Acquisition, Use and Impacts of New Technologies in Policing

Thursday, July 19th, 2018

Presenters: Rose Werth, Dr. Daniel Lawrence, and Dr. Bryce Peterson
Moderated by: Dr. Kevin Strom

Rose Werth

Rose Werth performs research analyses for the Policing Research Program at RTI International. She works on grants, evaluations, and training and technical assistance projects. Her work involves local criminal justice and service systems, homelessness, and sexual assault reform.

Daniel Lawrence, PhD

Daniel Lawrence, PhD, is a Research Criminologist in the Policing Research Program at RTI International. His research focuses on police legitimacy and procedural justice; police technology; police screening and hiring practices; and community policing. Current and past projects include evaluations of police-community interactions, body-worn cameras, gunshot detection technology, and public surveillance systems.

Bryce Peterson, PhD

Bryce Peterson, PhD, is a senior research associate in the Urban Institute's Justice Policy Center. His research focuses on correctional policy, children of justice-involved parents, video surveillance and body-worn camera technologies, federal and state justice statistics, and prison population forecasting.

Technology Acquisition and Implementation in Law Enforcement Agencies

Rose Werth
RTI International
Policing Research Program

Objectives

What is the relationship between policing strategies and technology use?

How are law enforcement agencies making decisions about technology acquisition?

NIJ Grant Number 2012-MU-CX-0043
Research on the Impact of Technology on Policing Strategy
in the 21st Century

GIS

Data Mining

Social Media

Car Camera

LPR

BWC

Professional	Problem-oriented	Offender Targeting	Predictive
Community	Zero Tolerance	Hot Spot	Intelligence-led

National Survey

776 agencies

Prevalence of Technology

Policing Strategy

GIS

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776 agencies

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Prevalence of Technology

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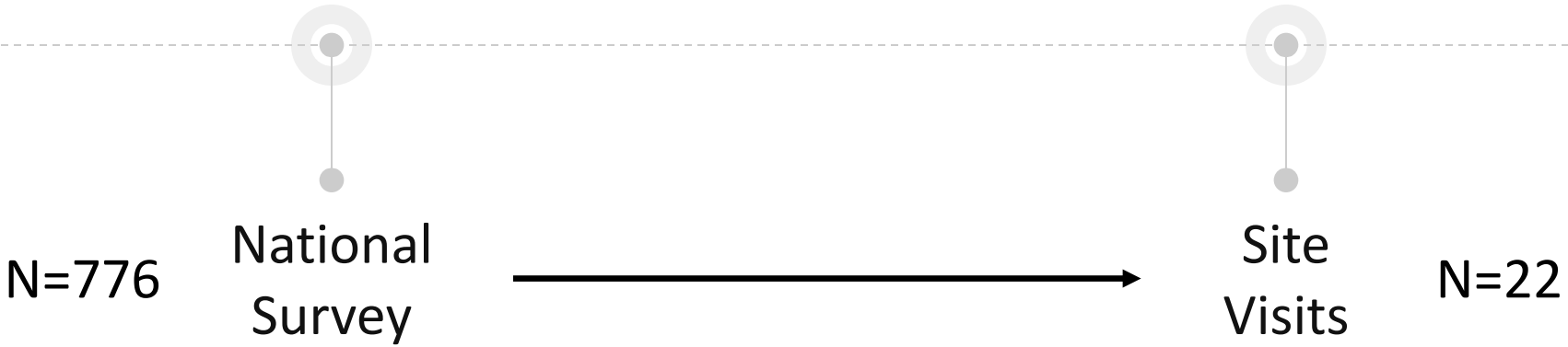
National Survey

776 agencies

Prevalence of Technology

Policing Strategy

If policing strategy has little connection to technology use, what does?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National Survey
Site Visits
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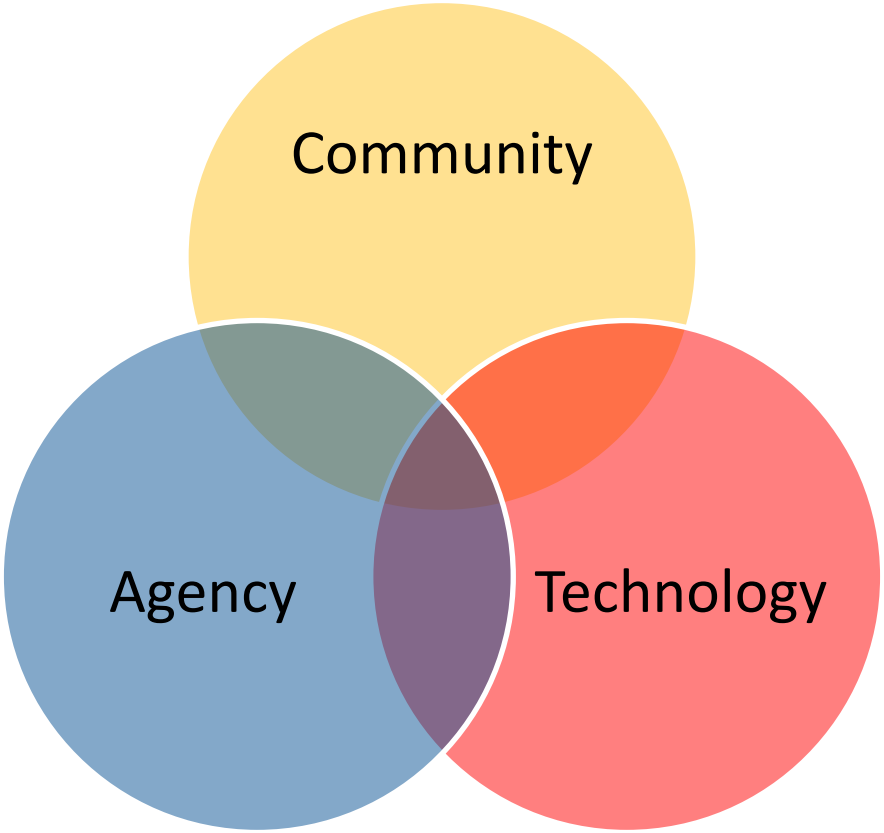
High Impact Agencies

Mixed Impact Agencies


Community
Agency
Technology

Case Study

Community	Agency	Technology
Little control over budget	Leadership turnover Ad hoc planning	Limited IT expertise

Small/mid-size agency
Mixed impact

Focus on community policing

12/38 technologies

In Car Cameras

At the time of our site visit, only eight in car cameras were still functional.

Case Study

Community	Agency	Technology
Serves large city	Culture Strong leadership Budget Careful planning	Strong IT expertise

Large agency
High impact

Focus on intelligence-led policing

24/38 technologies

License Plate Readers

Agency used grant funding to implemented a new LPR strategy: Fixed readers in high-crime areas

Future Research & Recommendations

Technology as building blocks

Performance Metrics

Questions?

