

2019 CRIME GUN  
INTELLIGENCE CENTER GRANT

# FINAL ANALYSIS REPORT

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**WINSTON-SALEM  
POLICE DEPARTMENT**

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## Table of Contents

Executive Summary	1
Project Timeline	4
Introduction	5
Background Information	8
WSPD CGIC Initiative	11
Gun Crime Reduction Unit	14
Departmental Reorganization	14
Impact of the WSPD CGIC Initiative	15
Violent Firearms Investigation Team	15
NIBIN Program	16
Results of VFIT Activities	17
NIBIN Program Data	18
eTrace Data	21
Gunshot Detection Technology	21
Success Stories	26
Conclusion	30
Endnotes	31
Appendices	38

### Evaluating the WSPD Crime Gun Intelligence Center Grant

In response to the increase in violent crime and specifically gun crime in Winston-Salem, the Winston-Salem Police Department (WSPD) established a crime gun intelligence center. The WSPD Crime Gun Intelligence Center activities were supported by the Fiscal Year 2019 Crime Gun Intelligence Center (CGIC) grant from the U.S. Department of Justice Bureau of Justice Assistance.

To meet the requirements under this grant, the WSPD CGIC Initiative was created. This initiative has been supported by a cohesive infrastructure that includes technology, specialized investigation, ballistic evidence collection & processing, and partnership with external agencies. The majority of these initiative components resulted from WSPD's CGIC Strategic Action Plan, which created an actionable design for implementing key CGIC elements.

The Strategic Action Plan included establishing policies and procedures, additional training information sharing, and new personnel. The Strategic Action Plan was reviewed and approved by an external team of training and technical assistance providers who partner with the Bureau of Justice Assistance. During the grant period, progress was monitored through monthly meetings attended by WSPD personnel and team members from the technical assistance providers.

This report provides a chronological narrative of the grant-funded WSPD CGIC Initiative along with data and statistics relevant to the project. All CGIC data and statistics were collected and maintained by WSPD's crime analyst assigned to this project.

The original project period for this grant was October 2019 through September 2022. The site visit from technical assistance providers for developing the Strategic Action Plan and the procurement of a gunshot detection system (per federal and local procurement requirements) took several months. Because of this, the tracking of statistics was not able to begin until August 2021 when the project was fully operational. Furthermore, because several performance metrics had not been tracked before the awarding of this grant, and therefore pre-award and post-award data was not available for those metrics.

Among the key findings in this report are:

- **Consistent performance measurement.** The recommendations addressed in the Strategic Action Plan, along with the required tracking and reporting of performance metrics necessitated the need to track and capture data, which gave WSPD opportunities to re-examine its approach to gun violence based on this data. Metrics in this analysis report will allow the Department to continue revising and developing policies and procedures that will enhance gun violence reduction efforts.
- **Improved case load summaries and overall investigation.** The CGIC Initiative has created a more streamlined and cohesive approach to incident response, investigation, and the possible prosecution of offenders. This grant has allowed additional technology, regular intelligence sharing with external partners, and additional personnel dedicated to all aspects of this initiative, including investigative work, administration, and the National Integrated Ballistic Information Network (NIBIN). With additional personnel

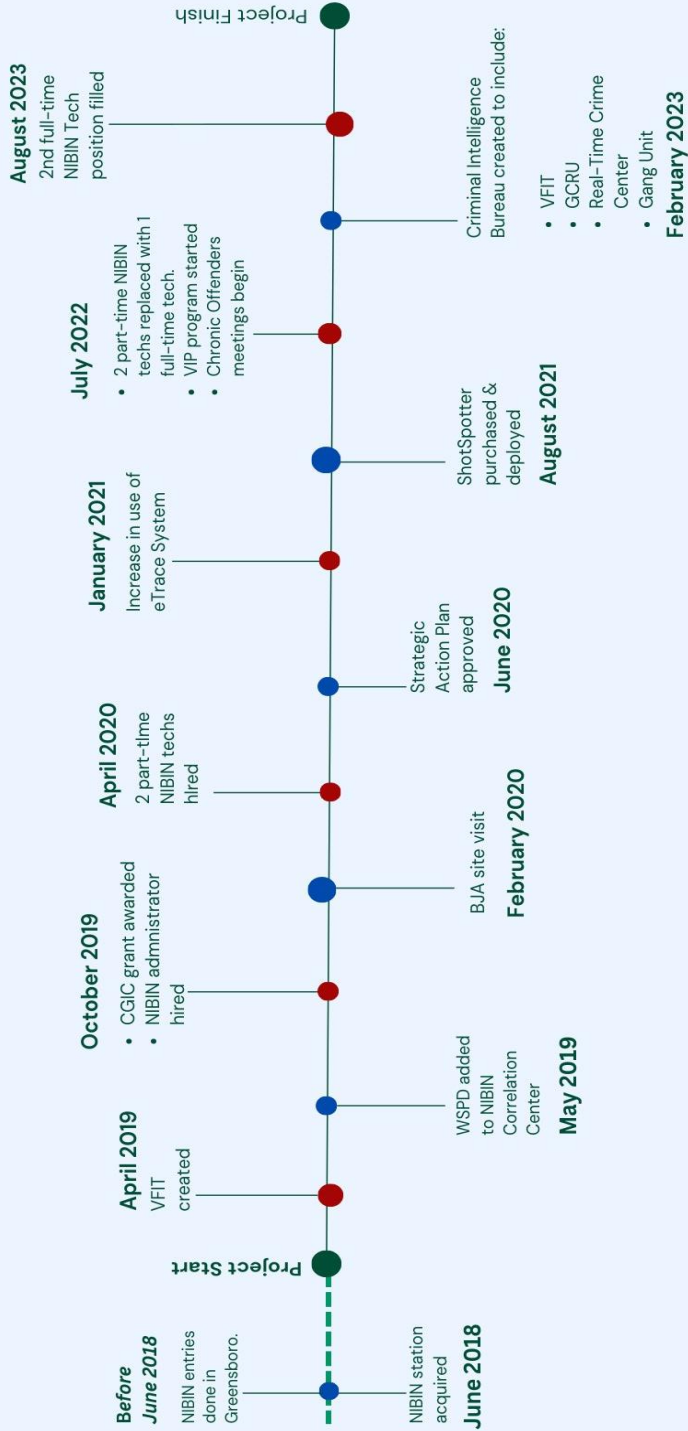
dedicated to NIBIN activities, WSPD has had consistently high percentages of NIBIN acquisitions within 10 days of the offense. Between January 2020 and September 2023, 38 of the 86 months reported 80% or higher for acquisitions entered within the 10-day mark.

- **Benefits from the use of a gunshot detection system.** WSPD has been using ShotSpotter gunshot detection technology since August 2021. Performance data shows multiple benefits from the use of this technology:
  - ***Enhanced response.*** Dispatch delay was significantly less with ShotSpotter alerts compared to Priority 2 calls. Dispatch delay for ShotSpotter alerts averaged only 3.85 minutes, compared to 10.7 minutes with Priority 2 Calls. Officer travel time for ShotSpotter alerts was faster, averaging 6.25 minutes compared to 9.08 minutes with Priority 2 calls. An average of 44.4 minutes were spent by officers at crime scenes generated by ShotSpotter, compared to 37.10 minutes spent at crime scenes prompted by Priority 2 calls.
  - ***Increase in reported gunshot incidents.*** The majority of gunshot incident responses within the ShotSpotter coverage area were initiated from ShotSpotter alerts versus citizen 911 calls. Of the 3,014 ShotSpotter alerts between August 2021 and September 2023, only 644 of these alerts were also reported via citizen 911 calls. To put this data into percentages, only 21.4% of the ShotSpotter alerts between August 2021 and September 2023 also had citizen 911 calls.
  - ***Increase in evidence collection & NIBIN Leads.*** ShotSpotter's technology of "pointing" to where shots are fired has made it easier to locate ballistic evidence. The increase in evidence collection is also a result of a more thorough processing of crime scenes. The increase in evidence collection also resulted in more NIBIN leads and connecting incidents that would not have been linked without the evidence.
  - ***Lives saved.*** In two instances, had the ShotSpotter system not alerted law enforcement to the shooting, the victims would most likely have died, since neither of these incidents were reported by citizen 911 calls. When officers responded to the ShotSpotter alerts, they were able to render aid and request EMS, which ensured both victims were transported to a local hospital, where the person was treated for (and survived) life-threatening injuries.
  - ***Community Engagement*** is a fundamental tenet within the guiding philosophy of the Winston-Salem Police Department. WSPD actively encourages the community's involvement in addressing the prevalent issue of violence. Under the CGIC Initiative, the Department has embraced a multifaceted approach that implements various technologies and establishes numerous avenues for community involvement in combating crime. With the integration of ShotSpotter, officers are now promptly informed of gunfire in the coverage area, which means a significant increase in police responsiveness, approximately 80% more responses than before. Consequently, residents who may have hesitated to report gunfire are witnessing a greater police

presence each time such incidents are detected. Moreover, officers, upon response, are actively engaging with residents by exiting their vehicles and initiating discussions about the incidents. This approach has led to a notable upswing in positive police-citizen interactions during times of heightened gun violence in the community.

- ***Cost Benefits.*** A 2022 report presented to Winston-Salem City Council estimated the use of the ShotSpotter gunshot detection system may save the community between \$5 million and \$8 million annually. This is based on an annual implementation cost of \$230,000 - \$350,000. Based on these estimates, savings would be a return of between \$15 and \$25 for each dollar spent. (A cost savings analysis has not yet been completed for 2023.)

# WSPD CGIC INITIATIVE PROJECT TIMELINE



## INTRODUCTION

Over the last 30 years, gun violence has largely remained a serious problem across the United States. Between 1993 and 2018, 71% of homicides were committed with a firearm. During this same period, the majority of firearm violence involved the use of a handgun.<sup>i</sup>

Throughout the last part of the 20th century, various gun violence reduction strategies were developed by U.S. Attorney's Offices and the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). These strategies were specific to the country's violent gun crime problems, a collaboration with U.S. Attorney's Offices, ATF, law enforcement agencies, and community stakeholders.<sup>ii</sup> In 1999, Congress authorized the establishment of the National Integrated Ballistic Information Network (NIBIN). As part of ATF, NIBIN provides agencies at the federal, state, and local levels with an automated ballistic imaging network. NIBIN can capture and compare ballistic evidence that can help solve and prevent violent crimes involving firearms. NIBIN is considered vital to any violent crime reduction strategy.<sup>iii</sup>

Additional efforts to reduce gun violence reduction have been developed since 1999. A more recent approach adopted by multiple agencies in the United States is the Crime Gun Intelligence Center (CGIC) Initiative. CGIC utilizes "interagency collaboration that focuses on the immediate collection, management, and analysis of crime gun evidence, such as shell cases, in real-time, to identify shooters, disrupt criminal activity, and prevent future violence."<sup>iv</sup> The primary outcome of CGICs is identifying armed violent offenders for investigation and prosecution.

The National Crime Gun Intelligence Center has published what it considers the seven effective CGIC elements for success:

- 1. Comprehensive Collection of Cartridge Cases and Crime Guns (ATF's Comprehensive Evidence Collection)** CGICs are both most functional and effective when law enforcement personnel (e.g., patrol officers, crime scene technicians, investigators) are called to the scene of all gun crimes and collect cartridge cases and crime guns left at the scene. Response and evidence collection policies and procedures must be developed and implemented by law enforcement leadership and communicated to the responding personnel. It is also important for CGIC leadership to meet regularly to evaluate their strategic priorities and operational policies and to review performance.
- 2. NIBIN Entry/Correlation and Crime Gun Tracing (ATF's Timely Turnaround)** Within 24 hours of recovery, crime guns are processed for forensic evidence; test-fired cartridge cases and recovered crime scene cartridge cases are entered into NIBIN; and NIBIN correlations to associated crimes are identified. All crime gun trace requests are submitted through eTrace to the ATF National Tracing Center within 24 hours of recovery.
- 3. Crime Gun Intelligence Analysis (Timely Turnaround)** NIBIN leads and eTrace results are received by the CGIC for analysis. The ATF, with support from local law enforcement, conducts a comprehensive analysis of all crime gun data collected from eTrace and NIBIN. This data is rapidly disseminated to investigators to ensure appropriate linkage of crimes to unlawfully used firearms and suspects. Examples of dissemination tools include NIBIN Lead



Referral Sheets and CGIC Bulletins that provide valuable information to law enforcement officers.

4. **NIBIN Lead/Hit Assignment and Analysis (Investigative Follow-Up and Prosecution)**  
NIBIN leads/hits are triaged and immediately assigned to investigators. All crime gun data generated by NIBIN and eTrace is uniformly examined and investigated by CGIC partners to ensure that information is shared with all CGIC stakeholders. ATF, local law enforcement, the local crime lab, state and federal prosecutors, and parole and probation should be included as CGIC partners to leverage their investigative capabilities. Parole and probation intelligence, including GPS monitoring data in the proximity of firearm-related crimes, should be used to identify violent offenders and unlawfully used firearms in violent crimes.
5. **Law Enforcement and Prosecution Collaboration and Offender Arrest (Investigative Follow-Up and Prosecution)** All actionable crime gun intelligence generated by CGIC is rapidly disseminated to all partners and pursued, using all available resources in conjunction with state and federal prosecutors. Local and federal prosecutors assist investigators by taking an active role in developing investigative strategies and providing investigators with resources needed to develop probable cause for offender arrest.
6. **State or Federal Prosecution (Investigative Follow-Up and Prosecution)** A strong partnership and close collaboration between the local prosecuting attorney and the United States Attorney's Office are critical to the effectiveness of CGIC operations. A local and federal prosecutor should be dedicated to working exclusively with the CGIC to consistently support investigators and determine the venue of crime gun prosecutions.
7. **CGIC Feedback to Process Participants (Feedback Loop)** All CGIC-related activities, such as NIBIN lead development and offender arrest and prosecution, should be tracked to measure CGIC outcomes and the impact on violent crime in the community. Feedback to all process participants, including the responding officers who initially collected the ballistic evidence, must be timely and consistent in order to maintain and sustain the CGIC processes. <sup>v</sup>

For purposes of the 2019 CGIC grant project and this report, the following are defined:

- **Crime Gun** – any firearm possessed or used, or intended to be used, during or in relation to a crime.
- **eTrace** – Electronic Tracing System. Internet-based system that allows participating law enforcement agencies to submit firearm traces to the ATF National Tracing Center (NTC).
- **NIBIN** – National Integrated Ballistic Information Network. ATF's NIBIN is the only interstate ballistic identification system that allows law enforcement partners to associate ammunition cases, crime guns, and crime scenes.
- **NIBIN Lead** – a linkage of two or more gun crimes (shooting, crime gun recovery) through the utilization of NIBIN technology.
- **NIBIN Hit** – a confirmed linkage of two or more-gun crimes (shooting, crime gun recovery) through the utilization of NIBIN technology made by two certified firearms

examiners.

- **CGIC Targeting** – the definitive outcome of CGIC, which enables the identification of violent offenders, gun crime trends, gun crime density areas, at-risk Federal Firearm Licensees (FFLs) or gun dealers, and crime gun sources. The process enables precise investigative and enforcement strategies and enhances prosecution efforts.

This report will outline the activities and practices implemented in developing the WSPD CGIC Initiative and provide numerical data recorded to measure its effectiveness.

## BACKGROUND INFORMATION

### A History of Gun Crime & Gun Violence in Winston-Salem

Winston-Salem is located in the North Central Piedmont region of North Carolina, spanning 134.7 square miles. With a population of 249,562, Winston-Salem is the largest city in Forsyth County<sup>vi</sup> and the fourth most populous city in North Carolina. The city is home to six colleges and universities including Salem College, the longest continuously running women's college in the United States, as well as the prestigious Wake Forest University and Winston-Salem State University.



Winston-Salem experienced multiple hardships in the latter part of the 20<sup>th</sup> century and early part of the 2000s, with many factories and businesses closing and/or relocating overseas. In the last 15 years, the city has seen some small growth with an emphasis on arts and innovation in the Downtown Business District. Despite these small positive changes, Winston-Salem continues experiencing significant public safety challenges, specifically violent crime and gun crime.

