Sustainability at its Worst: Crime and Chronic Illegal Behavior Settings

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Two Kinds of Sustainability (Re: Crime Analysis)

- Sustainability of criminogenic environments
  - I.e. “hotspots”
- Sustainability of methods for analyzing crime and crime patterns.
  - I.e., “hotspot mapping”

Both affect strategies for allocations of resources.
LOCATION MATTERS

KERNEL

Location Matters: Crime Hotspots

Density Value

Sample point

Kernel

Search radius
It happened here before.
Go here again.
SUSTAINABILITY, ANALYTICAL TECHNIQUES

- Analytical techniques shouldn’t be “hooked” on inputs which are outcomes intended to be prevented.

“MAPLESS MAP”

“A mapless map...describes how one variable is distributed in space. To determine ‘why’ it is distributed the way it is, the spatial distribution of at least one other variable needs to be considered.” (Rengert & Lockwood, 2010; p. 109)
• Hotspots tell where to go, but not what to do when you get there.

• Q: What attracts illegal behavior at this high-crime area
• Q: Why does crime cluster there over time?
RISK TERRAIN MODELING (RTM)

• Spatial analysis technique developed by Joel M. Caplan and Leslie W. Kennedy at Rutgers University.

rutgerscps.org/
THE RTM PROCESS

1. Test Inputs

2. Weight Valid Factors

3. Output Final Model

Produce Map

BEHAVIOR SETTINGS FOR CRIME

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1. Elastic net penalized regression (assuming Poisson distribution)
   - Uses cross-validation
2. Bidirectional stepwise regression
   - Bayesian Information Criteria (BIC) scores
   - Does it twice: Assumes both a Poisson and Negative Binomial distribution
3. “Best” model with lowest BIC score is selected
4. Relative Risk Value
   - Rescaling factor coefficients between the min and max values
   - Interpreted as weights of risk factors

See the User Manual at www.rutgerscps.org/software for details
**GUN VIOLENCE IN NEWARK, NJ**

*Best* Model Specification

The RTMCL utility determined that the best risk terrain model was a **Negative Binomial type II** model with 11 risk factors and a BIC score of 6291. The model also includes an intercept term that represents the background rate of events and an intercept term that represents overdispersion of the event counts:

<table>
<thead>
<tr>
<th>Name</th>
<th>Operationalization</th>
<th>Spatial Influence</th>
<th>Coefficient</th>
<th>Relative Risk Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NarcoticsArrests2012 StreetLevel</td>
<td>Density</td>
<td>226</td>
<td>1.2616</td>
<td>3.5311</td>
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<tr>
<td>Newark Foreclosure</td>
<td>Proximity</td>
<td>904</td>
<td>1.2114</td>
<td>3.3582</td>
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<td>Newark Restaurants Sliddown</td>
<td>Proximity</td>
<td>1356</td>
<td>1.0137</td>
<td>2.7558</td>
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<tr>
<td>Newark gas stations</td>
<td>Proximity</td>
<td>226</td>
<td>0.9321</td>
<td>2.5999</td>
</tr>
<tr>
<td>Newark convenience stores</td>
<td>Proximity</td>
<td>226</td>
<td>0.8411</td>
<td>2.3190</td>
</tr>
<tr>
<td>Newark Foods carryout</td>
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<td>226</td>
<td>0.7855</td>
<td>2.1934</td>
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<tr>
<td>Liquor/Estate2013 Bars</td>
<td>Proximity</td>
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<td>0.7001</td>
<td>2.0140</td>
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<tr>
<td>AbandorProp2013 Only/Certain</td>
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<tr>
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<td>0.3214</td>
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<tr>
<td>Liquor/Estate2013 LiquorStores</td>
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<td>0.2933</td>
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<tr>
<td>AllRisk Housing 2013 Points</td>
<td>Proximity</td>
<td>452</td>
<td>0.2904</td>
<td>1.3370</td>
</tr>
</tbody>
</table>

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**MITIGATE SPATIAL RISK FACTORS**

Vacant Property → Community Garden

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STRATEGIC EXAMPLE OF RTM

Risk-Based Interventions

NO MORE WHACK-A-MOLE!
POLICE PRODUCTIVITY

CRIME PREDICTION
CRIME RISK KALEIDOSCOPE

STUDY SETTINGS

Newark  Chicago  Kansas City
RESULTS

Table 1: Risk Terrain Model Results of Attractors and Generators of Robbery in Kansas City, Chicago, and Newark

<table>
<thead>
<tr>
<th>Factor</th>
<th>Kansas City</th>
<th>Chicago</th>
<th>Newark</th>
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</thead>
<tbody>
<tr>
<td>Bus Stops</td>
<td>D 1386.142</td>
<td>P 213</td>
<td>D 1556.95</td>
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<tr>
<td>Drug Markets</td>
<td>D 924.301</td>
<td>P 213</td>
<td>D 226</td>
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<tr>
<td>Gas Stations</td>
<td>D 632.217</td>
<td>P 213</td>
<td>D 226</td>
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<tr>
<td>Liquor Stores</td>
<td>P 924.204</td>
<td>P 872</td>
<td>D 226</td>
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<tr>
<td>Grocery Stores</td>
<td>1386.164</td>
<td>426</td>
<td>D 226</td>
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<tr>
<td>Homeless Shelters</td>
<td>1386.164</td>
<td>213</td>
<td>D 1356.048</td>
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</tbody>
</table>

Factor: Attractor/Generator of Crime
SO: Optimal Spatial Operationalization
SI: Optimal Spatial Influence
RR: Relative Risk Value

CONCLUSION

• Sustainable environments for crime exist.
• Characteristics of these environments may differ for different crime types and different jurisdictions.

• What does this mean for research?
• What does this mean for practice?
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