



جلسه ارائه علمی دانشکده مهندسی صنایع

Optimal Two-Phase Vaccine Allocation to Geographically Different Regions under Uncertainty

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Abstract

In this article, we consider a decision process in which vaccination is performed in two phases to contain the outbreak of an infectious disease in a set of geographic regions. In the first phase, a limited number of vaccine doses are allocated to each region; in the second phase, additional doses may be allocated to regions in which the disease has not been contained. We develop a simulation model to capture the disease dynamics in each geographic region for different vaccination levels. We formulate the vaccine allocation problem as a two-stage stochastic linear program (2-SLP) and then use the special problem structure to reduce it to a linear program with a similar size to that of the first stage problem. We also present a Newsvendor model formulation of the problem which provides a closed form solution for the optimal allocation. We construct test cases motivated by vaccine planning for seasonal influenza in the state of North Carolina. We also propose and test an easy to implement heuristic for vaccine allocation. We show that our proposed two-phase vaccination policy potentially results in a lower attack rate and a considerable saving in vaccine production and administration.

Biography

Faculty at College of Management, University of Massachusetts Boston

Research Interests:

Stochastic Modeling and Optimization with Applications in Healthcare Operations Management, Multicriteria Optimization with Applications in Radiation Therapy Treatment Planning, Application of Control Theory and Systems Dynamics in Analyzing Systems Behavior.

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Postdoctoral research, Harvard Medical School and Massachusetts General Hospital

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