Over the past seven years, officers have left the field of law enforcement in droves and law enforcement agencies have struggled with recruitment efforts, leaving them grappling with how to protect their communities with fewer officers, becoming all the more challenging with the increase in gun violence. Winston-Salem has not been immune to the surge in both gun crime and the nationwide staffing crisis. As of December 2023, WSPD is understaffed by 100+ officers. Due to these shortages, the Department recently evaluated patrol staffing and had to revise the patrol schedule. Officers are now working 12-hour shifts to ensure there is adequate coverage.

Table 1 shows the steady rise in gun crime, robbery, and aggravated assaults (all types) per 1,000 since 2015 in Winston-Salem.

Table 1. Violent Crime in Winston-Salem, 2015-2023\*

Type of Crime	2015	2016	2017	2018	2019	2020	2021	2022	2023 (To Date)*
<b>Murder</b>	15	22	21	22	28	23	30	25	42
<b>Robbery</b>	443	460	540	410	352	336	240	286	252
<b>Aggravated Assault</b>	1,359	1,464	1,730	1,867	2,178	2,649	2,524	2,646	1,967

\*2023 Data is through November 15, 2023

Table 2

**Winston-Salem  
Highest Years for Homicides**

Calendar Year	Homicides
2023	46
1994	44
1993	43
1992	41
2022	38

*\*2023 data as of 12/13/2023*

2023 is already slated to be the deadliest year in history for Winston-Salem. As of December 2023, WSPD has reported 46 homicides for the year, and several weeks are remaining in the calendar year (see Table 2).

Gun violence has re-emerged over the last several years as a critical issue facing communities in America. A 2022 report from the U.S. Center for Disease Control showed that between 2019 and 2020, there was a 35% increase in gun-related homicides, and the largest increase in firearm homicides was among Black persons (39%). Data from this report also showed that in 2020, counties with the highest poverty level had firearm homicide rates 4.5 times as high as counties with the lowest poverty level. <sup>vii</sup> Winston-Salem is no exception. Between 2019 and 2022, 56.5% or more of gun-related homicide victims have been Black. During 2019

and 2021, gun-related homicides have increased by 34.8%. Between 2022 and 2023 (to date), there has been a 65.2% increase in gun-related homicides. Winston-Salem’s poverty level in 2020 was 18.4% with county data showing 14.3% of the population living in poverty. This is above the national average of 11.4%. <sup>viii</sup>

Since 2018, there have been 20 or more fatal shootings in Winston-Salem each year. In both 2019 and 2020, four juveniles (under the age of 18) were killed by gun violence (a total of eight children killed by a firearm). In 2023, there have been six children killed by a firearm.



Deadly gun violence has permeated into local schools and government workplaces in Winston-Salem. In 2019 two City of Winston-Salem employees were killed, and two others were injured, including a police officer, because of a workplace shooting. Gunshots were reported at the Joycelyn V. Johnson Municipal Services Center, where an employee from the City Sanitation Department fired shots at a department colleague after an

ongoing dispute.

Just after noon on September 1, 2021, authorities were dispatched to Mount Tabor High School after a school resource officer reported a shooting. The school was placed on lockdown, and a 15-year-old student was transferred to a hospital with a gunshot wound, where he died from his injuries. Following an organized search lasting several hours, the suspect, a 16-year-old student, was apprehended and charged with one count of murder. He is currently awaiting trial.

Stolen firearms are also a significant problem for the city. During seven months in 2019, two Federal Firearms Licensee (FFL) dealers in the Triad region were targeted multiple times with many firearms stolen. This trend also continued in 2020. Several local FFL dealers were broken into with multiple firearms stolen. Several other dealers had break-in attempts. In 2019, over

310 firearms were reported stolen, with only about 1/3 being recovered (103). There were an additional 50 firearms reported as stolen that were later recovered. Stolen firearm data for 2022 and 2023 shows a 10.3% increase compared to the same data for 2020 and 2021.

A review of gun-related incidents in 2019 revealed that many of the guns used in Winston-Salem's shootings are being used repeatedly and passed around within loosely organized gangs or small groups. In 2019, 177 guns were identified as having been used in more than one incident. Intelligence information driven by NIBIN indicates once a gun is used in a crime in Winston-Salem, it will again be used in a second, unrelated violent crime within approximately 85 days. A study on NIBIN in the State of New Jersey revealed that in instances where there are two shooting events linked by ballistics through NIBIN, 50% of the time a third shooting event utilizing the same firearm will occur within 90 days. The rate at which the crime guns in Winston-Salem are being used again is even more frequent than in the New Jersey study.<sup>ix</sup> Police know some guns are being used in more than one crime, but putting the gun in the same person's hand can be difficult. Additionally, the lack of cooperating victims and/or witnesses significantly impacts the ability of prosecutors to receive a conviction in a non-fatal shooting case.

Two other major issues within crime gun investigation are ghost guns and straw purchases. Ghost guns undermine law enforcement. Ghost guns have no serial numbers, which means that gun traffickers can purchase unlimited numbers of parts and kits and build unserialized, untraceable guns that can then be easily diverted into the criminal market. This leaves law enforcement with no way to trace the firearms' origin. These weapons are, by design, perfect crime guns. Straw purchases involve someone who either (a) purchases a gun for another person who is prohibited by law from possessing one or (b) purchases a gun for someone who does not want their name associated with the transaction. Straw purchase cases are very difficult to prove in court, as it is challenging to link the gun to a specific individual. For example, a suspect can claim that a gun was stolen from their house or claim that they sold a gun to someone else and don't know who that person was.

## WSPD CGIC INITIATIVE

The WSPD CGIC Initiative formally began in October 2019. However, WSPD had begun implementing a few gun violence reduction tactics before this data began to be tracked under this grant. (A project timeline is on Page 4.)

In April 2019, WSPD created the Violent Firearms Investigation Team, which investigates violent crimes perpetrated by the use of firearms in Forsyth County and utilizes NIBIN to conduct investigations into violent firearm crimes. Additionally, the Violent Firearms Investigation Team allows NIBIN access to external agencies to enter ballistic evidence into NIBIN, thereby increasing its ability to connect gun crimes on a national level. At its peak, the Violent Firearms Investigation Team had as many as six officers assigned to the unit, but staffing shortages in the Department required a reduction. Currently, the unit is comprised of a WSPD Sergeant and four WSPD detectives. Two of these detectives serve as ATF Task Force Officers for the Department.

In the fall of 2019, the City of Winston-Salem was awarded the Fiscal Year 2019 Local Law Enforcement Crime Gun Intelligence Center Integration Initiative grant from the Bureau of Justice Assistance (hereafter, CGIC grant). The pursuit of this grant (and subsequent award) was the first of several strategies initiated to address recent surges in violent crime and more specifically, gun violence. WSPD is one of 54 local sites to receive a Bureau of Justice Assistance CGIC grant.

In 2018, representatives from WSPD visited the Chattanooga Police Department in Tennessee where they learned about the Department's crime gun initiatives, including a NIBIN program and a real-time crime center. This visit catalyzed WSPD to develop its own crime gun initiative.

After the CGIC grant was awarded, technical assistance providers from the Bureau of Justice Assistance conducted a site visit with WSPD in February 2020. The technical assistance providers made several recommendations that were outlined in WSPD's CGIC Strategic Action Plan. Most of these recommendations were implemented, which is apparent from the effective, streamlined operations WSPD has conducted as a CGIC site.

The goal of the WSPD CGIC Initiative is to disrupt gun violence through the consistent production of timely, precise, and actionable intelligence. To provide valuable intelligence for investigations, the CGIC strategy recommends focusing on the most violent connected firearm offenders. These offenders will be identified through a data-driven and forensics-led initiative as part of identifying, targeting, investigating, arresting, and ultimately prosecuting firearm-related offenders.

This analysis report will focus solely on the activity of WSPD. Under the 2019 CGIC grant,

WSPD proposed incorporating four essential CGIC elements that were included in the approved Strategic Action Plan:

### 1. Prioritize NIBIN cases

- *CGIC Priority Lead Cases* – investigative leads involving the most recent and violent crimes with an identified suspect. These cases include homicides, armed robberies, gang

involvement, recovered firearms, firearms trafficking, or ones having a CGIC target.

- *Investigative Lead Cases* – investigative leads are provided to the case officers who originally investigated the case. These cases can include shootings, violent armed robberies with shots fired, business armed robberies with shots fired, or cases with three or more incidents linked that have solvability factors.
- *District Lead Cases* – provided to the district police officers and/or district NIBIN liaisons, who originally responded to and investigated the incidents of gun violence without the assistance of the Criminal Investigations Division. These cases can include gunshot detection alerts, shots fired, and shots fired at persons, vehicles, and dwellings.
- *Situational Awareness Lead Cases* – investigative leads are provided to the district within which related NIBIN crimes occurred in order to increase situational awareness and assist with violence crime reduction deployment strategies.

## **2. Identification of CGIC Targets**

- The WSPD Crime Gun Intelligence Center (CGIC) must act as a firearms intelligence center
- WSPD will create a CGIC Intelligence Report (when appropriate) that identifies targets (individuals, groups, or locations) that have become a priority through the CGIC analytical process and NIBIN forensic analysis or pose a significant officer safety threat. Investigative debriefs are conducted between members of the Department's Investigative Services Bureau (Criminal Investigations Division and Special Investigations Division), Special Operations Division (Gang Unit), and Field Services Bureau (Street Crimes Units) to deconflict information and coordinate investigative efforts when shooters or shooting incidents overlap investigative areas of responsibilities. Periodically, the same units meet with external partners including state/federal prosecutor's office, ATF, Homeland Security, Federal Bureau of Investigation, probation and parole, etc., reviewing incidents and discussing persons who have been identified as "Violent Impact Players." Offenders and/or groups are identified and prioritized, and action plans are initiated.

## **3. Collaborative Criminal Investigations**

- CGIC teams are assigned to conduct collaborative retrospective investigations to bring cases to a successful conclusion.
- CGIC teams will utilize surveillance, confidential informants, and other alternative investigative techniques to target violent criminal firearm offenders.

- CGIC teams will conduct target debriefs to further investigative efforts.

#### **4. High Impact Prosecutions**

- Utilize the Forsyth County District Attorney's Office and the Middle District of North Carolina U.S. Attorney's Office to review and prosecute CGIC cases.
- Intelligently seek federal prosecutions that have higher incarceration sanctions for targeted offenders.

#### **Gun Crime Reduction Unit**

WSPD created and implemented the Gun Crime Reduction Unit (GCRU) to help decrease the workload of patrol officers and reduce gun violence in the city. GCRU is responsible for responding to and investigating gun violence crimes, specifically related, but not limited, to shootings and discharging firearms into an occupied dwelling and/or vehicle. In addition, GCRU serves warrants on those offenders whose apprehension is not assumed by the Special Weapons and Tactics Team (SWAT). GCRU is expected to engage in areas where gun violence is most prevalent to identify and arrest repeat offenders before additional gun violence occurs. GCRU officers are trained and have the experience to conduct more in-depth investigations.

#### **Departmental Reorganization**

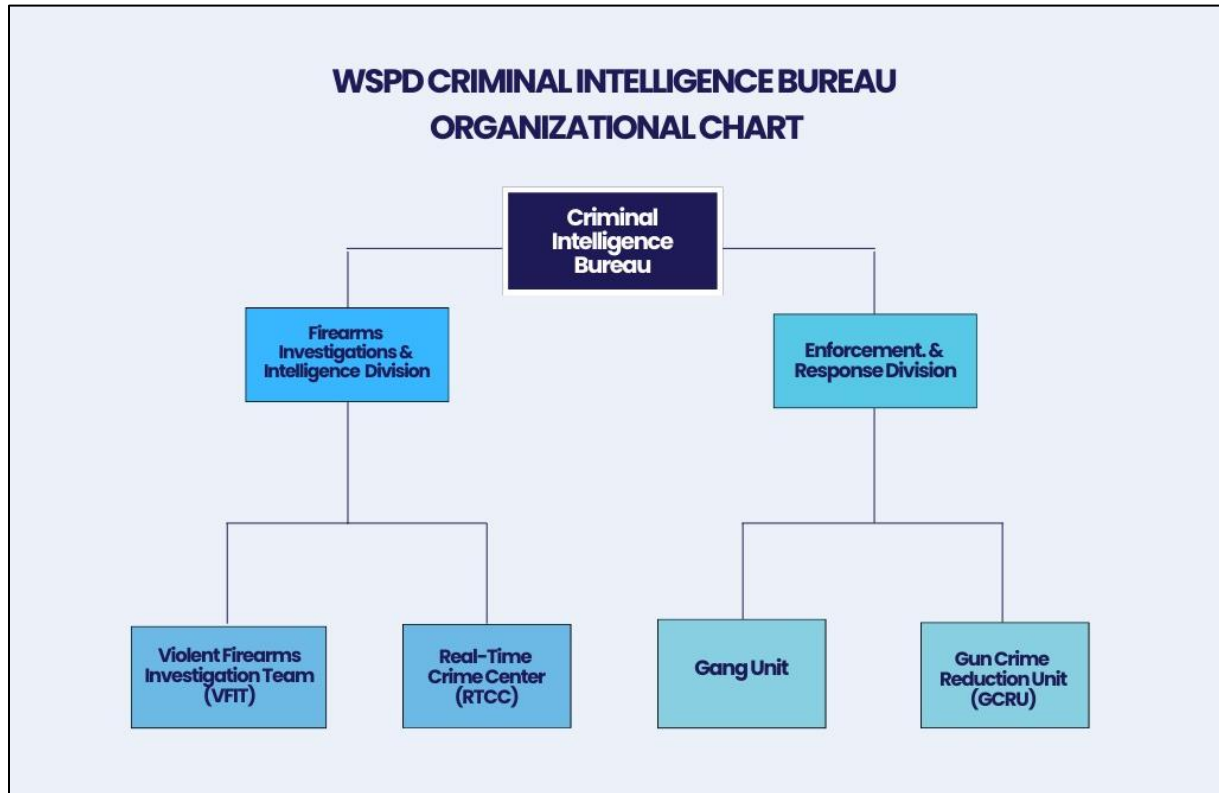
In 2023, both the Violent Firearms Investigation Team and the Gun Crime Reduction Unit were reassigned to the newly created Criminal Intelligence Bureau. The Criminal Intelligence Bureau was formed to integrate investigative resources and intelligence information, specifically focusing on gun crime and gang-related crime (Figure 2). The Criminal Intelligence Bureau has two major divisions:

- The Firearms Investigations and Intelligence Division is comprised of the Violent Firearms Investigation Team and the Real-Time Crime Center.
- The Response and Enforcement Division includes the Gang Unit and the Gun Crime Reduction Unit.

The Criminal Intelligence Bureau holds weekly intelligence meetings that are open to all Department personnel. The purpose of these meetings is to facilitate information sharing about violent crime, specifically gun and gang-related crime, with the appropriate personnel and investigative units in WSPD.



Figure 1



## IMPACT OF THE WSPD CGIC INITIATIVE

One of the most positive impacts of the 2019 CGIC grant is the required collection and maintenance of CGIC data. This requirement necessitated the capturing and tracking of data. This provided WSPD with opportunities to re-examine its approach to gun violence based on this captured data. Metrics in this analysis report will allow the Department to continue revising and developing policies and procedures, thus continuing to improve gun violence reduction efforts.

### **Violent Firearms Investigation Team**

Just before receiving the 2019 CGIC grant, WSPD established the Violent Firearms Investigation Team (VFIT) in April 2019. In mid-2019, it began a NIBIN program overseen by VFIT. The focus of VFIT is twofold: (1) prioritizing and targeting shooters responsible for the majority of the gun violence within Winston-Salem and (2) taking guns off the streets.