Policing Research Program

Policing@rti.org

Gunshot Detection Alerts: Sensitivity and Response Times Compared to Calls for Service

Daniel Lawrence, PhD
Research Criminologist
Policing Research Program
RTI International

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Traditional Measurements of Firearm Violence

Common Sources of Crime Data

- Citizen and Victimization Surveys (NCVS)
- Official crime statistics (UCR, NIBRS, Police Department Records)

Historically, citizen reports have been the primary means by which police become aware of unlawful gunfire (Mazerolle et al. 1999)

- However, these citizens tend to be concentrated within a very small network of young males, many of whom have been both victims and perpetrators of illegal firearm activity (Braga, 2003, 2007), and who may be socially connected (Fox, 1996; Papachristos, et al. 2015, 2017).

Reporting and Collection of Firearm Data

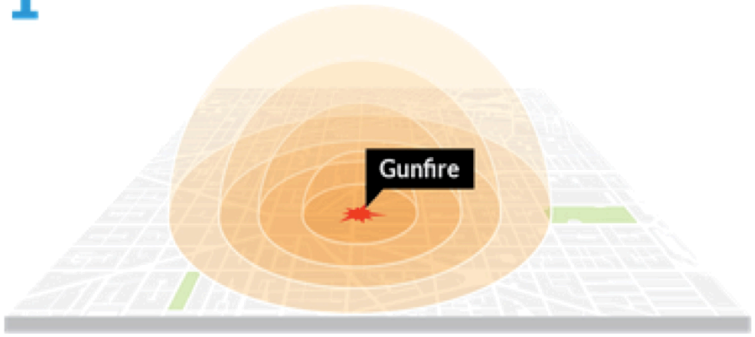
Dark Figure of Crime

- (Coleman and Moynihan, 1996; Penney, 2014)
- While firearms-related homicide records are generally considered reliable (Archer and Gartner, 1984; La Free, 2005; Alavarado and Massey, 2010), other forms of firearm violence involving weapons discharges are often unreported or underreported (Mazerolle et al., 1999).

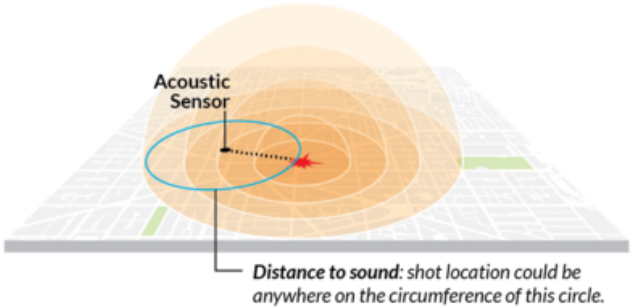
- Gunshot Detection Technology (GDT) may more reliably measure, report, and process firearm activity compared to citizen reports.

What is Gunshot Detection Technology?

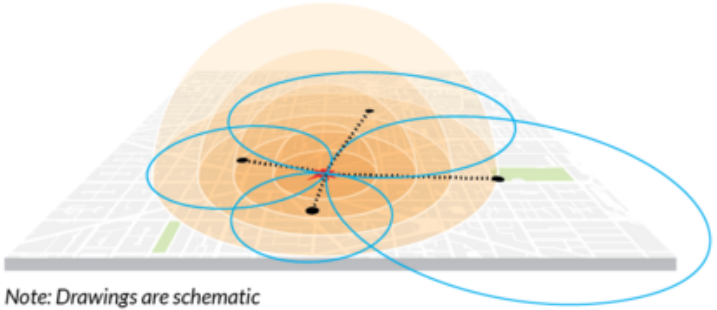
1 Gunfire produces sound waves that expand in every direction.



2 Acoustic sensors throughout the city listen for the distinctive waveforms that firearms produce. When detected, individual sensors calculate the distance to the sound.



3 Readings from multiple sensors are used to triangulate the location of the shot.



Note: Drawings are schematic

Research Questions of this presentation

RQ1:

- Can GDT offer a new, better, metric for firearm shooting-related crimes, compared to traditional calls for service from community members?

RQ2:

- Do officers respond differently to GDT alerts compared to shooting-related calls for service from community members?

Study Sites

City	Pop.[1]	Violent Crime per 10,000[1]	Property Crime per 10,000[1]	GDT Alerts per square mile[2]
Milwaukee, WI	600,193	153.30	406.40	552.17
Richmond, CA	110,868	91.91	341.40	148.45
Denver, CO	699,259	65.74	358.97	164.94

[1] 2016 UCR
[2] 2015 SST, Inc. Alerts

RQ1: Samples

	Milwaukee, WI	Richmond, CA	Denver, CO
Data	SST & CFS	SST & CFS	SST & CFS
Dates*	02/25/2011 to 05/31/2016	06/01/2009 to 10/31/2015	01/08/2015 to 05/31/2016
Time Period	5 years, 2 months	6 years, 4 months	1 year, 4 months
CFS Case Types	• "Active Shooter" • "Officer Shot" • "Shooting" • "Shots Fired"	• "Shooting" • "Shooting into an occupied dwelling" • "Shooting into an occupied vehicle" • "Shots Fired Richmond Municipal Code"	• "Shooting" • "Shots Heard / Fired"
Final CFS n	11,681	3,132	582
Final GDT n	14,791	8,980	546
Total n	26,652	12,112	1,128

*All Ju

Duplicate Events Removed with Haversine formula

- Calculates direct line distance on sphere from longitude and latitude

GDT Alerts to Calls for Service Ratio

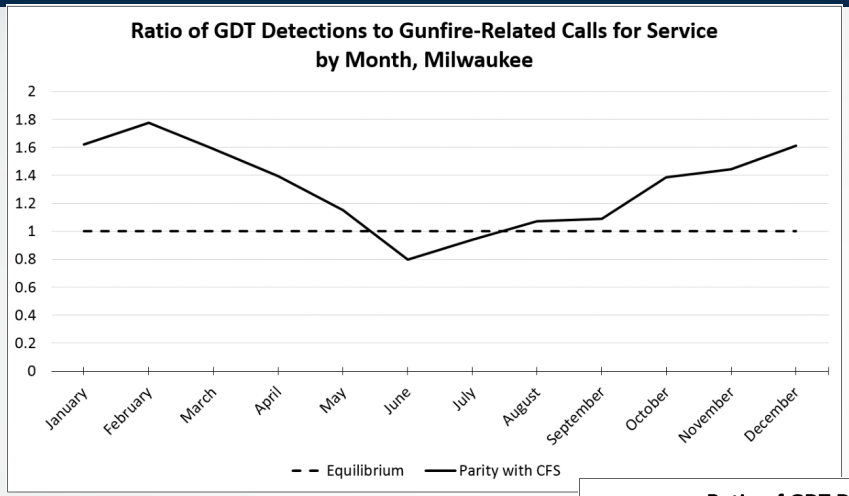
$$\frac{GDT\ Alert}{Call\ for\ Service\ Event}$$

