



## A Multi-jurisdictional Test of Risk Terrain Modeling and a Place-based Evaluation of Environmental Risk-Based Patrol Deployment Strategies

**Study Overview:** A place-based method of evaluation and spatial units of analysis were used to measure the extent to which allocating police resources to high-risk areas, derived from risk terrain modeling (RTM), affects the frequency and spatial distribution of new crime events. This quasi-experimental project had two primary goals: 1) to replicate and validate RTM in multiple jurisdictions and across many different crime types; and, 2) to evaluate intervention strategies targeted at high-risk micro-level environments across 5 cities<sup>1</sup>: Chicago, IL; Colorado Springs, CO; Glendale, AZ; Kansas City, MO; and Newark, NJ.

In completing the risk terrain models<sup>2</sup>, we used the RTMDx Utility, developed by the Rutgers Center on Public Security<sup>3</sup>. Following the RTM analysis in each city, each Police Department developed an intervention strategy that targeted the spatial influences of select significant risk factors. The Police Department also worked with the research team in the selection of target areas for the intervention. In evaluating the intervention, statistical comparisons were made to equivalent control areas locally within each city. Control areas were matched to treatment areas through Propensity Score Matching (PSM). Interventions in each city lasted approximately 3 months, and were implemented in 2013 and/or 2014. The post-intervention period was 90 days (3 months).

### General Findings:

**Q:** Do RTM outputs inform crime intervention planning and policing activities in ways that result in significant crime reductions in targeted areas?

**A:** Yes. Results across all study settings allow for a general conclusion that certain actions performed by police and intended to mitigate the spatial influence of risky features at high-risk places results in both short- and long-term crime reductions. RTM enabled police to make informed decisions and develop strategies about where to allocate resources and what to do when they got there. Spatial information produced through RTM to select target areas, develop place-based risk reduction strategies, and deploy resources was applied to a variety of crime types and customized for different settings in measured, transparent and sustainable ways. Crime reductions were best achieved by police with a concerted and consistent application of intervention activities geared toward mitigating the spatial influence of crime attractors at the high-risk places within a jurisdiction.



## Specific Findings:

### Colorado Springs

#### Risk Terrain Modeling Analysis:

The Colorado Springs Police Department (CSPD) identified Motor Vehicle Theft as their priority crime. A Risk Terrain Model was found that contains 6 risk factors (out of 19 tested): Disorder Calls for Service (RRV<sup>4</sup>=5.61), Multifamily Housing Units (RRV=2.75), Foreclosures (RRV=2.64), Parks (RRV=1.76), Sit-down Restaurants (RRV=1.51), and Commercial Zoning (RRV=1.37). Highest risk places<sup>5</sup> have 48 times greater likelihood of crime than some other locations. Conjunctive Analysis of Risk Factor Configurations (CARFC) found that the highest risk behavior settings<sup>6</sup> for Motor Vehicle Theft cover about 4% of the study area and account for nearly 43% of all crime incidents.

#### Risk-Based Intervention:

To reflect the RTM findings CSPD designed their intervention strategy with an array of activities performed by various CSPD units for the purpose of mitigating disorder problems in the target area: Code Enforcement property inspections, Community Service Officer Neighborhood Cleanups, Community Meetings, Proactive Police Enforcement against disorder offenses, Proactive Traffic Enforcement, and the deployment of License Plate Recognition (LPR) devices for the purpose of identifying stolen Motor Vehicles in the target area.

- A Motor Vehicle Theft reduction of 33% was achieved in the target area compared to the control area during in the post-intervention period. There was a slight diffusion of benefits.
- At the micro level, “code enforcement” was associated with reduced levels of Motor Vehicle Theft throughout the target area ( $p<0.01$ ). “Code enforcement” activities have an exceptionally strong and significant crime reduction benefit at high-risk places ( $p<0.01$ ).

**Colorado Springs Summary:** *The cumulative findings suggest that CSPD's risk-based intervention effectively addressed Motor Vehicle Theft. CSPD's targeting of disorder incidents was an effective crime control strategy. The micro-level analysis suggests that code enforcement focused at micro-level high-risk places is a particularly promising tactic.*

### Newark

#### Risk Terrain Modeling Analysis:

The Newark Police Department (NPD) identified Gun Violence as their priority crime. A Risk Terrain Model was found that contains 11 risk factors (out of 17 tested): Narcotics Arrests (RRV=3.53), Foreclosures (RRV=3.36), Restaurants (RRV=2.76), Gas Stations (RRV=2.54), Convenience Stores (RRV=2.32), Food Take Outs (RRV=2.19), Bars (RRV=2.01), Abandoned Properties (1.43), Schools (RRV=1.38), Liquor Stores (RRV=1.34), and Problem Housing (RRV=1.34). Highest risk places have 58 times greater likelihood of crime than some other locations. CARFC found that the highest risk behavior settings for Gun Violence cover about 5% of the study area and account for nearly 30% of all crime incidents.

