Data-Informed Crime Prevention at Convenience Stores in Atlantic City

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Overview:

Informed by risk terrain modeling and hot spot analysis, police commanders implemented a place-based intervention focused around convenience stores. Target areas throughout the city were reprioritized each month to create a dynamic deployment strategy that efficiently allocated resources to the most vulnerable places. Risk reduction actions, such as business checks, were favored over law enforcement against people. Robberies significantly decreased by 63% within four months.

Introduction

Certain businesses and establishments attract crime based on their function within the environmental backcloth (Brantingham & Brantingham, 1995). This insight allows for crime prevention strategies to be developed that turn attention to where crime is likely to occur, rather than who is likely to commit crime. One commonly identified crime attractor is convenience stores based on their multifaceted function within communities. They offer residents basic commodities that are difficult to find without a long trek to shopping centers or grocery stores outside the neighborhood. Locations of these stores are often optimized to serve a catchment area that can be reached on foot, and sometimes they are paired with other businesses such as fast-food restaurants, pharmacies or gas stations which may also often be the targets of crime. Convenience stores become local hubs for commerce as well as gathering points for community interactions.

This study presents the results of a place-based intervention that extends previous research on targeting problem locations by addressing the occurrence of crime in areas surrounding convenience stores. The intervention was specifically designed to reduce robberies in Atlantic City, New Jersey. Informed by a spatial analysis of robbery incident data, the policing strategy prevented crime by managing situational risks.

Literature Review

Place-Based Crime Prevention

Routine activities theory reminds us that patterns of criminal victimization vary dramatically depending on the circumstances and places in which people locate themselves and their property (Cohen and Felson, 1979; Kennedy and Forde, 1990). Environmental characteristics of those places vary considerably (Brantingham & Brantingham, 1995; Johnson, Bowers, Birks and Pease, 2008). New or chronic crime problems are a function of the attractive or generative qualities of environments that serve as cues to motivated offenders that certain places are suitable to commit crimes (Brantingham and Brantingham, 2008; Clarke and Eck, 2005; Caplan and Kennedy, 2016). That is, if

crimes cluster to form hot spots, it is probable that spatial attributes tie or anchor crime to that specific place. So, spatial analysis can offer clues about where and why crimes cluster and how to change situations at places to make them less conducive to crime (Goldstein, 2018; Smit, van der Vecht, and Lebesque, 2014; Hohl, Kondo, Kajeepeta, MacDonald, Theall, et al, 2019; Kennedy, Caplan and Piza, 2018).

The notion that crimes emerge and spatially concentrate where there is something about the place that attracts illegal behaviors and leads to crime outcomes is grounded in theory (Kennedy, Caplan, Piza, & Buccine-Schraeder, 2016; Brantingham & Brantingham, 1981; Quetelet, 1984; Park, McKenzie & Burgess, 1925; Shaw & McKay, 1969; Brantingham & Brantingham, 1995) and is well supported by research literature (Sherman, 1995; Sherman, Gartin, and Buerger, 1989; Ratcliffe & McCullagh, 1998; Ratcliffe & Rengert, 2008; Johnson et al., 2008; Caplan & Kennedy, 2016; Garnier, Caplan, and Kennedy, 2018; Connealy & Piza, 2019). Places can be "fantastically dynamic" (Jacobs, 1961/1992; p. 14) and the social relevancy (Kinney, 2010) of environmental features can affect their spatial influences at different times and under particular circumstances (Irvin-Erickson, 2015). Environmental criminology considers interactions among people, their geographies and crime. These are deeply fluid and something that must be considered carefully through data analyses to inform decisions about how to change environmental and situational factors to disrupt spatial risks and prevent crime outcomes (Kennedy et al., 2018). Creating hypotheses about the situational contexts for crime at problem places, or risk narratives (Kennedy et al., 2018), is also an essential component of engaging police and their community partners in the process of decision-making for intervention activities. Data-informed narrative building ties underlying circumstance to crime outcomes and permits the development of curative approaches to deal with these connections at the most vulnerable places.

