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Human mobility and epidemic invasion

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The current H1N1 influenza pandemic is just the latest example of how human mobility helps drive infectious diseases. Travel has grown explosively in the last decades, contributing to an emerging complex pattern of traffic flows that unfolds at different scales, shaping the spread of epidemics. Restrictions on people's mobility are thus investigated to design possible containment measures. By considering a theoretical framework in terms of reaction-diffusion processes, it is possible to study the invasion dynamics of epidemics in a metapopulation system with heterogeneous mobility patterns. The system is found to exhibit a global invasion threshold that sets the critical mobility rate below which the epidemic is contained. The results provide a general framework for the understanding of the numerical evidence from detailed data-driven simulations that show the limited benefit provided by travel flows reduction in slowing down or containing an emerging epidemic.