Enhancing CCTV’s Impact on Crime and Disorder

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Presentation Overview

- Why should CCTV work and how?
- Evaluation results
- Top 10 Lessons
- Questions, answers, and sharing of experiences
What would cameras prevent crime?

- **Rational Choice Perspective**
  - Criminals weigh costs/benefits of crime
  - Situational Crime Prevention: cameras = formal surveillance

- **Public surveillance cameras increase risk of apprehension**
  - Active monitoring enables LE to intervene on the spot

- **Public surveillance cameras increases risk of detection**
  - Footage supports investigative efforts, ID of perpetrator

- **What types of crimes should cameras prevent?**
  - Street crimes of all types
  - Some argue less impact on violent crime
  - May prevent crime behind closed doors
Does it work and at what cost?

• What can evaluation tell us about CCTV effectiveness?
• When are cameras not effective?
• How are they used in problem solving, apprehensions, investigations, prosecutions?
• Do the results justify the costs?
Impetus

- Cameras increasingly adopted by jurisdictions – often with DHS funding but serving a dual purpose
- Extensive research in the UK, very little in the U.S.
- Agencies need to know if and how public surveillance works
- Proposed/received funding from COPS to explore this question in detail – implementation, use, impact, & cost
Overview of Methodology

- Process Evaluation
  - Camera basics
  - Implementation, monitoring, and placement

- Impact Analysis
  - Structural Break Analysis
  - Differences-in-Differences

- Spatial Analysis
  - Density Mapping
  - Means Center
  - Weighted Displacement Quotient (WDQ)

- Cost-Benefit Analysis
# Camera System Basics

## WHAT

- Camera Hardware
- Monitoring camera feeds/recordings
  - Active Monitoring
  - Passive Monitoring
  - Central Monitoring
- Transmitting video footage
  - Wired network
  - Wireless network
- Recording and storing video footage

## WHY

- Crime Reduction Goals
  - Targeting chronic violent crime
  - Drug crimes
  - Crimes of disorder
  - Responding to crime spike
  - Increasing sense of law enforcement presence
- Solving Crime
- Component of Integrated CompStat Approach
- Expansion of Existing Camera System
Monitoring Techniques

- **Passive**
  - Relies on pre-programmed camera “tours”
  - Aids in investigations

- **Active**
  - Identifies suspicious behavior
  - Reveals crimes that would otherwise go unreported
  - Disrupts crimes in progress
  - Focuses on areas of interest to investigations
  - Employs retired officers, light-duty officers, trained civilians
## Implementation Differences

<table>
<thead>
<tr>
<th>City</th>
<th>Baltimore</th>
<th>Chicago</th>
<th>Washington</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Cameras</td>
<td>400+</td>
<td>2,000+ (access to over 8,000)</td>
<td>70+</td>
</tr>
<tr>
<td>Reason – data- and technology-driven approach to all crime types</td>
<td>Violent, firearms, drug-related</td>
<td>Recent spike in violent crime</td>
<td></td>
</tr>
<tr>
<td>Privacy Policies</td>
<td>Less Restrictive</td>
<td>Less Restrictive</td>
<td>More Restrictive</td>
</tr>
<tr>
<td>Monitoring Strategy</td>
<td>Mostly Active; Partially Centralized Dedicated Monitors</td>
<td>Mixed; Decentralized Non-Dedicated Monitors</td>
<td>Mostly Passive; Centralized Supervised Sworn Officers</td>
</tr>
<tr>
<td>Network Type</td>
<td>Primarily Wireless</td>
<td>Wireless</td>
<td>Mixed</td>
</tr>
</tbody>
</table>
Impact Analysis

- **Structural Break Analysis**
  - Detects significant changes
  - User aligns changes with implementation date(s)
  - Enables detection of incrementally implemented interventions

- **Difference-in-Differences**
  - Compares net change in crime in target area using control area to subtract out other changes at the same time
  - Assume other changes were identical between the treatment and control

- Searched for significant differences in average monthly crime counts within three areas:
  - (1) the target area of the camera (radius of 500 feet);
  - (2) at buffer zones of 500 feet (diffusion zone 500 feet beyond target area)
  - (3) at buffer zones of 1000 feet (displacement zone 1000 feet beyond target area);

