Fighting the swine flu pandemic with mathematics

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As swine flu spreads across America, good data can make all the difference in controlling it.

Who needs to get antiviral medications first? Who can wait? When should counties and states shut down airports, schools, and highways? When should they tell people to stay home from school and work?

As America — and the world — braces for the worst, a team of Tel Aviv University mathematicians says it may have a solution that can save both time and lives. Prof. Lewi Stone and his colleagues at TAU's Department of Life Sciences are creating a statistical tool which, they believe, has the power to macro- and micromanage pandemic influenza outbreaks.

Their secret weapon is the most extensive database in the world dealing with influenza outbreaks. "We've accessed a veritable gold-mine of data, collected over 10 years in Israel by a large network of hospital and medical clinics," says Prof. Stone. "It gives us a country-wide picture of what a seasonal flu is like and how much worse it would be if there were a swine flu pandemic."

The best data in the world

Two American teams tried to predict what would happen to the swine flu when it started infecting Americans, with limited success. The Israeli

team believes that their approach — a set of modeling tools modular in design - will be more successful. One reason is their impressive data set. Another is the modular way the model is conceived: The models are complicated when the existing data is good, simpler when key variables are missing.

"Based on our study of influenza outbreaks in Israel," says Dr. Amit Huppert of the Gertner Institute at Israel's Tel Hashomer Hospital, who is collaborating on the research, "we can estimate the rate at which the virus spreads in towns with a very young population. These communities are especially at risk. Communities in the U.S. with a high population of children can be advised to stock up on anti-virals."

"It's taken a lot of work to remove the 'noise' from the data set in a careful way," says Prof. Stone. Some doctors misclassified other respiratory illnesses as the flu, or perpetrated other doctors' reporting errors.

Finetuning for the worst

The TAU researchers also took into account that the swine flu will attack more people than an annual seasonal flu, because most people have only limited immunity to the new H1N1 swine flu. These factors are worked into the model so that communities, hospitals and bodies like the United Nations or the Center for Disease Control can make better decisions in planning.

Prof. Stone believes that we haven't seen the worst of the swine flu yet. "The pandemic, if it's like the previous one, will come in waves," he says. "The first wave is the weaker one and rather wimpy. It's not very dangerous. We still have to brace ourselves for the worst.

"Our model provides guidance for complex decisions such as whether to

close airports, schools, and travel routes, and how to distribute Tamiflu," Prof. Stone continues. "It could be applied to very small populations as well as populations as large as 6 to 10 million people and more."

Funded by Epiwork, a European Union project, the Tel Aviv University team -- which also includes Dr. Haggai Katriel, Uri Roll, Oren Barnea and Rami Yaari, all from TAU's Faculty of Life Sciences -- hopes to have a commercial version of the model available in three years. Prof. Stone, one of the project's managers, is a world expert in managing childhood epidemics like measles and mumps, and published a landmark study on his work two years ago in *Nature*.

The new Tel Aviv University model might also be used to understand bio-terror attacks, should such a catastrophic event take place.

Source: Tel Aviv University (news : web)