Qualitative evidence about the impact of VFIT includes:

- Gun-related cases assigned to the unit receive a more thorough investigation. These cases are investigated by officers with more experience and specialized training in firearm investigation.
- VFIT has removed the heavy burden of additional follow-up investigation by patrol officers and allows them to return to patrol duties. This has recently become more important with officer shortages in the Department.
- The Department's working relationship with CGIC partners has been bolstered, most notably with the U.S. Attorney's Office, the Forsyth County District Attorney's Office, and ATF. Strengthening these partnerships has increased WSPD's reach and its intelligence base. Having a specialized unit that also collaborates regularly with external partners has created a more efficient, streamlined approach to firearm investigations.
- A more robust working relationship with CGIC partners has helped WSPD create its Violent Impact Player (VIP) program in July 2022. The VIP program uses unbiased statistics to identify dangerous, high-risk offenders and chronic offenders to whom multiple cases of gun violence can be attributed.
- Upon recommendation of the technical assistance providers, two Department personnel (including the NIBIN Program Administrator) traveled to Hartford, Connecticut in October 2022 where they met with the Hartford Police Department to learn about their success with violent crime investigations. Based on these best practices, WSPD began regularly hosting its Chronic Offenders meetings. These monthly meetings are attended by various external partners, including the U.S. Attorney's Office, ATF, Forsyth County District Attorney's Office, probation and parole officials, Forsyth County Detention Center, Forsyth County Sheriff's Office, and Winston-Salem/Forsyth County Schools. WSPD representatives who attend these meetings include VFIT members, NIBIN personnel, WSPD Gun Crime Reduction Unit personnel, and other WSPD personnel from the Criminal Intelligence Bureau and the Investigative Services Bureau.

During the Chronic Offenders meetings, there are multiple discussions about the investigation, arrest, prosecution, and rehabilitation of these frequent offenders. This time is used to discuss specific offenders and decide whether to prosecute at the federal or state level, to share information about offenders and case linkages, and to share other intelligence.

- VFIT incorporated additional layers to its comprehensive gun violence reduction strategy by adding straw purchase investigations and utilizing eTrace more frequently. eTrace will be discussed in more depth later on in this report.
- Regular CGIC training and information dissemination is conducted by VFIT. CGIC and NIBIN training is now part of each Basic Law Enforcement Training cohort, and updates regarding CGIC, NIBIN, and WSPD's gunshot detection system are disseminated through the Department's policy dissemination software. VFIT has also worked one-on-one with individual members of the Forsyth County District Attorney's Office to train them on these same topics.

As part of the Violent Impact Player (VIP) program, VFIT shares reports monthly with WSPD officers about VIPs and whom to contact should anyone acquire intelligence about these individuals or respond to a case involving them.

- WSPD recently created a Firearm Recovery Questionnaire form that it will begin using soon. The use of this form will help ensure that the appropriate information is captured for proper investigative follow-up and prosecution. (Appendix A)
- A dedicated crime analyst has been assigned to VFIT since its inception, and he has been responsible for tracking all CGIC statistics. The analyst also works with other crime analysts assigned to the WSPD Real-Time Crime Center and the Investigative Services Bureau. With this dedicated position, WSPD is creating and sharing customized firearms data.

## **NIBIN Program**

WSPD acquired its own NIBIN station in 2018. Procuring the NIBIN station was crucial to augmenting firearm investigations. Before 2018, WSPD had to drive 25 miles to the neighboring city of Greensboro where staff used the ATF's NIBIN station. This process was expensive and time-consuming, since WSPD was driving multiple times each week to and from Greensboro to perform NIBIN entries and also share NIBIN access with other agencies.

VFIT assumed responsibility for the NIBIN program in May 2019 when WSPD was accepted as a NIBIN National Correlation and Training Center agency. This has improved WSPD's NIBIN program, especially the speed and accuracy of both NIBIN entries and image analysis. The National Correlation and Training Center provides consistent, timely ballistics analysis and correlation services to federal, state, local, and tribal law enforcement within 24-48 hours to more than 1,400 participating law enforcement agencies across the nation. This accounts for roughly 30% of all ballistic image acquisitions in the United States. <sup>x</sup>

In October 2019, WSPD added a NIBIN Program Administrator position. In addition to this position, the program is also supported by NIBIN technicians. The number of NIBIN technicians has fluctuated. Initially, two part-time technicians were hired in April 2020. By July 2022, these part-time positions were replaced with one full-time technician who was hired. In August 2023, a second full-time NIBIN technician was hired to meet the workload demands.

The ultimate goal is for WSPD to have a regional NIBIN program, where other agencies can utilize WSPD’s NIBIN equipment ballistic evidence entries. A regional NIBIN “hub” has the potential for linking gun crimes across the Triad region (cities of Greensboro, High Point, Kernersville, and Winston-Salem) and thus increasing the solvability of crimes that involve firearms.

**Results of VFIT Activity**

As was previously outlined, the WSPD CGIC Initiative has created a more streamlined, effective approach to gun crime investigation. This finding is supported by the data reported by VFIT between January 2020 and September 2023 (Table 3 and Table 4). Some of the statistics for 2023 have been affected by staffing shortages. Two vacant positions in VFIT have not been filled.

Table 3

**WSPD Annual eTrace Data (2021-2023)**

	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Crime Guns Entered in eTrace	1,334	1,408	1,253	3,995
Entries Resulting in eTrace Hit	690	1,152	884	2,726

Table 4

**WSPD Investigative Data (2021-2023)**

	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Cases Referred to CGIC Investigative Team	155	87	79	321
Cases Investigated by CGIC Team - Cleared by Arrest or Exceptional Means	65	46	45	156
Suspects Identified in CGIC Cases	110	98	153	361
Suspects Arrested in CGIC Cases (State Level)	52	67	83	202
Suspects Arrested in CGIC Cases (Federal Level)	52	6	49	107

## NIBIN Program Data

Prior to the 2019 CGIC grant award, WSPD did not capture all the measurable data that it began to track as part of this grant program (and still tracks as part of its CGIC approach). Because of this, most data cannot be displayed in terms of pre- and post-award periods. Nevertheless, the data provided below in various formats demonstrates the proactive, intelligence-led approach of WSPD to gun violence.

### NIBIN Acquisitions & NIBIN Leads

In late 2019 and early 2020, WSPD began consistently tracking NIBIN data based on entries using the NIBIN acquisition station it purchased in 2018.

Table 5

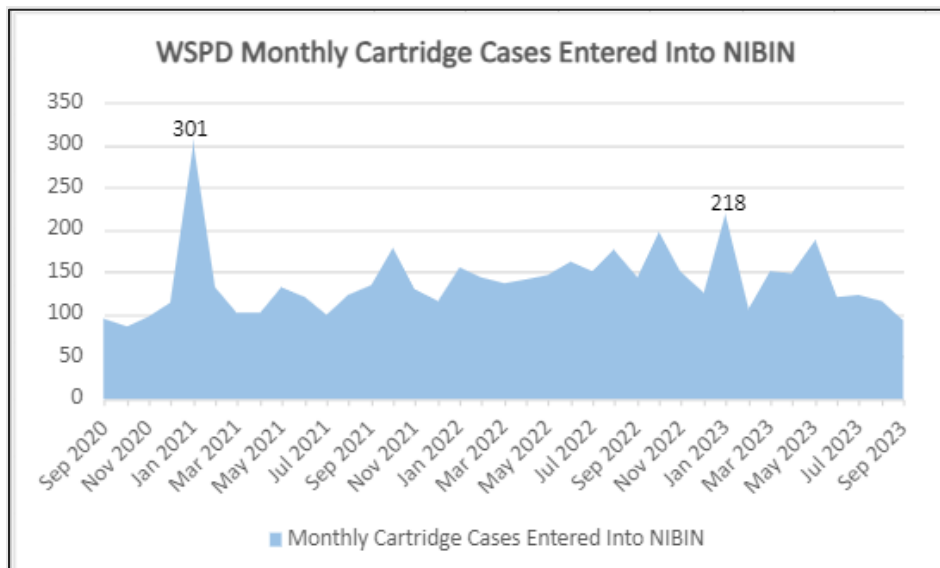
WSPD NIBIN Acquisition Data			
2020	2021	2022	2023
2,351	2,578	3,135	2,567

Recording of NIBIN acquisition data began in 2020 when 2,351 cartridge cases were entered into NIBIN for the year (Table 5). This number has continued to increase each year: 2,578 acquisitions in 2021; 3,135 in 2022; and 2,567 acquisitions through September 2023. NIBIN entry data reflects a combination of both evidence casings and

test fires.

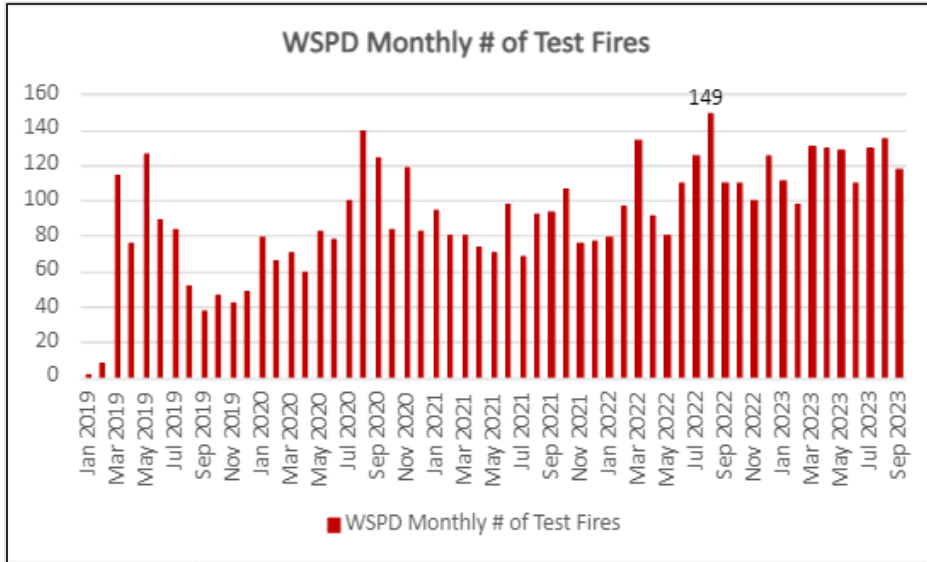
For cartridge case acquisition, WSPD has consistently recorded a high number of cartridge case acquisitions. There were 1,665 cartridge case NIBIN entries in 2021. January 2021 was the busiest month with 301 cartridge case entries. In 2022, there were 1,824 cartridge cases entered into NIBIN (196 in October alone). As of September 2023, WSPD had recorded 1,260 cartridge case NIBIN entries, slightly lower than this same nine-month period in 2022. January 2023 had the second-largest number of monthly cartridge case entries since WSPD began recording this data, with 218 cartridge case entries (see Figure 2).

Figure 2



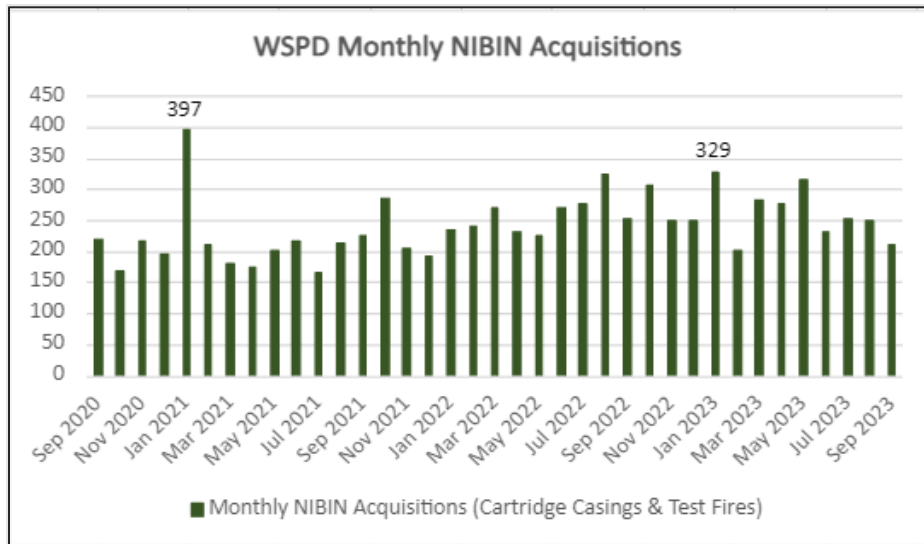
WSPD first began collecting test fire statistics in January 2019. During this first year, WSPD recorded 727 test fires (2019). In 2020 and 2021, there were 1,086 and 1,014 test fires respectively. Data for 2022 shows 1,311 test fires; and for 2023, there were 1,092 test fires through September 2023. January 2023 was the highest month during this period with 218 test fires (see Figure 3).

Figure 3



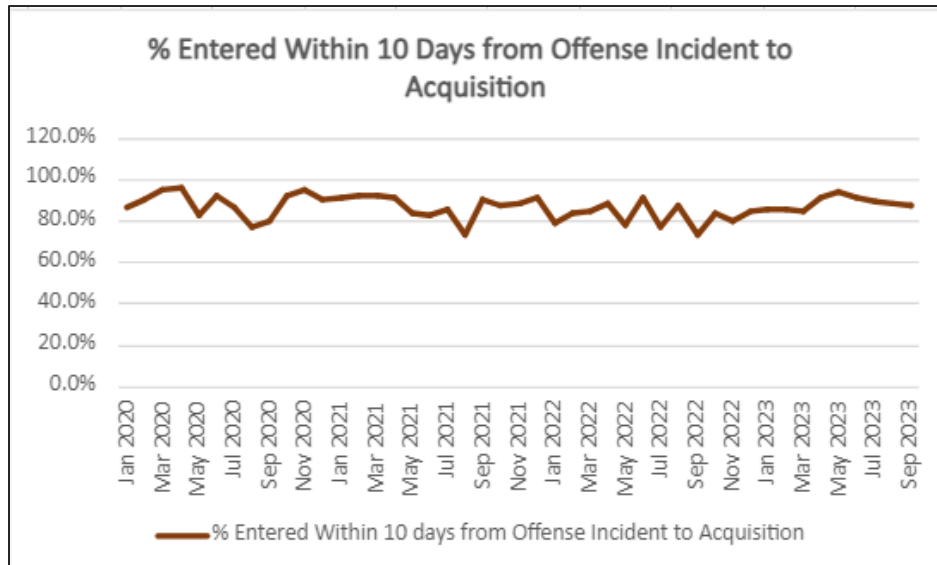
The tracking of both cartridge cases and test fires did not begin until September 2020 when WSPD added cartridge cases to its data collection. In 2021, there were 2,679 NIBIN acquisitions. WSPD reported 3,135 acquisitions in 2022 and 2,352 thus far in 2023 (through September). January 2021 was the busiest month with 397 NIBIN acquisitions. The second-highest month was January 2023 when 329 NIBIN acquisitions were reported (Figure 4).

Figure 4



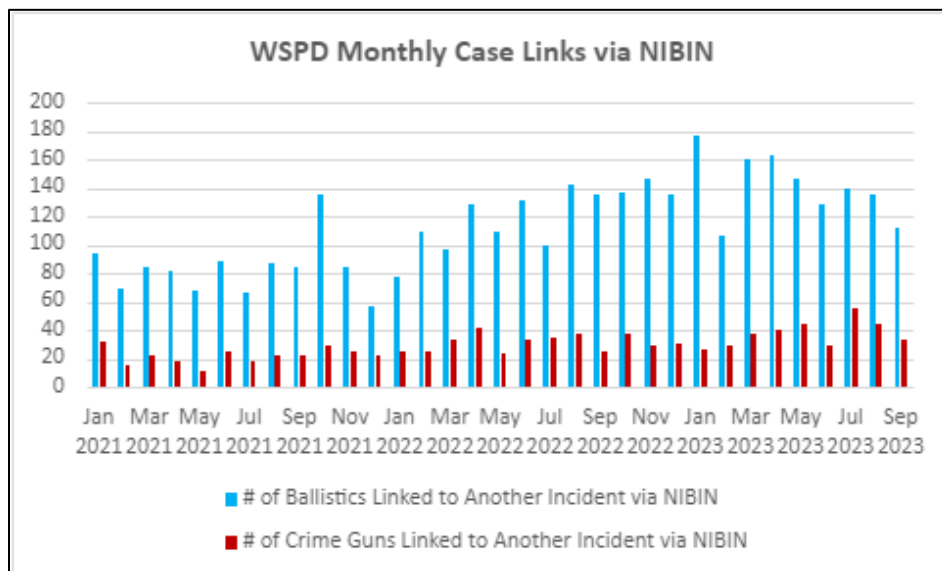
Supported by a NIBIN Program Administrator and two NIBIN technicians, the Department’s NIBIN program has contributed to timely, efficient NIBIN acquisitions. WSPD has reported consistently high percentages of NIBIN acquisitions within 10 days of the offense (see Figure 5). Between January 2020 and September 2023, 38 of the 45 months reported 80% or higher for acquisitions entered within the 10-day mark. The lowest percentage reported was 73.6% in both August 2021 and September 2022.