- Matched comparison areas for each area selected
  - Land use, historical crime rates, and socio-economic measures to the target area before the intervention
# Significant Changes in Crime, Downtown Baltimore*

<table>
<thead>
<tr>
<th>Crime</th>
<th>Time from Installation</th>
<th>Pre-Shift Mean</th>
<th>Post-Shift Mean</th>
<th>%Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larceny Inside</td>
<td>3 months</td>
<td>36.79</td>
<td>25.03</td>
<td>-31.97%</td>
</tr>
<tr>
<td>Larceny Outside</td>
<td>11 months</td>
<td>41.47</td>
<td>27.13</td>
<td>-34.58%</td>
</tr>
<tr>
<td>Violent</td>
<td>6 months</td>
<td>21.17</td>
<td>16.36</td>
<td>-22.72%</td>
</tr>
<tr>
<td>Total</td>
<td>4 months</td>
<td>119.05</td>
<td>89.47</td>
<td>-24.85%</td>
</tr>
<tr>
<td>1000-ft Buffer</td>
<td>5 months</td>
<td>82.83</td>
<td>58.38</td>
<td>-29.52%</td>
</tr>
</tbody>
</table>

*First set of cameras were installed in early May 2005; therefore, the intervention point was determined to be May 2005. The downtown extension cameras were not included in this analysis.
Baltimore’s Greenmount Area

<table>
<thead>
<tr>
<th>Crime Type</th>
<th>Area</th>
<th>Before</th>
<th>After</th>
<th>Change</th>
<th>Difference-in-Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Crime</td>
<td>Treatment</td>
<td>64.00</td>
<td>50.76</td>
<td>-13.24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>40.42</td>
<td>35.39</td>
<td>-5.03</td>
<td>-8.22†</td>
</tr>
</tbody>
</table>

*Camera installation occurred in early August 2005; therefore, the intervention point was determined to be August 2005.
†Significant at p<.05.
### Baltimore’s Tri-District Area

#### Significant Changes in Crime, Tri-District Area, Baltimore*

<table>
<thead>
<tr>
<th>Crime Type</th>
<th>Area</th>
<th>Before</th>
<th>After</th>
<th>Change</th>
<th>Difference-in-Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Crime</td>
<td>Treatment</td>
<td>37.61</td>
<td>29.12</td>
<td>-8.49</td>
<td>-12.35†</td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>32.53</td>
<td>36.38</td>
<td>+3.86</td>
<td></td>
</tr>
<tr>
<td>Larceny</td>
<td>Treatment</td>
<td>3.39</td>
<td>1.54</td>
<td>-2.83</td>
<td>-1.54†</td>
</tr>
<tr>
<td>Inside</td>
<td>Comparison</td>
<td>1.97</td>
<td>1.65</td>
<td>-0.32</td>
<td></td>
</tr>
<tr>
<td>Robbery</td>
<td>Treatment</td>
<td>3.84</td>
<td>2.08</td>
<td>-1.77</td>
<td>-2.06†</td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>3.47</td>
<td>3.77</td>
<td>+0.30</td>
<td></td>
</tr>
</tbody>
</table>

*Camera installation occurred in early March 2006; therefore, the intervention point was determined to be March 2006.†Significant at p<.05.
Baltimore’s North Avenue Area

- No significant findings
### Significant Changes in Crime, Humboldt Park, Chicago *

