

Study predicts HIV drug resistance will surge

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(PhysOrg.com) -- New research predicts that a wave of drug-resistant HIV strains will emerge in San Francisco within the next five years, hampering efforts to control the pandemic.

New research based on a novel mathematical model predicts that a wave of drug-resistant [HIV](#) strains will emerge in San Francisco within the next five years. These strains could prove disastrous by hindering control of the HIV pandemic.

In a study published Jan. 14 on the website of the journal *Science*, researchers from the Semel Institute for Neuroscience and Human Behavior at UCLA and the University of California, San Francisco's HIV AIDS Program at San Francisco General Hospital, developed a complex network model that tracks the transmission of multiple strains of HIV.

The model can be used to predict drug resistance in any setting where individuals are treated for [HIV infection](#). While in this case it was applied to San Francisco, the researchers found that the drug-resistant strains emerging in that city are also very likely to emerge in many African countries where treatment is just beginning.

The model showed that surprisingly many of the drug-resistant HIV strains that have evolved over the past last 10 years in San Francisco are much more transmissible than had been previously thought. The researchers predict these strains are likely to cause a new wave of drug resistance within the next five years.

"This isn't just about San Francisco," said senior author Sally Blower, director of UCLA's Center for Biomedical Modeling and a member of the UCLA [AIDS](#) Institute. "It's basically about many other communities in resource-rich countries and has significant implications for global health. San Francisco is like the canary in the mine. In fact, the most significant implications of our work are for countries where treatment is just being rolled out."

The researchers began the study by using their model to analyze data from San Francisco. They modeled the evolution of drug-resistant strains over the past 20 years and predicted their spread over the next five years, according to co-first author Robert Smith, who was a postdoctoral fellow in Blower's lab when the research was conducted.

"What was very disturbing was we found that some of the drug-resistant strains were increasing," said Smith, now an assistant professor in the department of mathematics and statistics at the University of Ottawa.

The researchers' model was able to explain this increase, said Justin T. Okano, the other co-first author on the study and a research associate in Blower's group.

"Our model showed that what is going on in San Francisco is very complicated — but in a nutshell, it is due to the bug, the drugs and sex," he said.

The researchers do not know the extent of the spread of resistance, said co-author James Kahn, professor of clinical medicine at the UCSF Positive Health Program at San Francisco General Hospital, who was among the first to document the spread of HIV resistance at San Francisco General Hospital.

"Our modeling can be applied to other diseases, too, and can improve

our understanding of the spread of resistant pathogens" he said.

The modeling also allowed the team to predict what is likely to happen in countries where HIV treatment is just becoming available.

"What is very unsettling is that our modeling shows that the current strategy for HIV elimination that is being proposed by the World Health Organization could inadvertently make things worse and significantly increase levels of [drug resistance](#) in many African countries," Blower said.

Erin Bodine, a graduate student at the University of Tennessee who was a research assistant in Blower's lab when the research was conducted, was also a co-author.

Provided by University of California Los Angeles

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