NIJ Funded Research on Firearms Violence in Urban Cities: Advancing Scientific Evidence to Inform

November 8, 2021 | 1:00 PM ET

The webinar will begin shortly
Important Notification

The studies presented here were supported by Award Numbers 2016-IJ-CX-0008, 2017-IJ-CX-002, and 2017-IJ-CX-0020 from the National Institute of Justice of the U.S. Department of Justice.

The opinions, findings, and conclusions or recommendations expressed here are those of the authors and do not necessarily reflect the positions or policies of the Department of Justice.
‘GOTTA MAKE YOUR OWN HEAVEN’:
GUNS, SAFETY, AND THE EDGE OF ADULTHOOD IN NEW YORK CITY

RACHEL SWANER, PHD, MPA
RESEARCH DIRECTOR
NOVEMBER 8, 2021
STUDY OVERVIEW

- Goal to understand why young people in NYC are carrying guns

- Interviewed 330 people:
  - 16-24 years old
  - Carried/owned a gun (87%)
  - Shot or shot at (81%)

- Seed recruitment
  - Cure Violence programs
  - Outdoor NYCHA “hot spots”
  - Indoor gang spaces
PARTICIPATORY METHODS AND TRUST BUILDING

- Field researchers that reflected study population
- Consistently present in places important to youth
- Respect for gang politics/engagement of gang leaders
- Long hours in the community
- Different approaches across and within neighborhoods
WHO DID WE TALK TO?

- 330 youth
- Gender: 79% men, 21% women
- Race/Ethnicity: 71% Black, 14% Latinx, 9% Multiracial
- Public Housing Resident: 78%
- Have Children: 37%
- Currently in School: 40%
- Criminal Justice System Involvement:
  - 91% stopped by police in last 2 years (average of 10 times)
  - 88% ever arrested (average of 7 times)
  - 63% every incarcerated
Violence was a near universal experience

- Shot/Shot At: 81%
- Attacked: 70%
- Shot/Shot At: 67%

Alternative economy as survival

At least ten people probably got their OSHA card, right. I bet if we went across the street, at this new site, probably couldn’t get us a job. [...] Why can’t we do it? Why can’t we work?
GUN CARRYING TO INCREASE SAFETY

- Generalized fear: pervasive sense of neighborhood distrust and a feeling that they could be victimized at any time
  
  I’m a paranoid person ever since I got stabbed. I come out of work and nobody’s after me [...] I still be lookin’ behind me. I don’t trust nobody.

- Localized fear: protection from retaliation
  

- Fear of the police
  
  They’re picking off people for no reason. [...] So Imma carry mine because I have to protect myself from you now. It’s not a regular person I gotta worry about.
Many talked about exercising restraint

*I’m not gonna just pull it out, tryna shoot you for no reason. Our number one rule was just: Don’t bust unless you need to bust.*

- 67% reported using marijuana daily, and talked about its calming effect

*I’ve been in positions where I’m hot and wanna go pick up my gun [...] and then I smoke and I’m thinking completely different. Like, “Yo, I’m wilding.” Like, “That shit wasn’t even worth it.”*
EXTREME DISTRUST OF POLICE

They think we out here shooting people for fun.

They’ll gun you down for anything.

At this point, being Black, it’s like you expect to be arrested or for them to bother you.
KEY TAKEAWAYS

- Youth mostly carrying to increase feelings of safety
- Unprotected by the police, punished for protecting themselves

*I worry about getting in trouble with the police because I know it’s against the law to have any type of weapon without a license, but at the same time, I just feel like I need to carry it to make sure generally I’m safe.*

- Institutional abandonment and lack of any pathway to methods of survival (economic, physical, emotional)

*It's like we're already in the trap, with the system and with the law. Everybody's going to jail, there's no jobs, minimum amount of services provided for us, health-wise. [...] So you can't go nowhere, you're just around. You do violent things or robberies when you got no other way out.*
RECOMMENDATIONS

- Bring services to spaces important to youth
- Hire more credible messengers
- Invest in community safety strategies outside of the police
- Create jobs for youth and those with criminal records
- Want to access these youth? Engage gang leadership
FOR MORE INFORMATION

