

## Tracking Risk for Crime Throughout the Day: An Examination of Jersey City Robberies

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### Keywords:

Violent Crime, Hot Spots, Risk Terrain Modeling, Temporal, Risky Places

### Overview:

Particular places are likely to influence crime occurrence at or around their location, and this influence is likely to shift over different daily micro time periods. Focusing on these landscape features at different hours of the day accounts for the various ways people interact with particular places throughout the course of a day. Situational contexts and opportunities for crime ebb and flow over time, suggesting that the interactions of people – including potential victims, motivated offenders, and capable guardians, vary across micro places of a jurisdiction’s terrain based on the influences of environmental features on criminal behavior at these places. The current study explores the variations in generators/attractors of robbery incidents in Jersey City, New Jersey over two-hour intervals within the period of a day.

### Full Reference:

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### Study Setting

Jersey City, New Jersey (NJ) is a densely populated urban environment located in northeastern NJ along the Hudson River, across from New York City. Its population of 264,000 residents is the second largest in NJ while geographically it’s one of the smallest municipalities, with a total land area just under 15 square miles. Approximately 17,000 people live within each square mile; the statewide average is about 1,200 residents per square mile.

### Data & Methodology

The dependent variable includes all incidents of armed (firearm, knife, and other weapon) and unarmed street robbery that occurred in Jersey City during calendar year 2014 ( $N = 445$ ) that are known to and recorded by the police. These crime data were provided at the address level by the Jersey City Police Department (JCPD) administrative records management system and then geocoded to a street centerline shapefile in ArcGIS. Robbery crime data were separated into 12 two-hour time intervals: 00:01-2:00 ( $n = 67$ ), 02:01-04:00 ( $n = 50$ ), 04:01-06:00 ( $n = 13$ ), 06:01-08:00 ( $n = 11$ ), 08:01-10:00 ( $n = 19$ ), 10:01-12:00 ( $n = 19$ ), 12:01-14:00 ( $n = 42$ ), 14:01-16:00 ( $n = 27$ ), 16:01-18:00 ( $n = 46$ ), 18:01-20:00 ( $n = 51$ ), 20:01-22:00 ( $n = 27$ ), and 22:01-24:00 ( $n = 73$ ).

We tested the spatial influences of 17 environmental features: bus stops, banks, bars, check cashing service, convenience stores, gas stations, grocery stores, laundromats, liquor stores, manicuring establishments, parking lots, pawn brokers/second hand stores, pharmacies, restaurants, schools, vacant buildings, and variety stores. Most environmental feature datasets were acquired from Infogroup. All others – bus stops, liquor stores, parking lots, and vacant buildings – were obtained from the JCPD. Robbery incident and risk factor datasets were collected at the same time and are considered temporally consistent with the then-present state of the city in 2014.

