Describing Gun Violence Levels across Time and Space in Cincinnati, Ohio

12 July 2017
BACKGROUND

PLACE-BASED INVESTIGATIONS OF VIOLENT OFFENDER TERRITORIES (PIVOT)

<table>
<thead>
<tr>
<th>Year</th>
<th># of Persons Shot</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>418</td>
</tr>
<tr>
<td>2009</td>
<td>416</td>
</tr>
<tr>
<td>2010</td>
<td>430</td>
</tr>
<tr>
<td>2011</td>
<td>427</td>
</tr>
<tr>
<td>2012</td>
<td>374</td>
</tr>
<tr>
<td>2013</td>
<td>427</td>
</tr>
<tr>
<td>2014</td>
<td>375</td>
</tr>
<tr>
<td>2015</td>
<td>479</td>
</tr>
</tbody>
</table>
P.I.V.O.T.
Place-base Investigations of Violent Offender Territories

Baltimore / McHenry Place Network Investigation

Source: CPD Investigative Intelligence
CPD - CAPS
Citywide Violence Scores

Legend
- Neighborhoods
- CIRV Territory

Potential Problem Solving Locations
Violent Hot Spots by Violence Score
- Core Score = 12 (12 locations)
- Core Score >= 11 (2 locations)
- Core Score >= 10 (9 locations)
- Core Score >= 9 (5 locations)

Combined Violence Score
- < 3
- 3-5
- 6-8
- 9-12

There are 23 clusters of 8 or more contiguous cells (100x100 ft) with violence scores of 10+. A 400 foot buffer (~1 block radius) is drawn around each of these clusters.

A violent score of 12 means that each violent indicator (shootings, agg robbery, firearm/gun offenses and weapon-related calls for service) is in the top 1% of the city across all 3-time periods of interest, 1 yr, 3 yr, 5 yr.

Prepared by: SCRMA Blake Christenson & CRMA Beth Christenson
Data Prepared On: 12/29/2015
### PIVOT Partners

#### Bi-Weekly Working Group Meetings

<table>
<thead>
<tr>
<th>Local Community Councils</th>
<th>Community Partnering Center</th>
<th>City Planning</th>
<th>Buildings &amp; Inspections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community &amp; Economic Development</td>
<td>Health Department</td>
<td>Fire Department</td>
<td>Law Department</td>
</tr>
<tr>
<td>Environment &amp; Sustainability</td>
<td>Public Services</td>
<td>Transportation &amp; Engineering</td>
<td>Keep Cincinnati Beautiful</td>
</tr>
<tr>
<td>Cincinnati Recreation Commission</td>
<td>Parks Department</td>
<td>Port Authority</td>
<td>Community Redevelopment Corporations</td>
</tr>
</tbody>
</table>
How do we measure, in (near) real time, progress toward reducing gun violence?
TOWARD A GUN VIOLENCE METRIC

1. Measures gun violence
2. Precise measurement
3. Measures current levels
4. Changes in short periods
MEASURES GUN VIOLENCE

Datasets

- Shooting Incidents: 20 pts
- Robberies: 10 pts
- Gun Offenses: 5 pts
- Shots Fired Calls-for-Service: 1 pt

Number of Incidents

RMS

CAD
PRECISE MEASUREMENT

100’ x 100’
MEASURES CURRENT LEVEL + CHANGES IN SHORT TIME PERIODS

224 days’ worth of data time weighted

Dataset

0 – 27.9 days ago = \textbf{1.0} x weight

28 – 55.9 days ago = \textbf{0.8} x weight

56 – 111.9 days ago = \textbf{0.6} x weight

112 – 167.9 days ago = \textbf{0.4} x weight

168 – 224 days ago = \textbf{0.2} x weight
EXAMPLE OF A STEP-BY-STEP PROCESS

0. **SOURCE LAYERS**
1. **EXTRACT + MANIPULATE DATA**
2. **DATA PROCESSING**
3. **POST-PROCESSING**
**STEP 0: CREATING “PLACES”**

Data Management Tools ➔ Sampling ➔ **CREATE FISHNET**

- **Extent** = jurisdiction boundary
- **Cell height** = 100 feet
- **Cell width** = 100 feet
- **Type** = polygon

- **Post-processing:** select & export cells intersecting jurisdiction boundary
  - Cincinnati is made up of 225,618 100’ x 100’ cells
• “DateDiff” expression

• Assign a “Factor Score” to each data point where:
  – $x < 28$ days difference = 1.0
  – $28 \leq x < 56$ days difference = 0.8
  – $56 \leq x < 112$ days difference = 0.6
  – $112 \leq x < 168$ days difference = 0.4
  – $168 \leq x < 224$ days difference = 0.2
  – $x > 224$ days difference = 0.0
STEP 2A: CREATING SPATIAL RELATIONSHIPS

Analysis Tools ➔ Overlay ➔ SPATIAL JOIN (Join One To Many) x4

- Fishnet joined to points (shootings, robberies, firearms offenses, weapon-related calls for service)
- Search radius = 400 feet – i.e., the total set of places "influencing" the location of the event.
- 100' x 100' places balloon to 700,000+ in some layers
• Sum the factor score calculated in Step 1
  – Case field = “TARGET_FID”
Join the summary statistic tables back to the original fishnet layer
• Calculate the violence score by multiplying:
  – 20 x sum of factor scores for shootings
  – 10 x sum of factor scores for robberies
  – 5 x sum of factor scores for gun offenses
  – 1 x sum of factor scores for weapons-related calls-for-service
CURRENT USES

1. Traditional “Hot Spotting”
2. Armig the Problem Solvers Toolbox
3. Other?...
TRADITIONAL "HOT SPOTTING"

3-Dimensional Kernel Density Estimates

Overall Violence Scores* as of 27-Sep-2016

*Overall violence score is a weighted metric incorporating shootings, robberies, gun crimes, and weapon-related calls-for-service over 224 days.
TRADITIONAL “HOT SPOTTING”

Change maps

*Overall violence score is a weighted metric incorporating shootings, robberies, gun crimes, and weapon-related calls-for-service over 224 days.
HAPTIC FEEDBACK FOR PROBLEM SOLVING

Site-specific project maps

Violence Change Score: 22May16 - 22 May17

*Overall violence score is a weighted metric incorporating shootings, robberies, gun últimales, and weapon-related calls-for-service over 224 days

Source: CPD RMS
Score tracking

Overall Gun Violence Score at Harrison Av & McHenry Av

$y = -0.0004x^2 + 36.065x - 766097$

$R^2 = 0.799$
**Thank You!**

See more:

- Research in Brief: Place-Based Investigations to Disrupt Crime Place Networks
  - (April 2017 issue of *Police Chief*)

- CPDPIVOT.com
  - 3 white papers (and counting)

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