Email: rswaner@nycourts.gov

Read/listen: https://www.courtinnovation.org/publications/gun-violence-NYC

Other topics covered: gangs and social networks, criminal justice involvement, access to guns, neighborhood perceptions
Effects of Building Demolitions on Firearm Violence in Detroit, Michigan

Rose Kagawa, PhD, MPH
University of California, Davis
Randomized Controlled Trial, Lot Clean-Up
What was the effect of building demolition in Detroit, Michigan in 2017 on the prevalence of violent and firearm-related crime?
Demolitions in Detroit

http://www.detroitmi.gov/

VPRP
Outcomes

1. Homicide, rape, robbery, and aggravated assaults
2. Homicide, robbery, and aggravated assaults where a firearm was used

• Unit of analysis = block
Actual Crime Prevalence in Detroit, 2017
Actual Crime Prevalence in Detroit, 2017
Actual Crime Prevalence in Detroit, 2017
Counterfactual Crime Prevalence in Detroit, 2017

Q1 Q2 Q3 Q4

VPRP
Targeted Minimum Loss-based Estimation (TMLE)
High Dimensional Data + Super Learner

- 100+ variables
  - Home type and quality
  - Sales values
  - Foreclosure rates
  - Vacancy
  - Owner/renter occupancy
  - Demographics
  - Socioeconomic indicators
  - …
- Demolitions 2009-2017
- Spatial lags

The Sample

Gold and Blue = Higher SES
Pink and Green = Lower SES
Demolition in the Study Period
Demolition in the Study Period
Firearm Violence in the Study Period
Estimated Effects not Distinguishable from Zero*

<table>
<thead>
<tr>
<th></th>
<th>Total Violent Crimes</th>
<th>Total Violent Crimes w/ Firearms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference in Proportions (95% Confidence Intervals)</td>
<td>Difference in Proportions (95% Confidence Intervals)</td>
</tr>
<tr>
<td>Q2</td>
<td>-0.0003 (-0.005, 0.005)</td>
<td>-0.0005 (-0.003, 0.002)</td>
</tr>
<tr>
<td>Q3</td>
<td>0.0007 (-0.005, 0.006)</td>
<td>0.0004 (-0.004, 0.003)</td>
</tr>
<tr>
<td>Q4</td>
<td>-0.0009 (-0.006, 0.004)</td>
<td>-0.0006 (-0.003, 0.002)</td>
</tr>
</tbody>
</table>

*Preliminary results, subject to change
Conclusions and Limitations

- Models do not allow effect to travel outside of block
- Limited data availability
  - 2017 demolitions unique
- Higher "dose" (Jay et. al. 2019)
  - >5 demolitions in Detroit associated with reductions in firearm assaults
- Next steps
  - Drug crimes, lower level crimes (arson, theft from a building, vandalism, prostitution, disorderly conduct, drunkenness, and trespassing)
  - Cleveland
Thanks to funding from the National Institute of Justice Award No. 2017-IJ-CX-002

Research Team

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Alaina de Biasi  Garen Wintemute
Michael Henderson
Latent environmental determinants of firearm violence: An exploratory factor analysis

Max Griswold, Priscillia Hunt, Rosanna Smart, Sean McKenna
Nov 8\textsuperscript{th}, 2021
Background and Motivation

• Lots of theories on the relationship between built environment & incidence of crime.

• Previous studies typically focused on a single built environment feature’s effect on crime.

• However, we might expect clusters of built environment features within a given neighborhood.

• Knowing whether these types of built environment features cluster together and are associated with firearm violence can help researchers design better empirical models & urban planners design cities.
Research Questions

1. Are there latent built environment factors associated with firearm violence (i.e., zoning, neighborhood characteristics, etc.)?

