BACKGROUND

- Research has established that crime is highly concentrated at a small proportion of micro-places, and changes in crime at relatively few micro-places can have considerable influence on citywide crime rates (e.g., Weisburd et al., 2004).
- Studies using trajectory models reveal (e.g., Groff et al., 2010; Wheeler et al., 2016):
  - relative stability of crime over time at most micro-places
  - both the clustering of high crime micro-places and street-to-street variability in crime trajectories.
- The present study builds on this work to examine spatiotemporal crime patterns across 6 cities (Seattle, San Antonio, Philadelphia, Chicago, Los Angeles, and New York City). We use Local Moran’s I as an alternative method to identify statistically significant high and low crime clusters across each city and outliers within those clusters that differ significantly from their local spatial neighbors.

METHODS

- Crime counts were aggregated annually (2008-2018) to street segments for each city.
- Local Moran’s I (i.e., Cluster and Outlier Analysis) was used to identify statistically significant high and low crime clusters and spatial outliers over the study period (Anselin, 1995).
- Cluster: area where a street segment and its neighbors are similar and have more (or less) crime than would be expected in a random distribution.
- Outlier: street segment is dissimilar from its neighbors and falls within a statistically significant high or low crime cluster.
- Consistent with Neighborhood Unit theory, spatial neighbors are all street segments within a ¼ mile radius (Perry, 1929). The distance decay function was used to give greater weight to adjacent neighbors than those at the ¼ mile boundary.
- The Local Moran’s I index was produced (using FDR correction and 999 permutations) for every street segment for each year and assigned a category type:
  - Low crime segment in low crime cluster (LL)
  - High crime segment in low crime cluster (HL)
  - High crime segment in high crime cluster (HH)
  - Low crime segment in high crime cluster (LH)
  - Non-significant segment
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  - High crime segment in high crime cluster (HH)
  - Low crime segment in high crime cluster (LH)
  - Non-significant segment
- Stable street segments are those that fell in same category for the entire study period.
- Sporadic street segments are those that were both non-significant and fell into a single significant category during the study period.
- Changing segments & clusters are segments that fell into multiple significant categories during the study period.

FINDINGS

<table>
<thead>
<tr>
<th>FINDINGS</th>
<th>Stable street segments</th>
<th>Sporadic street segments</th>
<th>Changing segments &amp; clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seattle</td>
<td>12,622</td>
<td>47.5</td>
<td>48.65</td>
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<tr>
<td>San Antonio</td>
<td>8,212</td>
<td>63.9</td>
<td>36.1</td>
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<td>Philadelphia</td>
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<td>50.0</td>
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<td>Chicago</td>
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<td>64.9</td>
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<td>LA</td>
<td>8,033</td>
<td>59.9</td>
<td>40.1</td>
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<tr>
<td>NYC</td>
<td>5,873</td>
<td>62.9</td>
<td>37.1</td>
</tr>
</tbody>
</table>

Cluster & Outlier Visualization Example: Philadelphia

- There was a great deal of stability observed across all cities, with a majority of street segments in 5 of 6 cities (and 47.5% in the 6th) falling into the same category for every year of the study.
- It was fairly common for street segments to move from significant to non-significant (or vice versa) during the study, ranging from 17.7% of street segments in New York City to 32.0% in Seattle.
- It was less common for a street segment to fall into multiple significant categories during the study.
- The most common form of change was within low crime clusters, ranging from 3.5% of street segments in San Antonio to 17.3% in Seattle.
- Change within high crime clusters was less common, ranging from 1.1% of street segments in San Antonio to 6.6% of street segments in Philadelphia.
- Changing clusters were rare, with less than one percent of street segments in any city falling in both a low crime cluster and a high crime cluster over the course of the study.

DISCUSSION

- There was a great deal of stability observed across all cities, with a majority of street segments in 5 of 6 cities (and 47.5% in the 6th) falling into the same category for every year of the study.
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References:


