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Crime Hot Spots Can Be Cooled

A new computer simulation predicts hot spots where police intervention will not simply displace crime, but rather erase it completely.

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THE GIST:

- **Using a new mathematical model, researchers working with police may be able to shut down crime hot spots.**
- **The team ran simulations that led to the formation of crime hot spots and then simulated police intervention.**
- **Although some hot spots kept reappearing, others disappeared completely.**

Not all crime hot spots are created equal, a new mathematical model suggests. For some areas repeatedly hit hard with crime, police intervention can shut down lawlessness and keep it down. But for others, police involvement just shifts the trouble around.

"If you see a hot area of crime, you want to know: If you send the police in, will that displace the crime or get rid of the crime altogether?" said Andrea Bertozzi, a mathematician at UCLA who presented the new model February 20 at the annual meeting of the American Association for the Advancement of Science. "We were able to predict the ability to suppress or otherwise displace hot spots." The results will also appear February 22 in the *Proceedings of the National Academy of Sciences*.

The study "makes a major contribution to the theory of hot spots of crime," comments John Eck, a criminologist at the University of Cincinnati.

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Working with anthropologists, criminologists and the Los Angeles Police Department, Bertozzi built a mathematical representation of how areas with frequent, repeated crimes form within a city and change over time.

The team modeled a city as a two-dimensional grid populated with burglars and houses to rob. The researchers used previous studies to add a mathematical description of how attractive a region is to a burglar. Data has shown, for example, that the house next door to a house with a broken window is more likely to be robbed.

Bertozzi and colleagues ran simulations that led to the formation of crime hot spots and then

simulated police intervention. Two sharply distinct outcomes emerged. Certain kinds of hot spots just moved around in response to police efforts to quash them. "It's impossible," Bertozzi said. "You hit one and it pops up somewhere else."

But for others, suppressing the hot spot once erased it forever.

The difference comes from how the hot spot forms in the first place. The model shows that a high-risk zone forms around every break-in. If the boundaries of risk zones overlap, then a persistent hot spot forms. "The diffusion of risk basically binds together local crimes, which then will seed more crimes," Bertozzi said.

But suppressible hot spots can form from one large crime spike, in which a single event draws in more criminals. A good example of this might be the formation of a drug market, said UCLA anthropologist Jeffrey Brantingham, a coauthor of the paper.

"You wouldn't suspect this was the case from just mapping the hot spots," Brantingham said. "Empirically they look very much the same." The math was able to show that there may be two different types of hot spots when the data alone could not, he said.

"This is something that would be important for us in real life," Bertozzi said, "to be able to go and tell the police, in this situation you're going to be able to get rid of the crimes, and in this other situation you're only going to displace them."

Though the researchers compared the model's predictions of where and when burglaries would happen with real data from a region of the San Fernando Valley, Eck says he would want to test the model's police intervention predictions. Still, he says, it makes "a really elegant start."