Epidemiological Simulation for Influenza Prevention

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Abstract

Vaccination is one preventive measure against influenza that can be done without placing restrictions on social activities. However, since the stockpile of vaccines that can be prepared before the arrival of an emerging pandemic strain is generally quite limited, one has to select priority target groups to which the first stockpile is distributed. In this paper, we study a simulation-based priority target selection method with the goal of the enhancing the collective immunity of the whole population. As a model region where the disease spreads, we consider a city composed of suburbs and central areas connected by one commuter train line. The human activity is modelled following the agent-based approach. The enhancement of the collective immunity is judged by the illness attack rate in unvaccinated people. The simulation results show that this illness attack rate can be reduced from 40% for the baseline cases down to 5%, provided students and office workers are given exclusive priority in the first three months. This significant reduction is in contrast with the case of random vaccination, where the illness attack rate exhibits a small reduction to 30%. In addition, giving preference to active social groups does not mean sacrificing high risk groups, which correspond to elderly people in our simulation model. This administration design reduces the mortality rate further across all ages compared with random administrations to all social groups.