Research Brief: “Can Hot Spots Policing Reduce Crime in Urban Areas? An Agent-Based Simulation.”

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Summary

Police departments around the country organize patrol deployments by identifying and focusing units within small geographical areas with particularly high rates of crime. This tactic is commonly referred to as a “hot spots” method of police patrol. In dozens of rigorous evaluations conducted over the past two decades, the hot spots method has developed a strong empirical record demonstrating effectiveness in reducing crime and disorder within targeted areas. Additionally, place-based police patrol interventions have consistently shown significant reductions in crime within targeted areas without evidence of crime shifting to immediately adjacent locations.

However, empirical evaluations of hot spots methods have not examined potential crime reduction effects beyond the targeted areas themselves and adjacent locations. While this is a straightforward and valuable question to address, it is challenging to answer from a research methodology perspective. Hot spots have been evaluated using rigorous (experimental and/or quasi-experimental) research designs. These designs allow researchers to have confidence that changes in crime or disorder are truly due to hot spots and not other possible explanations. For example, in studying hot spot effectiveness in a large urban area, a random selection of patrol beats could be assigned to hot spot tactics and compared against other beats that do not use those tactics. Therefore, any changes in crime between two randomly picked sets of beats (where the only difference is use of hot spots) can be attributed to hot spots. This allows research to compare a hot spot “treatment” to a “control” where tactics are business-as-usual.

Still, these rigorous designs are not perfect and cannot address whether the use of hot spots somewhere in a jurisdiction manages to impact crime throughout a jurisdiction. This question is particularly important in large urban areas where neighborhoods and communities are interconnected and police resources may already be stretched. But since any random assignment of beats takes place within a single jurisdiction, there is no appropriate comparison group to another jurisdiction that does not use any hot spot tactics. The latter would be necessary to understand whether the use of hot spots itself has a widespread crime reduction effect. In other words, the unanswered question is whether a high tide (i.e. hot spots patrol methods) truly raises all boats (in providing bonus crime reduction effects outside of the hot spot area).

The authors of this study aimed to circumvent this methodological issue by using a computer simulation estimating police patrol and criminal activity (in particular, street robbery) in an urban area rather than gathering data by direct observation. The simulation, also referred to as an agent-based model, created

estimations of patterns of citizens, police, and potential criminal offenders based on decades of previous research.

In particular, researchers used three "known facts" about crime to build the simulation: (1) Crime is not geographically random and concentrates in certain neighborhoods; (2) Repeat victimization of certain people and places is common; and (3) Highly motivated offenders are responsible for approximately half of crimes committed. The researchers established a set of rules that simulated the behavior of "agents" (i.e. civilians, police officers, and potential criminal offenders) who are programmed to navigate along established patterns designed to simulate regular travel and police patrol. [1]In turn, a simulated urban environment grid pattern was established with varying levels of "risk" for street robbery by which some areas had higher likelihoods of a simulated street robbery occurring.[2] Simulated criminal offenders[3] in the model had a pre-coded likelihood to commit a simulated street robbery that depended on multiple factors, such as the characteristics of the potential victim, the risk inherent in the immediate surrounding environment, and the presence of police officers.[4] Once rules for agent behavior were established, the model was run to observe how agents interact with each other—in this case, the interaction being whether or not street robberies occur.

The simulation ran multiple times with the end goal of measuring total robberies, both across the overall urban environment and within smaller geographical units. Keeping the basic rules for simulated civilians and simulated criminal offenders constant, the pattern of police patrol was changed across iterations to determine if the total number of robberies within the urban environment and within established hot spot areas changed.[5] Three different police patrols were used—random patrol within a beat, a "low intensity" hot spots intervention in which one-third of patrol officers were required to spend half their time in the top five established hot spots, and a "high intensity" hot spots intervention in which half of patrol officers were required to spend all of their time in the top five established hot spots. In addition, there was a fourth condition with no police patrol at all.

Researchers evaluated the results by comparing the relative number of robberies and patterns of crime across police patrol conditions. As expected, all three police patrol patterns exhibited significantly lower rates of robbery as compared to the no police patrol condition in both hot spot areas and within the overall urban environment. Comparing the random police patrol intervention to the low and high 1 Simulated civilians moved a randomized number of grid cells towards established locations designed to mimic regular travel. Each civilian was also randomly assigned a basic "attractiveness to offenders" score to establish their base likelihood of being robbed by criminal offenders in the model. 2 Riskiness of location was established using a Poisson distribution ranging from 0 to 6. This is important because using that distribution actually assumes most locations are likely safe even in an urban environment. Realistically, even if a "violent city" were cut into small squares, the majority of squares likely experience little to no crime. The simulation takes that fact about crime distribution into account. 3 Based upon established literature, the model assigned civilians with random criminal propensity scores such that 5% of offenders would account for 50% of the crime. 4 Simulated criminal offenders were "deterred" if a police officer was within 329 feet of the offender, even if all other factors would predict a robbery should take place. 5 The top five "hot spots" were established by running the model with no simulated police patrol and using a local indicator of spatial autocorrelation (LISA) statistic to identify cells with high average robberies that were surrounded by other cells with high average robberies. intensity hot spots police patrol patterns, the high intensity intervention reduced robberies more than low intensity patrol. Specifically, the low intensity intervention reduced robberies within the entire area by 2.4% and

within hot spot areas by 18.8%, while the high intensity intervention reduced robberies by 11.7% within the entire area and within the hot spot areas by 77.3%. Researchers also observed a slight reduction in robberies in the immediate areas surrounding hot spots in the high intensity condition, suggesting a possible diffusion of crime control benefits.

As agencies consider how to implement place-based patrol frameworks, the results of this study suggest that high-intensity interventions may be a promising avenue for crime control benefits across large areas with minimal risk of crime displacement. At the same time, the researchers cautioned that empirical hot spots interventions often have not reached the same level of intensity as the "high intensity" simulated hot spots intervention in this particular model. Researchers suggested that the results presented in this study indicate that hot spots policing may be more effective at relatively higher levels of concentration. Additionally, the finding of a possible citywide effect of hot spot tactics may explain at least a small part of the observed national crime rate drops in the last two decades particularly in high-crime areas, as numerous police departments across the nation began to adopt hot spot techniques starting in the 1990s.

NOTES

[1] Simulated civilians moved a randomized number of grid cells towards established locations designed to mimic regular travel. Each civilian was also randomly assigned a basic "attractiveness to offenders" score to establish their base likelihood of being robbed by criminal offenders in the model.

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