2. Do latent built environment factors correlate with firearm violence separately from built environment features?

3. Generally: How suitable is current open-source administrative data for NIJ-funded academic research on the built environment?
Related Research

Socio-economic, built environment, and mobility conditions associated with crime: a study of multiple cities

Marcio De-Nardo,
Yaron Azoulay, Dominique Luccioni, Maria C. González & Bruce Lead

The article focuses on the relationship between socio-economic conditions and crime. It examines how various factors influence crime rates in different cities, highlighting the importance of considering both socio-economic factors and accessibility. The study suggests that communities with higher socio-economic status tend to have lower crime rates, emphasizing the role of economic opportunities and social cohesion in reducing crime.

LAND USE AND VIOLENT CRIME

THOMAS D. STICKY, JOHN M. OTTENBERGER

The article investigates the relationship between land use and violent crime. It presents a unique approach by using Geographic Information Systems (GIS) to analyze data from various datasets, including land use categories, crime rates, and demographic information. The study reveals that certain land use patterns are associated with higher rates of violent crime, providing insights for urban planning and crime prevention strategies.

Danger zone: Land use and the geography of neighborhood crime

Jody Winstead

This article explores the impact of land use on neighborhood crime across the United States. It uses advanced analytical tools to map crime patterns and find correlations between specific land use practices and crime rates. The study highlights the importance of understanding the geographical distribution of crime and how different land use configurations can affect community safety.

REDDUCING CRIME BY SHAPING THE BUILT ENVIRONMENT WITHIN AN EMPIRICAL STUDY OF LOS ANGELES

JAMES M. ANDERSON, JOHN M. MACDONALD, RICKY BUTHENTHAL, & J. SCOTT ASHWOOD

The article discusses strategies for reducing crime through the design of the built environment. It presents empirical evidence from Los Angeles, demonstrating how the layout and design of urban spaces can influence crime rates. The study advocates for the incorporation of evidence-based planning principles to create safer, more inclusive communities.

TRAJECTORIES OF CRIME AT PLACES: A LONGITUDINAL STUDY OF STREET SEGMENTS IN THE CITY OF SEATTLE

DAVID WEISBURD

This research examines the spatial patterns of crime over time, focusing on street segments within the city of Seattle. By analyzing data over several years, the study reveals how crime hotspots can change and evolve, providing valuable insights for law enforcement and urban planners in effectively managing crime prevention strategies.
Methods

1. Extract publicly-available data and clean datasets.

2. For each set of built environment and socio-economic status variables:
   1. Determine inclusion & number of factor variables.
   2. Conduct exploratory factor analysis.

3. Then, use regression models to estimate association between built environment and firearm crimes, adjusting for neighborhood & socio-economic variables.

4. Rank models on out-of-sample goodness-of-fit

5. For best performing models: Assess relationship between built environment variables & firearm crime
Data

All publicly available, at the tract-level:

- Reported crimes with a firearm (homicide, robbery, aggravated assault)
  - Extracted from cities’ police department’s open databases on incident reports.
  - Years of coverage: 2015 to 2018
  - \( N = (2k, 4.5, 20k, 30k) \) for Pittsburgh, New Orleans, Detroit, Los Angeles, respectively.

- Built environment features
  - Office of Assessor – Property assessment datasets
  - \( N = 100k – 1 \text{ million} \) observations property types
  - Years of coverage: 2015-2018,

- Socioeconomic status and population demographics.
  - American Community Survey 5-Year series, U.S. Census Bureau
  - Averaged over 2013-2018
Firearm crimes, 2015-2018

New Orleans | Pittsburgh | Detroit | Los Angeles
Identified factors typically have intuitive interpretations.
Identified factors typically have intuitive interpretations.
Some factors are more mysterious without additional investigation.
But additional analysis revealed their interpretation.
Factor loadings in Los Angeles
Predicted count of firearm crimes

Number of buildings in tract

Model:
- BE variables
- BE factors
- SES factors
- BE variables & SES factors
- BE variables & SES variables
- BE factors & SES factors
- BE factors & SES variables

Graphs show the relationship between the number of buildings in a tract and the predicted count of firearm crimes for various types of buildings.
Limitations

• Like all observational studies, results are correlative unless we captured all relevant adjusters (which is true of quasi-experimental approaches as well).