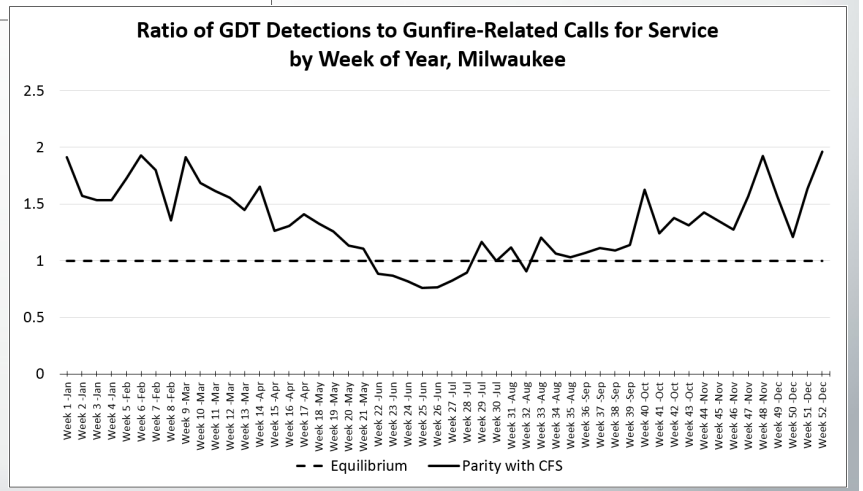
When greater than 1 = There are more GDT Alerts than CFS
When equal to 1 = GDT Alerts and CFS are the same
When less than 1 = There are less GDT Alerts than CFS

…within the time periods under consideration:

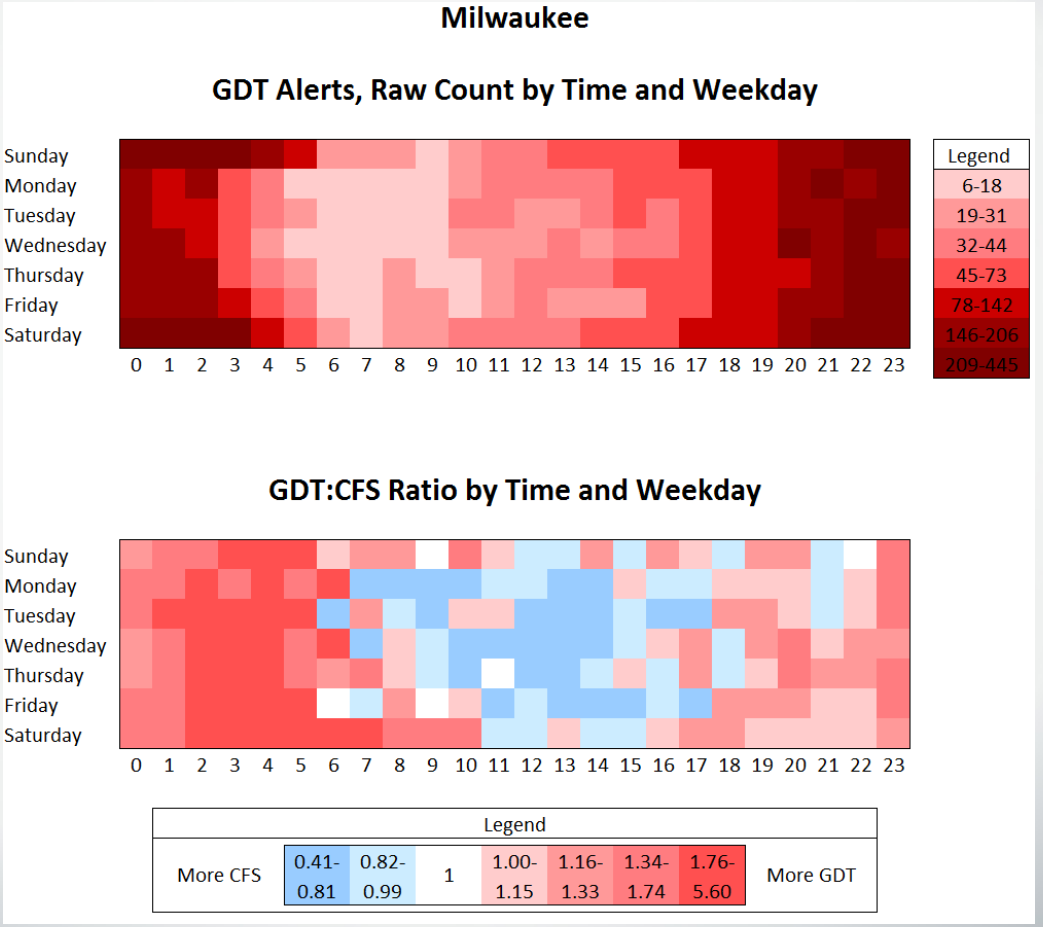
- Month
- Week of Year
- Day of Week
- Hour of Day

