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## **Dynamics of Stochastic Epidemics on Heterogeneous Networks - Variance of an epidemic during early growth period**

Epidemic models currently play a central role in our attempts to understand and control infectious diseases. Here, we derive a model for the diffusion limit of stochastic susceptible-infectious-removed (SIR) epidemic dynamics on a heterogeneous network. Using this, we consider analytically the early asymptotic exponential growth phase of such epidemics, showing how the higher order moments of the network degree distribution enter into the stochastic behaviour of the epidemic. We find that the first three moments of the network degree distribution are needed to specify the variance in disease prevalence fully, meaning that the skewness of the degree distribution affects the variance of the prevalence of infection. We compare these asymptotic results to simulation and find a good agreement for city-sized populations.