

COVID-19 and Crime:

Analysis of Crime Dynamics Amidst Social Distancing Protocols

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Guidehouse



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Acknowledgements



- Society for Mathematical Biology Education Subgroup
- NIMBioS Investigative Workshop: Mathematics of Gun Violence
- Society for Mathematical Biology Writing Group
- UTK Department of Ecology and Evolutionary Biology
- Funding: ASEE NDSEG Fellowship, NIH/NIGMS - IMSD #R25GM086761

Preliminaries

shelbymscott.github.io

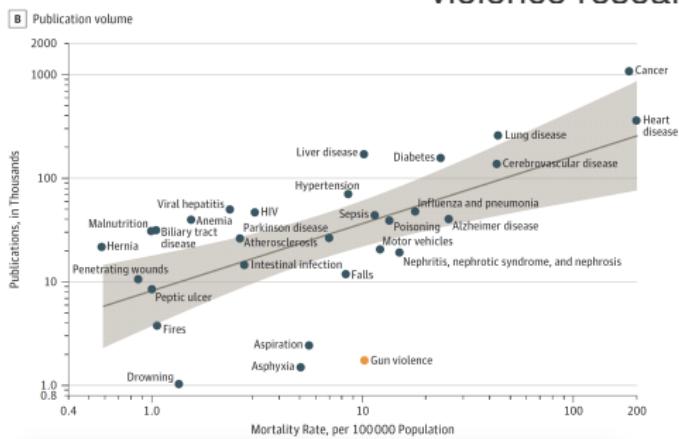


Overview

- 1 Motivation
- 2 Project Initialization
- 3 COVID-19 and Crime
- 4 Conclusions and Future Work
- 5 Why You Should Join a Writing Group and Questions

The Cost of Gun Violence in the United States

- Gun violence costs the United States \$229 billion annually
- It leads to the death of 36,000 individuals and the non-fatal injury of 85,000 others
- Homicide is the leading cause of death in black males aged 10-24
- 75% of homicides involve the use of a firearm
- (Kellerman 1993) Having a gun in the home increases the risk for homicide occurring in the home
- (1996) Dickey Amendment removes CDC funding for gun violence research



Stark 2017, Joint Economic Committee 2019, APA 2013, CDC 2017, Kellerman 1993

Missing Quantitative Models in the Literature

Major Question	Mathematical Models						Statistical Models					
	I	II	III	IV	V	VI	I	II	III	IV	V	VI
Analyzing the Spatio-Temporal Distribution	•	•		•			•		•	•	•	
Impacts of Constraining Gun Availability	•		•	•			•	•				
Effects of Population Characteristics	•		•	•			•	•		•	•	•
Intervention Attempts and their Impacts	•		•				•	•		•	•	•

Individual Cost of Gun Violence

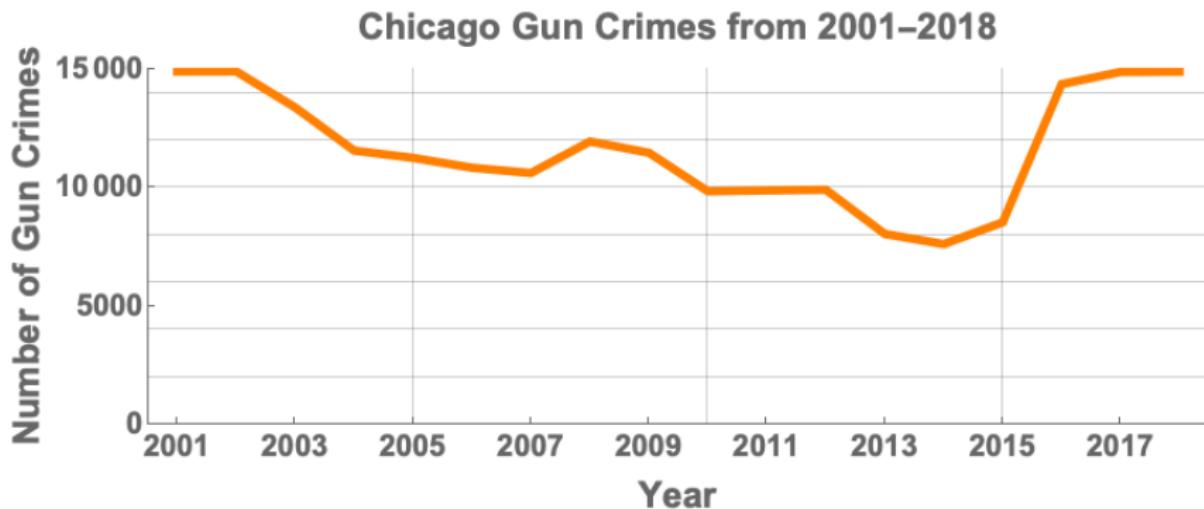
- Adults reporting exposure to gun violence as children showed an increased likelihood for chronic health conditions and risky behaviors

