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Asymptotic profiles of the steady states for an SIS epidemic patch model with asymmetric connectivity matrix.

The dynamics of an SIS epidemic patch model with asymmetric connectivity matrix is analyzed. It is shown that the basic reproduction number R_0 is strictly decreasing with respect to the dispersal rate of the infected individuals, and the model has a unique endemic equilibrium if $R_0 > 1$. The asymptotic profiles of the endemic equilibrium for small dispersal rates are characterized. In particular, it is shown that the endemic equilibrium converges to a limiting disease-free equilibrium as the dispersal rate of susceptible individuals tends to zero, and the limiting disease-free equilibrium has a positive number of susceptible individuals on each low-risk patch. Moreover a sufficient and necessary condition is found to guarantee that the limiting disease-free equilibrium has no positive number of susceptible individuals on each high-risk patch. (Received January 20, 2020)