Figure 5



Consistently high amounts of ballistic evidence entered into NIBIN have been linked to other cases because of the steady number of NIBIN entries performed by the WSPD (Figure 6).

Figure 6



## eTrace

The technical assistance providers encouraged WSPD to increase its use of eTrace. The Electronic Tracing System, also known as eTrace, is an internet-based system where participating law enforcement agencies can submit firearm traces to the ATF National Tracing Center. The benefits of eTrace include:

- Significant reduction in turnaround time
- Time required to process a trace request
- Increase in the overall number of crime guns traced
- Improved data quality of trace related
- Information through real-time data validation <sup>xi</sup>

One of the two NIBIN technicians is responsible for eTrace submissions. Since increasing its use of eTrace, WSPD has entered just under 4,000 crime guns between January 2021 and September 2023 (Table 6). 68% of these entries have resulted in a hit in the eTrace system.

Table 6

**WSPD Annual eTrace Data (2021-2023)**

	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Crime Guns Entered in eTrace	1,334	1,408	1,253	3,995
Entries Resulting in eTrace Hit	690	1,152	884	2,726

## **Gunshot Detection Technology**

One of the primary activities for this grant project was the purchase of a gunshot detection system. ShotSpotter, Inc. was selected as the vendor. On August 19, 2021, ShotSpotter was deployed in the city, covering an area of three-square miles. This confidential coverage area is selected based on its heavy concentration of gun violence.

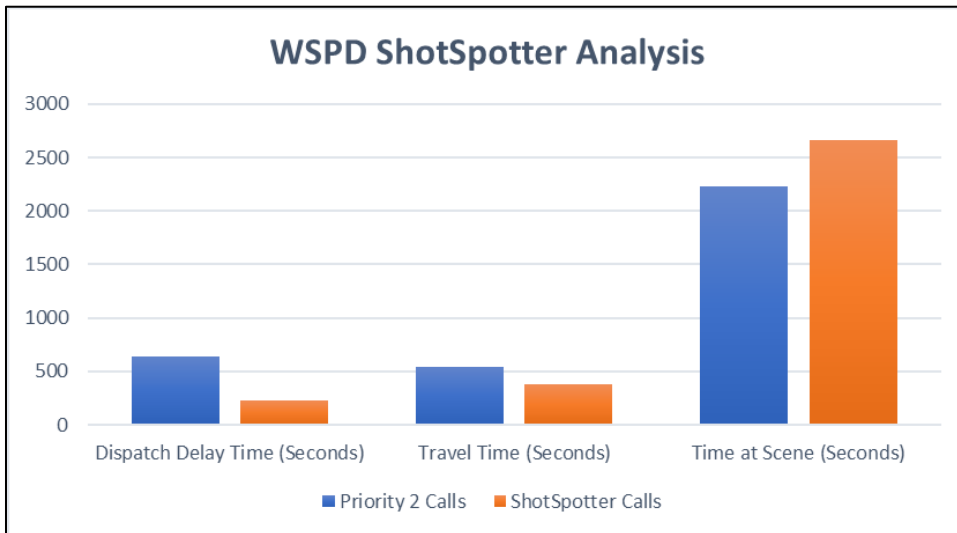
The efficacy of ShotSpotter in Winston-Salem can also be seen in the following areas:

- **Faster response time.** Since its use, ShotSpotter has remarkably reduced dispatch times, as it bypasses the 911 system and directly dispatches gunfire alerts to officers. Figure 7 shows the average time in seconds for dispatching calls, traveling to an incident, and the time spent at the scene for investigation and processing. Additionally, WSPD utilizes the Live911 platform, which allows officers in the field to hear 911 emergency calls in real time and identify precise caller locations. WSPD defines Priority 1 calls as involving life-threatening incidents and having a corresponding 911 call for service. Priority 2 calls are defined as those that are not in progress, not life-threatening, or don't involve imminent danger). Priority 2 calls have occurred recently enough that either quality evidence can be obtained, and/or the call could escalate to a more serious incident if not



handled by WSPD.

Figure 7



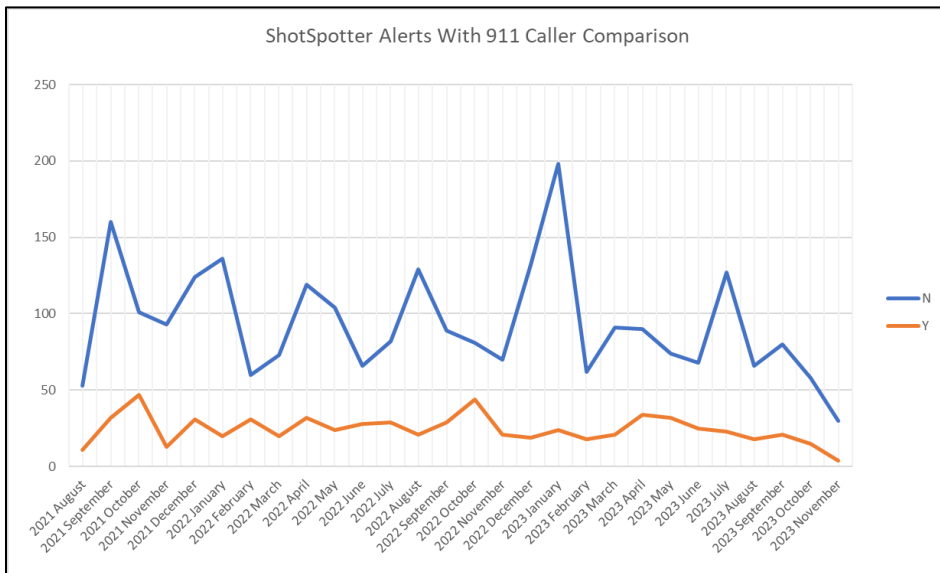
- **Accurate locations.** Studies have shown that gunshot detection systems improve law enforcement response, as gunshot detection systems provide more accurate locational data than citizen reports.<sup>xii</sup> Since the deployment of ShotSpotter, the technology has provided officers with locations and maps of reported gunfire that they can access using mobile devices. Citizens who report gunfire cannot always provide an exact location of where they think the gunshots came from. Nor can they always supply an accurate number of gunshots that they believe they heard. ShotSpotter alerts and its mapping technology have increased the amount of ballistic evidence collected for NIBIN acquisition. The accuracy has also helped WSPD locate victims and witnesses more quickly.
- **Better evidence recovery & case investigation.** Reports in recent years indicate that there is a correlation between police having a more exact location and both the retrieval of shell cases and the ability to perform link analysis of firearms.<sup>xiii</sup> Figures 10, 11, and 12 in the Success Stories section are where ShotSpotter and the WSPD CGIC Initiative were integral parts of incident response, investigation, and subsequent arrests.
- **Community Engagement** is a fundamental tenet within the guiding philosophy of the Winston-Salem Police Department. The Department actively encourages the community's involvement in addressing the prevalent issue of violence. Under the CGIC Initiative, the Department has embraced a multifaceted approach that implements various technologies and establishes numerous avenues for the community to be involved in combating crime. With the integration of ShotSpotter, officers are now promptly informed of gunfire in the coverage area, which means a significant increase in police responsiveness, approximately 80% more responses than before. Consequently, residents who may have hesitated to report gunfire are witnessing a greater police presence each

time such incidents are detected. Upon response, officers are actively engaging with residents by exiting their vehicles and initiating discussions about the incidents. This approach has led to a notable upswing in positive police-citizen interactions during times of heightened gun violence in the community.

WSPD made its first ShotSpotter presentation to the Winston-Salem City Council in 2023. These updates help ensure that city leaders and the community are informed about the use of ShotSpotter and its impact on public safety.

- Increased reporting of gunfire.** A recent report showed that 80% of gunfire in the United States goes unreported by community members. This same report suggested that based on this statistic, it would be natural to assume that gunshot detection systems lead to more police responses to gunfire, but this is not the case. Researchers found that gunshot detection system alerts involve a smaller percentage of assaults and homicides than 911 calls from citizens, suggesting that ShotSpotter alerts may lead to a higher number of reported gunfire but not necessarily reported assaults and homicides.<sup>xiv</sup> Data from law enforcement agencies indicates that in coverage areas where it is deployed, a gunshot detection system will initiate more alerts than citizen 911 calls.<sup>xv</sup> This trend appears to be consistent in Winston-Salem. The majority of gunshot incident responses within the ShotSpotter coverage area initiated from ShotSpotter alerts rather than citizen 911 calls (see Figure 8).

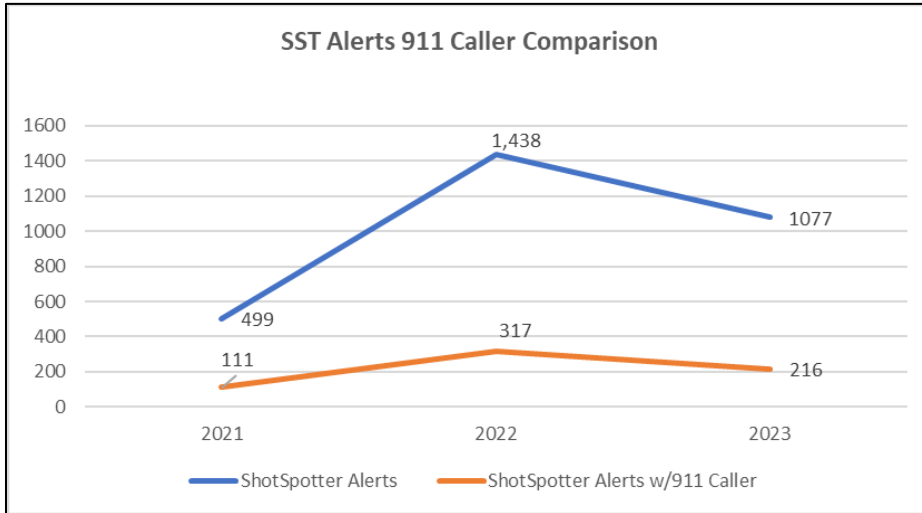
Figure 8



Between August 2021 and September 2023, only 644 alerts were also reported via citizen 911 calls. To put this data into percentages, only 21.4% of the ShotSpotter alerts between August 2021 and September 2023 also had citizen 911 calls. In 2021, there were 499 ShotSpotter alerts compared to 111 alerts with 911 calls. In 2022, there were 1,438

ShotSpotter alerts compared to 317 alerts with citizen calls. There have been 1,077 ShotSpotter alerts in 2023 (through September) compared to 216 alerts with citizen calls. (see Figure 9).

Figure 9



WSPD partnered with Atrium Health Wake Forest Baptist Hospital, a Level 1 trauma center to conduct an analysis of gunshot victims in the ShotSpotter using data provided by WSPD. The analysis indicated that there has not been a statistically significant change in the gunshot wound patients from the ShotSpotter zip code compared to gunshot wound patients treated from the rest of the city.

The surgeon overseeing this study acknowledged that using the zip code might not be as specific as using the actual ShotSpotter coverage area, but it was the best correlation to use for cross-referencing the hospital’s trauma registry.

- **Victim assistance.** Victim assistance is one of the most significant benefits reported by WSPD between August 2021 and September 2023. It is a secondary benefit of reduced response time, accurate location, and increased reporting of gunfire. Figure 11 in this report’s Success Stories section describes one of two incidents where a life was saved due to faster response time from ShotSpotter alerts. (A YouTube video about this life-saving incident can be found at <https://tinyurl.com/35ezcnjw> .)
- **Cost Benefits.** In a 2022 report presented to Winston-Salem City Council, estimates indicated that the use of the ShotSpotter gunshot detection system may save the community between \$5 million and \$8 million annually. This estimate is based on an annual implementation cost of \$230,000 - \$350,000. Based on these numbers, savings would be a return of between \$15 and \$25 for each dollar spent.<sup>xvi</sup> A cost-savings analysis has not yet been completed for 2023. (A copy of the 2022 cost-benefits analysis

can be found in Appendix B.)

- **Reductions in gun violence.** When gunshot detection technology was first implemented by civilian law enforcement agencies, one of the primary purposes was to reduce gun violence. Studies to date have been inconclusive on whether this technology is successful in this aspect.<sup>xvii</sup> At the time of this report, it is still too early to conclude whether the use of ShotSpotter has been effective in reducing gun-related crime. Between 2020 and September 2023, there was little if any reduction in violent crime (Table 7). Furthermore, the COVID-19 pandemic is also a potential variable affecting the impact a gunshot detection system has had on gun violence and violent crime rates.

Table 7

	2020	2021	2022	2023	Total
Homicide	30	38	33	43	144
Rape	105	106	91	87	389
Robbery	336	240	286	252	1,114
Aggravated Assault	2,649	2,524	2,646	1,967	9,786

## SUCCESS STORIES

Success stories in this section demonstrate the effectiveness of the WSPD CGIC Initiative.

Figure 10

**SUCCESS STORY**


On December 9, 2021, at approximately 11:00 PM, a ShotSpotter alert was received for gunfire at 3025 N. Patterson Avenue. A patrol officer responded to the ShotSpotter alert around approximately 11:40 PM, communicating with dispatch operators who helped direct him to the location of the alert. ShotSpotter had indicated that the gunfire was detected in an open field across the road from where the officer parked his patrol vehicle. As the officer crossed the road and walked up an embankment towards the field, he heard a voice yell, "Help me!" At the top of the embankment, the officer saw a male lying on the ground who was bleeding heavily.

EMS was called while responding officers rendered aid, and shortly thereafter EMS transported the victim to the hospital. According to the initial responding officer, the victim was found exactly where the alert was pinned inside an 82-foot diameter generated by ShotSpotter. Had this been a regular 911 call about gunshots heard in a general area, the response time (including the location of the gunshot) would have been much longer, and the victim would have died.

Winstar-Saklen Police  
Bureau of Alcohol Tobacco, Firearms and Explosives  
Winstar-Saklen Police Department  
Real Time Crime Center  
NIBIN  
National Integrated Ballistic Identification Network




Figure 11




## SUCCESS STORY

### CASE SUMMARY — Bad JuJu


The Winston-Salem Police Department responded to multiple ShotSpotter alerts involving seven gunshot wound victims. The Real Time Crime Center (RTCC) assisted officers in identifying the suspect vehicle and developing suspect leads. Violent Firearm Investigations Team (VFIT) detectives were assigned the case and developed actionable leads to this investigation. A week after the initial incident, a juvenile victim was shot during another shooting incident. VFIT detectives were able to determine that [redacted] was a suspect in both incidents. Special Weapons and Tactics (SWAT) units were able to locate [redacted]. A search warrant at his location of arrest resulted in multiple firearms and narcotics seizures. [redacted] was found guilty on this series of incidents.




On 5/15/2022, ShotSpotter alerts indicated 95 rounds discharged in the area of Bethlehem Ln. Officers responded to multiple scenes around US 52, E 28th St., and Bethlehem Lane.




The investigation revealed that two uninvolved subjects were both shot in the head on US 52 while in their vehicle. On E 25th St., officers located 5 individuals suffering from gunshot wounds. 122 shell casings were seized from the scenes.




Officers located witnesses and surveillance footage from the RTCC of the incident. A white BMW vehicle was determined to be the suspect vehicle at all of the locations. RTCC surveillance footage showed firearms protruding from the roof of the vehicle while on 25th St.




The stolen suspect vehicle, a white 2011 BMW, was recovered a short time later, unoccupied on Comley St. with shell casings inside. Shell casings triangled from the stolen vehicle were determined to be from the same firearm used on Bethlehem Ln.




VFIT detectives were contacted by CrimeStoppers and multiple confidential informants. Intelligence was provided by sources indicating that a subject named "JuJu" was the suspect. Detectives determined "JuJu" to be [redacted].




On 6/23/2022, ShotSpotter alerts were received by officers near E 25th St. The investigation revealed that two white vehicles stopped in the area and exchanged gunfire. A female juvenile was struck by gunfire as well. Multiple casings were seized from the scene.



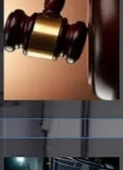
Warrants were drawn against [redacted]. SWAT officers located [redacted] on Eltha Dr. where he was taken into custody. A search warrant was executed at this location resulting in the seizure of two stolen firearms and trafficking levels of heroin.