Health Outcome	Risk Increase
Heart Disease	2.2
Stroke	2.4
Chronic obstructive lung disease (COPD)	3.9
Hepatitis	2.4
Ecstasy Use	9.2
Marijuana use	2.9
Poor mental health	2.7
Involvement in juvenile justice system	3.5
Use of substances during sex	6.5
Lack of condom use during sex	2.2

Byrdsong 2016 and Voisin 2016

The Impact of Gun Crime in Chicago

- Past studies have shown a diffusion of gun crime in both space and time
- Between 2015 and 2016 there was a 68% increase in gun crimes, disproportionately affecting disadvantaged neighborhoods
- Data used for this study:
 - Chicago city crime dataset, 2001 - 2017
 - Baton Rouge and Baltimore Public Crime Databases



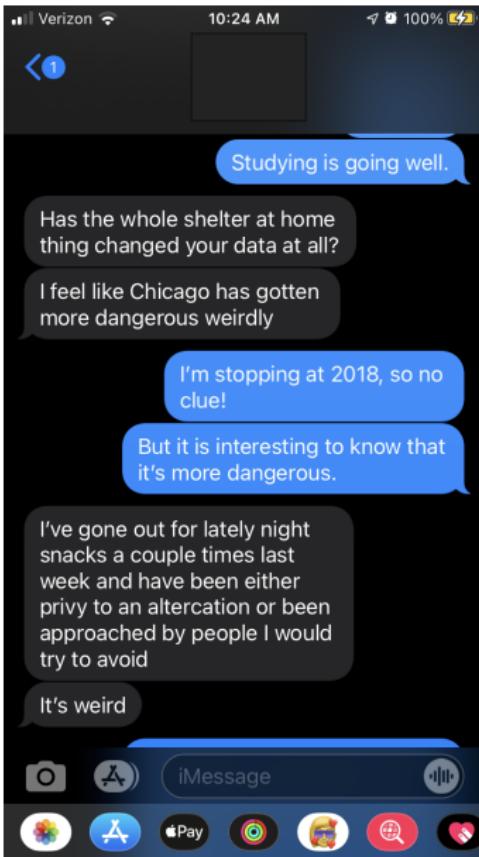
Loeffler and Flaxman 2017, Kapustin 2016, Chicago City Data Portal

Significant Events Impact Crime

- March 26, 2020: Text from friend in Chicago
- April 3, 2020: Meeting with Lou, during which this topic was mentioned
- July 31, 2020: First manuscript submitted to Science for publication

The Takeaways:

- Research ideas can come from anywhere
- “A quick little paper,” is never quick
- In fact, a quick little paper can become a dissertation chapter

