Risk auto theft: Predicting spatial distributions of crime events

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Risk of Auto Theft: Predicting Spatial Distributions of Crime Events
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Research Abstract
Police typically rely on retrospective hotspot maps to inform prevention strategies aimed at reducing future crime. The current study reviews environmental crime theories that help to identify causal factors associated with risk of auto theft. Map layers are created from data that operationalize these risk factors. These layers are combined using spatial analysis techniques to produce a “risk density” map. Analysis of crime data are used to determine whether our “risk density” map better predicts subsequent auto theft events than a traditional retrospective hotspot map.

Risk Terrain Modeling
Risk Terrain Modeling (RTM) was developed by Joel M. Caplan and Leslie W. Kennedy at Rutgers University School of Criminal Justice. Both worked to produce a method that academics and law enforcement can use to simultaneously apply several, if not all, risk factors and/or correlates to generate a criminogenic risk assessment for specific crimes. RTM is, “a new approach to risk assessment that standardizes risk factors to common geographic units over a continuous surface” (Caplan et al., 2010, p. 23). In other words, individual map layers are created from each risk factor and later combined to produce a composite “risk terrain” map via GIS software. These maps can help to evaluate the crime risk of specific locations and focus crime prevention programs in high-risk areas. In comparison to the original retrospective “hotspot” map, RTM should provide a better model to predict the spatial distribution of future crimes.

Little evidence exists regarding the implementation of forecasting methods by police agencies during crime analysis. Caplan et al. (2010) sought to identify certain risk factors that increase or reduce the future occurrence of crime in particular locations. The study took place in Irvington, New Jersey and applied RTM to shootings to test the predictive power of risk terrain maps over two, six month periods. Because the risk factors applied pertain to place and/or location rather than characteristics of individuals, their unit of analysis was geographical places rather than offenders. This fits well with environmental criminological theories that focus on events rather than offenders (Brantingham & Brantingham, 1981).

The risk factors examined by Caplan et al. (2010) include the dwellings of known gang members, locations of retail business infrastructure, and locations of drug arrests. based on Irvington’s high volume of shootings, violent crime, large violent drug markets, and higher than average number of gang members. Their findings indicate that RTM effectively predicted 42% of future shootings compared to the 21% correctly predicted by the conventional retrospective approach. We attempt to determine whether RTM can be applied to successfully predict the occurrence of other crimes in other cities.

Current Study
The current study employs crime pattern theory (Brantingham & Brantingham, 1981) to examine crime attractors of auto theft in an attempt to predict auto theft incidents that occurred between July and December in 2009. Common risk factors for auto theft include high schools (Roncek & Lobasco, 2006), taverns, and burglary incidents occurring during the previous six months (Copes & Cherbonneau, 2006). High schools were excluded from the final risk density model since an initial chi-square analysis revealed that these locations were not significantly associated with auto theft locations in Las Vegas ($p = .999$, 2-tailed). Kernal risk density layers were created for taverns and burglary incidents before creating a combined risk terrain model.

Project Analysis and Future Research
The Risk Terrain Model based on tavern and burglary locations, which represent attractive nodes for offenders, was significantly correlated with future auto theft incidents. However, the retrospective hotspot map was also significantly correlated with future auto theft incidents and appears to be a better predictor of these incidents. These results suggest that the risk terrain model created for this study is incomplete or does not accurately capture the risk associated with these locations and incidents. Future research will identify additional risk factors significantly associated with auto theft in Las Vegas (e.g., casinos) and attempt to better operationalize and weight the risk factors included in the current study.