Shell casings from E 25th St. and test fire cartridges from one of the stolen firearms from Eltha Dr. were placed into NIBIN. NIBIN Leads indicated that the stolen Taurus G3 firearm was used during the E 25th St. shooting involving the injury to the juvenile.




VFIT Detectives interviewed [redacted]. Mr. [redacted] denied involvement in either shooting incident. Cell phone analysis indicated that [redacted] was in the area of both incidents during their time of commission.



On March 2, 2023, Mr. [redacted] was found guilty and sentenced to serve an active prison sentence of 21 to 28 years.

Linked Suspects



**NIBIN Crime Gun** 220263, 220264, 220266

**CHARGES**  
Assault With Deadly Weapon Inflicting Serious Injury x 4, Discharging Firearm Into Occupied Dwelling x 4, Possess Stolen Motor Vehicle, Firearm By Felon, Trafficking Heroin






Figure 12

## SUCCESS STORY

### CASE SUMMARY— Moe's Chicken

A ShotSpotter Alert is received near a restaurant. Officers and detectives investigate and learn that [redacted] and [redacted] approached a black vehicle. As the vehicle left the area, [redacted] discharged a firearm at the vehicle multiple times. [redacted] attempts to fire a handgun but it malfunctions. Investigative measures were taken by VFIT Detectives, RTCC, and Gang Unit which resulted in [redacted] and [redacted] being identified as the suspects. Both [redacted] and [redacted] were charged with Firearm By Felon.





#### Linked Suspects



**CHARGES**  
Was charged with (2) Possession of Firearm By Felon, (1) Discharging Firearm in City Limits



**CHARGES**  
Was charged with (1) Possession of Firearm By Felon



**NIBIN**  
Shell casings from 3112 Indiana Av are traced. One representative exhibit is entered into NIBIN.



**POLICE INVESTIGATION**  
VFIT Detectives assume the investigation. VFIT reviews the surveillance footage and identify the three subjects as [redacted] and [redacted] is determined to be the shooter of the .40 caliber shell casings. [redacted] is observed possessing a handgun but it malfunctions.



Officers on scene locate and seize ten .40 caliber shell casings in the parking lot of the business. Officers locate surveillance footage of the incident showing three subjects approach the black vehicle. The black vehicle leaves and two of the subjects display firearms at the vehicle.



A ShotSpotter alert is received by [redacted] Communications on 11/7/2021 outside of a restaurant. Patrol units respond and determine that a subject discharged a gun at a black vehicle.



VFIT detectives and Gang Unit attempt to locate [redacted] is located. Odor of marijuana is coming from the residence. Officers and detectives observe a firearm in the vehicle of [redacted] VFIT detectives draft a search warrant for the home.



[redacted] was taken into custody by VFIT detectives. [redacted] admitted to discharging the firearm on 11/7/2021 at the restaurant. [redacted] was also arrested on a later date. [redacted] refused to speak with detectives.



On 11/22/2021, officers conducted a traffic stop. Officers seized a .40 caliber Glock handgun. The driver was interviewed by officers but provided no actionable information. The test fire was placed into NIBIN. NIBIN Leads link the gun to 40-caliber casings from the scene.

28



Figure 13

## SUCCESS STORY

### CASE SUMMARY — Teamwork Dreamwork

The Winston-Salem Police Department responded to N Liberty St. in regards to a shooting incident. Officers identified the two juvenile suspects within twenty minutes of the incident through witness statements, surveillance footage from the RTCC, and additional investigative strategies. The two juvenile suspects were interviewed and confessed to their involvement in the shooting. Multiple units including GCRU, Gang Unit, VFIT, and RTCC assisted with the investigation which led to juvenile petitions. NIBIN Leads linked the shell casings from the scene to the seized firearm. Both suspects were charged via Secure Custody Orders and await the judicial process.





WSPD officers responded to the area and assumed the investigation. Officers on scene located two shell casings in close proximity to the ShotSpotter alert. These casings were seized as evidence.



On 3/1/2023, officers were dispatched to a ShotSpotter alert on N Liberty St. Forsyth County deputies located a suspect suffering from a gunshot wound in his vehicle on N Liberty St.



The Real Time Crime Center reviewed surveillance footage in the area. RTCC officers and personnel located suspects fleeing the scene on foot into the Piedmont Circle neighborhood and into a residence.



The Gun Crime Reduction Unit, Gang Unit, SWAT, and patrol officers approached the residence and made contact with the juvenile subjects inside. The subjects met the descriptions of the suspects of the N Liberty St. shooting.



Officers transported the two juvenile suspects to the Public Safety Center. VFIT detectives responded and conducted an interview on both juvenile suspects.

### Linked Suspects

	<p><b>Juvenile 1</b> NIBIN Crime Gun 230102</p> <p><b>CHARGES</b> Assault With Deadly Weapon With Intent To Kill Inflicting Serious Injury, Possession of Stolen Firearm</p>
	<p><b>Juvenile 2</b> NIBIN Crime Gun</p> <p><b>CHARGES</b> Assault With Deadly Weapon With Intent To Kill Inflicting Serious Injury</p>





GCRU officers contacted Juvenile Justice. Secure Custody was granted and the suspects were transported to a juvenile justice facility.



The seized shell casing from the scene and the test fire cartridge from the stolen firearm were placed into NIBIN. NIBIN leads indicated that the shell casing came from the stolen firearm.



The Gun Crime Reduction Unit obtained a search warrant for the residence where the suspects were located. During the search, a stolen firearm was located. In addition, the clothing used during the robbery and shooting was located and seized.



During the interviews of the juvenile suspects, both juvenile suspects provided information indicating their involvement in the shooting of Mr. When interviewed the scene, Juvenile Suspect 1 discharged a round striking [redacted]



## CONCLUSION

The National CGIC Initiative focuses on the immediate collection, management, and analysis of crime gun evidence in real time, helping identify shooters, disrupt criminal activity, and prevent future violence. These National CGIC Initiative activities are accompanied by interagency collaboration.

WSPD incorporated multiple CGIC elements, beginning as early as 2018. Yet it was through the 2019 Local Law Enforcement Crime Gun Intelligence Center grant that the majority of CGIC elements were implemented as part of the WSPD CGIC Initiative. The initiative included enhanced collaboration with external agencies, use of emerging technology, greater evidence collection, case investigation, and information sharing, and more consistent performance measurement. These activities were also bolstered by the Department creating specialized units, streamlining investigative procedures, and hiring additional NIBIN personnel. They have made a measurable impact in getting guns and suspects off the streets, which is supported by the Success Stories section of this report.

Additional evaluation will provide the opportunity to analyze data and identify areas for improvement related to policy and procedure and other practices. WSPD intends to continue collecting and evaluating current performance metric data and tailor its policies and procedures accordingly. WSPD personnel involved in this initiative will continue monitoring prosecution and sentencing data moving forward since it is too early to accurately measure this aspect of the WSPD CGIC Initiative during this project period. Furthermore, WSPD will continue to provide annual updates to the Winston-Salem City Council to ensure that city leaders and community members stay informed.

Aside from prosecution and sentencing data, the initiative has had a positive impact. This report supports the conclusion that the WSPD CGIC Initiative has improved the Department's response to gun violence, particularly from an investigatory perspective.

## NOTES

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Appendix A

WSPD Firearm Recovery Questionnaire



**WINSTON-SALEM POLICE DEPARTMENT  
FIREARM RECOVERY QUESTIONNAIRE**

**Make**

**Model**

**Type**

**Caliber**

**Serial Number**

1. Have you ever been arrested? (Y / N)

---

2. Was the firearm loaded when it was recovered? (Y / N) How many rounds of ammunition were in the firearm?

---

3. Have you ever been convicted of a crime in a court of law? (Y / N) For what offense?

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4. Have you ever served time in jail for a conviction? (Y / N) If yes, where?

---

5. Is this your firearm? (Y / N) If no, who does the firearm belong to?

---

---

6. How long have you had the firearm? Do you let others use the firearm? ( Y / N )

\_\_\_\_\_

7. When has someone else possessed this firearm?

\_\_\_\_\_

8. Why are you in possession of the above-described firearm?

\_\_\_\_\_

9. Did you purchase the firearm from a (person/business)? If yes, please identify the person/business.

\_\_\_\_\_

10. How did you pay for the firearm?

\_\_\_\_\_

11. How much did you pay for the firearm?

\_\_\_\_\_

12. Are you currently under any restraining orders/protective orders/bond requirements that restrict you from possessing a firearm? ( Y / N )

13. When was the firearm issued? (Date/Location)

\_\_\_\_\_

14. Are you currently under any felony indictment(s)? ( Y / N ) For what charge?

\_\_\_\_\_

15. Do you have warrants? ( Y / N )

\_\_\_\_\_

16. Did you know about the warrant(s) prior to your dealings with Law Enforcement today? ( Y / N )

\_\_\_\_\_

17. Do you own other firearms? ( Y / N ) If yes, what type?

\_\_\_\_\_

---

18. Where are these additional firearms?

\_\_\_\_\_

19. Do you use illegal substances? ( Y / N ) If yes, what type of substances?

\_\_\_\_\_

20. How long have you used these substances?

\_\_\_\_\_

21. How often do you use these substances?

\_\_\_\_\_

\_\_\_\_\_  
Signature of Possessor

\_\_\_\_\_  
Date/Time

\_\_\_\_\_  
Officer Signature Unit/Code Number

\_\_\_\_\_  
Date/Time

---

**YOUR CONSTITUTIONAL RIGHTS**

Before we ask you any questions, you must understand your rights:

- You have the right to remain silent.
- Anything you say can be used against you in court.
- You have the right to talk to a lawyer for advice before we ask you any questions and to have them with you during questioning.
- If you cannot afford a lawyer, one will be appointed for you before any questioning if you wish.
- If you decide to answer questions now without a lawyer present, you will still have the right to stop answering questions at any time. You also have the right to stop answering questions at any time until you talk to a lawyer.

**WAIVER OF RIGHTS**

- I have read/been read this statement of my rights and I understand what my rights are. I am willing to make a statement and answer questions. I do not want a lawyer present at this time. I understand and know what I am doing. No promises or threats have been made to me and no pressure, force, or coercion of any kind has been used against me.

Signed: \_\_\_\_\_

Date & Time: \_\_\_\_\_

Witness: \_\_\_\_\_

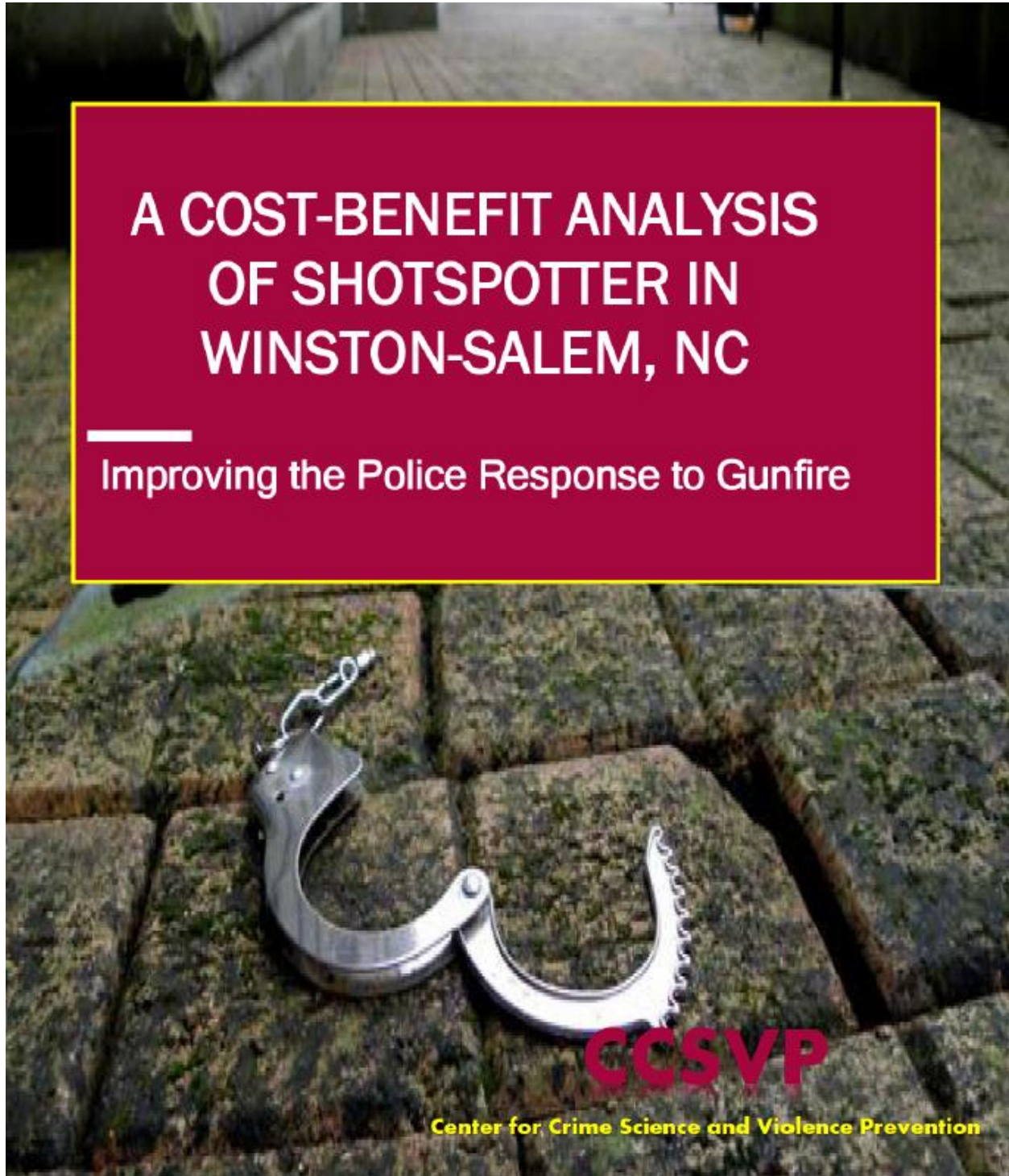
Witness: \_\_\_\_\_

Witness: \_\_\_\_\_

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Name:	Incident Report Number:
Alias:	Date & Time:
D.O.B.:	Interview Location:
Address:	Interview City/State:
City/State:	Interviewer:
Phone:	Charges:
Can You Read and Write:	Employment
Highest Grade Completed:	





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## INDEX

Executive Summary.	3
Introduction.	4
ShotSpotter in Winston-Salem, NC.	6
Responding to Gunfire Alerts.	8
Results of ShotSpotter Responses.	15
Crime Reductions.	18
Cost Impacts.	23
Conclusions and Recommendations.	25
Sources.	26

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## EXECUTIVE SUMMARY

ShotSpotter's gunshot detection system was deployed in Winston-Salem in August 2021. Since then, nearly 2,000 alerts received a response by Winston-Salem Police.

