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Bilateral interactions in disease dynamics - Decreasing epidemic thresholds with facilitated contact rates ALEJANDRO MORALES GALLARDO, MPI-DS, Goettingen, DIRK BROCKMANN, Northwestern University, Evanston, THEO GEISEL, University of Goettingen, MPI-DS, Goettingen — Compartmental epidemiological models are very successful modeling paradigms in epidemiology. Typically, they are employed for quantitative assessments of key parameters such as the basic reproduction number R_0. These models rest on two key assumptions: 1.) a population is well mixed 2.) transmission is triggered by a population averaged contact rate. However, experimental evidence shows that contact rates vary substantially, and it has been hypothesized that this variability can change the dynamics of population relevant disease dynamics. However, for inhomogeneous populations the translation of distributed contact rates into effective disease transmission events is non-trivial. Transmission may either depend only on the contact rate of the transmitting individual alone (unilateral transmission), or on the contact rates of transmitting and receiving individual (bilateral transmission). In the SIS model we show that in either systems the endemic state of a disease can be stable for values of $R_0 < 1$ unlike homogeneous systems with a critical value $R_0 = 1$. Furthermore, bilateral contact dynamics entail parameter regimes in which a stable endemic state can cease to exist if the mean contact rate is increased, an unexpected effect absent in homogeneous populations.

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