

A Spatio-Temporal Comparison of Violent Crime

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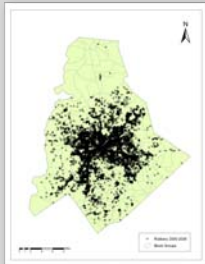
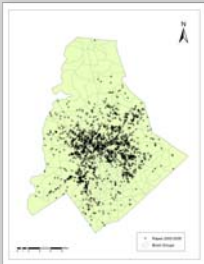
Charlotte-Mecklenburg, NC

Population in

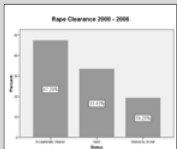
- 2000: 659,454
- 2007: 855,127
- Growth: 29.7% in seven years
- Study Period: 2000 – 2006
- Total UCR Part 1 Violent Crime: 121,989



Point-Pattern Maps: Rape & Robbery



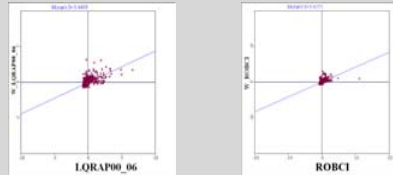
- Rapes reported to CMPD
- N=2070



- Robbery reported to CMPD
- N=20568



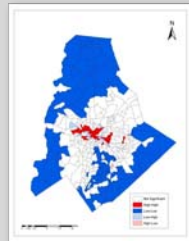
ESDA Global Moran's I: Rape & Robbery



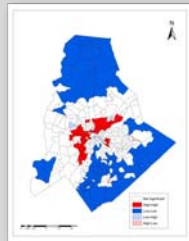
Moderate to strong, positive spatial autocorrelation
 •Rape= 0.4409 Robbery = 0.4171

Local Indicators of Spatial Association

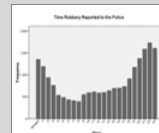
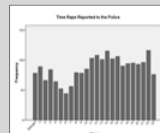
Rape



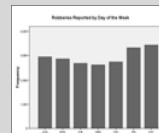
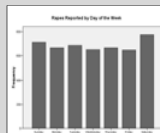
Robbery



Temporal Pattern: Rape & Robbery



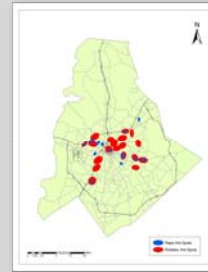
Rape: Report times lowest early in the morning, consistently high report beginning at 8 am throughout the day into late evening. Robbery: Report times highest in the evenings beginning at 5 pm.



Rape: Report times highest on Saturday and Sunday with fairly consistent reporting other days
 Robbery: Report times highest on Friday and Saturday.

Spatial Hot Spot Map: Rape over Robbery

Hot Spot Parameters: 2640 feet, Rape: 25 incidents & Robbery: 250 incidents

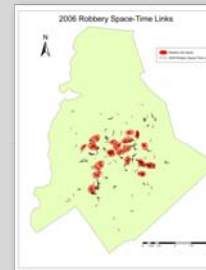


Total Rape Hot Spots: 13
 Total Robbery Hot Spots: 19

Spatial hot spots for rape co-occur with robbery hot spots (8/13).

Hot spots are more common within the city center and along major highways and interstates.

Space-Time Interaction: Knox Method (Monte Carlo Sim)



	Time	
	Far	Close
S p a c e	Far	4,949,226
	Close	1056

Test Statistic = 1056
 P=value from MC Sim = 0.00100
 999 Monte Carlo Simulations

For ROBBERY:

- There are 7087 pairs with significant space-time interaction occurring within a half-mile and 1 day
- Additional space-time hot spots can be identified

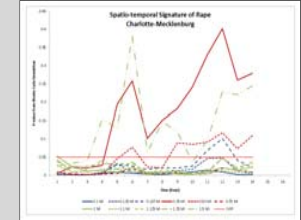
	Time	
	Far	Close
S p a c e	Far	2118971
	Close	67

Test Statistic = 67
 P=value from MC Sim = 0.00300
 999 Monte Carlo Simulations

For RAPE:

- There are 67 pairs with significant space-time interaction occurring within a half-mile and 1 day
- Possible additional space-time hot spots may emerge

Spatio-Temporal Signatures: Rape & Robbery



Rape exhibits significant space-time interaction throughout the range of times & distances. There seems to be a 7 to 9 day cycle.



Robbery also exhibits a strong space-time interaction with all values for both space & time significant. The far ranges are slightly less consistent.

Conclusions and Implications

There is both spatial and temporal clustering of violent crime in Charlotte-Mecklenburg. The spatial clustering tends to be strongest near the city center for both crimes. However, the temporal clustering for rape was more diffused (Ratcliffe, 2004) and Robbery exhibited a more focused temporal pattern. Both crimes evidenced significant space-time interaction. Again, the space-time signature of rape was more diffused than the pattern for robbery (Grubestic & Mack, 2008).

The combined study of space, time, and space-time interactions improves the overall utility of hot spot mapping. It may also serve to provide greater focus for policing interventions giving guidance on both where and when these operations should occur.

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