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Research on a 15-Year Statewide Program to Generate Enhanced Investigative Leads on Crime Gun Violence

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Abstract

Statement of Purpose

This study examines the innovative use of firearms related evidence to enhance violent crime investigations in New Jersey. The study integrates firearms evidence, particularly shootings event information, ballistics imaging and crime gun tracing with intelligence analysis to provide investigators with new avenues of lead generation. This research is the first formal assessment of this unique statewide collaboration and information sharing effort.

Methods/Approach

The study is a mixed methods approach to policy analysis using both quantitative and qualitative analysis. The researchers' analyzed ballistics imaging submissions over a multi-year period in addition to examining open source and agency documents that tracked many of the crime reduction projects the New Jersey State Police incorporated into their crime gun intelligence effort.

Results/Conclusion

This effort changed the use of firearms forensic evidence from a sole evidential focus to one that also incorporates a premonitory focus required to generate investigative leads. This project demonstrated the critical importance of fusing firearms forensic evidence such as ballistics imaging with locally available information, such as arrest and incident data on a statewide basis. This study further demonstrated the value of ballistics imaging to connect, previously unconnected incidents, individuals, and weapons particularly when combined with other law enforcement data sets.

Innovation & Significance to the field

While major urban police agencies conduct crime gun intelligence programs, this New Jersey project was a statewide, multi-jurisdictional effort. Unknowingly, the New Jersey State Police initiated this project in 2006 as part of a Governor mandated comprehensive crime reduction strategy. However, unlike similar firearms violence strategies, over a 15-year period this project evolved into a program of the ongoing initiatives that often-produced short-term wins that incrementally changed the business processes and investigative culture within all participating agencies. It illustrated the critical need of information sharing across forensic, criminal intelligence (such as fusion and real time crime centers), and investigative entities across all levels of government – local, state, and federal - in supporting violent crime suppression efforts.

Executive Summary

This analysis documents the development of a forensic and criminal intelligence capability that occurred in the state of New Jersey over almost two decades, beginning in the early 2000's. It illustrates the ongoing commitment to continuous improvement from a collaboration of justice agencies that were focusing on violent crime reduction. This group of organizations, led by the New Jersey State Police, were able to institutionalize the use of forensic technology, crime analysis and information sharing to support criminal investigations across New Jersey.

Intelligence-Led Policing (ILP) became the framework for the New Jersey State Police to reformat its approach to violent crime primarily through the development of their state fusion center, the Regional Operations and Analysis Center (ROIC) or "the Rock" as it is known. ILP provided a guide to planning, collecting, and collating vital violent crime data, then using crime analysts and analytical technology to develop information products to officers, detectives, police commanders, prosecutors, and policy makers. Along with an intelligence-led approach to crime reductions, the NJSP also embraced change management concepts.

Whether by design or serendipity, the New Jersey State Police followed many of the principles of leadership expert John Kotter's Leading Change model. Kotter has articulated some of the common problems inherent in achieving organizational change (Kotter, 2012). He proposes an Eight-Stage Process for leading change in agencies such as American police departments.

1.   Establishing a sense of urgency
2.   Creating the guiding coalition
3.   Developing a vision and strategy
4.   Communicating the change vision
5.   Empowering broad-based action

      6.   Generating short-term wins

      7.   Consolidating gains and producing more change

      8.   Anchoring new approaches in the culture

Kotter (2012) argues that many organizational transformation efforts fail because leaders are unable to effectively establish a sense of urgency for that change. Successful change occurs when a majority of senior managers believes that business as usual is not working. In the case of violent crime in New Jersey, there were several precipitating events that created that sense of urgency to use a more intelligence-led approach to firearms crime specifically.

Creating a guiding coalition of key decision makers that promote and support organizational change is Kotter's second step of leading change. Change agents not only have to believe in the new direction of the organization but also convince a core group of leaders to work together as a team to drive that change.   Working closely with local, state, and federal partners on programs such as the Violent Enterprise Source Targeting (VEST), Project Watchtower, the Targeted Integrated Deployment Effort (TIDE) and fundamentally the CorrStat information sharing effort-built trust among the various agencies and state police entities involved in this firearms crime reduction strategy. These specific projects required coordination of investigations and prosecution that reinforced the efficacy of intelligence-led policing. CorrStat specifically contributed to sustaining a guiding coalition of decisionmakers in urban areas as well as statewide to share information and resources to battle violent crime.

Change leaders have to create a vision and strategy for change that clarifies for police agency actors where the organization is heading. Further, it provides an incentive for organizational champions and their followers to take action in the right direction, even when it is not in their short-term interests. Finally, a clear vision acts to coordinate the actions of

individuals across the organization and beyond. In this case, the ILP and crime suppression vision was outlined in two important documents.