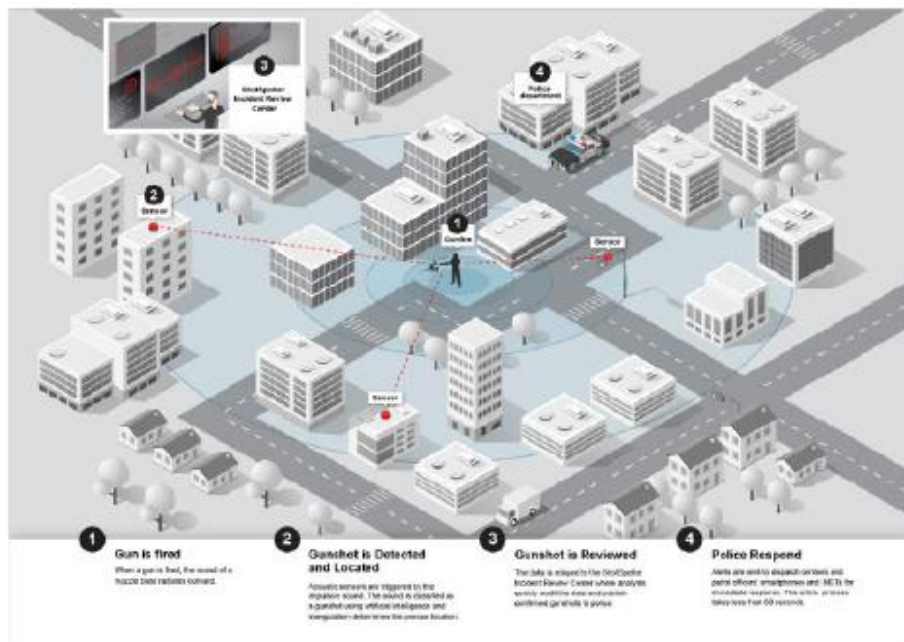
Results indicate:

- ❖ Improved response to gunfire
  - ◆ The response to alerts is significantly quicker than those called in by residents (- 5 min.).
  - ◆ ShotSpotter calls received significantly more investigative time, which likely indicates improved evidence recovery.
  - ◆ Fewer than one in four ShotSpotter alerts also received a call from residents.
- ❖ ShotSpotter produces the following actionable results:
  - ◆ Shell casings were recovered in 581 incidents (37.1%)
  - ◆ Firearms were recovered in 47 (3%) of alerts.
  - ◆ Sixty-seven (3.4%) gun-related arrests are connected to alerts.
- ❖ Deployment of ShotSpotter is related to a reduction in violent gun crimes:
  - ◆ Aggravated assaults are down 26% comparing before-after results in the ShotSpotter area.
  - ◆ Comparable area and overall city numbers indicate an increase in aggravated assaults during the same period. Comparatively assaults are down 38% in the ShotSpotter community.
  - ◆ In real numbers, there are between 51-75 fewer assaults annually in the ShotSpotter area than would be expected.
- ❖ Cost-Benefits:
  - ◆ Our estimate suggests that ShotSpotter may save the Winston-Salem community between \$5 and \$8 Million annually.
  - ◆ Average annual implementation cost is estimated between \$230,000-350,000
  - ◆ This indicates a \$15-25 return for each dollar spent.



## INTRODUCTION

ShotSpotter is an Acoustic Gunshot Detection System (AGDS) which uses multiple sensors to detect the location of gunfire. Upon positive identification of the sound patterns of gunfire, acoustic events are reviewed by ShotSpotter personnel for accuracy. Once a final determination is made an alert is forwarded to the police agency. Alerts are typically forwarded to dispatchers, also officers may receive notifications directly on their Mobile Data Terminals (MDTs) or mobile phones. Alerts include precise location data, the number of rounds fired and an accurate time stamp of the incident. Audio of the incidents can be streamed as well.



**Figure 1. Gunshot detection**

Source: <https://www.shotspotter.com/law-enforcement/gunshot-detection-technology/>

ShotSpotter systems have been deployed in well over 130 cities in the US and the company is currently the leading vendor for gunshot detection systems. While gunshot detection has been criticized for being inaccurate and leading police to many so-called 'false positives'- reported gunfire that turned out to be other loud sounds- this is not supported by recent research (Mares, 2022). In fact, the accuracy of the system appears quite precise (Watkins et al., 2002).

---

ShotSpotter also utilizes human reviewers to further limit false positives. Gunshot detection has typically been viewed positively by community residents (Haberman et al., 2020; Vovak et al., 2021). Moreover, 2/3 of the general public supports the use of the technology by police<sup>1</sup>. There are, however, some limitations to these systems. For example, they are unlikely to detect indoor gunfire but also have difficulty picking up gunshots fired from a vehicle.

Even though gunshot detection systems are primarily deployed to reduce gun violence, academic research has found mixed results with respect to crime reductions (*cf.* Lawrence et al., 2019; Mares & Blackburn, 2021; Mares, 2023). Implementation differences, however, may explain the degree of success and agency experiences. There is little doubt, however, that gunshot detection improves the speed and precision of the response (Piza et al., 2023).

Below we will quantify some of the results ShotSpotter has brought to the City of Winston-Salem and how it has impacted police practices and outcomes. A cost-benefit discussion will also be provided.

<sup>1</sup> <https://morningconsult.com/2021/09/13/data-privacy-security-gunshot-detection-technology-poll/>

## SHOTSPOTTER IN WINSTON-SALEM, NC

In August 2021 ShotSpotter provided Winston-Salem with a 3 square mile area of coverage for its gunfire detection system. The area covered is located just North-East of Downtown, South-West of Smith Reynolds Airport and intersected by Highway 52<sup>2</sup>.

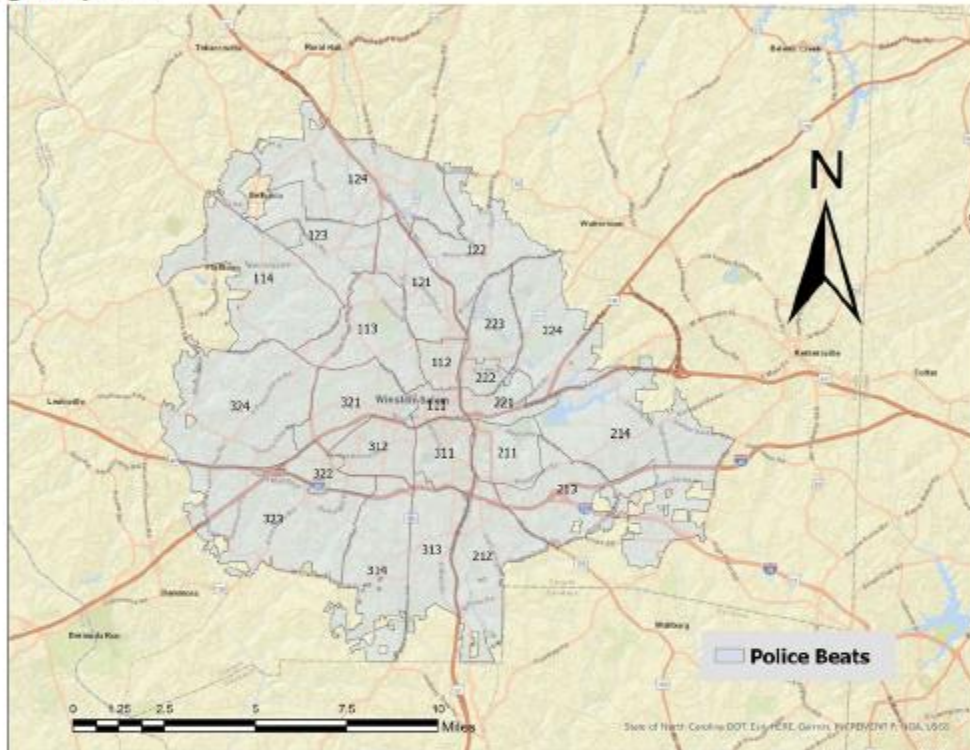


Figure 2. Winston-Salem Police Beats.

Between late August 2021 and December 31<sup>st</sup>, 2022, Winston-Salem Police Department (WSPD) responded to nearly 2,000 ShotSpotter alerts. In this report we detail the initial results of the technology and the WSPD response to these alerts. We will conclude with a cost-benefit assessment of the technology and implications for current policies and practices.

<sup>2</sup> Please note that the exact coverage area of ShotSpotter is law enforcement sensitive information and therefore not shown.



## RESPONDING TO GUNFIRE ALERTS

Winston-Salem PD officers responded to a large number of ShotSpotter alerts in the area that received coverage, but simply responding, of course, does not mean that this is an effective or efficient use of officer time (Blackburn & Mares, 2019). Below we detail some important metrics that provide better context for the data.

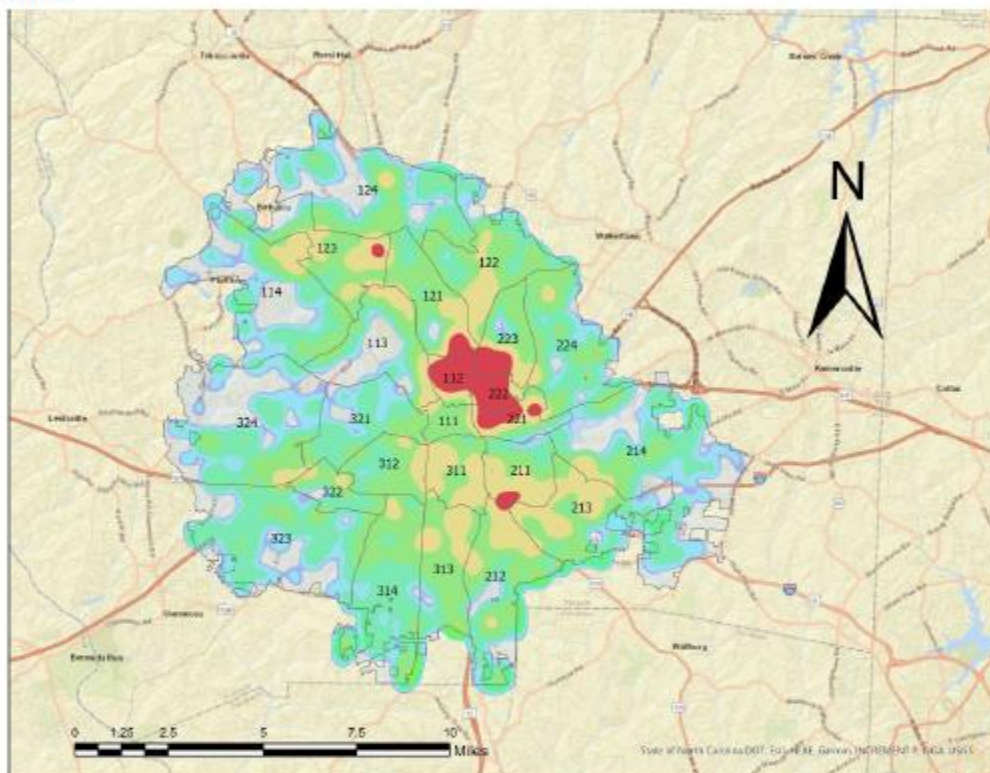


Figure 3. Violent Crime Hot Spots in Winston Salem (red is high violence, blue is low violence).

To make comparisons more meaningful we created a comparison area that shares some key characteristics with the area covered by ShotSpotter. Although no area in Winston-Salem has quite the density of gun-related crimes as the ShotSpotter area we did find an area that has a relatively higher density of gun-related crimes, including several pockets of multi-family housing with even extremere densities (see figure 3). This comparison area is south of Downtown and east of Highway 52, running primarily along Interstate 40. The comparison area is a bit larger than the ShotSpotter area, 4.5 versus 3 square miles, yet both have fairly equitable numbers of calls for service for gunfire and

a reasonably similar number of violent crimes (see table 1 below). That does not mean the two areas are completely comparable but given that implementation of ShotSpotter occurred in the area of highest need, this is the closest comparison we are able to find and better as a comparison against overall city data alone. Both areas share a large proportion of violent and gun offenses in Winston-Salem. Combined they account for 30% of gunfire related calls for service (excluding ShotSpotter alerts) and 33% of violent crimes (excluding sexual assaults) within the city limits.

INCIDENT TYPE	SHOTSPOTTER AREA	COMPARISON AREA	REST OF CITY
DFSA	883	1,012	5,015
DFSAD	238	244	702
SHOOTING*	156	95	354
<b>TOTAL CFS</b>	<b>1,277</b>	<b>1,351</b>	<b>6,071</b>
MURDER <sup>1</sup>	18	13	45
ROBBERY	76	46	364
ASSAULT	508	378	1709
<b>TOTAL CRIME</b>	<b>602</b>	<b>437</b>	<b>2,119</b>

**Table 1. Comparison of Calls for Service / Crimes 2020-2022**

\*Shooting includes call codes for: drive by shooting, person shot and GSW.

<sup>1</sup>. Crime data ends on Dec 13<sup>th</sup> 2022, and thus does not include the full year.

Figures 4 and 5 below show some interesting patterns when ShotSpotter was activated. In the ShotSpotter area, for example, we see a large drop in Discharging of a Firearm calls for service (DFSA). While those numbers were already trending down somewhat, they really took a dive a few months into implementation and remained extraordinarily low from there. By contrast (figure 6), the comparison area shows mostly steady patterns with a bit of an increase in gun discharges that caused property damage (DFSAD). A rapid decline in what are essentially shots fired calls by the public was also seen in St. Louis



(Mares & Blackburn, 2021) and should not simply be taken as evidence that gun crimes are down. Rather, it may suggest that calls by residents are replaced by ShotSpotter alerts, which now outweigh prior levels of calls by residents.

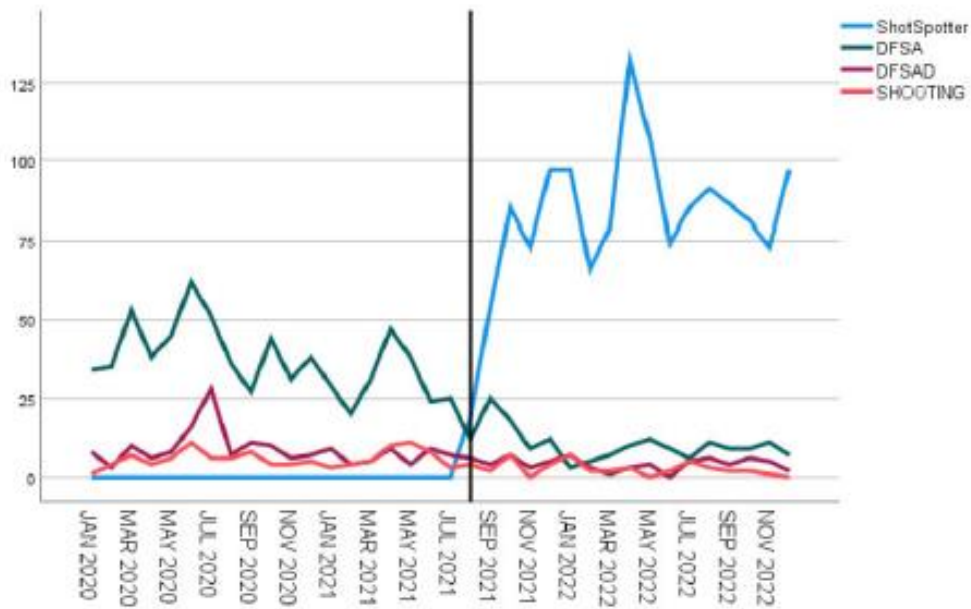
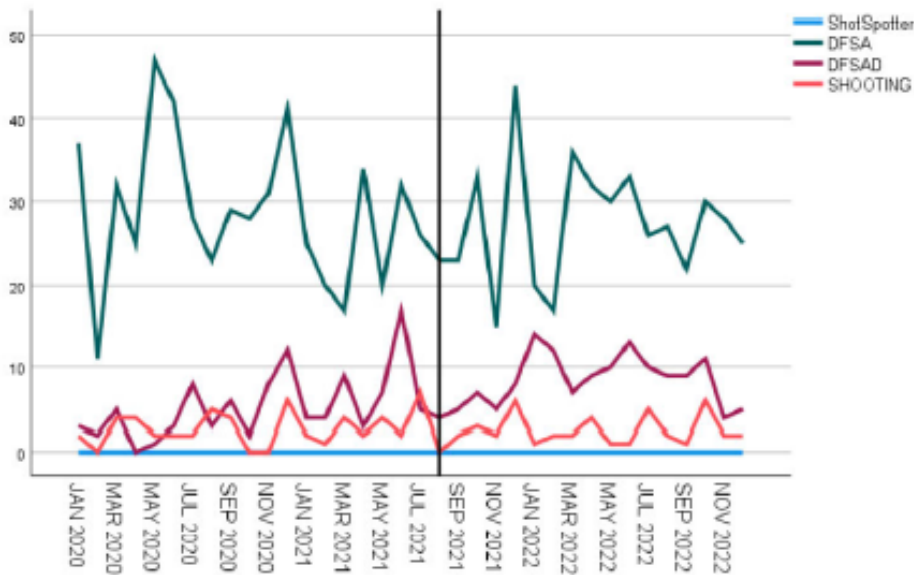


Figure 4. ShotSpotter Area. Monthly trends in gunfire related calls for service.



**Figure 5. Comparison Area. Monthly trends in gunfire related calls for service.**

To explore how ShotSpotter impacts the response to gunfire we first examine response-time information, comparing discharging events reported by community members to ShotSpotter alerts. In table 2 below we can see that ShotSpotter alerts get dispatched more than 5 minutes faster than calls by residents, which is statistically significant. While travel time to the scene of a gunfire incident takes slightly longer for ShotSpotter alerts, this difference is only 13 seconds. This means that from the time a gun is fired to the moment police arrive, ShotSpotter responses receive a 5-minute advantage.