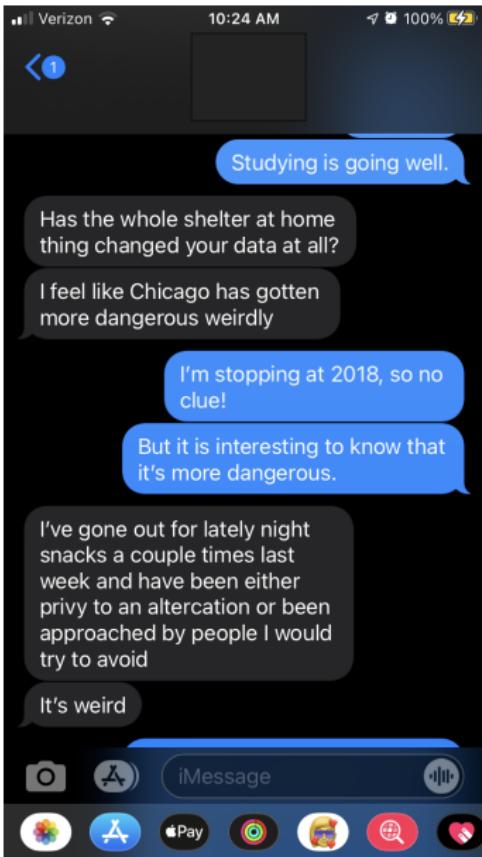


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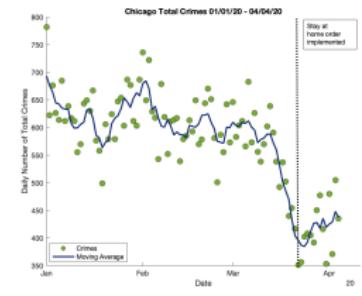
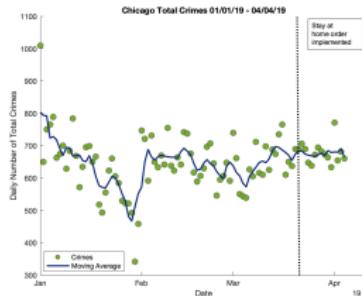
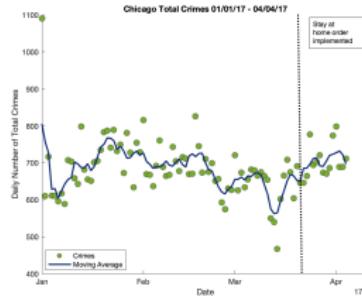
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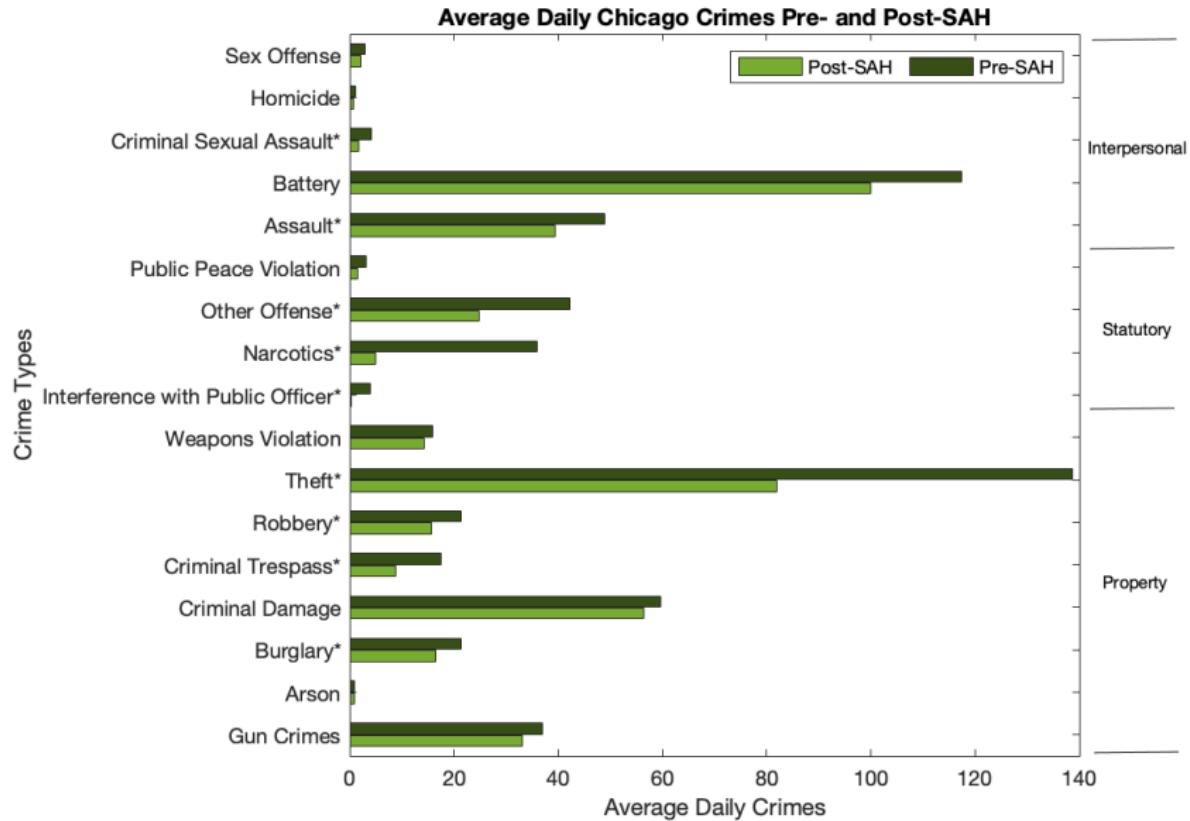