• Constructed factors have been robust to alternative methods and optimization routines but can be difficult to interpret concretely.

• Underlying datasets have significant limitations themselves.
Conclusions

• Administrative data held useful information but could be improved for research purposes.
• Built environment factors (e.g. zoning) greatly improve predictions of firearm crimes at the census tract-level.
• It is unlikely previous studies uncovered robust causal estimates of the relationship between built environment variables & crime.
Quantifying Attractive and Repellent Influences of Firearms Violence in the Built Environment

Luke Muggy, Ph.D.
Co-authors: Tyna Eloundou Nekoul, Max Griswold, Sean McKenna, Rosanna Smart, and Priscillia Hunt

Funding acknowledgement: National Institute of Justice

NIJ Funded Research on Firearms Violence in Urban Cities: Advancing Scientific Evidence to Inform Practice
November 8th, 2021
Agenda

• Background and Motivation
• Method
• Data
• Results
• Discussion
Firearms violence is a serious problem in the U.S.

- In 2018, there were 57,000+ incidents of reported firearm violence\(^1\)
- Resulted in over 28,000 injuries\(^1\) and 14,789 willful or accidental deaths\(^2\)
- Compared to countries like Canada (2.05), United Kingdom (0.23), and Japan (0.06), the U.S. experiences significantly more firearm-related homicides per 100,000 citizens (12.21)\(^2\)
  - That said, rates in Honduras (60) and Venezuela (49.22) are much worse\(^2\)
- The costs to U.S. society are enormous: Social costs of a homicide are an estimated $8.6 million per life lost by homicide\(^4\)

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1. USDOJ (2019)
2. Gun Violence Archive (2020)
4. Heaton (2011)
Firearm violence is not necessarily widespread

- Long history of literature on place-based crime\textsuperscript{1,2}
- More recently, “hotspot” research shows shootings tend to be heavily clustered in specific geographical areas\textsuperscript{3}
- Where and Why? One area of research examines built environment features
- Knowing this could help:
  - Law enforcement focus patrols in areas that attract crime
  - City planners focus on managing land use, physical development, and supporting infrastructure
  - Both may leverage this information to strategize the locations of new built environment (ex. Substations, Schools, etc.) that deters crime

1. Jacobs (1961)
2. Aufrichtig et al. (2017)
What does previous research find, and what is our contribution?

Previous studies, largely in New England states using risk-terrain modeling, find:

- **Risk Factors**: Retail businesses\(^1\), “At-risk” housing, bars, liquor stores, dance halls\(^2\), grocery stores, bus stops, and residential foreclosures risk factors\(^7\)
- **Not risk factors**: Gas stations, fast food restaurants, laundry/dry-cleaning services, and schools\(^3\)

This study seeks to: **Better understand influence of built environment features on incidence of firearm violence in multiple U.S. cities.**

Our contributions to literature:

1. Examine four new city-landscapes across the United States: West (Los Angeles), South (New Orleans), Midwest (Detroit) and Northeast (Pittsburgh)
2. Test new features
3. Use actual street networks (rather than blocks or “crow flies” distances)
4. Take into account socio-economic status.

2. Kennedy et al. (2011)
3. Xu and Griffiths (2017)
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We test the Spatial Randomness Hypothesis to determine if influence on firearm violence

• In practice, what are we doing?

1. Compute **observed** Cross-K values on the observed data
2a. Randomly distribute firearms violence locations over many iterations of Monte Carlo simulation
2b. After each iteration, compute **simulated** Cross-K values
3. Compare observed with simulated
   A. If observed **greater** than simulated: *Attractive influence*
   B. If observed **less** than simulated: *Repellent influence*

**Network Cross-K Function for Stochastic Spatial Events**

\[
K^{ab}(t) = \frac{1}{n_a n_b} \sum_{i=1}^{n_a} \sum_{j=1}^{n_b} p_{ij}^t
\]