Milwaukee, Month and Week of Year

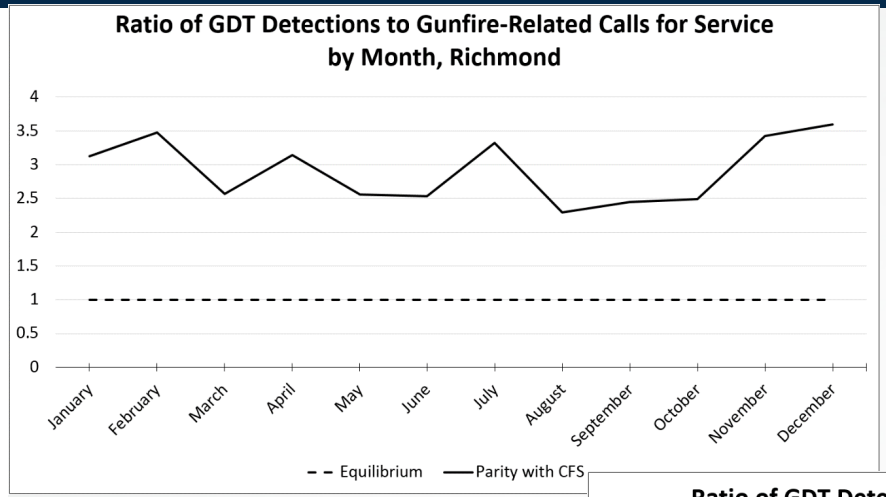


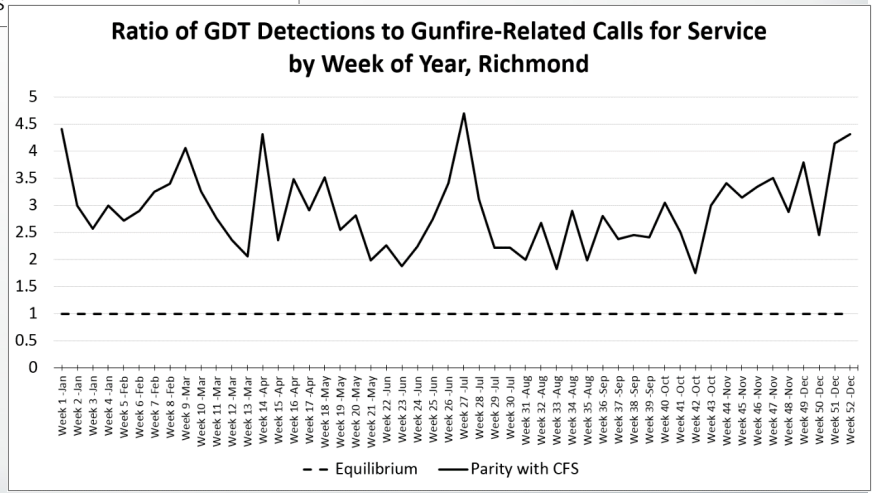


Milwaukee, Weekday and Time of Day

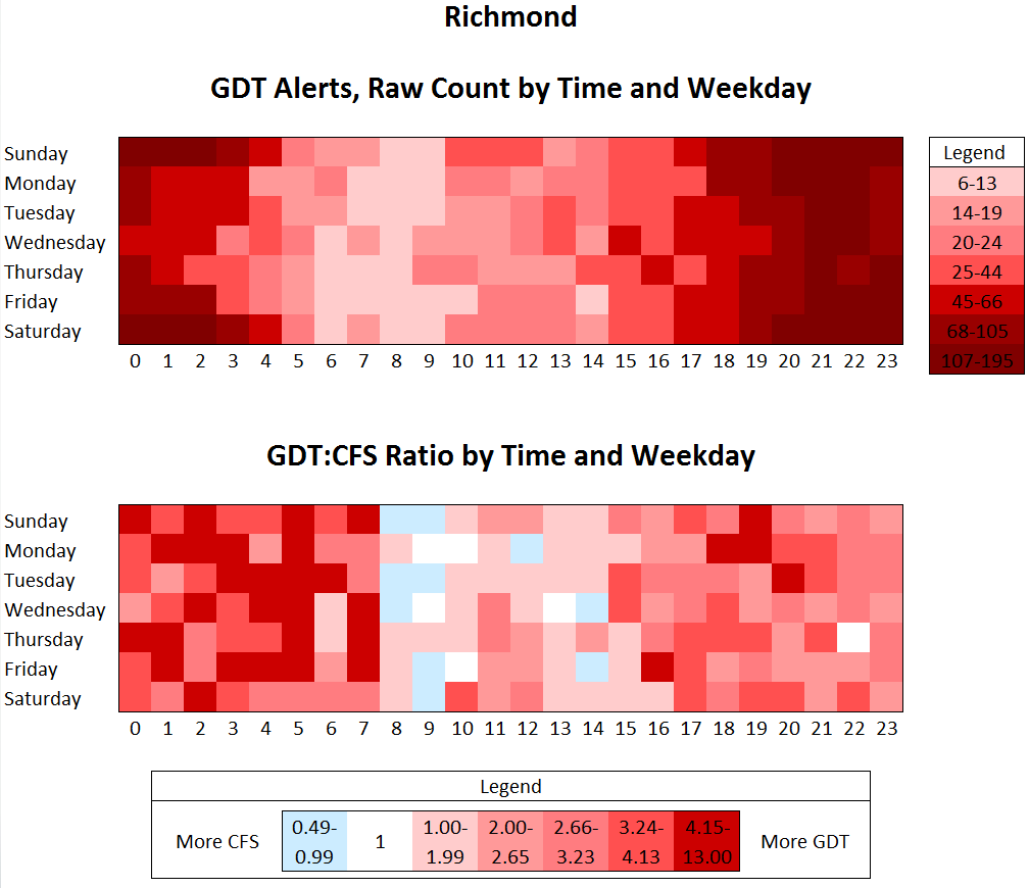


Richmond, Month and Week of Year

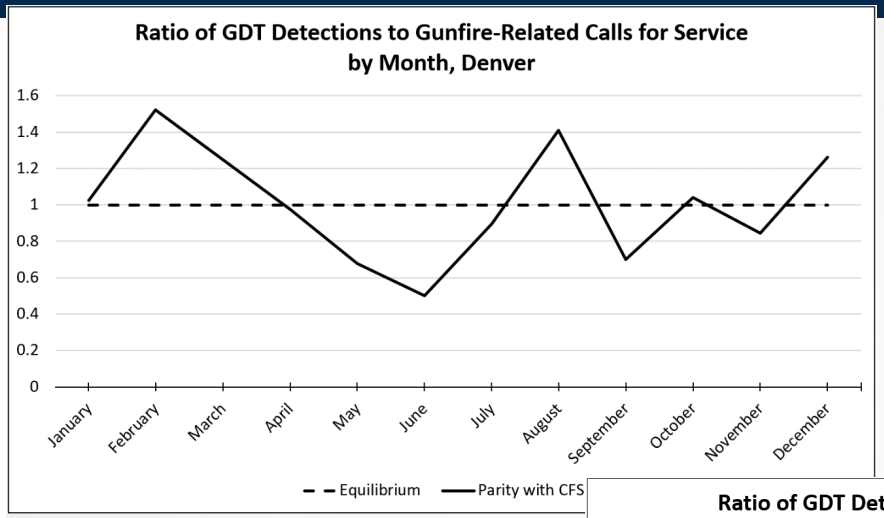


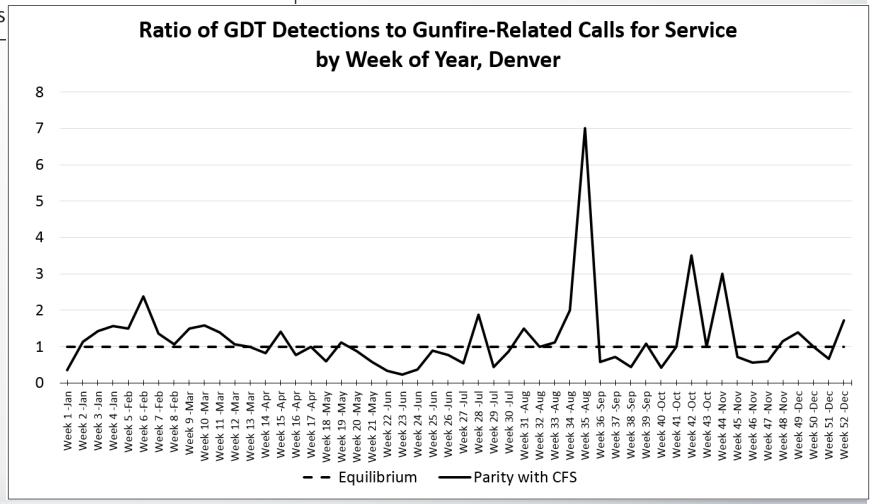


Richmond, Weekday and Time of Day

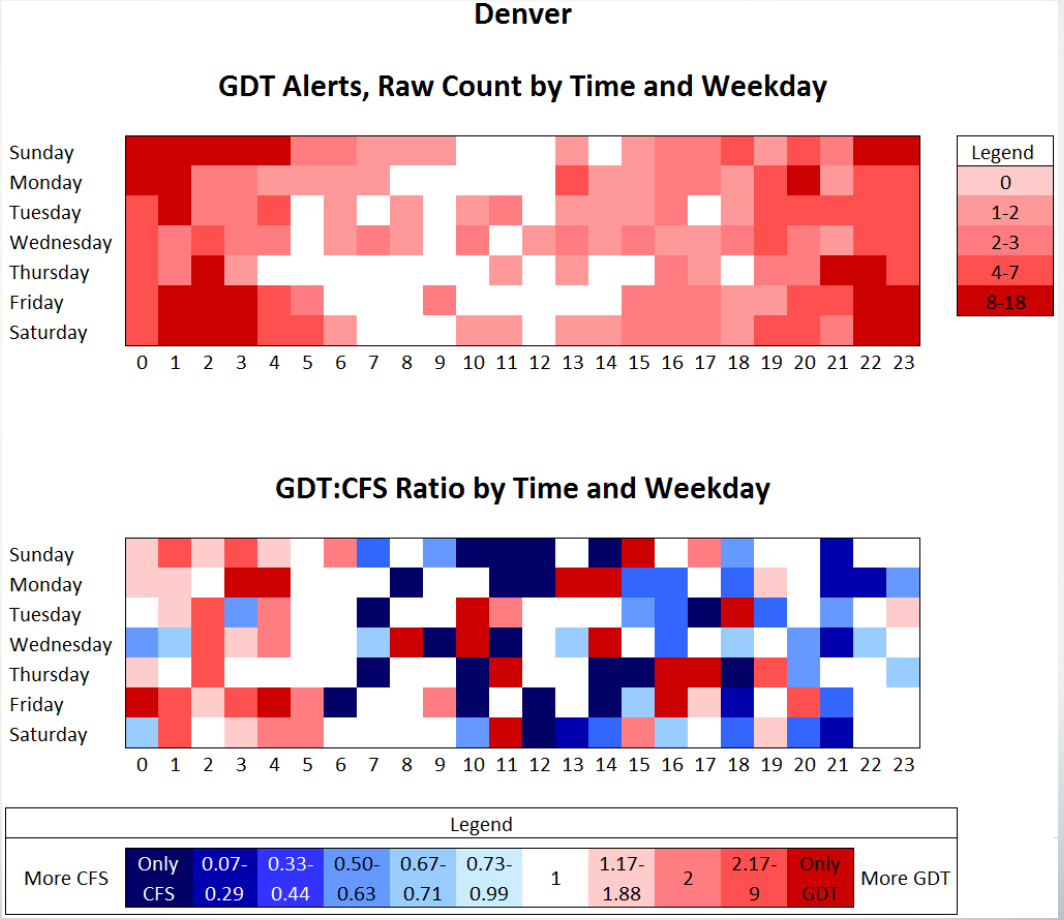


Denver, Month and Week of Year





Denver, Weekday and Time of Day



Research Question 2

RQ2:

- Do officers respond differently to GDT alerts compared to shooting-related calls for service from community members?

Response Time Defined:

