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Basic reproduction numbers for a class of reaction-diffusion epidemic models

We study the basic reproduction numbers for a class of reaction-diffusion epidemic models that are developed from autonomous ODE systems and present a general numerical framework to compute such basic reproduction numbers; meanwhile, the numerical formulation provides useful insight into their characterizations. Using matrix analysis, we show that the basic reproduction numbers are the same for these PDE models and their associated ODE models in several important cases that include, among others, a single infected compartment, constant diffusion rates, uniform diffusion patterns among the infected compartments, and partial diffusion in the system.