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On the effect of lowering population's movement to control the spread of an infectious disease

We study the asymptotic behavior of endemic equilibrium solutions of a diffusive infection epidemic model in spatial heterogeneous environment when the diffusion rate d_S of the susceptible hosts and the diffusion rate d_I of the infected group of the population are sufficiently small. In particular, we address the question of how the magnitude of the ratio $\frac{d_I}{d_S}$ affects the total size of the infected group at endemic equilibrium when both d_S and d_I are sufficiently small. Our results indicate that when d_I and d_S are sufficiently small, the size of $\frac{d_I}{d_S}$ plays a crucial role in the dynamics of the disease in the sense that : (i) if $\frac{d_I}{d_S}$ is sufficiently small, the disease may persist and the total size of the infected group will approach its maximal size; (ii) if $\frac{d_I}{d_S}$ is significantly large, then the total size of the susceptible hosts is maximized while the total size of the infected group is minimized. Hence, our results suggest that lowering the movement rate of the population in the attempt to control the spread of an infectious disease is an effective control strategy if the susceptible hosts movement's rate is kept sufficiently smaller than that of the infected individuals.