Bringing the insights of environmental criminology and place-based crime interventions to the study of convenience stores provides a way of making sense out of the level of security that is needed to protect these facilities, but also understanding the role that these play in creating higher risks for crime nearby. These establishments function as both attractors and generators of crime (Brantingham and Brantingham, 1995; Alazio and York, 2007; D'Allessio and Stohlzenberg, 1990). As attractors, they offer targets for predatory crime, such as robbery or theft; and on the other hand, as generators, they could operate as venues that support or concentrate illegal activities, attracting disorder and unruly behavior because of their late hours and limited supervision.

This demonstrates how convenience stores that are not necessarily direct targets of crime can influence the situational contexts of people at nearby places and foster more suitable settings for crime relative to other parts of the city. It is this nexus of people, places, attractors and generators of illegal behavior that warrant policing and prevention (Moezzi, et al., 2017).

As an example, Kennedy et al. (2018) describe a risk narrative for violent crime in Jersey City, NJ that was articulated by a community stakeholder after being told that bodegas (convenience stores), vacant buildings and gas stations were diagnosed as environmental risk factors: Many youth hang out after school near bodegas where they can easily congregate and get food and drinks. But, while bodegas close at 10 p.m., as required by city ordinance, gas stations with food marts are exempted. These 24/7 gas stations provide alternative spaces with supplies for youth to congregate late at night, creating a unique context for turf conflict, offending or victimization.

Study Area and Methods

Atlantic City is 11 square miles of land located on an island off the coast of Southern New Jersey. The Atlantic City Police Department (ACPD) serves the local residential population of 39,558 plus the 25 million annual visitors. The visitor population creates a challenge for law enforcement because, while crime hot spots exist in the city, a churning population of potential offenders precludes law enforcement's primary focus on people who may commit

crimes, but is ideal for a focus on *places*. The view of "place as case" suggests that if crime can be seen as situationally-located it is more likely to be mitigated and prevented (Lum & Koper, 2013).

In October 2016, Atlantic City began to see a surge in robbery incidents. These incidents were spatially clustered some months and randomly patterned other months; there were no obvious hot spots. Police, city officials, and other community stakeholders felt a sense of urgency to tackle this problem. The ACPD analyzed robbery incident data, diagnosed environmental conditions that hosted this crime most often, and then intervened at the most vulnerable places using existing resources in optimal ways. The focus of intervention efforts was on the role that particular convenience stories played in driving these crime increases.

Police can create intervention strategies that reflect geographic relationships to be mitigated through situational crime prevention, and that are in line with public values and collective expectations.

Intervention Planning and Deployment

Risk Terrain Modeling (RTM) was used by ACPD to assess the spatial nature of robbery incidents as they related specifically to Atlantic City's environmental backcloth (Barnum et al., 2017). Grounded in crime pattern theory and environmental criminology, RTM offered police commanders information about the places where robberies were occurring so they could tailor thoughtful responses at the most criminogenic settings (Caplan & Kennedy, 2016; Caplan, Kennedy, Barnum & Piza, 2015). Here, RTM was performed with the RTMDx software[1], a spatial diagnostic tool that tests for significant relationships between attributes of the environment[2] and crime patterns.

A risk terrain model to inform the intervention strategy was produced to diagnose the most significant attractors/generators of robbery incidents that had occurred within the recent past two months (from December 2016 through January 2017; N=51). Convenience stores emerged as the top risk factor, with a relative risk value (RRV) of 13.06. This meant that places within one block from a convenience store were at least thirteen times more likely to experience robberies compared to other places in the city. Similar interpretations could be made for the two other significant risk factors shown in Table 2. Comparisons across risk factors can also be made using these RRVs; places around convenience stores were 2.6 times more likely to experience robberies than places around hotels and rooming houses. Risk terrain maps showed places that were affected by one or more of these risk factors, with relative risks at places throughout the city reflected by relative risk scores (RRSs). The highest-risk places identified by this risk terrain model had RRSs ranging from 34.18 to 143.17. So, these places had a likelihood of robbery that was at least 34 times greater than elsewhere in Atlantic City. These results were presented to the ACPD commanders.

