Optimizing Vaccine Allocation for Pandemic Influenza

Bismark Singh[1,*], Hsin-Chan Huang[1], Lauren Ancel Meyers[1]
[1] The University of Texas at Austin
*bismark.singh@utexas.edu
David P Morton[2]
[2] Northwestern University

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We consider allocation of vaccine doses to population priority groups in an influenza pandemic. Since the spatial distribution of vaccination locations, many of which are pharmacies, and personnel might not be equal across different geographic regions [1], a simple pro-rata policy could provide unequal geographic coverage to population target groups. Thus, distribution schemes become complicated with the notion of equity between different population groups and geographies. Using an optimization model, we seek to achieve *p*roportionally fair coverage of vaccine doses to population priority groups as informed by specified weights. Our model has the feature that if the weight of one priority group is twice that of another, then we seek half the shortage for the higher priority group. Through secondary objectives, we seek to provide clear direction to healthcare providers on which vaccine type should be given to whom, and help maintain equity among different regions. Using the 2009 H1N1 vaccine distributions in Texas as a case study, we analyze the performance of the Texas Department of State Health Services. We also embed our model in a publicly available Web-based decision-support tool for the Texas DSHS [2].

We assume a large fraction of available vaccines are distributed to healthcare providers based on their requests, and then optimize county-level allocation of the remaining doses to achieve equity. Based on vaccine quantities delivered to registered healthcare providers in response to their requests during the 2009 H1N1 pandemic, we find that a relatively small cache of discretionary doses (on par with the 6.8% actually reserved in 2009) suffices to achieve equity across all counties in Texas.

References

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