Abstract: Influenza pandemics have occurred an average of three times every century since the 1500s. There is an ominous expectation that a severe pandemic could occur and infect between 20 to 47 million people in the U.S. alone with an economic impact ranging between $71.3 and $166.5 billion. Pharmaceutical interventions (PHIs) with vaccines and antivirals are the most effective methods of mitigation; however, availability of PHIs is unlikely to be adequate during the early stages of a pandemic. Non-pharmaceutical interventions (NPIs), such as quarantine and school closure, offer a viable alternative and may be the only intervention strategy for many undeveloped countries. We developed effective NPI strategies and in this presentation we demonstrate the efficacy of these strategies on large-scale simulated outbreaks involving three different scenarios of virus transmissibility. We modeled pandemic influenza outbreaks using an agent-based simulation approach. The model incorporates detailed population demographics and dynamics, variety of mixing groups and their contact processes, infection transmission process, and non-pharmaceutical interventions. Using a statistical experimental design approach we examine the influence of characteristic parameters of virus epidemiology, social behavior, and non-pharmaceutical interventions on various measures of pandemic impact such as total number of infections, deaths and contacts. The experimental design approach also yields the knowledge of the extent of interactions among the above parameters. The results show that significant improvements in the NPI based pandemic mitigation approaches can be attained by the strategies derived from our methodology.

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