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Qualitative properties of some discrete models of disease propagation

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Abstract: In this paper the qualitative properties of certain spatial disease propagation models are investigated. The paper can be considered as a generalization of the papers \cite{farhor2014,farhor2016}. The models of these papers assume that the members of the population do not move and that the infection is localised in the sense that only the members in a certain neighbourhood of the infective member can be infected. The considered qualitative properties were: the nonnegativity and the monotonicity of the density functions, and the preservation of the amount of the members. Sufficient conditions for these properties were obtained for the mesh size and the time step in certain finite difference solutions of the model. In these works, the one-dimensional case was investigated only. The present paper extends the above result in two directions: with results for higher dimensional problems and for another disease propagation model given in \cite{capasso}. Here the members are allowed to move according to some diffusion law. Similarly to the previous model, sufficient conditions are given that guarantee the validity of the qualitative properties. We focus only on the properties of the discrete models. The results are verified on test problems.

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