First, the New Jersey State Police Practical Guide to Intelligence-Led Policing, written in 2006 provides strategic direction for state police entities concerning ILP. It represents a fundamental paradigm shift in policing and is emblematic of the series of sweeping changes that have taken place in justice organizations across New Jersey centering on a fierce commitment to a policing philosophy driven by the sharing of information and dissemination of intelligence. Second, in 2007, Governor John Corzine released "A Strategy for Safe Streets and Neighborhoods" to address violent crime including gang, drug and youth violence and the illegal possession of firearms (Corzine, 2007). It was a multi-pronged approach to reducing violent crime in New Jersey. The Strategy on Safe Streets mandated the statewide reporting of all fatal and non-fatal shootings involving the criminal use of firearms. The data that was captured has proved invaluable when cross-referenced with data from other investigative technology systems. The Strategy on Safe Streets specifically highlighted the potential to use national databases such as the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) National Integrated Ballistic Information Network (NIBIN) and its crime gun tracing system, eTrace (Corzine, 2007). These data systems have the potential to connect seized firearms to certain offenders and multiple incidents. This also raised awareness in the law enforcement and prosecution world about the potential for ballistics imaging and crime gun tracing as an investigative tool.

The next step in Kotter's eight-stage process (2012) is to communicate the change vision. If substantial organizational change is required, guiding coalition members need to communicate across the agency. The NJSP's ILP guide along with the Safe Street strategy defined specific activities that fulfill the vision. To follow up on this strategy, the New Jersey Attorney General

Anne Milgram issued a directive in 2008 to New Jersey police agencies calling for the use of crime gun intelligence-led strategies to assist criminal investigations (Milgram, 2008). This directive specifically mandated New Jersey law enforcement agencies to query recovered firearms through the National Crime Information Center (NCIC) to determine if the weapon is stolen. In addition, it required police departments to enter eTrace-related firearm data into NJ Trace, the state repository for crime gun data as well as having it test-fired and the results entered into ATF's NIBIN ballistics imaging system. These firearms evidence programs were codified into law in 2013 through New Jersey Public Law 2013, Chapter 162 that required law enforcement agencies to collect and submit crime gun evidence in a timely manner for forensic analysis. This law resulted in an increase in submissions of firearms and related evidence to NJSPs crime laboratory, illustrating the effectiveness of that legislation.

Kotter next explains that empowering broad-based action involves leaders removing barriers to enacting the vision. It may entail reducing structural barriers to getting things done, possibly adding technology, or changing work rules. In other circumstances, it will involve adding staff or training existing staff in a new approach like Intelligence-Led Policing. In other cases, organizations will need to adjust business processes to conform to a new approach. After the passage of the Attorney Generals directive and the 2013 legislative mandate, the New Jersey State Police were confronted with firearms evidence backlogs at their lab. They subsequently convened a group of subject matter experts and key partners to examine the evidence processing and analysis process. This broad-based action resulted in the development of new guidelines, the Rapid Assessment in NIBIN (RAIN) and later Project 360 to reduce the processing time for crime gun evidence. They enhanced that effort through outreach and training across the state in

the new business processes. The New Jersey State Police established regional firearms evidence drop-off sites to streamline the evidence submission process for police agencies.

The evolution of a robust analytical capability at the ROIC is another broad-based action that goes against traditional policing methods. Fusion centers have had an uneven progression across the country, which makes the New Jersey example exceptional as an information sharing center. The ROIC was able to use its investigative staff along with its crime analysts to collect, analyze and produce tactical and strategic analyses of violent crime across the state. The professional analytical staff at the ROIC and later the three real time crime centers are able to scan arrests on a daily basis to examine the presence of high-risk offenders that are frequently involved in shootings and other violent crimes. The ROIC has operationalized analysis as a key feature of intelligence-led policing and highlighted the value added for criminal investigations. This analytical component has been used to enhance some of the crime reduction initiatives such as VEST and Project Watchtower, but also GunStat, NJ POP described below and CorrStat.

CorrStat assisted in institutionalizing information sharing of criminal information and breaking down organizational barriers across agencies. The CorrStat monthly executive meeting established high-level buy-in for sharing investigative information across jurisdictions while the three-times weekly analyst and detectives' meetings developed trusted relationships among the line level professionals. It also demonstrated the utility of forensic evidence technologies like ballistics imaging and gun tracing.

