Reduced models for a stochastic multilayer SIR model including households and workplaces

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Résumé

We study a stochastic *SIR* model with two levels of mixing, namely a global level which is uniformly mixing, and a local level with two layers representing household and workplace contacts, respectively. First, we illustrate through simulations that a well calibrated, uniformly mixing *SIR* model yields a satisfying approximation of epidemic key characteristics. Second, we establish the large population convergence of the corresponding stochastic process. Convergence to the unique deterministic solution of a measure-valued equation is obtained. In the particular case of exponentially distributed infectious periods, we show that it is possible to further reduce the obtained deterministic limit, leading to a finite dimensional dynamical system capturing the epidemic dynamics.

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