Final epidemic size with triggered policy and optimal intervention strategies during infectious disease outbreaks

Khalil Ahmad Muqbel, Gergely Röst, Attila Dénes
University of Szeged, Szeged, Hungary

We introduce new intervention strategies to control infectious disease outbreaks. The analysis of these strategies is based on the SIR framework. We apply a given intervention (transmission control, mass vaccination or mass treatment) when the number of infected individuals reaches a prescribed threshold level, and continue our intervention until the number of susceptibles drops to the critical level such that the epidemic is vanishing on its own afterward. The strategies are defined by parameters such as the threshold level to initiate a strategy, and the effort put into the strategy. We show the relation between the final epidemic size, the length and the total cost of the intervention, and the intervention parameters. Finally, we discuss why these strategies are better than some previously suggested ones.

[1] A. Handel, I.M. Longini, R. Antia, What is the best control strategy for multiple infectious disease outbreaks? *Proceedings of the Royal Society B: Biological Sciences* (2007);274(1611):833-837. doi:10.1098/rspb.2006.0015.

[2] Y. Xiao, X. Xu, S. Tang, Sliding mode control of outbreaks of emerging infectious diseases. *Bulletin of mathematical biology* 74(10), 2403-2422.

[3] F. Brauer, C. Castillo-Chavez, *Models for endemic diseases.* Mathematical Models in Population Biology and Epidemiology. Springer New York, 2012. 411-464.