Interestingly also is that ShotSpotter investigations appear to take much longer (7+ minutes) than calls from community members. This makes some sense as knowing the precise location of gunfire increases the chances of finding evidence.

	SHOTS FIRED (DFSA)	SHOTSPOTTER ALERTS
DISPATCH TIME	8.84	3.62***
TRAVEL TIME	6.75	6.87*
INVESTIGATIVE TIME	41.06	48.29**
TOTAL TIME	54.79	55.65
CASES	168	1,395

**Table 2. Calls for service times in minutes in ShotSpotter area.**  
 Statistical significance is based on Mann Whitney U tests: \* p<.05, \*\* p<.01, \*\*\* p<.001

What the prior table does not tackle is whether the implementation of ShotSpotter has implications for how gunfire is responded to. To do so we compare response times before and after ShotSpotter implementation for several areas in Winston-Salem. Here we focus on gunfire-related calls (ShotSpotter and DFSA) for service. Table 3 below shows that the area covered by ShotSpotter has a significantly lower dispatch time, but significantly longer travel, investigative and consequently total time. Interestingly, dispatch times lengthened significantly in both the comparison and remainder of Winston-Salem, which makes the time-saving even more impressive. Where prior to ShotSpotter, dispatch times were within a minute of each other across the three different areas, after implementation, the ShotSpotter area dispatched calls for service in nearly half the time, or 4 minutes faster.

	BEFORE	AFTER
<b><i>SHOTSPOTTER AREA</i></b>		
DISPATCH	5.77	4.19***
TRAVEL	5.53	6.85***
INVESTIGATIVE	42.78	47.51***
TOTAL	53.03	55.56***
CASES	715	1563
<b><i>COMPARISON AREA</i></b>		
DISPATCH	6.77	8.277**
TRAVEL	7.73	7.64
INVESTIGATIVE	35.05	34.54
TOTAL	48.01	54.92
CASES	560	451
<b><i>REST OF CITY</i></b>		
DISPATCH	6.07	8.92***
TRAVEL	8.59	9.22***
INVESTIGATIVE	33.20	35.40***
TOTAL	46.69	53.95***
CASES	2845	2349

**Table 3. Comparison of calls for service times before/after ShotSpotter implementation.**  
Statistical significance is based on Mann Whitney U tests: \* p<.05, \*\* p<.01, \*\*\* p<.001

Interestingly both the ShotSpotter area and the rest of the city experienced an uptick in the time it took officers to get to the scene of an incident. While it is easy to read too much in these numbers, we suspect the increased travel times may simply be an outcome of declining officer numbers. As police agencies face growing attrition this is not terribly surprising. Investigative times changed significantly for both the ShotSpotter area and the rest of Winston-Salem with the former increasing proportionally the most. We believe this is likely an outcome of the more serious nature of incidents in the ShotSpotter area which requires more resources, but also may be connected to the fact that the proportion of ShotSpotter calls to DFSA calls in that community is severely out of balance.

---

In sum, results of response times indicate that implementation of ShotSpotter fundamentally altered the times it takes police to get to gunfire and how long police investigate the crime scene. These results stand in contrast to the comparison area, which saw the exact opposite. It is fair to read such results as a positive development and improving the WSPDs ability to better serve the community. While the geographic accuracy and reporting speed of ShotSpotter is probably a large benefit to police, crucial information about shootings is often relayed by community members. Keeping residents connected to police and reporting gunfire is therefore extremely important.



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## RESULTS OF SHOTSPOTTER RESPONSES

Because a new ShotSpotter Alert can be generated after a few second pause in gunfire it is important to clean ShotSpotter data prior to further use. We therefore remove alerts that occurred within 30 minutes and 500ft of one another to create a better representation of the number of unique gunfire incidents (Huebner et al. 2021). Out of the 1,965 alerts recorded we found that they represented 1,595 distinct incidents. A few alerts lack additional data, mostly recent cases for which all investigative details may not have been available, and are also excluded from analysis. According to data tracked by WSPD, out of 1,567 unique shooting incidents with complete data, firearms were recovered in 47 (3%) incidents, and casings were recovered in 581 incidents (37.1%) with a total of 1,577 casings. We should point out as well that the number of casings recovered by responding to ShotSpotter alerts (3 sqm) nearly matches the 2,101 casings found by responding to calls for service from the community in the entire city (134 sqm)

Like other cities, few of gunfire incidents in Winston-Salem also generated calls for service from community members (Huebner et al.,2021; Mares 2022). In only 287 (18.3%) cases was a ShotSpotter incident accompanied by a community call. Crime-wise, ShotSpotter alerts were connected to 41(2.6%) aggravated assaults, 3 robberies and 7 homicides. Seventeen initial (1%) arrests were enacted, which is higher than reported in other locations (Mares & Blackburn, 2021), but this only counts arrests made during the initial response. A combined total of 67 (3.4%) gun-related arrests were made in connection to responding *and* investigating ShotSpotter alerts, suggesting that benefits of the system may extend beyond the initial response.

Delving a bit more into the data we also look at which factors may explain why some ShotSpotter incidents may be more likely reported by residents. To do so a statistical model was developed that measures the likelihood of a ShotSpotter alert also receiving a report by a community member (yes/no). We explored several possible explanative factors including: (1) the total number of rounds fired during the incident (2) the number of ShotSpotter alerts per incidents, (3) whether the alert led to the scene of a violent crime and (4) temporal variation (month, day of the week and hour of the day) as there is

quite a bit of variability in when alerts occur (see figure 6 below, for example).

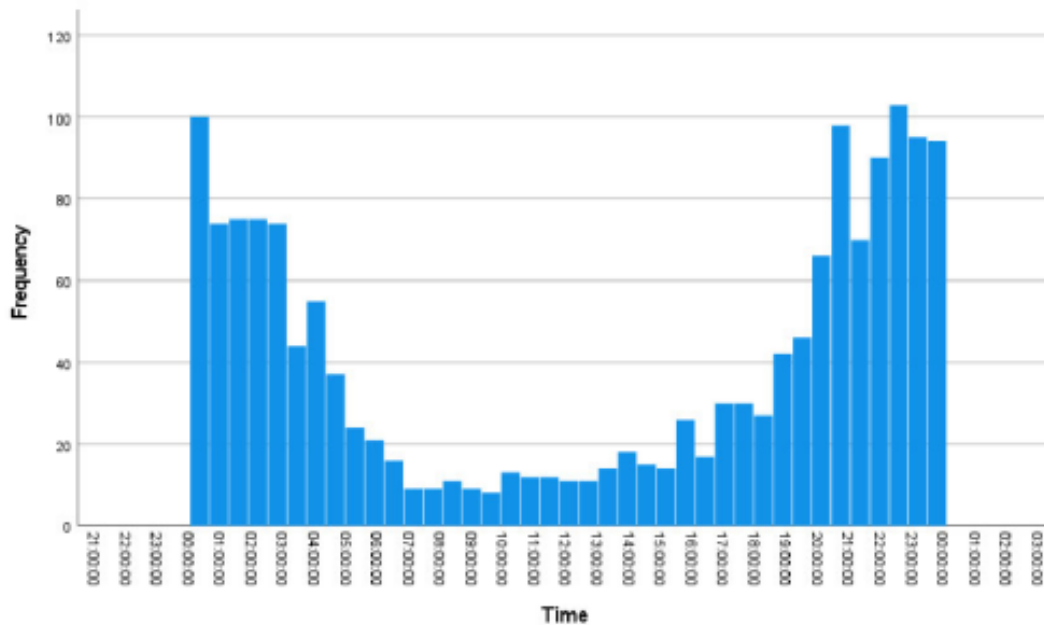


Figure 6. Time chart of ShotSpotter alerts.

Findings of the statistical analysis indicate that the only statistically important factors impacting reporting by residents is the number of rounds fired during an incident *and* whether the incident was connected to a violent crime (assault, homicide or robbery). Each additional round fired increases the likelihood of receiving a community call by around 13%. This is not surprising; more rounds mean more clarity on whether a loud sound is actually gunfire and also increase the chances that more people heard the gunshot. Violent crimes are also far more likely to receive calls from the community, probably because victims or bystanders notify 911. Our analysis suggests that violent crimes are 14 times more likely to be called in by community members than gunfire incidents without a victim.

In more tangible terms, 78.4% of ShotSpotter alerts in which a serious violent crime occurred receive a community call, whereas only 16.3% of gunfire incidents without a victim generate such a call. This also means that nearly ¼ of crimes did not receive a call from the public and that ShotSpotter alerts provided a faster response for victims. Some may not have been uncovered altogether, or failed to yield a crime scene. A good number of assault victims often show up at hospitals and refuse to cooperate with police, which can leave the crime scene unknown and hampering investigations (Mares, 2022).

## CRIME REDUCTIONS

One of the key reasons police departments purchase gunshot detection is to tackle gun-related violent crime (Mares, 2023). Winston-Salem only has had ShotSpotter for a little over a year, which makes extremely thorough approaches to measure the impact not quite feasible yet. We can, however, provide some initial insights into the efficacy of ShotSpotter by comparing before and after levels of violent crimes.

Below (figures 7-9) we compare multiple crime incidents in the ShotSpotter area, the comparison area and remainder of the city. First let's examine total DFSA, or illegal discharging of a firearm<sup>3</sup>. In the ShotSpotter area a substantial uptick in such incidents occurred once ShotSpotter became active (represented by the black vertical line). Reported incidents increase from around 30 to about 70 per month. This is not surprising as ShotSpotter uncovers more such events. In the comparison area, the number of such incidents appears mostly stable, with no discernable trend. The remainder of the city also looks fairly stable with perhaps a bit of an overall upward trend, but clearly nothing comparable to the substantial break seen in the ShotSpotter area.

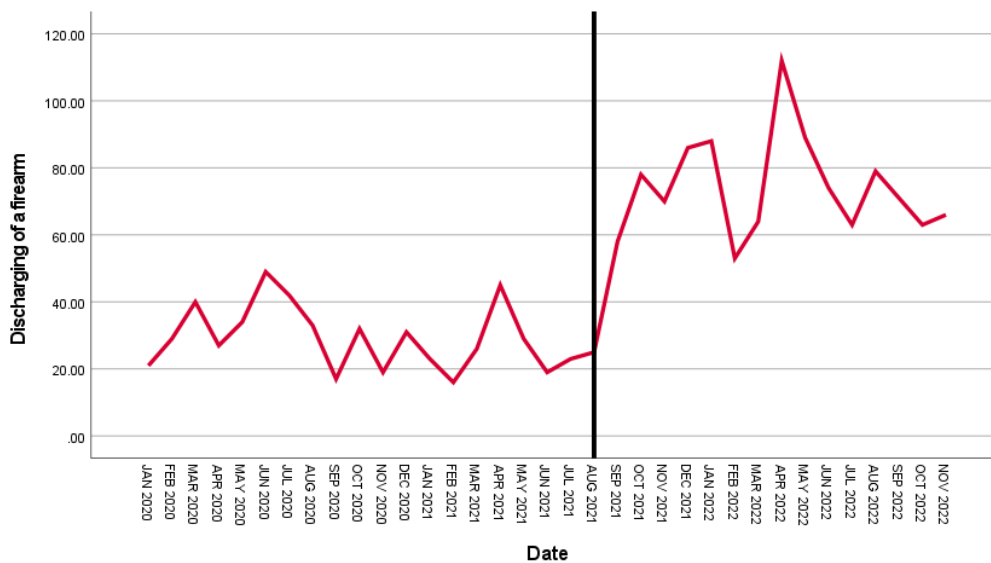


Figure 7. Discharging incidents -ShotSpotter Area.

<sup>3</sup> In WSPD RMS system this includes ShotSpotter alerts that are sustained as such, but also other calls for service in which a firearm was found to be discharged but in which no person was injured.



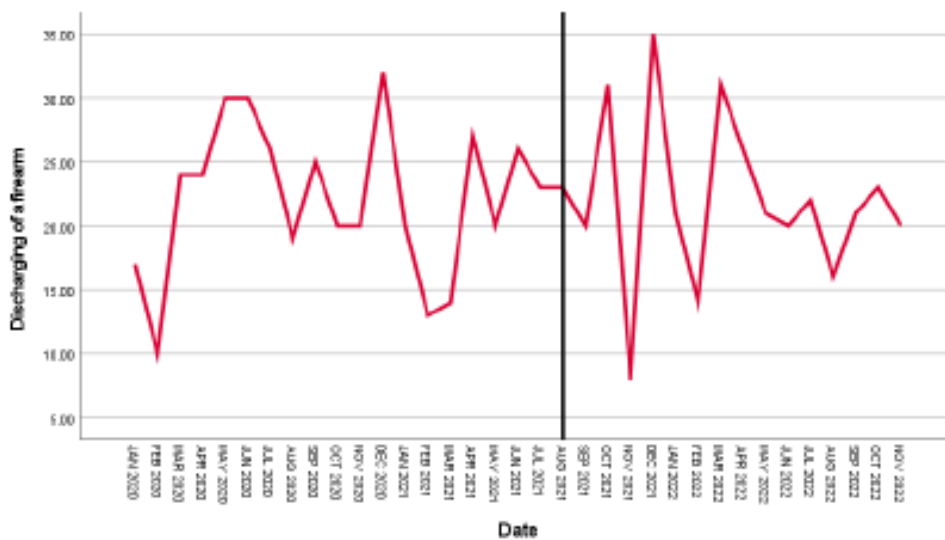


Figure 8. Discharging incidents - Comparison Area.