TABLE 2: Robbery Risk Terrain Model to Inform POP Intervention Strategy

Significant Risk Factors (out of the 29 tested)	RRV
Convenience Stores	13.06
Hotels and Rooming Houses	4.96
Retail Jewelry Stores	4.89

The areas within 1-block from convenience stores became the 'target areas'. This involved 101 convenience stores in target areas throughout the city, which covered a total of 0.67 square miles. Upon arrival at these areas, patrol officers were instructed to conduct property checks and "meet-and-greets" with convenience store managers. A business visit log was created by the ACPD in collaboration with members of the city's mercantile association to record police officer engagements with store managers. These engagement activities were

supplemented with directed police patrols within the 1-block area around convenience stores at least once every shift (Koper, 1995; Sherman, 1990).

Deployment Strategy

The intervention began February 1, 2017. Police officers received maps showing the target areas within every patrol district. They also received instructions about what convenience stores to focus on at these places while on patrol, and what to do when they arrived. A subset of convenience stores was prioritized each month. This served three purposes: First, it helped optimize the allocation of limited patrol resources without the need for overtime or extra funding. Second, it reduced the likelihood of alert fatigue among police officers who would otherwise be assigned to focus on the same target areas for long or uncertain periods of time. And finally, it allowed for ongoing assessments that were sensitive to the expected risk reduction impact of activities at the priority target areas each month. Basically, this tactical prioritization helped to shake things up and keep things fresh.

To select priority target areas each month, risk terrain models and kernel density estimate (KDE) hot spot maps were produced using crime data from the two previous months. For instance, robbery patterns from January through February were analyzed to identify high-risk places for the month of March. Target areas (that is, the 1-block area around convenience stores) were given priority for the month if they overlapped with high-risk places (via RTM) that also intersected current hot spots (via KDE values > two standard deviations from the mean), as depicted in Figures 1 through 4. While the intervention activities remained the same for the duration of this initiative, the deployment areas changed monthly according to the updated analyses and related prioritizations.

The intervention strategy was a data-informed staggering of business checks at selected convenience stores and directed police patrols up to one-block around their vicinity during every 8-hour shift. This lasted four months.

Figures 1-4: Priority Target Areas for Each Month, February-May, 2017
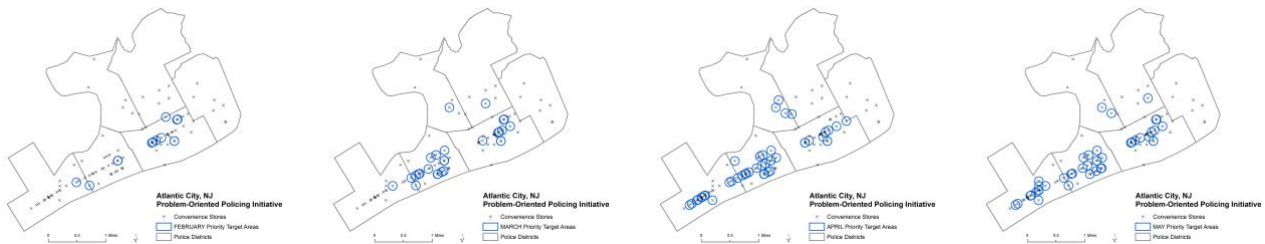
Outcome Assessment

The pre-intervention period is October 1, 2016 through January 31, 2017 and the post-intervention period is February 1, 2017 through May 31, 2017. Over 1,100 business checks with sign-ins were recorded during the intervention period. On average, 67 different convenience stores were visited each month (range: 34-79), with approximately 279 total sign-ins per month, or about three per shift. In the pre-intervention period, the City of Atlantic City recorded 79 robberies within 1-block of convenience stores. During the post-intervention period, the city recorded 29 robberies within 1-block of convenience stores. This represents a 63% reduction of robberies in the target areas. A paired samples T-test suggests these results are statistically significant (p<0.001).

Discussion and Conclusion

Atlantic City had a robbery problem that necessitated a citywide response. The approach ACPD took to understand robbery occurrence relied on spatial analysis to identify where officers should devote their resources and what to

do at these places. ACPD focused on convenience stores because these were identified as high-risk through the use of a spatial diagnostic tool, risk terrain modeling (RTM). Staggered business checks and directed patrols around these places offered optimal police presence resulting in crime deterrence effects. Robberies significantly reduced by 63 percent.