Impact of COVID-19 on Crime

- January 24, 2020: First case of COVID-19 in Chicago
- March 9, 2020: State of Emergency declared
- March 21, 2020: Stay at Home order implemented



Do the Impacted Crime Types Differ?



Do Headlines Hold?

- There are multiple claims about temporal patterns of gun crime in Chicago, IL.
- Goal: Test whether these hypotheses hold

Experts Discuss Cook County Gun Violence: 744 Deaths In 2017

Leading clinical experts gathered in Cook County this week to discuss gun violence as a public health issue.

 **Carrie Frillman**, Patch Staff 

Posted Thu, Feb 1, 2018 at 10:09 am CT

Chicago's brutal summer of gun violence

7:30 / By Bridget Brennan

Posted Tue 2 Oct 2018 at 3:03pm, updated Tue 2 Oct 2018 at 5:47pm

36 people shot in Chicago over Memorial Day weekend, marking a reduction in gun violence

Aamer Madhani USA TODAY

Published 11:05 a.m. ET May 29, 2018 | Updated 1:59 p.m. ET May 29, 2018

43 shot, 5 fatally, in Halloween weekend gun violence

Published October 29, 2018 | Chicago | FOX 32 Chicago

Chicago shootings leave at least 4 dead, 12 wounded over MLK weekend

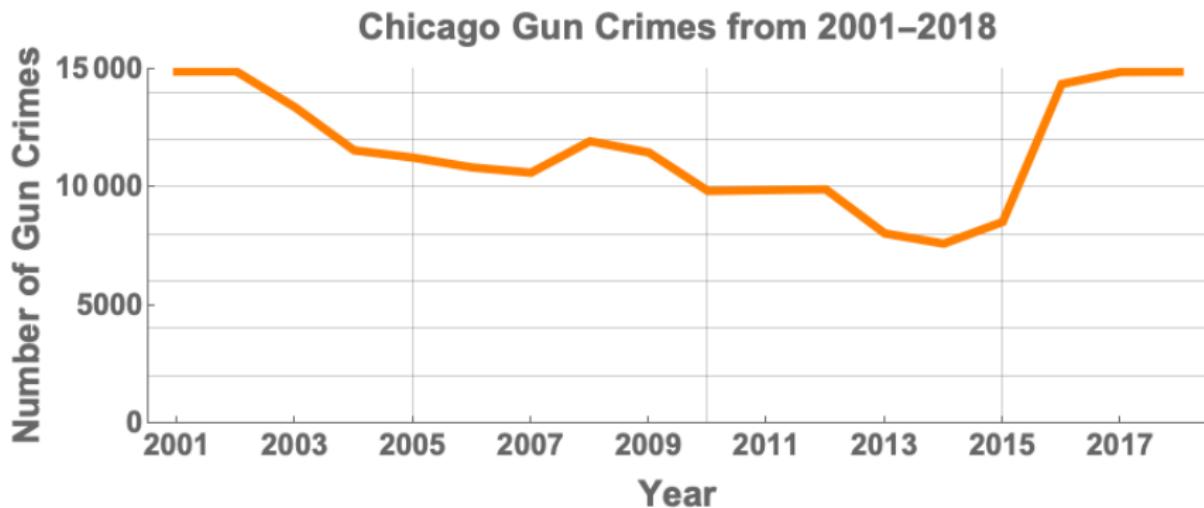
Chicago's deadliest Memorial Day weekend since 2015: 10 shot dead, 39 wounded