#### Risk-Based Intervention:

To reflect the RTM findings, NPD designed their intervention strategies to generate checks and manager contacts at three business types: Restaurants, Food Take Outs, and Gas Stations. Each day during the intervention, a task force comprised of 3 officers, under the supervision of a Lieutenant, visited businesses located within the target area. Upon visiting the business, officers were required to meet with the on-duty manager and have them sign the sheet, to ensure that proper contact was established.



- A Gun Violence reduction of approximately 35% was achieved in the target area compared to the control area during the post-intervention period. There was a slight diffusion of benefits.
- At the micro level, the intervention activities were associated with a reduction of Gun Violence within the portions of the target area identified as high-risk. The reduction approached statistical significance ( $p=0.06$ ).

**Newark Summary:** *The NPD task force's intervention activities were a promising approach to gun violence. The strategy generated a large reduction of gun violence, and had a particularly great impact at high-risk portions of the target area. Newark's outcome evaluation was inherently an assessment of the use of a "task force" as well as the "intervention actions" performed by the task force. Ultimately, significant crime reductions can be achieved when a task force consistently and thoughtfully implements intervention activities at high-risk places.*

## Kansas City

### Risk Terrain Modeling Analysis:

The Kansas City Police Department (KCPD) identified Aggravated Violence as their priority crime: all shooting incidents (hits and homicides), aggravated assault (with a firearm), and street robbery (with and without a weapon). A significant Risk Terrain Model was found that contains 15 risk factors (out of 21 tested): Bus Stops (RRV=3.38), Weapon Offending Parolees and Probationers (RRV=3.20), Suspicious Person with a Weapon Calls-for-service (RRV=2.43), Variety Stores (RRV=2.28), Packaged Liquor Stores (RRV=2.28), Hotels (RRV=2.27), Fast Food Restaurants (RRV=2.18), Drug Markets (RRV=2.11), Bars (RRV=2.05), Rental Halls (RRV=1.61), Restaurants (RRV=1.41), Convenience Stores (RRV=1.41), Grocery Stores (RRV=1.28), Foreclosures (RRV=1.27), Liquor Licensed Retailers (RRV=1.24). Highest risk places have 46 times greater likelihood of crime than some other locations. CARFC found that the highest risk behavior settings for Aggravated Violence cover about 4% of the study area and account for nearly 38% of all crime incidents.

### Risk-Based Intervention:

To reflect the RTM findings, KCPD designed their intervention strategies to address nightclubs, suspicious person with a weapon calls-for-service, weapon offending parolees and probationers, drug sales, packaged liquor stores, and liquor licensed retailers<sup>7</sup>. An array of activities intended to mitigate the spatial influences of these risk factors, enhance community awareness, and deter motivated offenders was conducted by various KCPD units and city officials in the target area: Code Enforcement, Directed Patrols, Licensing and Inspection checks, meet-and-greets with known offenders juxtaposed with social service referrals/support, CPTED inspections, Pedestrian Checks, Area Presence, Residence Checks, Traffic Violations, and Building Checks. A new protocol for dispatching officers to certain calls-for-service locations was also enacted.

- Aggravated Violence decreased by 12% in the target area compared to the control area during the post-intervention period, but the findings did not achieve statistical significance.
- At the micro level, and in the during-intervention period, Pedestrian Checks, Area Presence, and Residence Checks were each associated with lower levels of Aggravated Violence throughout the entirety of the target area. In the post-intervention period, Building Checks conducted within high-risk areas were associated with reduced crime levels.

