect of periodicity and variability on disease outbreaks. The deterministic models are extended to continuous-time Markov chain and stochastic differential equations. A numerical study of the dynamics of several stochastic SIR and vector-host models with environmental variability and periodicity are investigated in terms of probability of an outbreak.