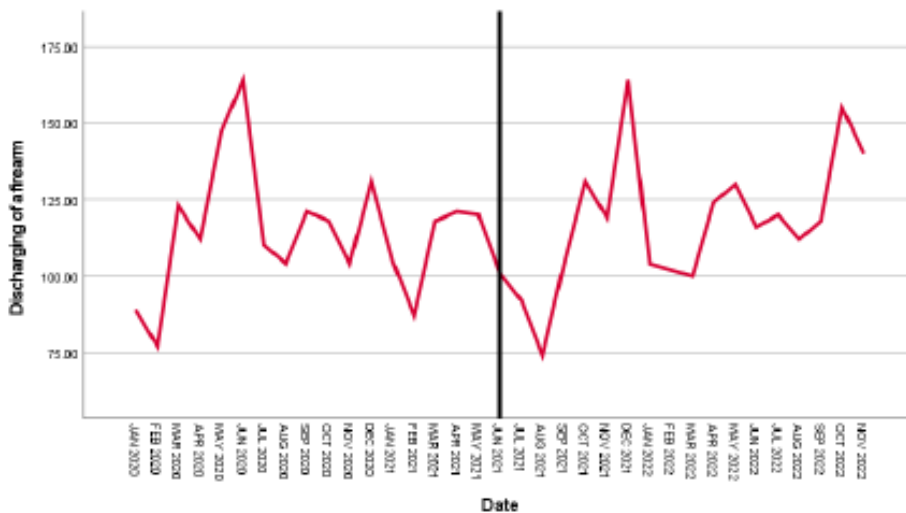
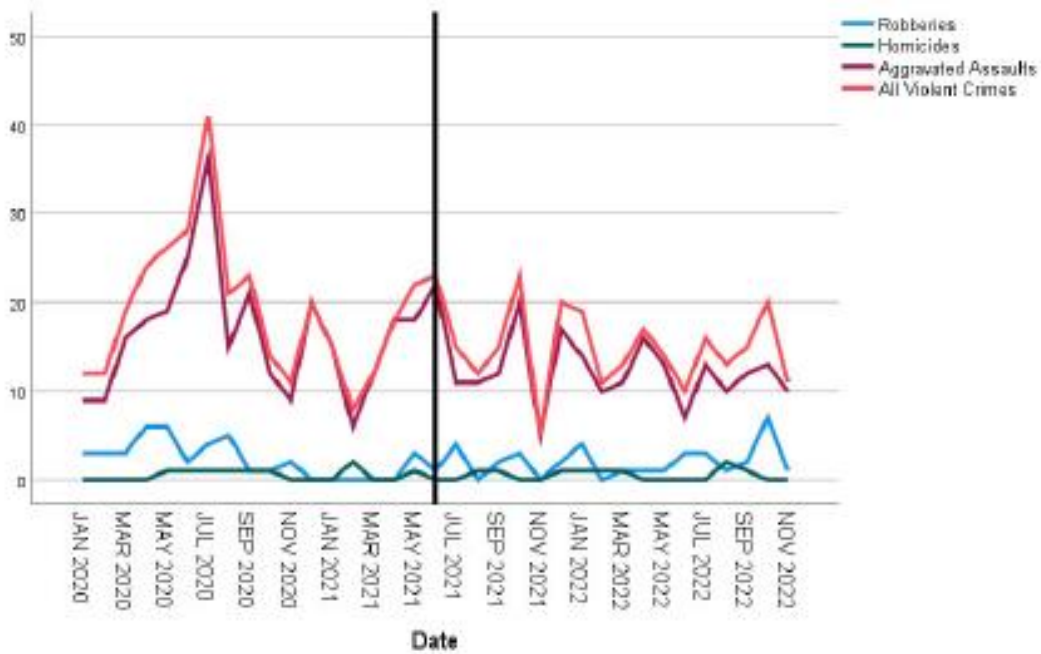
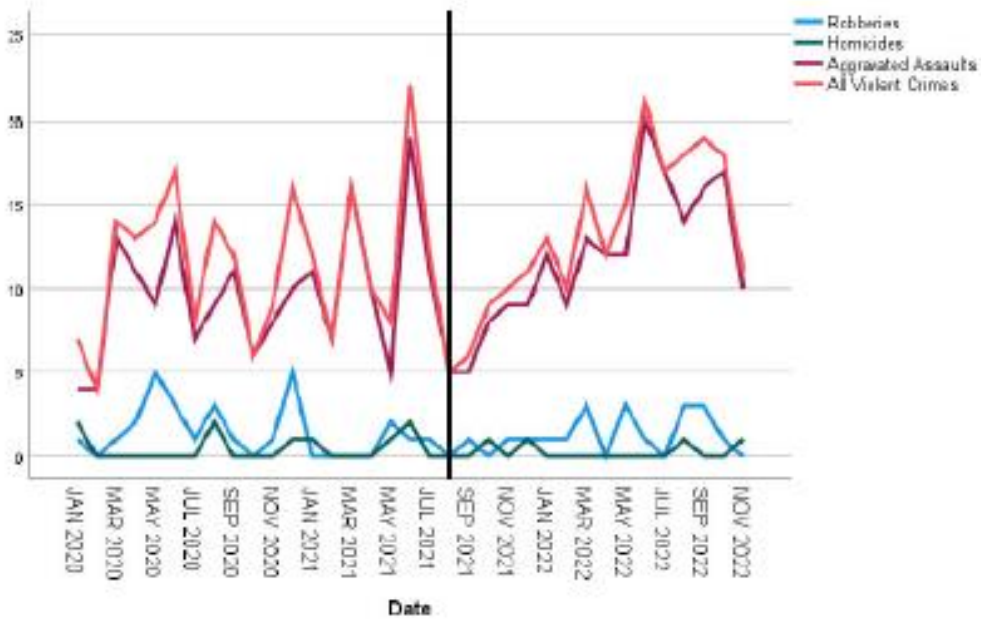


Figure 9. Discharging incidents -Remainder of City.

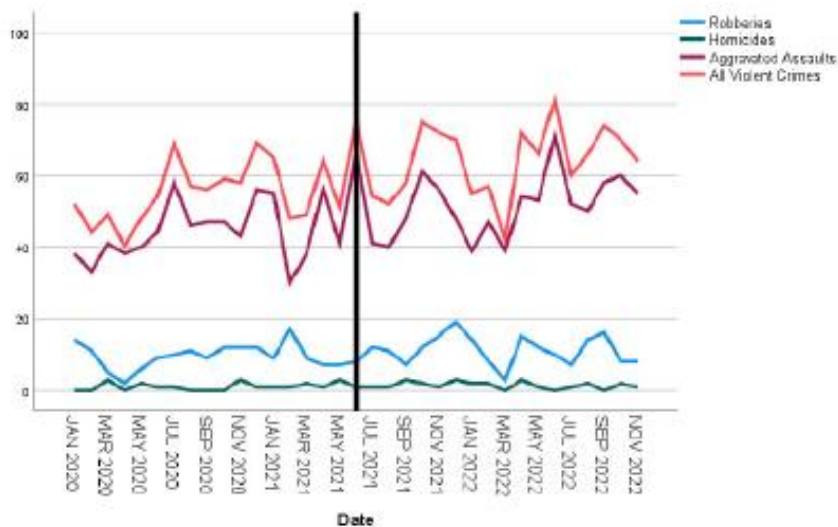
Turning to more serious violent crime committed with a firearm: homicides, robberies and aggravated assaults (see figures 10-12 below). For the ShotSpotter area we observe lower levels of aggravated assaults after ShotSpotter implementation but see no changes in trends in homicides and robberies, which is most likely an outcome of the relative rarity of these events. By contrast the comparison area and the remainder of Winston-Salem display a growth in assaults levels. What is more, because aggravated assaults are most numerous, they dominate the results we see for the combination of all three violent gun crime types.



**Figure 10. Violent gun crimes -ShotSpotter Area**



**Figure 11. Violent gun crimes - Comparison Area**



**Figure 12. Violent gun crimes -Remainder of City**

That said, trends lines are often subjectively interpreted, so it is important to examine whether the trends we described can be verified in statistical analysis. To this end we perform a statistical test (independent t-test) that compare average crime levels before and after ShotSpotter implementation.

Crime Type	SST area	Comparison area	Rest of City
<i>Robbery-Pre</i>	2.32	1.42	9.58
<i>Robbery-Post</i>	1.94 (-16%)	1.19 (-17%)	11.19 (+17%)
<i>Homicide-Pre</i>	.47	.47	1.11
<i>Homicide-Post</i>	.56 (+19%)	.25 (-46%)	1.50 (+35%)
<i>Assault-Pre</i>	16.37	9.74	45.16
<i>Assault-Post</i>	12.13* (-26%)	11.75 (+21%)	51.94* (+15%)
<i>Violent-Pre</i>	19.16	11.63	55.84
<i>Violent-Post</i>	14.63* (-24%)	13.19 (+13%)	64.63* (+16%)
<i>Discharge-Pre</i>	29.21	22.11	112.84
<i>Discharge-Post</i>	71.19***(+143%)	22.00 (0%)	119.56 (+6%)

**Table 4. Comparison of before/after crime levels.**

Statistical significance is based on independent t-test: \* p<.05, \*\* p<.01, \*\*\* p<.001

---

The results indicate that the ShotSpotter area experienced substantial changes in crime incidents and those changes are consistent with those seen in the earlier trend graphs. We should caution to readers that both robbery and homicide are relatively rare for the ShotSpotter and comparison areas and that proportionally large swings in those numbers are expected, we therefore encourage interpretation primarily focus on the more numerous categories of aggravated assault and discharging of a firearm.

For aggravated assaults the ShotSpotter area displays a statistically significant reduction when comparing before/after ShotSpotter implementation, with an average reduction of around 26%. By contrast the comparison area exhibits a non-significant increase of 21% and the remainder of the city experienced a significant 15% increase.

If we take the results from comparison area (+21%) as the likely change the ShotSpotter area would have experienced without the technology the overall comparative reduction for the ShotSpotter area equals 38%<sup>4</sup>, which is a substantial number and comparable to results found in Cincinnati (Mares, 2023). When examining violent crime (combining robbery, homicide and aggravated assaults) a similar conclusion may be reached, which also shows the relatively small numerical impact that robberies and homicides have in overall levels of violence. The ShotSpotter area displays a 24% reduction in mean monthly violence numbers, whereas the control area and the remainder of the city experienced a 13% and 16% uptick respectively. Again, considering the comparison area as a benchmark for expected changes in violence levels, the overall likely contribution of ShotSpotter would indicate a comparative 32% reduction.

For discharging of a firearm events the situation is quite different. Here the ShotSpotter area shows a very large and statistically significant increase, more than doubling prior levels. Both the comparison area (0%) and the remainder of the city (+6%) show a fairly stable picture. While these data might be viewed by some as alarming, they are in fact not; in fact, these results are in line with prior work (Mares & Blackburn, 2021) and a simple outcome of more events being reported and sustained through ShotSpotter. The increase is most likely not an actual increase in people discharging firearms, but merely a reduction in underreporting that is common for such crimes.

<sup>4</sup> Assuming the ShotSpotter area would also have experienced a 21% increase, it would have experienced 19.8 assaults instead of the 12.1 reported, which is a 38% reduction from expected.



---

What is not included above is a small but potentially important impact the improved speed of the police response may have. Several medical studies have pointed out that a quicker response may -in some cases- prevent death or serious permanent disability to victims of gun violence (Goldenberg et al., 2019; Gontarz et al., 2021). Indeed, WSPD identified two cases in which victims received faster medical care that according to medical professionals likely saved their lives; in one case only a ShotSpotter alert led to the victim. While in such cases ShotSpotter may not prevent crime, it reduces the seriousness of the victimization and the severity of harm. Not only does this have positive effects for victims, the cost-savings of preventing lives lost through improved access to medical care is potentially substantial. Considering that the societal cost of a homicides are easily in the millions, but assaults cost only a fraction of this could have substantial repercussion for the overall cost impacts of gunshot detection systems. The problem is that making this argument can only be robustly done with a large sample of data, likely involving multiple cities and a substantial period of observations.

We would be amiss not to point out to some limitations in the analysis. The amount of data is limited, which prevents more robust types of analysis. Also, the comparison area is not fully comparable to the ShotSpotter area, which could under- or overstate the differences. What is more, 2020 data are likely still very much impacted by COVID-19, which may explain some of the reductions in 2021, even though these were not seen city wide or the comparison site. In short, some caution should be given to the conclusions, and they should be regarded as indicative, but not definitive.

---

## COST IMPACTS

Because aggravated assaults are the driving force of violent crime trends in both the ShotSpotter and Comparison area and because this category in particular show significant reductions in crime after implementation of ShotSpotter we can use this to calculate the impact of ShotSpotter on the cost of crime. To do so we can use two established methodologies to explore: (1) estimated additive cost and (2) Willingness-To-Pay estimates. Additive cost approaches are essentially a simple tallying of all the costs that are incurred by crime, such as medical cost, lost wages and criminal justice related costs. Willingness-To-Pay (WTP) approaches rely on economic research that suggests a simple additive cost approach may be less accurate as it does not reflect the subjective value that people assign to crime concerns. WTP estimates instead rely on asking a large number of people how much they are willing to pay for a specific percentage crime reduction.

For an estimated additive cost, we use data from Rand, which estimates the average cost of an Aggravated Assault at \$128,937.40<sup>5</sup>. Because the cost of living in Winston-Salem is lower than the national average, we adjust for this<sup>6</sup> and derive a localized cost of \$104,826.11 for each aggravated assault. Using the pre-ShotSpotter average **annual** number of assaults in the ShotSpotter area (196.44) and factoring in just the raw crime reductions achieved (-26%) this represents a reduction of 51 aggravated assaults per year, or an annual cost-savings of \$5,353,931. If we incorporate the fact that crime went up in the comparison area and use the comparative reduction of 38% this would suggest 75 fewer assaults per year, or a cost-saving of \$7,861,958

Using WTP estimates from Cohen et al. (2004) we find that serious assaults are estimated here to cost an inflation-adjusted average of \$124,063.39. Adjusted for the cost-of-living in Winston-Salem this brings us to an estimated cost per aggravated assault of \$100,863.54. Using again, both the raw and comparative crime reductions calculated this means a cost savings between \$5,144,041 and \$7,564,766.

Of course, ShotSpotter costs money and so does the response to the additional gunfire incidents as well as the increasing demand for evidentiary

<sup>5</sup> <https://www.rand.org/well-being/justice-policy/centers/quality-policing/cost-of-crime.html> with inflation adjusted using <https://data.bls.gov/cgi-bin/cpicalc.pl?cost1=87%2C238.00&year1=200701&year2=202301>

<sup>6</sup> [https://www.bestplaces.net/cost\\_of\\_living/city/north\\_carolina/winston-salem](https://www.bestplaces.net/cost_of_living/city/north_carolina/winston-salem)

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processing. The current ShotSpotter contract for Winston-Salem costs the city about \$205,000 per year. In addition, the WSPD will respond to additional calls for service (ShotSpotter alerts). While this does not incur additional personnel costs -they are already on duty and responses are primarily in otherwise low volume hours (see figure 6), it will incur additional wear and tear on vehicles and increase gas usage. Using the federal mileage rate of 58.5 cents/mile (2022) we can estimate -very roughly- the cost of the immediate response. Assuming an average speed of 45 miles per hour, or .75 miles per minute the average travel distance to and from a ShotSpotter alert is  $2x (.75 \times 6.87) = 10.3$  miles, or a cost of \$6.03. multiplying this by the number of alerts per year (1,500) this would only add just over \$9,000 for a single vehicle response. However, it is more likely that two vehicles may respond (supervisor) and in some cases additional vehicles may be needed. To be conservative we believe it is reasonable to put vehicle related response cost at around \$25,000.

What is less clear is what the cost of evidence processing may be. ShotSpotter delivers a substantial increase in casing recoveries. From August 2021 through the end of 2022, records show ShotSpotter alerts led to recovery of 1,577 shell casings, compared to 2,101 casings recovered in the entire city through conventional means. Estimating the cost of processing these rounds is not simple, as it involves handling by personnel to file and trace the casings as well as the cost of the machines that perform the tracing. What is more, not all casings recovered will need tracing, some are too deformed to reliable match, some may be part of a large number of similar rounds. Just the same if we want to be extremely conservative and price processing for each casing at \$100, the total cost is still fairly non-consequential for the overall cost-benefit picture. Annualizing the casings recovered would mean about 1,200 casings per year at a cost of \$120,000.

In sum, while the cost-savings, based on crime prevention can be estimated anywhere between \$5,144,041 and \$7,861,958, the costs of increased surveillance and enforcement are only in the range between \$230,000 and \$350,000 per year. It should be pointed out, however, that while the savings are shared by all in Winston-Salem, the costs are entirely on the WSPD side.

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## CONCLUSIONS AND RECOMMENDATIONS

Results of our analyses show positive results from WSPDs implementation of ShotSpotter's acoustic gunshot detection system. The data indicate a substantially faster response time (~5 minutes) in the ShotSpotter area and a reduction in serious violent crimes committed with a firearm (26-38% reduction in aggravated assaults with firearm). Anecdotally the system also improves health outcomes for victims of gunfire, but this is more difficult to establish with current data. Finally, the system appears to improve investigative outcomes by returning substantially more shell casings and increasing arrests for gun-related offenses. These results are most certainly encouraging and indicative of a sound implementation by WSPD.

As our results indicate, the benefits of ShotSpotter certainly appear to outweigh the cost of the city's investment in the technology with a net annual gain to society of about \$5-8,000,000 and a cost between \$230,000 and \$350,000. Even at the lower end of our estimate the implementation of the system indicates a 15 dollar return for each dollar spent. That by all accounts appears to be a solid investment in limited resources. We believe it is therefore reasonable to support continued investment in the technology by WSPD.

We should acknowledge, however, that the current data are somewhat limited for a more comprehensive evaluation, and we encourage WSPD to continue to track its successes with the system and reevaluate the cost-benefits on an ongoing basis. That said, results are in line with other agencies that have shown adherence to best practices, such as Cincinnati (Mares, 2023).

In sum, ShotSpotter deployment in Winston-Salem shows strong potential and initial success based on the current data. We encourage a more extensive evaluation around the 3-year mark when more data has accrued, and a more detailed analysis is feasible. We also commend WSPD for its tracking of the data and the results connected to their response to ShotSpotter investigations. Close tracking of these results is important because crime reductions by themselves may not only be rooted in deterrence, but also in investigative work. Here we would encourage the department to track how ShotSpotter generated evidence (casings and alert data) assist in prosecution of gun offenders. This will likely become more important over time but can provide insights beyond those examined here.

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CCSVP works with Criminal Justice agencies and community organizations to reduce violence and evaluate ongoing efforts to minimize gun violence. We believe in collaborative, evidence-based and data informed actions to serve public interests and those working in the criminal justice field.

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