

Robbery Risk as a Co-function of Place and Time

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Introduction

In the robbery literature it is widely acknowledged that "place" plays an important role in the decision to engage in robberies because most robberies are financially oriented (Miller, 1998). Therefore, places offering less risk of detection, more accessible targets and more rewards are more attractive to offenders (Braga et al., 2011). Robbery is an ideal crime type to predict with place based indicators because it is a volume crime with mobile targets that lead offenders to choose crime sites where there is less exposure to guardianship, and more access to vulnerable places (Van Patten et al., 2009).

Opportunity theories acknowledge that offenders and targets operate within the built urban form and they use the concepts of environmental backcloth, crime generators, crime attractors, crime enablers, crime detractors, and hot spots to explain criminogenesis. Robbery studies using these concepts provide an incomplete picture of robbery emergence. First, few studies examine the criminal careers of places as a function of a dynamic interaction between different features at places. Second, most studies assume the temporally uniform crime generating influence of land use types, omitting the dynamic nature of such places.

This study aims to provide a novel analytical framework for the analysis of street robberies in Newark, New Jersey in 2010 to understand the spatial influence of features at micro places on robbery emergence. This analytical framework sets the basis for identifying the dynamic spatial influence of landscape features. The detection of significant and non-significant spatial influences of features at different times will benefit spatio-temporally focused proactive policing interventions. If crime analysts succeed in identifying how spatial influence of micro places increases the crime risk at different times, this information can be used to

reduce spatial influence of features and the crime outcomes through removing opportunities for crime and introducing control (i.e., target hardening; surveillance; increased police presence; modifying rules of order for facilities; curfews for risky businesses; and increasing guardianship); improving the conditions in locations that might breed crime activity, empowering the residents at these locations; and focused deterrence of high risk offenders via violence reduction programs that target areas in which high risk offenders are likely to frequent. This analytical framework might also benefit other crime policies such as residency restrictions and drug free zone enforcements in the establishment of restrictions and zonal areas.

With this research we propose the following research question: *"To what extent do the spatial influences of criminogenic features of the landscape affect the occurrence of street robbery incidents at micro places at different times of the day and week?"*

Why Street Robberies?

Street robberies are seen as an ideal crime type to study due to several reasons. First, according to FBI's 2010 Uniform Crime Reports, robbery is the second most frequent violent crime following aggravated assault. Second, most robberies are financially oriented, and places offering less risk, more targets and more rewards are more attractive to offenders. Third, most robberies take place at metropolitan cities, with streets being the main domain. Fourth, robberies are high volume crimes, so they are ideal for statistical testing. Lastly, with the fear it induces on citizens, robbery deserves specific attention.

Street Robberies in Crime & Place Literature

Looking at the concentration of robberies at micro places, Braga et al. (2011) found that only 8% of all street segments generated 65 percent of robberies between 1980 and 2008 in Boston. In his study of street segments in Chicago, St. Jean (2007) also found that robberies concentrated at certain blocks. In a similar vein, Weisburd et al. (2004, as cited in



Weisburd, 2008) found that in Seattle, certain street segments had the highest number of robberies.

Street Robberies & Environmental Features

Spatial distribution of robberies is related to presence and proximity to several features of landscape such as: banks and cash points, public transportation stops, bars, small commercial businesses, liquor stores, restaurants, schools, vacant buildings, public housing, illegal drug, prostitution and gambling markets and etc. (Bernasco & Block, 2009; St. Jean, 2007; Tilley et al., 2004; Wright & Decker, 1997)

Study Setting

The study extent of this research is Newark, NJ. Newark has been chosen as the study extent as New Jersey has the 9th most robberies in U.S. and Newark has experienced a robbery rate more than 4 times the state average in 2010. In this research the areas including Newark Liberty International Airport and Port Authority are excluded from the study extent as these areas do not fall within Newark Police Department jurisdiction. Since many crime and place authors suggest the feasibility of the choice of micro units of analysis for the contextual analysis of crimes, the unit of analysis of this research is defined as cells with a size of 145 ft-by 145 ft. This cell size has been chosen as it is half the median length of a Newark city block (290 ft.). This length is believed to be a better estimate than average street length because the average length of Newark streets is skewed by highway street segments.

Dependent Variable, Risk Factors & Analytical Strategy

The dependent variable of this study is the presence or absence of street robbery incidents (Y/N) at the predefined micro places in 2010. Newark PD, following FBI's definition, defines robbery as "The taking or attempting to take anything from the care, custody or control of a person or persons by force, or threat of force or violence and/or by putting the victim in fear". Since streets are the main domain of robberies, only robberies that took place in the public space were included in the analysis.

To test the temporality of the spatial influence of criminogenic features, we classified the dependent

variable into 7 groups. Model 0 included all the robberies in 2010, whereas the daytime work weekday (Model 1) and daytime work weekend (Model 4) models included the robberies on weekdays and weekends between 6 a.m. and 6 p.m. The happy hours weekday (Model 2) and happy hours weekend (Model 5) models included the robberies between 6 p.m. and 2 a.m. The bedtime weekday (Model 3) and bedtime weekend (Model 6) models included robberies between 2 a.m. and 6 a.m. on weekdays and on weekends.