<table>
<thead>
<tr>
<th>Crime Type</th>
<th>Area</th>
<th>Before</th>
<th>After</th>
<th>Change</th>
<th>Difference-in-differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Crime</td>
<td>Treatment</td>
<td>301.39</td>
<td>243.53</td>
<td>-57.86</td>
<td>-38.30&lt;sup&gt;†&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>349.57</td>
<td>330.00</td>
<td>-19.57</td>
<td></td>
</tr>
<tr>
<td>Violent</td>
<td>Treatment</td>
<td>33.00</td>
<td>23.19</td>
<td>-9.81</td>
<td>-5.87&lt;sup&gt;†&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>29.57</td>
<td>25.62</td>
<td>-3.95</td>
<td></td>
</tr>
<tr>
<td>Drug</td>
<td>Treatment</td>
<td>115.22</td>
<td>77.31</td>
<td>-37.91</td>
<td>-33.49&lt;sup&gt;†&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>120.57</td>
<td>116.14</td>
<td>-4.43</td>
<td></td>
</tr>
<tr>
<td>Robbery</td>
<td>Treatment</td>
<td>11.52</td>
<td>8.53</td>
<td>-2.99</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>11.43</td>
<td>11.61</td>
<td>+0.18</td>
<td>-3.17&lt;sup&gt;†&lt;/sup&gt;</td>
</tr>
<tr>
<td>Weapons</td>
<td>Treatment</td>
<td>3.96</td>
<td>2.58</td>
<td>-1.37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comparison</td>
<td>3.78</td>
<td>4.56</td>
<td>+0.77</td>
<td>-2.15&lt;sup&gt;†&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*First camera installation on July 31, 2003 and, therefore, intervention line inserted at August 2003.

†Significant at p<.05.
Chicago’s West Garfield Park Area

- No significant findings
DC’s Individual Cameras

- Crime in each area pooled together (i.e., target, 500-ft, and 1000-ft buffers)
- No significant findings
DC’s Cluster Camera Area

- 13 cameras in close proximity
- No significant findings
- BUT crime did go down – just can’t attribute it to cameras
Crime Displacement and Diffusion of Benefits

• Spatial displacement of crime after camera installation
  – Crime moves outside viewshed of camera
  – Crime moves into similar crime target areas

• Diffusion of benefits following camera installation
  – Cameras have deterrent effect beyond viewshed
  – Distance at which cameras no longer influence crime
Cost-Benefit Analysis

• Why conduct a CBA?
  – Extension of Impact Analysis
  – Common Unit of Analysis
  – Can Inform Decision-Making Among City Stakeholders
Costs and Benefits, Baltimore

• **Cost** of the Intervention
  - Initial Start-up Costs
    • Infrastructure
    • Installation
    • Equipment
  - On-Going Costs
    • Monitoring
    • Maintenance
    • Equipment

• **Benefits** of the Intervention
  - Averted Criminal Justice Costs
    • Law Enforcement
    • Court
    • Incarceration
  - Averted Victimizations
    • Tangible Costs
      – Medical and Mental Health Treatment
      – Lost Earnings
    • Intangible Costs
      – Pain and Suffering
      – Reduced Quality of Life
CBA Results:
Total Crime Costs and Benefits, Baltimore

- Total costs over observation period:
  - $8.06 million ≈ $224,000/month

- Benefits over observation period:
  - $12 million ≈ $334,000/month

- Benefit-Cost ratio (benefit per dollar cost):
  - $1.49
CBA Results:
Total Crime Costs and Benefits, Chicago

• Total costs over observation period:
  • $6,845,000 ≈ $190,000/month

• Benefits over observation period:
  • $29.4 million ≈ $815,000/month

• Benefit-Cost Ratio (Benefit per Dollar Cost):
  • $4.29
CBA Considerations: Public Safety and Societal Benefits

- Incorporates public safety system & victim benefits:
  - Governments do not accrue benefits of averted crimes to victims in their budgets
  - Considering public safety system benefits only:
    - Baltimore: from $334,000 per month to $237,000 from $1.49 to $1.06
    - Chicago: from $815,000 per month to $533,000 from $4.29 to $2.81
Summary and Limitations

- Cameras can have impact on crime
  - Caveat: are we sure it was the cameras?
- Why do they work in some neighborhoods and not others?
  - Active monitoring
  - Sufficient concentrations
  - Integration into LE/investigative activities
- Costs: careful consideration to planning and procurement activities
  - Costs of cameras themselves are minimal compared to the costs of installation, maintenance, and monitoring
  - Caveat: less cost-beneficial when societal benefits are removed
Assess your Needs and Budget

- Many options available for surveillance systems
  - Covert/overt (signs, lighting)
  - Fixed/PTZ
  - Monitored/programmed
  - Wired/wireless

