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The stochastic epidemic modelling: The influence of incidence rates and perturbations.

Epidemic models provide an insight on how to react to an epidemic outbreak. For this matter, we investigate several aspects of stochastic dynamical systems according to different incidence rates and perturbations. We carry out a thorough analysis to show the existence of the global and positive solutions. We explore the extinction and the persistence of the disease regarding a derived stochastic threshold of the model. Moreover, we use suitable Lyapunov functions in order to explore the impact of the perturbation on the stability around the equilibrium points. Finally, we give some numerical illustrations to support our analytical results.