Model #	Model Name	Day of the Week & Time of the Day	# of Robberies in 2010
0	Base Model	All days and all times	1371
1	Daytime Work_Weekday	Monday 6 AM-5:59PM Tuesday 6 AM-5:59PM Wednesday 6 AM-5:59PM Thursday 6 AM-5:59PM Friday 6 AM-5:59PM	371
2	Happy Hours_Weekday	Monday 6 PM-11:59 PM Tuesday 12 AM - 1:59 AM & Tuesday 6 PM - 11:59 PM Wednesday 12 AM - 1:59 AM & Wednesday 6 PM - 11:59 PM Thursday 12 AM - 1:59 AM & Thursday 6 PM - 11:59 PM Friday 12 AM - 1:59 AM	344
3	Bed Time_Weekday	Tuesday 2 AM - 5:59 AM Wednesday 2 AM - 5:59 AM Thursday 2 AM - 5:59 AM Friday 2 AM - 5:59 AM	99
4	Daytime Work_Weekend	Saturday 6 AM-5:59PM Sunday 6 AM-5:59PM	129
5	Happy Hours_Weekend	Friday 6 PM- 11:59 PM Saturday 12 AM - 1:59 AM & Saturday 6 PM - 11:59 PM Sunday 12 AM - 1:59 AM & Sunday 6 PM - 11:59 PM Monday 12 AM - 1:59 AM	291
6	Bed Time_Weekend	Saturday 2 AM - 5:59 AM Sunday 2 AM - 5:59 AM Monday 2 AM - 5:59 AM	137

The risk factors of this research are the spatial influence of criminogenic features of landscape at micro places in Newark, NJ. As supported by literature: at risk housing, bars, bus stops, banks, corner stores, drug arrests, gas stations, grocery stores, gun arrests, liquor stores, pawn shops, retail stores, schools, sit-down restaurants, takeout restaurants, and vacant buildings were included in the analysis as criminogenic features:

- These features' spatial influences have been operationalized as either distance from or density of these features.
- The highest risk places associated with each risk factor were operationalized as all cells within the specified distance or density of the risk features.
- The statistical significance of the operationalized spatial influence of each risk factor was measured with chi-square test.
- Risk factors have been weighted in relation to each other.
- The operationalized spatial influence of significant criminogenic features was combined.
- A spatial lag variable was created to account for spatial autocorrelation.



- The vulnerability to the combined spatial influence of criminogenic features of the landscape was tested with logistic regression, controlling for spatial lag.

Layer Name	Operationalization of Spatial Influence	Search Radius
Bars_Social Clubs	Distance	290 feet
Bus Stops	Distance	145 feet
Banks	Distance	290 feet
Corner Stores	Distance	145 feet
Drug Arrests	Density	870 feet
Grocery Stores	Distance	290 feet
Gun Arrests	Density	870 feet
Liquor Stores	Distance	290 feet
Prostitution Arrests	Density	870 feet
Sit Down Restaurants	Distance	290 feet
Take Out Restaurants	Distance	290 feet
Vacant Buildings	Distance	290 feet
At Risk Housing	Distance	290 feet
Parking Lots	Distance	290 feet
Gas Stations	Distance	145 feet
Schools	Distance	290 feet
Light Rail Stations	Distance	145 feet
Pawn Shops	Distance	290 feet
Retail Stores	Distance	290 feet

Results

According to chi-square test results for all time models, only bus stops and grocery stores seem to be stable predictors. When time models are examined separately, disaggregated time models had a different combination of criminogenic features than the base model. For instance:

- For all time robberies: bars, bus stops, grocery stores and sit-down restaurants,
- For daytime work weekday robberies: at-risk housing, bars, bus stops and grocery stores,
- For Happy Hour Weekday robberies: bus stop, grocery stores, at-risk housing and sit down restaurants,
- For Bedtime Weekday robberies: at-risk housing, bars, bus stops and grocery stores,
- For daytime work weekend robberies: bus stops, grocery stores and sit-down restaurants,
- For Happy Hour Weekend robberies: bars, bus stop, grocery stores, at-risk housing and sit-down restaurants,
- For Bedtime Weekend robberies: bars, bus stops, sit- down restaurants and grocery stores have been significant predictor variables.

Looking at the logistic regression results, with the exception of Model 5, which is Happy Hours weekend, the probability of street robbery occurrence is higher in disaggregated time models at cells identified to be high risk. As you can see below, with the exception of Model 5, street robberies are 4 to 16 percent more likely to occur at high risk cells in

the disaggregated time models when compared to the base model. And in all models, including Model 0, robberies are 35% to 51% more likely to happen at cells identified to be high risk with RTM.

	Exp(B)						
	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Composite Risk Value	1.35***	1.42***	1.39***	1.50***	1.51***	1.33***	1.45***
Spatial Lag	0.989	2.11E+10	2.79E+10	2.85E+11	7.89E+10	5.20E+10	1.38E+11
Constant	0.03***	0.009***	0.01***	0.002***	0.004***	0.008***	0.004***
	R ² = .193	R ² = .193	R ² = .159	R ² = .27	R ² = .069	R ² = .173	R ² = .166

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Wright, R., & Decker, S. H. (1997). *Armed Robbers in Action: Stickups and street culture*. Lebanon, NH: Northeastern University Press. response to crime occurrence to one that is more strategic, anticipating where resources will be needed to respond to and prevent newly emerging crime problems.

