Immunization on a Network

We showed earlier that epidemics spread "instantaneously" on scale free graphs of degree $\gamma \leq 3$, and that there was no epidemic threshold. While this makes these networks extremely vulnerable to epidemics, we can also exploit the heterogeneity to find very effective immunization strategies [?].

Consider an SIS epidemic with the ratio between infection rate and recovery rate λ , on, for simplicity, a scale free network with minimum connectivity $k_{\min} = m$ and degree $\gamma > 2$. Suppose we can give a vaccine to a fraction g of the nodes, which makes them fixed in the S state (i.e., they can't get infected).

- (a) Assuming a mean field network structure, which nodes should you immunize?
- (b) As a function of γ , describe the smallest possible g for which the network is immune against the epidemic i.e., the epidemic will die off because we are below the threshold. Comment on the results.