- Determining the appropriate options depends on:
  - Purpose
  - Budget
  - Camera location

- How may cameras???
Evaluation Findings

- Questions on Evaluation?
Solicit Stakeholder Input

- Jurisdictional leaders - city/county manager, mayor, city council
- Law enforcement
  - Useful tool or threat to autonomy?
- Community members
  - Privacy concerns
  - Placement issues
  - Decreased property value
- Public involvement and education is key
- Case studies: failed attempts to implement camera systems - what can we learn?
Lessons on Planning, Implementation, & Use

- Review of lessons learned across study sites
- Audience should share lessons too!
Plan Ahead for Maintenance & Infrastructure Costs

- Vendors don’t always detail entire system cost
  - Obtain multiple bids
  - Learn from your peers
- Camera value depends on continued functionality
- Routine maintenance includes:
  - Replacing cameras regularly
  - Readjusting antennae
  - Clearing viewsheds
- Infrastructure/hardware has 5-year life cycle
Plan Ahead for Staffing Costs

- Costs include staffing and operating system
- Uniformed or civilian staff must:
  - Monitor cameras
  and/or
  - Retrieve footage
- Additional hiring:
  - officers/trained monitors
  - technical staff
Choose Camera Locations to Maximize Viewsheds & Crime Prevention Potential

• Placement is important, but potentially controversial

• Strategies include:
  – Mapping crime to identify hotspots
  – Consulting commanders
  – Soliciting input/feedback from public
  – Camera saturation/blanketing distribution

• Ideal locations may not be feasible
  – physical and manmade obstructions
  – mounting permission challenges

• Caveat: You will never please everyone!
Develop a Sound Privacy Policy

- Protect anonymity and personal privacy
- Respect private property
- Prevent discrimination
- Codify and disseminate policies
- Train supervisors and monitors
- Ensure evidence quality and integrity
Balance Privacy Protection with System Utility Carefully

- Access to video feeds must be available
- Restrictive regulations may inhibit active monitoring
- Jurisdictions should draft policies to maximize utility
- Decision-makers can:
  - Learn from experiences of other jurisdictions
  - Consult with legal counsel early
Weigh the Costs and Benefits of Using Active Monitoring

- Benefits of active monitoring
  - Real-time identification of suspects, witnesses
  - Prevention or disruption of crimes
  - Ability to dispatch officers quickly
  - Provide responders with key information re: safety

- Costs of active monitoring:
  - Cost!
Integrate Camera Systems with Existing Practices and Procedures

• Deploy officers just beyond camera viewsheds
• Enhance investigations
• Incorporate systems into CompStat programs
• Employ portable cameras
Set and Manage Realistic Expectations for Video Footage Quality

- Even the best system has limitations
- Footage quality may be impacted by
  - Darkness
  - Inclement weather
  - Equipment damage
  - Dirt collecting on lens
Set and Manage Realistic Expectations for System Usage

- All Cameras cannot always be monitored
- Pre-programmed tours may miss incidents
- Educate on how to use and present footage
- Cameras are a *supplement* to investigations
Integrate with Other Technology

• Systems can enhance information available

• Jurisdictions have successfully integrated systems with:
  – Gunshot detection systems
  – Incident mapping software
  – License plate recognition software

• Possibility exists for future developments
  – video analytics (e.g., muzzle flash, furtive movements)
  – facial recognition

The views expressed are those of the authors and should not be attributed to the Urban Institute, its trustees, or its funders.
Incorporate Video Evidence with Witness Testimony in Court

- Footage cannot replace witness testimony
- Presents completely objective view
- Most attorneys recommend using available footage
- CSI effect: need to manage jurors’ expectations
- Footage often needs authentication/explanation
- Footage can confirm or refute testimony
Use Surveillance Systems to Complement, but not Replace

- Systems support and enhance policing
- Images can provide information on:
  - People
  - Circumstances
  - Incidents
- Cameras leverage police knowledge, activities - they don’t replace them
A special thanks…

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  – Joshua Markman
  – Allison Dwyer

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• Office of Community Oriented Policing Services