Police sometimes feel pressured to act quickly to suppress crime problems without expectations of longer-term crime prevention impacts. Reactions could take the form of "putting cops on dots" and encouraging officers to try to deter motivated offenders by actively suspecting, surveilling or stopping many people who enter high-crime areas. Offering a different approach, this study demonstrates that rapid crime suppression is possible with tactics focused on targeting high risk locations and not necessarily the people located there.

Police commanders developed a data-informed action plan centered on officer interactions with convenience store properties and places nearby. In shuffling the priority of these target areas each month, ACPD applied theory and prior research evidence to a deployment strategy that added dynamism and practical utility to the intervention strategy. The resulting product was *tolerable* (to patrol officers), with only some target areas prioritized at once; *optimal*, with priority given to areas that were relatively high-crime and also vulnerable settings; *flexible*, with reassessments occurring regularly to tend to spatial patterns of robbery that might change in response to police presence; and *anticipatory*, with expectations of the potential for displacement at similarly situated settings in order to stay ahead of emerging problems elsewhere. It worked.

Reliable and valid data analysis can trigger new ways of thinking about and reacting to crime problems. Ferguson (2017) warns of some negative consequences of 'big data policing' that should be taken seriously. But data analytics can also empower police officers to be creative in devising interventions when the analysis supports ideas that might otherwise appear as if they came from 'left-field'. ACPD's experience supports the conclusion reached by Willis, Mastrofski and Kochel (2010) that data-informed debate can help tackle the most pressing crime problems without penalizing individual officers for creative failures. Data analytics can lead to a general consensus about how best to intervene in a way that meets community expectations.

The demand for immediate results with limited resources is probably a familiar scenario to many police leaders. This study revealed how data analysis plays a critical role in policing under these circumstances, not only for understanding the nature of a pressing crime problem, but also for developing dynamic resource allocation protocols that are responsive to new crime patterns that emerge during the intervention. The crime prevention strategy used here was straightforward and replicable, demonstrating that police can succeed at improving their operational impact while working closely with community stakeholders, such as business place managers, in meeting their objectives to reduce crime.

References
Complete references are provided in the full-text journal article.

Endnotes

[1] From the Rutgers University Center on Public Security: www.rutgerscps.org/software.html

[2] Adult Businesses & Restaurants, Auto Repair Shops, Bail Bonds, Banks, Beauty/Hair Shops, Check Cashing, Gas Stations, Child Care Centers, Hotels & Rooming Houses, Laundromats, Liquor Stores, Pharmacies, Recreation (Golf, Ice Rink, Billiards, Pier), Parking Lots, Parks, Pawn & Second-hand stores, Bars, Eat-in Restaurants, Take-out Restaurants, Retail: Clothing & Accessory, Retail: Jewelry, Schools, Spa & Massage Parlors, Variety Stores, Vacant Properties, Public & Section VIII Housing, Social Services, Parolee Residences. Datasets for these environmental features were obtained from city administrative records and InfoGroup and then ground-truthed by ACPD commanders for accuracy and construct and content validity before serving as inputs for RTM. RTMDx was used to determine if any environmental features are correlated with the robbery incident locations via an elastic net penalized regression using cross-validation. Then bidirectional stepwise regressions (Poisson and negative binomial) are performed to construct the best model from the cross-validated risk factors while minimizing the Bayesian Information Criteria (BIC) value (see Caplan, Kennedy and Piza, 2013 for full statistical steps). RTMDx analyzes multiple risk factors simultaneously to determine how the co-location of multiple factors creates risky environments for crime. Risk terrain maps and tables listing the significant risk factors that comprise the maps are the analytical products. For each significant risk factor, tabular outputs include a relative risk value (RRV), which is the exponentiated factor coefficient (i.e., relative weight). A relative risk score (RRS) is assigned to each micro place of the risk terrain maps to convey the full range of spatial risks of crime throughout the study area. Highest-risk places are defined as places greater than two standard deviations from the mean RRS.