- Cumulative edge length in network
- \( K^{ab}(t) \) Cross-K function
- \( l_E \) Cumulative edge length
- \( n_a \) Number of features (e.g., Libraries)
- \( n_b \) Number ofInstances of Firearms Violence
- \( p_{ij}^t \) Probability of building \( i \) being within distance \( t \) of shot \( j \), where
  - \( p_{ij}^t = \begin{cases} 1 & \text{if building } i \text{ is within distance } t \text{ of shot } j \\ 0 & \text{otherwise} \end{cases} \)
If influence is detected, we evaluate “Risk” at varying distances

1. Compute **Shot Density per Facility** values using the observed data for each feature
2. Perform Auto-changepoint detection using Pruned Exact Linear Time (Pelt) algorithm
3. Apply piecewise linear regression to each segment

If influence is detected, we evaluate “Risk” at varying distances $p_{ij}$:

$$p_{ij} = \begin{cases} 1 & \text{if building } i \text{ is within distance } t \text{ of shot } j \\ 0 & \text{Otherwise} \end{cases}$$

Number of features $n_a$, Distance value $n_b$, $p_{ij}$

$$S(t) = \frac{\sum_{i=1}^{n_a} \sum_{j=1}^{n_b} p_{ij}}{n_at}$$

**Example.** Given two restaurants, suppose one firearm incident occurred within 100ft of one of the restaurants.

$$S(100) = \frac{1}{2(100)} = 0.005$$
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Our analysis uses open source, geocoded data

- Firearm violence data
  - Total reported crime (homicide, robberies, & aggravated assault) w/ firearm
  - Uniform Crime Report defined, local police department data

- Built environment feature data
  - Feature types differ across cities due to data sources
  - Many features including: Restaurants, grocery stores, libraries, and so on...

<table>
<thead>
<tr>
<th>City</th>
<th>Years</th>
<th>Types of Features</th>
<th>Number of Features</th>
<th>Number of Firearms Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pittsburgh</td>
<td>2015-2017</td>
<td>36</td>
<td>5,315</td>
<td>11,535</td>
</tr>
<tr>
<td>New Orleans</td>
<td>2015-2017</td>
<td>27</td>
<td>3,116</td>
<td>7,656</td>
</tr>
<tr>
<td>Detroit</td>
<td>2014-2016</td>
<td>25</td>
<td>6,277</td>
<td>14,141</td>
</tr>
</tbody>
</table>
Geospatial distribution of *total reported crimes with a firearm* by city
Agenda

• Background and Motivation
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Detailed results for attractive features

Simulated (Blue) and Observed (Black) Cross-K Values

Tobacco Retailer (427)  Lodging (316)  Transit Stations (57)

Shot Density Values (with 5% error band)

Low SES in black, High SES in gray.
Detailed results for attractive features

Los Angeles, CA – Convenient Stores and Supermarkets

Simulated (Blue) and Observed (Black) Cross-K Values

Shot Density Values (with 5% error band)
Detailed results for repellent features

Simulated (Blue) and Observed (Black) Cross-K Values

Shot Density Values (with 5% error band)
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We estimate ‘average’ results within a city

- Majority of features exhibit repellent influence
  - Common features with repellent influence include: Schools, Sport Venues, Nursing Homes, Veteran’s Affairs Centers
  - RAND colleagues doing qualitative work heard a lot about sport venues as well.
- Firearm violence occurs near some built environment features
  - Lodging in New Orleans attract up to 1,000ft. (Novel result)
  - Alcohol outlets in New Orleans attract up to 250ft. (also found for Newark, NJ\textsuperscript{1} and Irvington, NJ\textsuperscript{2})
  - Transit Stations in Los Angeles attract up to 360ft. (also found for Irvington, NJ\textsuperscript{5})
- No significant influence for fast food restaurants. (also found for Newark, NJ\textsuperscript{3})

1. Kennedy et al. (2011)  
3. Xu and Griffiths (2017)
But this is not the end of the story...

• Still need to understand why we might be obtaining these results
• Likely some important heterogeneity to figure out:
  • Firearms incidents along network borders
  • Number of features
  • Socio-economic status (We have presented an approach for quantitative study)
  • Ambient population
  • Physical size of features (e.g. campus universities)
Thank you!