

Modelling How Information Spreads By Word Of Mouth Is Helping Stop HIV

Social work meets computer science.

With so many people living in a social media bubble, it's easy to forget that in all of our communities, most information still spreads without the help of Facebook.

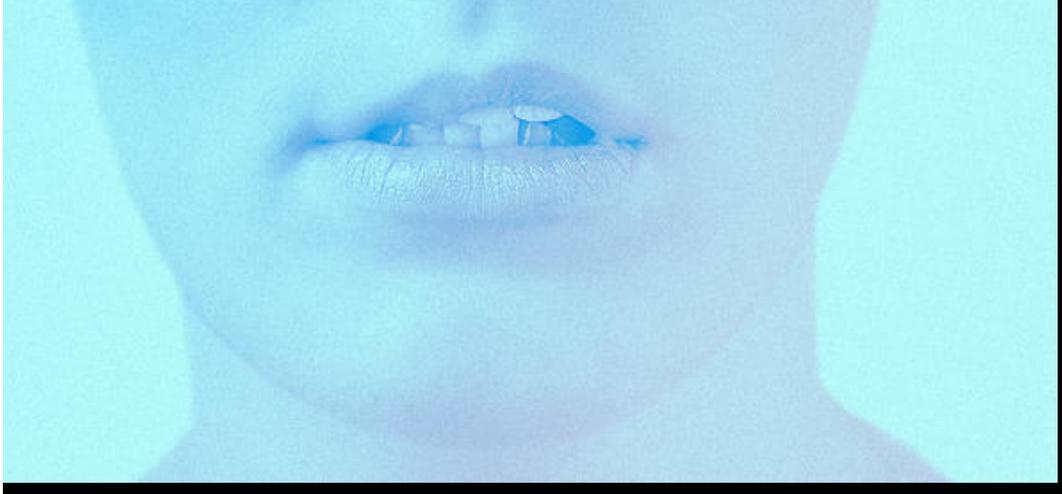
That's one reason that University of Southern California computer scientist and game theorist Milind Tambe has studied how information spreads among messy real-life social networks. His past work has included helping predict wildlife poaching threats and assisting the U.S. military to disseminate pro-American sentiments in Afghanistan.

Now he's teamed with Los Angeles social workers to look at a very different hard-to-reach population: homeless youth, one of the most at-risk populations for HIV in the United States.

Among the two million homeless teens and young adults in the U.S., about 11% are HIV-positive—an epidemic rate that's 10 times higher than is found in the general population. Social work centers work to spread prevention awareness, but these are also teens who have much more immediate concerns, like housing and feeding themselves.

Even knowing how to spread information is challenging, according to Eric Rice, an assistant professor at the USC School of Social Work and co-author of the new study. Unlike most teens, homeless kids don't stay in one place for very long and their friends are always changing. Social workers instead use "peer-led HIV prevention"—a.k.a. word-of-mouth from friends. Centers invest to educate a few homeless teens who can then spread HIV prevention awareness to their own networks.

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Doing peer-led prevention well isn't easy. "One of the sticky problems with peer-led HIV prevention programs is: Who are supposed to be the peer leaders? It matters a lot who you pick," says Rice.

Often, social workers pick teens they think are most popular or most responsible or, simply, most willing. But that doesn't always lead to getting the information out best: "To use high school as an example, if you're only picking the popular kids, you're never going to reach the nerd network. Or the Goth kids," Rice says.

Before getting involved with computer scientists, Rice worked with the the social service center My Friends Place to survey 1,000 homeless teens and young adults in Los Angeles over two years. He then created a map of how young people were connected to one another. It was painstaking work; he was essentially creating a Facebook-like social network by hand. He realized he couldn't expect anyone else to replicate it if they wanted to improve prevention programs in a practical way.

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That's where the algorithm created by Tambe and his PhD student Amulya Yadav came in. It maps the network to find the best person to pinpoint, who is most likely to be able to spread information to the most number of people. It takes into account the huge amounts of uncertainty about people's relationships.

"The program essentially calculates thousands and thousands and thousands of possibilities, and votes on the best choice," says Rice. It outperformed simple decision rules, such as always picking the person with the most connections, by 60%.

The social work center My Friend's Place isn't using the program yet, but that's the goal. Rice hopes to create a mobile app where social workers could input information about the social relationships of everyone who comes into the center, so it can continuously update the social network map.

Rice believes that not long from now, it won't seem strange for a computer scientist and a social worker to collaborate. "People will say, 'Oh yeah, of course you're using heavy computation to try to solve complex social problems.'"



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