- From community member call to 911 to when officer arrived at the scene

RQ2: Samples

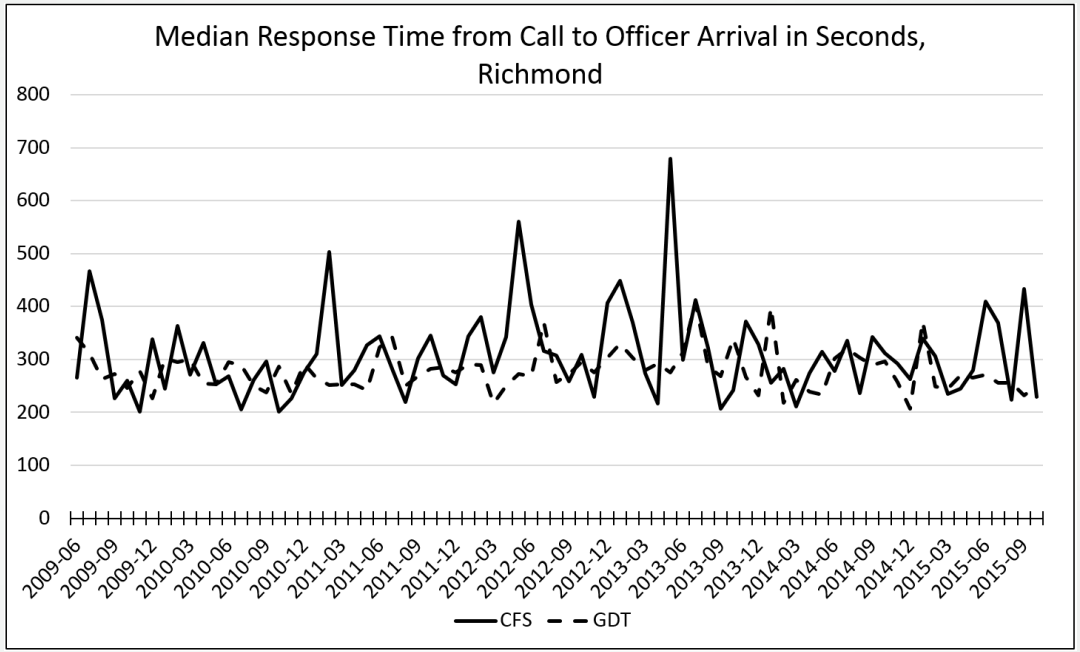
	Milwaukee, WI	Richmond, CA	Denver, CO
Data	CFS	CFS	CFS
Dates	02/25/2011 to 12/31/2016	06/01/2009 to 10/31/2015	01/08/2015 to 06/15/2016
Time Period	5 years, 10 months	6 years, 5 months	1 year, 5 months
CFS Case Types	• "Shooting" • "Shots Fired" • "ShotSpotter"	• "Shooting" • "Shots Fired Richmond Municipal Code" • "ShotSpotter"	• "Shooting" • "Shots Heard / Fired" • "ShotSpotter"
Final Shooting n	1,595	795	37
Final Shots Fired n	8,505	1,636	606
Final GDT n (within CAD)	20,094	7,098	447
Total n	30,194	9,529	1,090

