

## STABILITY ANALYSIS OF A DELAYED SIR MODEL WITH NONLINEAR INCIDENCE RATE

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### ABSTRACT

In this paper a delayed SIR model with exponential demographic structure and the nonlinear incidence rate is formulated. We show if the basic reproductive number, denoted,  $R_0$ , is less than unity, disease free equilibrium is stable. Moreover, we prove that  $R_0 > 1$ , the endemic equilibrium is locally stable without delay and the endemic equilibrium is stable if the delay is under some condition. Finally a numerical example is also included to illustrate the effectiveness of the proposed model.

**KEYWORDS:** SIR Epidemic Model, the Basic Reproduction Number, Stability, Time Delay, Hurwitz Criterion, Hopf Bifurcation