Analysis of Deterministic and stochastic SIRC epidemic model with time-delay for COVID-19

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An epidemic model based on deterministic and stochastic SIRC has been proposed for COVID-19, taking into account cross-immune classes and time delays in transmission terms. Under some criteria, infection-free and endemic steady states are asymptotically stable. Using the next-generation matrix method, the reproduction number $\mathcal{R}_0$ for the deterministic model is calculated according to contact rate, recovery rate, and other parameters. Positive global solutions exist and are unique for stochastic analysis. Stochastic models have a smaller reproduction number than deterministic models of the same type $\mathbb{R}_0$. We obtain conditions for the extinction of the disease by using the stochastic Lyapunov functional. It appears that white noise and time delay play a significant role in controlling the spread of the virus.

References

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