*All J

~~Duplicate Events Removed with Haversine formula~~

- ~~Calculates direct line distance on sphere from longitude and latitude~~

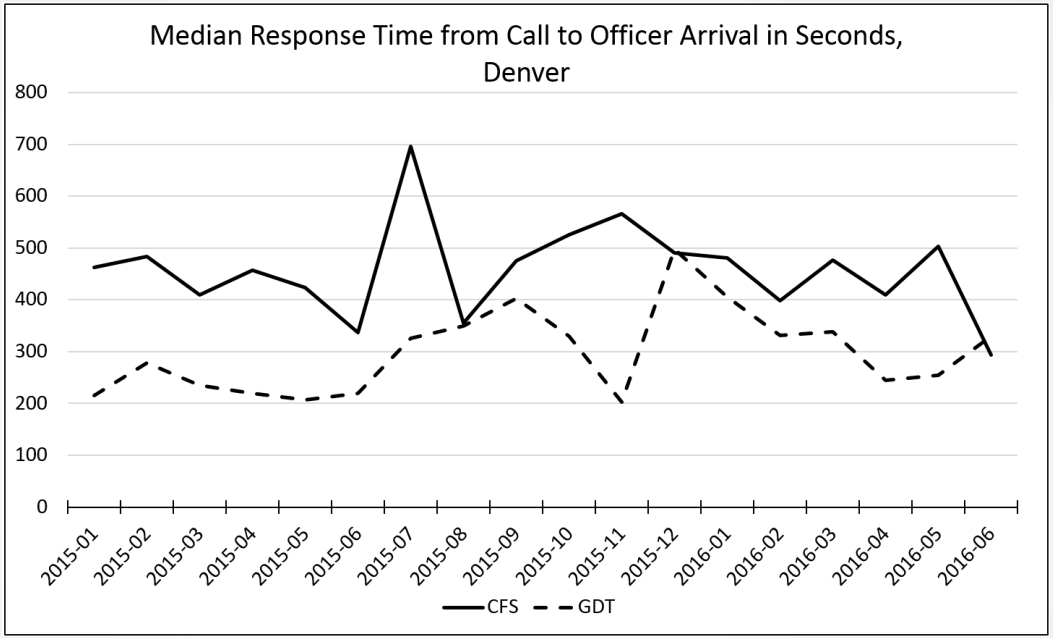
Response Times, Richmond



Response times are 28.5% longer for “Shooting” CFS vs SST

Response times are 6.2% longer for “Shots Fired” CFS vs SST

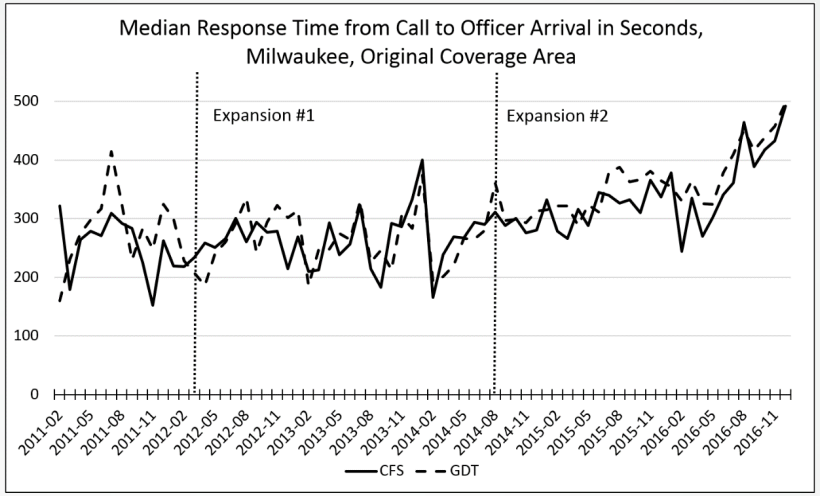
Response Times, Denver



Response times are 10.2% longer for “Shooting” CFS vs SST (n.s.)

Response times are 26.5% longer for “Shots Heard/Fired” CFS vs SST

Response Times, Original Coverage Area, Milwaukee



Original Deployment:

- Response times are 15.8% longer for SST vs “Shooting” CFS
- Response times are 6.1% longer for “Shots Fired” vs SST

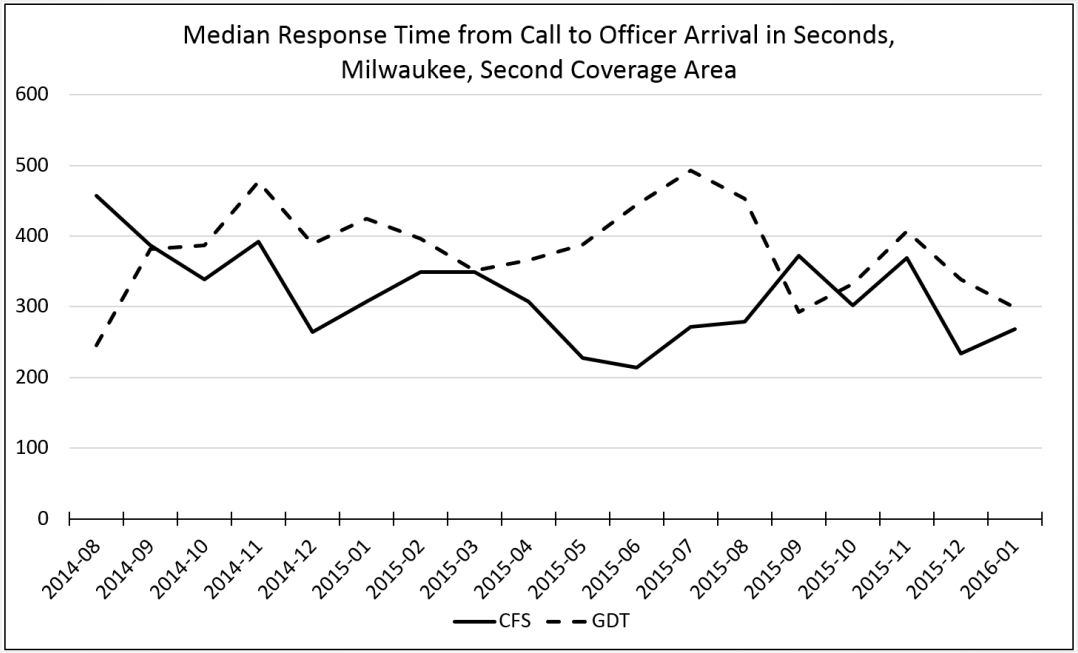
Expansion #1:

- Response times are 11.7% longer for SST vs “Shooting” CFS
- Response times are 7.5% longer for “Shots Fired” vs SST

Expansion #2:

- Response times are 18.5% longer for SST vs “Shooting” CFS
- Response times are 3.3% longer for “Shots Fired” vs SST

Response Times, Second Coverage Area, Milwaukee



Response times are 22.2% longer for SST vs “Shooting” CFS

Response times are 6.0% longer for SST vs “Shots Fired” CFS

GDT vs Shooting-Related Calls for Service - Takeaways

- **Shooting Notifications**
  - **Gunshot Detection Technology does seem to more reliably measure, report, and process firearm activity compared to citizen reports.**
    - **But the ratio of GDT alerts to CFS is highly volatile to seasonality, day of the week, and time of day**

- Response Times
  - In two of the sites we see significant response times for GDT alerts compared to shooting-related CFS. But results are much more mixed in the largest, and highest crime city.

Principal Investigators' Contact

Nancy La Vigne, PhD
Director
Justice Policy Center
The Urban Institute
nlavigne@urban.org
@NLVigne

Daniel Lawrence, PhD
Research Criminologist
Policing Research Program
RTI International
dlawrence@rti.org
@LawrenceAtRTI

(dlawrence2@urban.org
@LawrenceAtUrban
after July 20, 2018)

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The Milwaukee Police Department Body-Worn Camera Program: Results from a Randomized Controlled Trial

Bryce Peterson, PhD
Lilly Yu
Urban Institute

Daniel Lawrence, PhD
RTI International

Milwaukee BWC Program

- Milwaukee Context
  - Strained police-community relations
  - High profile police shooting (Dontre Hamilton)

- BWC Program
  - Increase accountability and aid investigation
  - Launched in October 2015
  - Funding from *Strategies for Policing Innovation*

BWC Rollout

Phase	Description	# BWCs	Districts	Time
1	Pilot	182	2, 5, NTF	Oct, 2015
2	RCT treatment group officers	252 treatment group + 16 additional officers	1-4, 6, 7	Mar, 2016
3	Officers not in RCT	238	1-7	Jun, 2016
4	RCT control group officers	252 control group + 171 additional officers	1-7, NTF	Dec, 2016

Notes: RCT = randomized controlled trial; NTF = Neighborhood Task Force.

