Geospatial Technology for Reducing Residential Burglary*

Elizabeth Groff
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The challenge of residential burglary

• Residential burglary exacts emotional and financial toll
  • Sense of violation
  • Average loss in US is $2,116 (median = $600)

• Burglaries tend to cluster in space and time
  • Neighbors of burgled home are at greater risk
  • Risk decays over a short time period
  • Almost all research in UK

• How do we use this information to interrupt the ‘near repeat’ pattern?
Prevention initiatives in UK

• Strategies for interrupting ‘near repeat’ burglary patterns
  • Provide the public with information about increased risk – very quickly
  • Offer burglary audits
  • Purchase dead bolts, window locks and other target hardening measures

• Positive results in several UK towns
Translating research into practice in US

- Can providing the public with timely information about burglary risk reduce residential burglary?
Study design

• Sites

Redlands, CA

Baltimore County, Maryland
Baltimore County Maryland

- Population - 817,455 (2012)
- Burglaries - 1,110 (2013)
Redlands, California

- Population - 69,916 (2012)
- Burglaries - 353 (2013)
Quantifying near repeat pattern

- Near repeat calculator
  - Over what space-time windows does a near statistically significant near repeat pattern exist?
  - Download free at [http://www.temple.edu/cj/misc/nr/download.htm](http://www.temple.edu/cj/misc/nr/download.htm)
Output from near repeat calculator

- Significant space-time risk thresholds
- Near repeat pattern exists

<table>
<thead>
<tr>
<th></th>
<th>0 to 7 days</th>
<th>8 to 14 days</th>
<th>15 to 21 days</th>
<th>22 to 28 days</th>
<th>29 to 35 days</th>
<th>More than 35 days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Same location</strong></td>
<td>4.7%</td>
<td>1.90</td>
<td>0.00</td>
<td>4.07</td>
<td>5.43</td>
<td>0.42</td>
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<tr>
<td>1 to 400 feet</td>
<td>5.31</td>
<td>1.85</td>
<td>0.87</td>
<td>0.97</td>
<td>1.38</td>
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<tr>
<td>401 to 800 feet</td>
<td>2.16</td>
<td>1.65</td>
<td>1.42</td>
<td>1.26</td>
<td>1.09</td>
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<tr>
<td>801 to 1200 feet</td>
<td>2.07</td>
<td>1.19</td>
<td>0.92</td>
<td>1.42</td>
<td>1.19</td>
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<tr>
<td>1201 to 1600 feet</td>
<td>1.39</td>
<td>1.41</td>
<td>1.19</td>
<td>0.73</td>
<td>1.15</td>
<td>0.96</td>
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<tr>
<td>1601 to 2000 feet</td>
<td>1.45</td>
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<td>1.36</td>
<td>1.21</td>
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<td>More than 2000 feet</td>
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Statistical significance table

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<tr>
<td>1 to 400 feet</td>
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<td>0.25</td>
<td>1.00</td>
</tr>
<tr>
<td>401 to 800 feet</td>
<td>0.05</td>
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<td>0.30</td>
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Estimating potential crime reduction

- ArcGIS 10.2 Network Analyst (OD Cost Matrix Solver)
- Identify burglaries within distance threshold (400 feet or 800 feet for example)
- Count the number of burglaries that occur within a specified temporal threshold (e.g., 7 or 14 days)
- Export the file of events within space-time threshold
- Use Excel’s pivot tables to get counts
- Calculate potential crime reduction
Example of near repeat patterns
Randomized control trial design

- Random assignment of burglaries as they occur
  - 131 treatment
  - 131 control
- Generate high risk zones and buffers to test for displacement
Creating and tracking burglaries in the high risk zones

- High risk zone
  - Measure outward from burglary along street network to high risk distance threshold

- High risk buffer
  - Measure outward from burglary along street network to high risk buffer distance threshold

- Tracking via a software program
  - Open source will be available from Azavea.com (still under construction)
Automated tool to track events

Burglary

- Within existing zone or buffer?
  - Yes → Count as outcome
  - No

  - No → Exclude burglary from study
  - Yes → Random assignment

- Generate high risk zone and high risk buffer. Overlap check.

- Overlay with address points

- Report showing addresses to treat

- Deploy field workers within ~ 24 hours
Treatment

- Raise awareness of risk
- Deliver information via uniform personnel

Tools

- Script to follow
- Hang tag to leave
- Offer of security audit
- Ask for information
Analysis

- Compare burglaries in the treatment zones and control zones
- Examine the buffers to quantify displacement or diffusion of benefits
Status and outlook

• Target start date August 1, 2014
• Anticipate treatment will run about six months to a year
  • Limited resources for treatment extend time
• Conduct citizen survey
  • Did information translate into action?
• Report results within two months of end of experiment
Thanks!

- Questions?????

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