A Better Shot at Immunization

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A new immunization strategy could reduce the vaccine doses needed to protect a population from disease (and reduce the antivirus updates required to protect a network of computers) by as much as 50%.

The immunization scheme was developed by a collaboration of physicists from Boston University, Bar-Ilan University in Israel, and Stockholm University. It's similar to previous strategies that focus on immunizing the most highly connected people (or computers) first.

The more connections you have to neighbors, coworkers, customers, and relations, the more vital it is to make sure you don't catch the disease and pass it on to your many contacts. Once the most highly connected people are protected, it's time to move to the next most highly connected people, and so on down the list. The benefit of the technique is that only a fraction of the population has to be vaccinated in order to quash an epidemic.

The innovation in the new immunization strategy focuses on using the connections among a network of people to assign them to a number of small, but equally sized groups. Then people in each group are immunized based on their connections within the group. The equipartioning is key - other immunization methods tend to be less efficient because they overemphasize immunizations of small clusters of individuals relative to larger clusters. That can't happen if population is divided up so that all the clusters are the same size.

The physicists confirmed the effectiveness of their scheme by simulating infections on various populations, including an Internet-based computer network and a network of Swedish workers and their families compiled by the Swedish government. The need for immunization was reduced by 5% to 50% in each of the networks, significantly lowering the potential expense and time that it would take to protect populations and networks from contagious infections.

Citation: Yiping Chen, Gerald Paul, Shlomo Havlin, Fredrik Liljeros, and H.Eugene Stanley
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