Randomized Controlled Trial (RCT)

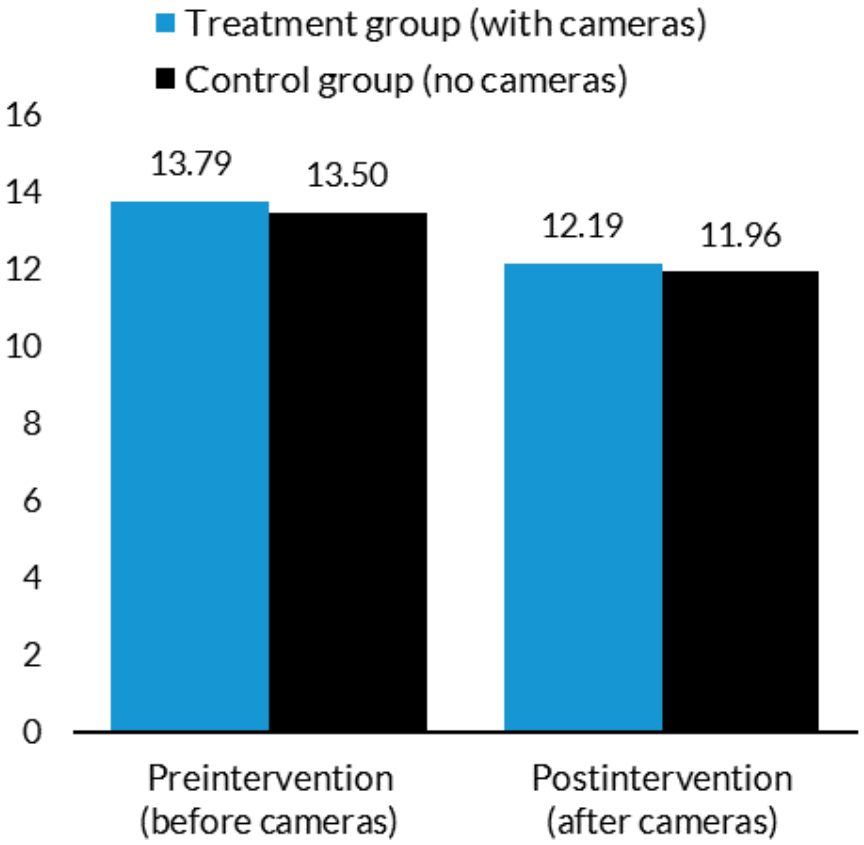
- Randomly assigned 504 officers to treatment (camera) and control (no camera) groups
- Stratified assignment by district, race & shift

Dist.	# Officers	% of MPD	# BWCs	# Control	RCT Sample	% of Sample
1	95	11.7%	30	30	60	11.9%
2	146	18.0%	40	40	80	15.9%
3	168	20.7%	52	52	104	20.6%
4	144	17.7%	46	46	92	18.2%
6	103	12.7%	34	34	68	13.5%
7	156	19.2%	50	50	100	19.8%
Total	812	100%	252	252	504	100%

Methods

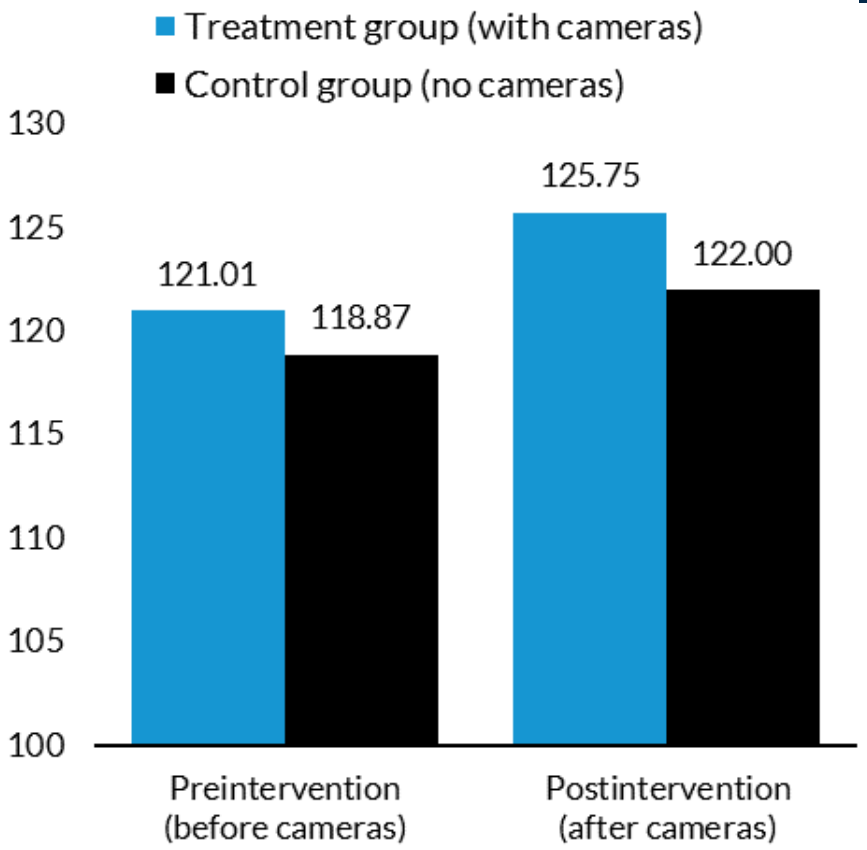
- Data from Mar 21 – Dec 20, 2016
  - Arrests, traffic stops, subject stops, citizen complaints, and use of force
- Difference-in-differences estimation
  - Differences pre- and post-intervention between treatment group and control group
- Poisson and logistic regression

Average Number of Arrests



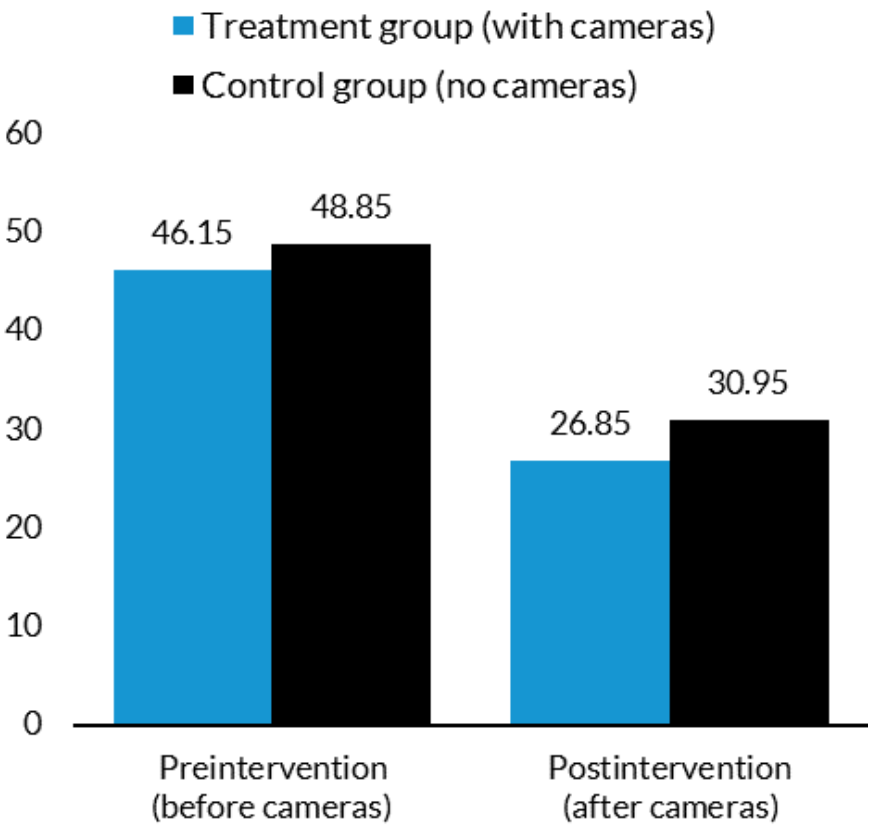
Finding:
BWCs did not affect officer arrests.

