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# Inhomogeneous epidemics on weighted networks

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## Abstract

A social (sexual) network is modeled by an extension of the configuration model to the situation where edges have weights, e.g. reflecting the number of sex-contacts between the individuals. An epidemic model is defined on the network such that individuals are heterogeneous in terms of how susceptible and infectious they are. The basic reproduction number  $R_0$  is derived and studied for various examples, but also the size and probability of a major outbreak. The qualitative conclusion is that  $R_0$  gets larger as the community becomes more heterogeneous but that different heterogeneities (degree distribution, weight, susceptibility and infectivity) can sometimes have the cumulative effect of homogenizing the community, thus making  $R_0$  smaller. The effect on the probability and final size of an outbreak is more complicated.