

disease spreads. Motivated by the problem of reducing hospital acquired infections we examine four aspects of using social networks for epidemiology.

## 1.1 Hospital Acquired Infections

*Nosocomial* (hospital-acquired) infections are a major cause of morbidity and mortality in United States hospitals, causing up to an estimated 80,000 deaths a year [103, 52]. Nosocomial diarrhea due to *Clostridium difficile* is estimated to cost US hospitals over 1.1 billion dollars annually [62]. Usually hospital acquired infections enter a hospital through patients who, during their care, spread the disease to a healthcare worker (HCW). Infected HCWs then, in treating other patients and interacting with other HCWs, spread disease throughout the hospital. In the case of an outbreak of a nosocomial infection, the hospital can employ strategies for controlling the outbreak such as isolation [53], quarantining, sending infected HCWs home, or in certain circumstances, patient cohorting. These types of interventions can be modeled as optimization problems on social networks where the objective is to remove disease transmission pathways (edges) in order to separate sets of individuals (nodes). But for patient care, quarantine and isolation are problematic; isolation and quarantine severely degrade the level of patient care because HCWs are less willing to use additional precautions (respirators, gowns, gloves, etc.) required to treat patients in isolation.

Ideally it is better to simply prevent these outbreaks from happening. Some hospitals have instituted policies such as HCW uniform requirements, equipment