

GLOBAL DYNAMICS OF A DIFFERENTIAL-DIFFERENCE SYSTEM: A CASE OF KERMACK-McKENDRICK EPIDEMIC SIR MODEL WITH AGE-STRUCTURED PROTECTION PHASE

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In this work, we are concerned with an epidemic model of susceptible, infected and recovered (SIR) population dynamic by considering an age-structured phase of protection with limited duration, for instance due to vaccination or drugs with temporary immunity. The model is reduced to a delay differential-difference system, where the delay is the duration of the protection phase. We investigate the local asymptotic stability of the two steady states: disease-free and endemic. We also establish when the endemic steady state exists, the uniform persistence of the disease. We construct quadratic and logarithmic Lyapunov functions to establish the global asymptotic stability of the two steady states. We prove that the global stability is completely determined by the basic reproductive number.

References

- [1] M. Adimy, A. Chekroun and C. P. Ferreira. (2019). *Global dynamics of a differential-difference system: a case of Kermack-McKendrick SIR model with age-structured protection phase*. To appear in *Mathematical Biosciences and Engineering*.