sion. Finally, experiments on random graph models with clustering suggest that local clustering does have a profound effect on the spread of disease.

1.4 Vaccination Policies

Vaccination is an easy way to prevent hospital acquired infections [100, 110]. Yet, non-compliance and vaccination shortages [67] remain a problem. Recent research suggests that employing "targeted" vaccination strategies is a viable option for protecting the entire population in spite of these problems [41, 6, 18]. However, the effectiveness of targeted vaccination strategies require knowledge of *who* to vaccinate in order to minimize the spread of disease. Social contact networks and disease diffusion models provide valuable insight into who these "key" individuals are.

If we suppose that disease diffusion is a dynamical process over a social contact network $G = (V, E)$, then there are two natural optimization problems that fall out. The first problem, which we call *budgeted vaccination*, is to find key individuals to target with vaccination in the case of vaccination shortages. That is, given a budget b of vaccinations, find a size-b subset $V' \subseteq V$ to vaccinate such that the number of vertices infected as a result of disease diffusion on $G \setminus V'$, the graph resulting from the removal of V' from G, is minimized. The second problem, which we call *restricted disease*, is to minimize the number of individuals that need to be vaccinated in order to "restrict" disease spread to a given size of the population. More precisely, given integer budget $k < |V|$, find a minimum size subset of vertices $V' \subseteq V$ whose removal from G reduces the expected number of people infected as a result of a single infected