The weekend's victims include a 16-year-old boy killed Saturday in Washington Park and a man fatally shot in a Lawndale attack that injured three others.

By Sun-Times Wire | Updated May 26, 2020, 9:12am CDT

Temporal Analysis Results

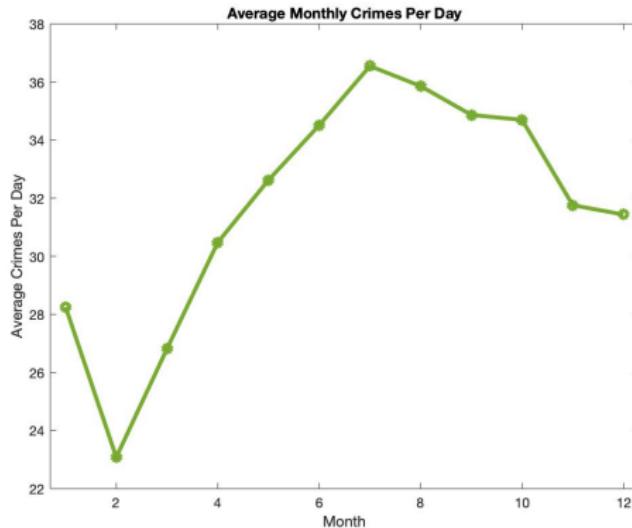
- Are there yearly patterns in gun crime?
- Method: t -tests



- Yes
- Significantly higher years: 2001, 2002, 2016, 2017, 2018
- Significantly lower years: 2013, 2014, 2015

Temporal Analysis Results

- Are there monthly patterns in gun crime?
- Method: *t*-tests



- Yes
- February has significantly lower crime than other months

Temporal Analysis Results

- Are there daily patterns in gun crime? Are there holiday patterns?
- Method: outlier analysis
- and *t*-tests

Holiday	Month	<i>p</i> -value	CI	σ	<i>t</i> -stat	Result
New Year's Eve	December	0.43	[−3.64, 8.32]	8.83	0.80	0
New Year's Day	January	9.8523×10^{-5}	[6.39, 17.32]	8.07	4.41	1
Memorial Day	May	0.33	[−3.86, 11.27]	11.17	1.00	0
July 4 th	July	0.58	[−4.95, 8.74]	10.11	0.56	0
Labor Day	September	0.69	[−5.04, 7.53]	9.28	0.40	0
Halloween	October	0.09	[−1.07, 13.46]	10.73	1.73	0
Thanksgiving	November	4.05×10^{-5}	[−16.67, −6.62]	7.41	−4.71	1
Christmas	December	3.04×10^{-7}	[−15.98, −8.23]	5.72	−6.35	1

- Yes, but not as much as the media reports
- There do not seem to be patterns in which days are outliers between years
- New Year's Day shows significantly higher crime than the rest of January
- Thanksgiving and Christmas show significantly lower crime than the months in which they fall
- When extended to a moving average, many of these patterns dissolve