## Results

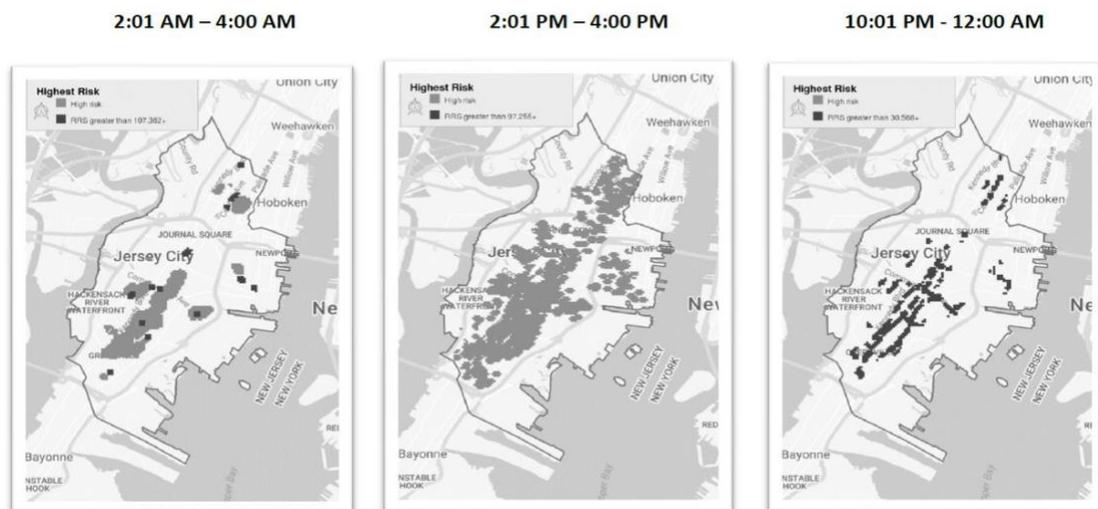
Table 1 demonstrates that the 12 two-hour time intervals each had a different set of environmental features that connected with street robbery patterns. Figure 1 represents the movement of that spatial vulnerability, suggesting that robbery does not remain static in space and time even within a day's timespan. Based on these results, we conclude that spatial vulnerability to robbery varies according to distinct spatial influences of physical features of the landscape over the course of a day.

*Of the 17 environmental features tested, we identified nine that significantly increased the risk of robbery (banks, bus stops, convenience stores, grocery stores, manicuring establishments, restaurants, schools, vacant buildings, and variety stores).*

Bus stops were the most prevalent risk factor among all of the models, present in nine of the 12 time periods. Grocery stores and vacant buildings were the next most influential factors, each identified five times in the models. Schools appeared in two of the time periods. Risk factors found to be significant in only one time period were banks, convenience stores, manicuring establishments, restaurants, and variety stores. These, perhaps, are the most noteworthy as they help to create highly unique behavior settings for robbery at particular times and places in Jersey City.

To demonstrate the variety of uniquely vulnerable places for robbery in Jersey City, Figure 1 highlights three time periods: 2:01am – 4:00 am (early morning), 2:01 pm – 4:00 pm (afternoon), and 10:01 pm – 12:00 am (late evening). The maps categorized as 'highest risk', here meaning "highest vulnerability", are symbolized with dark grey areas indicating places with relative risk scores (RRSs) two standard deviations or more above the mean, while the lighter grey shaded areas are places equal to or greater than the top five percent of RRSs. These maps indicate the combined risks, or vulnerabilities to crime, of the significant environmental factors in their respective models. We are primarily concerned with the darkest grey areas because they indicate places with the greatest vulnerability to robbery.

Figure 1: Risk Terrain Maps for Three Time Intervals (2:01 – 4:00 AM; 2:01 - 4:00 PM; 10:01 PM – 12:00 AM)



The time frame from 2:01 am to 4:00 am exemplified a model when there were four environmental factors present (banks, bus stops, grocery stores, and vacant buildings). The risk terrain map during this timeframe includes both dark grey and light grey shading of risk, whereby risks of robbery appear concentrated in the core of the downtown area of Jersey City, with some other vulnerabilities located the northern part of the city too. Note the relatively few places that are symbolized as being at the highest-risk (dark grey) during this time period. The risk terrain map for the afternoon time period (2:01 pm to 4:00 pm) was the most dispersed of the three maps and there were just two environmental factors (bus stops, and vacant buildings) found to be significant during this time.

The late-night time period from 10:01 pm to 12:00 am had four significant environmental factors (bus stops, grocery stores, manicuring establishments, and vacant buildings). The risk terrain map during this timeframe has the most ‘highest risk’ places, mainly in the downtown area and a few other areas located in the north and east ends of the city. Viewing all 12 maps chronologically depicts a turbulent landscape of vulnerability to robbery in Jersey City throughout a day.