Average Number of Traffic Stops



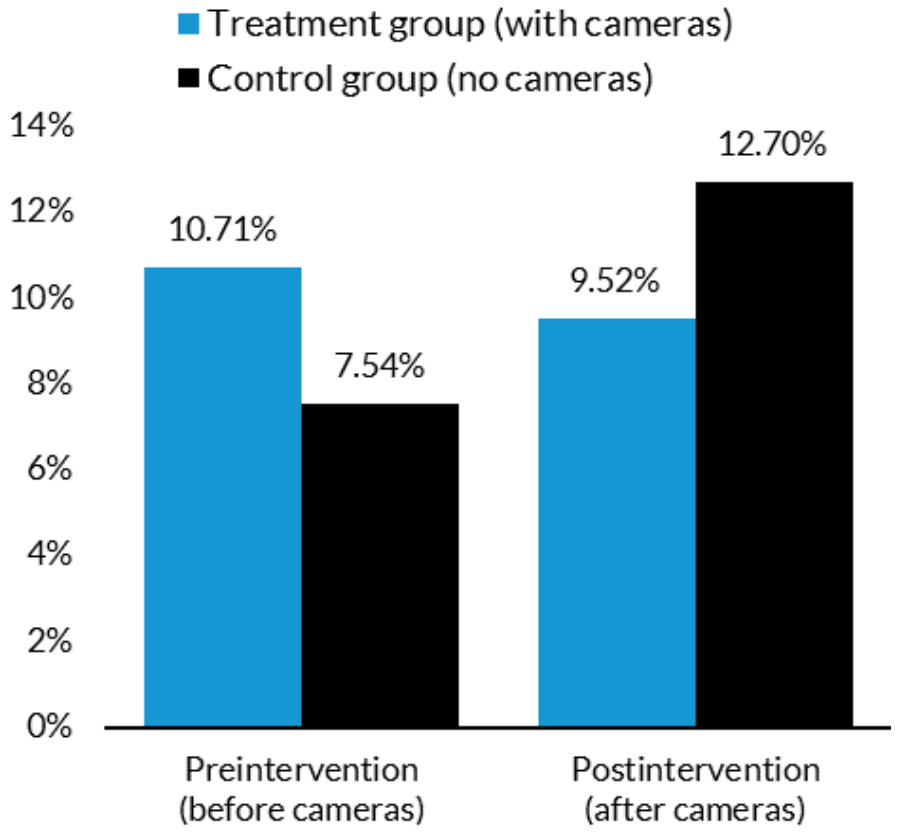
Finding:
BWCs did not affect traffic stops.

Average Number of Subject Stops



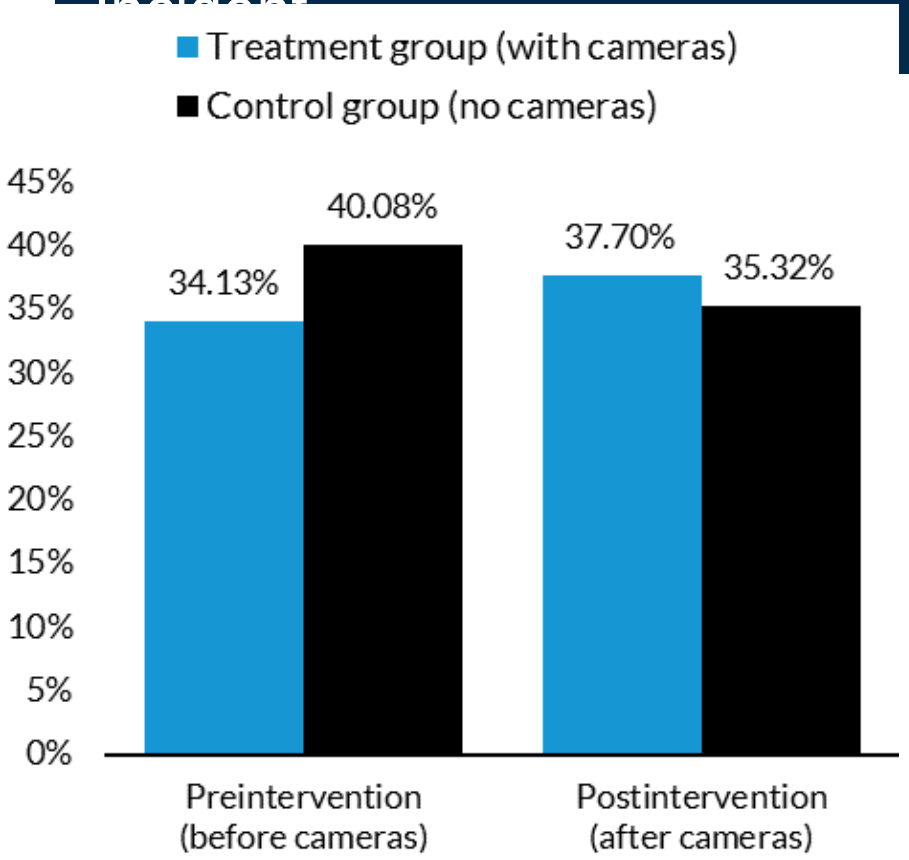
Finding:
BWCs **lowered** subject stops.

Share of Officers with One or More Complaint



Finding:
Fewer officers with BWCs had one or more complaint.

Share of Officers, One or More Use-of-Force Incident



Finding:
BWCs did not affect use of force.

Key Takeaways

1. Officers with BWCs became more selective in who they approached and stopped

2. BWCs reduced complaints against officers
   - "Civilizing effect" vs. reluctance to lodge complaint
   - Recommendation: require officer notification

3. BWCs had no effect on use of force
   - UOF already decreasing, 2013 to 2016
   - BWCs may document existing restraint

Appendix: Difference-in-Difference Results

	Incident Rate Ratios			Odds Ratios	
	Arrests	*Traffic stops*	*Subject stops*	*Citizen complaints*	*Use-of-force incidents*
Group	1.02	1.02**	0.94***	1.47	0.77
Period	0.89***	1.03*	0.63***	1.78†	0.82
Group x period	1.00	1.01	0.92***	0.49†	1.43
Constant	13.50***	118.87***	48.85***	0.08***	0.67**
Chi²	49.63***	51.24***	2399.10***	3.92**	2.26**

† $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$