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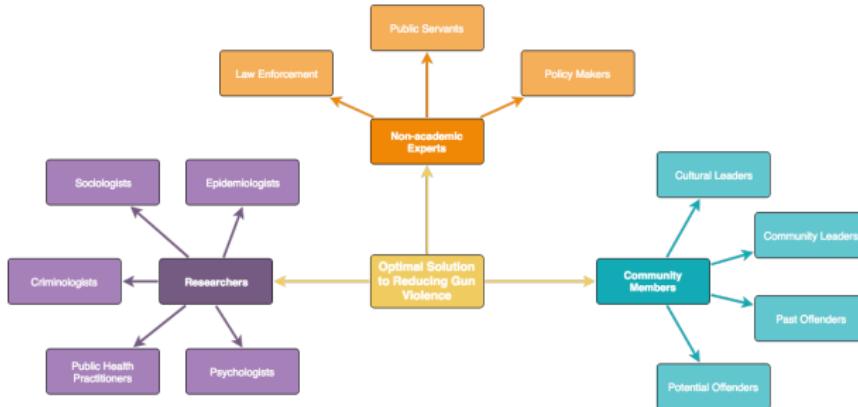
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Research Conclusions

- Gun crime and gun violence are major public health concerns in the United States
- There is a lack of research on gun crime in the United States
- There are far more factors contributing to gun crime outside the availability of guns
- This is all incredibly complicated. Evidence-based policy is the goal, but it may not be easily accessible.



How Writing Groups Shaped This Research

- Methodology: support for the wild idea to pick up a new project at the end of my dissertation
- Writing: editing previous versions of this manuscript and providing feedback
- Publishing: celebrating submission to “reach” journals, venting with rejections and helping with revisions and re-submissions.

Thank you for submitting your manuscript "COVID-19 and Crime: Analysis of Crime Dynamics Amidst Social Distancing Protocols" to Science. Because your manuscript was not given a high priority rating during the initial screening process, we have decided not to proceed to in-depth review. The overall view is that the scope and focus of your paper make it more appropriate for a more specialized journal. We are therefore notifying you so that you can seek publication elsewhere.

Thank you for submitting your manuscript, titled "COVID-19 and Crime: Analysis of Crime Dynamics Amidst Social Distancing Protocols", to PNAS; the results of our assessment have led us to the decision to decline to consider it for publication at this time.

How Writing Groups Shaped My Graduate Experience

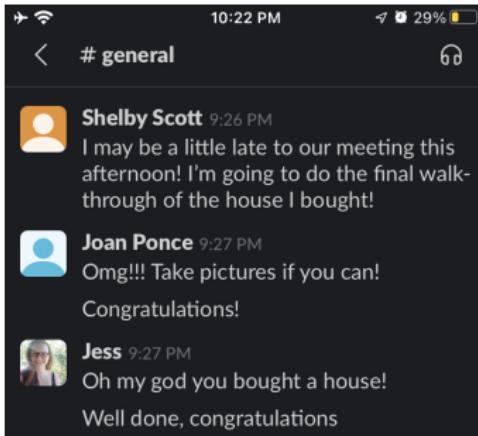
- Encouragement: supporting that I was ready to defend, attending my exit seminar, talking me through the job market
- Feedback: on talks that I was planning to give, on figures I was presenting to my committee, on the structure of dissertation chapters, on emails to important people
- Pandemic Support: empathizing with the loneliness, fighting the isolation, and showing off moments of levity (mainly in the form of foster kittens)

Dear Dr. Scott:

I'm pleased to inform you that your manuscript has been deemed suitable for publication in **PLOS ONE**. Congratulations! Your manuscript is now with our production department.

How Writing Groups are Shaping My Post-Academic Experience

- Continued academic productivity: pushing me to complete manuscripts, giving feedback on presentations, academic networking
- Accountability: completing tasks, applying for things I don't feel qualified for, striving for rejections (because this is how we reward ourselves)
- Personal Connections: these women are now my friends. They have celebrated my accomplishments and sat with me in my frustrations – academic and personal. They are now close friends of mine as well as being academic powerhouses.



Questions?

