

## A Pilot Application of Risk Terrain Modeling: Aggravated Assault in Newark, NJ

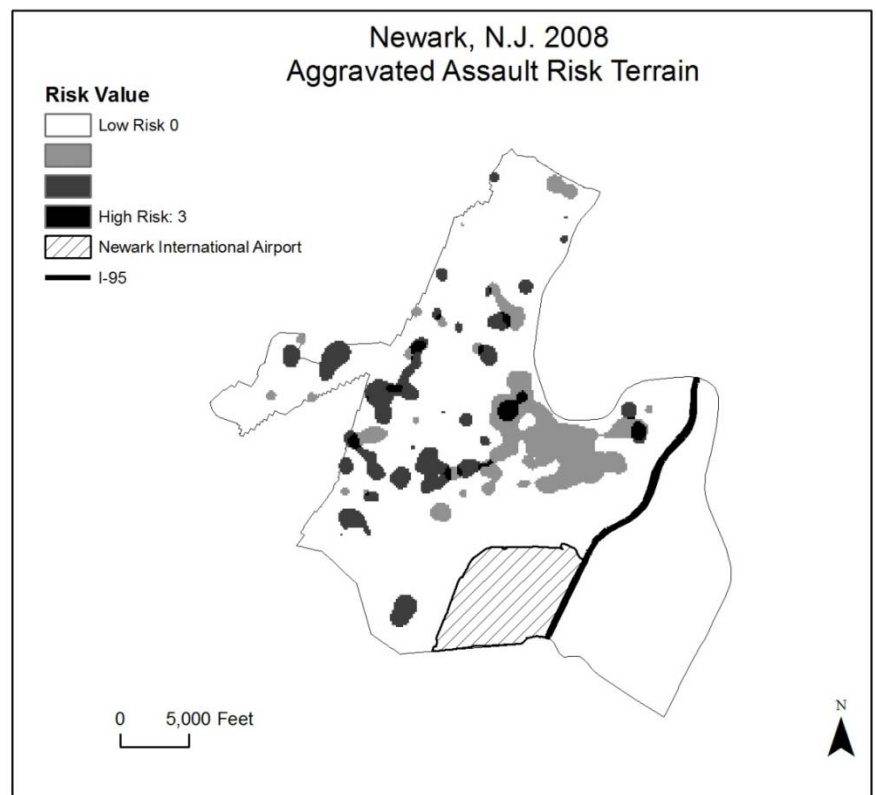
Victoria Sytsma | May 2011

This research brief presents a pilot study employing the technique of Risk Terrain Modeling<sup>i</sup> (RTM) to the offence of aggravated assault within the city of Newark, NJ. This pilot contributes to the existing literature by producing greater insight into the spatial intersection of a variety of environmental facets conducive to the outcome of aggravated assault. Further, by spatially engaging potential risk factors favorable to the occurrence of a criminal event, one can provide strong explanatory conjecture without having to rely upon past criminal incidents.

The combination of lower inhibitions due to alcohol, over-crowding, poor communication, and the possibility for the presence of other crimes such as prostitution and drug dealing makes bars and social clubs an environment ripe for aggravated assaults to occur.<sup>ii</sup> In addition, drug markets contribute to aggravated assaults through drug deal disputes and turf wars turning violent.<sup>iii</sup> For this pilot study, 3 risk factors for the spatial occurrence of aggravated assault are operationalized here; the locations of drug arrests, narcotic hotspots, and the locations of bars and social clubs. It must be noted that this is not an exhaustive list of the risk factors linked to aggravated assault by any means. This is a pilot study and accordingly these findings may be built upon in future research.

The area under study here is the city of Newark, NJ. Despite recent reductions in violent crime, at 413 aggravated assaults per 100,000 in Newark in 2008 versus the national average of 275, Newark continues to face challenges with violent crime (UCR, 2008). It must be noted that the Newark Liberty International Airport is not patrolled by the Newark Police Department and these findings cannot be generalized to that area of Newark. Further, the area of Newark south of highway I-95 is home to Port Authority; an area also not patrolled by the Newark Police and thus the results do not apply to this location as well.

The period under study here for the location data is 2008 and the risk calculation produced for this period was tested for predictive validity against 2008 aggravated assault point data to see if the risk calculation indeed significantly predicted aggravated assault to occur within the 2008 landscape. The ArcView Spatial Analyst Extension was used to convert data to raster and it was geocoded to street centerlines of Newark, NJ (obtained from Census 2000 TIGER/Line Shapefiles). Each of the 3 risk factor layers were then reclassified into a dichotomous variable, operationalized as 0=not highest risk, 1=highest risk; with '1' referring to all values greater than 2 standard deviations from the mean. In the case of the *narcotic hotspot* risk layer, because it was a polygon shapefile as opposed to point data, no standard deviations were used –a location was either a hotspot or it was not. The Raster Calculator function in ArcMap was used to combine each risk factor into a Risk Value layer which can be seen in the Figure to the right.



The predictive validity of this RTM was tested by converting the Risk Value layer into a vector polygon grid with each cell representing 140 square feet –approximately half a Newark city block. The 2008 aggravated assault point data was joined with this polygon grid of 38,047 cells to determine if criminal events spatially intersect with risk. As seen in Table 1, a logistic regression was run and it was found that for every one unit increase in risk value, the odds of an aggravated assault occurring increases by 116%; these results were statistically significant.

Table 1 Logistic Regression for Risk Value on Aggravated Assault

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 <sup>a</sup> RiskValue	.773	.035	485.531	1	.000	2.165	2.021	2.319
Constant	-4.051	.041	9600.986	1	.000	.017		
-2 Log likelihood= 8064.931; Nagelkerke R <sup>2</sup> = .050								

This pilot study gives credence to the use of RTM, particularly in police agencies such as Newark where budgets require efficient methods to determine where patrols are needed. However, because this is merely a pilot study, other risk factors surrounding aggravated assault may be investigated in the future. The adaptive nature of RTM makes this method amenable to investigating risk factors grounded in theory and literature, but also risk factors which arise out of police and crime analysts’ experiences with a criminal event or location. Finally, based on the forecasting nature of this method, RTM might be used for crime *prevention* based on the environmental contexts of a given area -as opposed to merely relying on past crime events to prevent where future crime will occur.

**Endnotes**

<sup>i</sup> See [www.riskterrainmodeling.com](http://www.riskterrainmodeling.com)

<sup>ii</sup> Scott, M. S., & Dedel, K. (2006). *Assault in and around bars* (2nd ed.). Washington, DC: Office of Community Oriented Policing Services, U.S. Department of Justice.

<sup>iii</sup> Office of National Drug Control Policy. (2000). *Drug-related crime fact sheet*. Washington, DC: Office of National Drug Control Policy.