**Kansas City Summary:** *RTM enabled Kansas City police officials to make decisions about where to allocate resources and what to do when they got there in order to suppress crime in the short-term and reduce crime occurrence over the long-term. Intervention activities affect crime differently over varying times and places. Synthesizing results from the micro level analyses, it can be generally concluded that "pedestrian checks", "directed patrol", and "knock-and-talks" have the greatest impact on reducing crime among all places within*



*the target areas when sustained, whereas longer-term crime reduction benefits at high-risk places are best achieved via “building checks”.*

## Glendale

### **Risk Terrain Modeling Analysis:**

The Glendale Police Department (GPD) identified Robbery as their priority crime. A Risk Terrain Model was found that contains 7 risk factors (out of 11 tested): Drug-related Calls for Service (RRV=15.56), Convenience Stores (RRV=2.88), Take Out Restaurants (RRV=2.54), Apartment Complexes (RRV=2.53), Gang Member Residences (RRV=2.41), Liquor Stores (RRV=2.30), and Bars (RRV=2.19). Highest risk places have 58 times greater likelihood of crime than some other locations. CARFC found that the highest risk behavior settings for Robbery cover about 1% of the study area and account for nearly 17% of all crime incidents.

### **Risk-Based Intervention:**

To reflect the RTM findings, GPD designed their intervention strategy to address all 7 risk factors. The activities included Directed Patrols, Flyer Distribution, Community Meetings and Engagement Activities, Proactive Stops, and Proactive Arrests.

- Robbery decreased by 42% in the target area compared to the control area during the intervention period. There was a very strong diffusion of benefits effect.
- At the micro level, and in the during-intervention period, Directed Patrols were associated with lower levels of Robbery. Flyer Distribution activities were associated with fewer Robberies in the post-intervention period, with the reduction approaching statistical significance (p=0.09).

**Glendale Summary:** *The intervention produced a statistically significant reduction of Robbery throughout the target area during the intervention period. In addition, there was a diffusion of benefits beyond the targeted area. “Directed patrol” had the greatest impact on reducing crime among all micro-level places within the target areas during the intervention period, whereas longer-term crime reduction benefits were best achieved via “flyer distribution”.*

## Chicago

### **Risk Terrain Modeling Analysis:**

The Chicago Police Department (CPD) identified Shootings as their priority crime. A Risk Terrain Model was found that contains 10 risk factors (out of 15 tested): Foreclosures (RRV=5.38), Problem Buildings (RRV=3.72), Gang Hotspots (RRV=2.86), Laundromats (RRV=2.27), Liquor Stores (RRV=1.92), Gas Stations (RRV=1.65), 311 Lights Out Calls (RRV=1.41), Schools (RRV=1.35), Bus Stops (RRV=1.33), Bars (RRV=1.28). Highest risk places have 76 times greater likelihood of crime than some other locations. CARFC found that the highest risk behavior settings<sup>8</sup> for Shootings cover about 15% of the study area and account for nearly 56% of all crime incidents.

### **Risk-based Intervention:**

To reflect the RTM findings the CPD designed an intervention strategy that focused on Foreclosures and Problem Buildings. The strategy entailed the CPD working in partnership with other City of Chicago departments to conduct site visits of known problem properties throughout the city to improve conditions conducive to crime and, when necessary, issue citations for code violations. City agencies also sought to work with private lenders to address the broader scope of the foreclosure crisis.



- A process evaluation found that CPD could not manage to collect measurement data in a systematic or coordinated way to allow for adequate evaluations of outcomes. Cumulative totals of building inspections and citations were 280 and 24, respectively. But CPD was unable to provide incident-specific information including the precise date, time, and location of each action. Therefore, we were unable to complete an outcome evaluation of CPD's intervention<sup>9</sup>.

#### Endnotes

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<sup>1</sup> Originally, 6 cities were proposed as study settings for interventions. However, Arlington, TX withdrew from the study early on due to excessive turnover of personnel within the department.

<sup>2</sup> Using then-current data from calendar year 2012

<sup>3</sup> [www.rutgerscps.org](http://www.rutgerscps.org)

<sup>4</sup> Relative Risk Value (RRV)

<sup>5</sup> Places with risk values greater than 2 standard deviations above the mean risk value, according to the risk terrain map.

<sup>6</sup> The behavior settings with a relative frequency of crime (RFC) above the mean

<sup>7</sup> "Packaged liquor stores" refer to businesses whose primary purpose is to sell liquor. "Liquor licensed retailers" are facilities that are in business to sell other items, but also sell liquor, such as convenience stores, grocery stores, etc.

<sup>8</sup> The behavior settings with a relative frequency of crime (RFC) above the mean

<sup>9</sup> It should be noted that during this project, there were mayoral elections (and subsequent run-off elections), internal transfers/promotions of police personnel, and multiple other research projects (unaffiliated with ours) that may have strained CPD's data management resources.

