barriers faced by older people in accessing transport particularly for leisure. Future research should explore these synergies and the potential for community led, demand responsive transport with multi stakeholder engagement. This review highlights that access to public transport in rural communities is an important factor in mitigating social exclusion for older people, their physical and mental wellbeing and maintaining an active lifestyle.

http://dx.doi.org/10.1016/j.jth.2018.05.063

2339

Model Based Policy Analysis for Infection Spread during Air Transportation

Sirish Namilae*[1], Anuj Mubayi[2], Ashok Srinivasan[3], Pierrot Derjany[4]

[1] *Embry Riddle Aeronautical University, FL*
[2] *Arizona State University, AZ*
[3] *Florida State University, FL*
[4] *Embry-Riddle Aeronautical University, Daytona Beach, FL, USA*

Background: Public transportation in general and air travel in particular have been identified as leading factors in the spread of many different viruses. The high economic and public perception costs on the transportation sector due to pandemic events necessitates transportation policy that addresses mitigation. We formulate a multiphysics computational model that incorporates particle dynamics based pedestrian movement of travelers in transit hubs (e.g. airports), contact analysis and stochastic infectious disease spread, to frame and analyze transportation policies that can mitigate infectious disease spread.
Methods: In the multi-scale model, we model the pedestrian movement using a particle dynamics social force model. A location dependence of desired velocity is introduced to reduce reliance on repulsive forces that are difficult to estimate. The pedestrian trajectory information from the above model is integrated with a discrete-time stochastic Susceptible-Exposed-Infectious (SEI) model for infection transmission. The probability-distribution of infection transmission varies depending on the incubation periods and transmission rates for specific diseases. The amount of RNA virus copies in blood serum is used to estimate the infection probability profile for diseases including Ebola and SARS. The number of infected travelers for a given transportation policy (e.g. boarding strategy, gate size etc) can then be estimated using this multi-scale model. Further, the transportation policies that minimize the infection spread are evaluated and algorithms to quantify policy robustness using massively parallel supercomputers are discussed.
Results: Several Boarding and deplaning strategies, airplane and gate size are evaluated as policies for three directly transmitted diseases Ebola, SARS and H1N1 influenza. We found that deplaning had a smaller impact on infection dynamics because of the lower number of new contacts and lower time of exposure during the comparatively faster process. Among boarding strategies, we found that two-zone randomized boarding process results in fewer number of infections. Smaller airplanes such as 50 seaters are more effective in reducing infection. Comparing the infectivity of first day and peak day for the three diseases (day 3 for Ebola, day 5 for H1N1 and day 4 or 5 for SARS), the mean of the Poisson distribution increases marginally by one unit for Ebola and SARS but expands significantly for H1N1. The information is presented in terms of policy analysis maps.
Conclusions: A multi-scale pedestrian dynamics–infection dynamics model is presented as an approach for exploring air-travel policies that minimize infectious disease spread. Several transportation policy options that impact the disease spread are presented.

http://dx.doi.org/10.1016/j.jth.2018.05.064