Table 1: Risk terrain model results for 2014 Robbery in Jersey City, New Jersey

		RISK FACTORS								
		Banks	Bus Stops	Convenience Stores	Grocery Stores	Manicuring	Restaurants	Schools	Vacant Buildings	Variety Stores
TIME (24 HOUR CLOCK)	00:01-02:00	O/SI	D/382					P/1146	D/1146	
		RRV	3.16					6.09	2.52	
	02:01-04:00	O/SI	D/382	P/1146		D/1146			D/1146	
		RRV	6.25	12.13		2.78			2.74	
	04:01-06:00	O/SI	P/382			P/1146				
		RRV	3.97			14.07				
	06:01-08:00	O/SI							P/382	
		RRV							27.57	
	08:01-10:00	O/SI	D/1146							
		RRV	16.41							
	10:01-12:00	O/SI	D/382							
		RRV	9.12							
	12:01-14:00	O/SI				P/764		P/382		
		RRV				14.37		6.30		
	14:01-16:00	O/SI	P/764						P/382	
		RRV	19.51						4.31	
	16:01-18:00	O/SI	P/764	D/382						
		RRV	22.19	4.99						
	18:01-20:00	O/SI				P/764				P/382
		RRV				6.23				5.13
20:01-22:00	O/SI	D/764					P/1146			
	RRV	3.01					12.72			
22:01-24:00	O/SI	D/382			P/764	D/382		D/1146		
	RRV	2.94			3.79	3.06		3.77		

**Discussion & Conclusion**

Time-stable features of the physical environment have a dynamic influence over the timing and location of robbery incidents. Crimes are already well-known to cluster at particular places (Weisburd, 2015) of the environmental backcloth (Brantingham & Brantingham, 1995) under study. This paper builds on this knowledge to add that within short temporal windows, such as 2-hour periods, attractors and generators of crime fluctuate to influence daily micro spatial crime patterns.

*Grounded in environmental criminology theories, this research affirms that the relevancy and interactions of particular environmental features on crime varies by time of day, over the course of a day, within the same jurisdiction.*

This supports Grubestic's and Mack's (2008) notion that the spatial and temporal dimensions of crime are interdependent entities, and expands on routine activity theory as it relates to physical features of the environment. Routine activities of people over the course of a day may interact at particular places to shape the social relevancies and influences of particular features of the landscape on illegal behaviors and crime outcomes (Ratcliffe, 2006).

*This can be utilized to inform police patrolling and, potentially, lower crime rates in the areas they serve.*

Police patrols are more effective when they operate with a narrow focus on the most problematic places for illegal behavior (Skogan & Fyrdl, 2004). Many agencies have adopted this operational strategy, but they often focus on the places where crimes have happened in the past (Eck, Chainey, Cameron, Leitner, & Wilson, 2005). This study suggests that agencies could identify the underlying environmental features that drive vulnerability at criminogenic behavior settings rather than wait for crimes to emerge or spike. Settings and their constituent features could become the focus of tailored, proactive police interventions designed to mitigate spatial risks for tactical crime prevention at key moments of the day (Caplan & Kennedy, 2016). The current study suggests that timing and spatial influences of environmental factors should also be considered when allocating resources for place-based crime prevention initiatives.

Variations among environmental factors and their spatial influences on surrounding places suggests a temporality of their social relevancy, perhaps due to routine activities and related expectations of motivated offenders and place-based opportunities for crime (Barnum, Caplan, Kennedy & Piza, 2017; Bernasco & Block (2011); Rengert, 1997). As the social relevance of settings change over time, spatial influences of environmental features located there stimulate or revive opportunities for crime at these places. Notably, examining vulnerable places does not remove the importance of the human factor. It simply shifts the focus away from personal characteristics to personal preferences and routine activities observed at places throughout the course of a day. This suggests a way of looking at crime outcomes more as function of a dynamic interaction among people that occurs at places. We now know more about how the attributes of criminogenic places are not constant nor necessarily set in place over time.

## **References**

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