

Sharing Scarce Flu Vaccine May Be Best: Game Theory Model Shows Hoarding Supplies Isn't Healthiest Choice

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Image: Fuqua School of Business, Susan Barker

(PhysOrg.com) -- As manufacturers race to test and deliver an H1N1 influenza vaccine by October, public health officials are working equally feverishly to determine how scarce doses should be allocated.

Because supplies are expected to be short, governments may be tempted to buy large quantities of vaccine and antiviral treatments to protect their citizens. Yet research from Duke University's Fuqua school of Business and the European School of Management and Technology (ESMT) indicates that in the case of some epidemics, countries would be best served by giving their drug supplies to another country.

Duke Professor Peng Sun, Duke PhD student Liu Yang, and Professor Francis deVericourt of ESMT created a model based on [game theory](#) to test how countries with adequate drug supplies should react to an epidemic affecting a neighboring country with little or no supply of vaccine or treatments. Their findings indicate that countries possessing treatments are sometimes best served by donating their treatments to the first country afflicted by an epidemic, instead of using the drugs on their own citizens. In game theory, this situation is referred to as a Nash Equilibrium, the combination of actions by different players that results in the best outcome each player can expect, given the other players' moves.

“When an epidemic begins in a small or poor country that does not have treatments available, other countries can often prevent the spread of the epidemic, and best protect their own citizens, by giving their stockpile of treatments to cover the country experiencing the initial outbreak,” said Sun. “While this may appear to be a purely altruistic move, it’s actually in everyone’s best selfish interest, because the donating country can avoid a significant number of infections by helping arrest the spread of the disease at its point of origin.”

The team’s findings also underscore the need for a central planning organization such as the [World Health Organization](#). “Our models demonstrated that centralized allocation of treatments across countries frequently results in better containment of an outbreak than what is possible when individual countries are left to determine a course of action,” Sun said.

One country’s donating decision in fact makes it more beneficial for another country to donate. Without coordination, every country may decide not to donate; this also creates a state of equilibrium, but is not the most effective way of containing the outbreak.

The researchers note that game theory analysis also raises potentially interesting and disturbing ethical questions. “The [outbreak](#) may be better contained with an enforceable centralized allocation across countries,” Sun said. “However, some countries may benefit a lot while others actually suffer more than they would have if they acted solely in their own best interests.”

Sun’s paper, which has been accepted for publication in the journal *Operations Research*, is available for [download here \(PDF\)](#).

Provided by Duke University ([news](#) : [web](#))

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