Other initiatives included the implementation of a statewide shooting incident database, NJ POP to provide near-real time intelligence on firearms violence as well as a daily crime gun report to share that information with police and prosecutors.

Major organizational redesign takes time to implement, reinforcing what Kotter outlines as the next phase of leading change, achieving short-term wins. It may take years to transform an agency completely. In police departments specifically, short-term wins, activities that improve performance and reinforce the change vision are important milestones along the way. Creating short-term wins provides evidence that the vision is the correct path. These achievements are also opportunities to reward innovators and early adopters (Rogers, 2003) that took risks and sacrificed the safety of the status quo.

The success of CorrStat, NJ Trace and NJ POP to share information led to the development of more analytical products such as the monthly GunStat and the Daily Crime Gun Report. Along with this information sharing came a need to enhance analytical technology, resulting in the piloting and testing of several information repositories and analytical applications.

The next step in Kotter's process is consolidating gains and producing more change. Having some initial successes in organizational transformation can help to build momentum for additional structural and cultural change. In some situations, initial small wins can create an environment that allows organizations to add new staff, business processes and technology that it did not see as integral to the previous mission.

The success of the ROIC as a criminal information analysis and sharing hub led to the development of three regional Real-Time Crime Centers (RTCC) to expand the analytical capabilities provided to local and state agencies. Decentralizing some of the analytical expertise allowed analysts to develop local knowledge of the crime environment, build relationships in those regions and allowed the RTCCs to focus on regional issues.

Also this led to the development of BackTrace as a more sophisticated analytical application. BackTrace is a repository of criminal justice data that supports investigative and prosecutorial entities for violent crime cases. BackTrace has incrementally automated the collection, sharing and analysis of violent crime arrest data, NIBIN, NJ Trace and NJ POP data among others to provide users with investigative support packages that examine geographical patterns, crime gun data, and connects incidents with suspects and victims. It has become an example of consolidating gains and producing more change, as well as anchoring new approaches in the culture (Kotter, 2012) as it allows investigators and prosecutors to derive data from the system using simple query tools and dashboards. It is currently evolving as users request additional features to support their work.

In summary, this almost two decades long crime reduction project has provided New Jersey criminal justice professionals with a continuous stream of innovations focused primarily on violent crime. Through the collaboration of a range of agencies, this crime gun effort has become institutionalized as a way of doing business. It illustrates the effectiveness of an intelligence-led policing approach as a strategy to address firearms crime across jurisdictions and the utility of data-driven policy making.

ACKNOWLEDGEMENTS

Introduction

Since 2006 New Jersey has initiated multiple legislative and statewide law enforcement initiatives, that focused on interagency information sharing, the standardization of data collection, and the creation of state-wide tracking systems. Under the framework of intelligence-led policing (ILP), these directives were undertaken and overseen by key stakeholders in the New Jersey State Police Department (NJSP). The commitment to intelligence-led policing by these stakeholders, coupled with technological innovations regarding information sharing and processing of firearms-related evidence, culminated in an environment of policing innovation that is sustained to the present day and provides a foundation for future change.

The study is divided into three major sections. The first analyzes the NJSP's ongoing commitment to implementing ILP in New Jersey since 2006. This section examines the movement and continual commitment to ILP by analyzing the shift to this model of policing in post-9/11 America, the establishment of the New Jersey State Police Regional Operations and Intelligence Center (ROIC), and multiple state and law enforcement agency initiatives geared at mitigating gun crime while simultaneously increasing intelligence as well as providing active outreach, engagement, and support to law enforcement actors throughout New Jersey. State directives and legislation such as then-Governor Corzine's "A Strategy for Safe Streets and Neighborhoods" and New Jersey Attorney General Anne Milgram's Directive on Crime Guns in 2008 helped initiate and support programs and technological developments, such as NJ Trace and NJ POP. Moreover, the NJSP engaged in a continuous program of initiatives to support local law enforcement agencies including CorrStat, TAG, VEST, and TIDE, which provided analytic and investigative support. In 2013, the basic tenets of Milgram's 2008 Directive were codified into Public Law 2013 Chapter 162, (N.J. Stat. § 52:17B-9.18) requiring all New Jersey law

enforcement agencies to "fully participate, through the utilization of electronic technology, in interjurisdictional information and analysis sharing programs and systems to deter and solve gun crimes."

The second component of the study examines the renewed implementation of the National Integrated Ballistic Information Network (NIBIN) program and other forensic technologies by the New Jersey State Police (NJSP) and its partner law enforcement agencies involved with NIBIN across New Jersey, now known at the Garden State Ballistic Community of Interest, since the early 2000s. This part of the analysis will examine how the NIBIN program's initial focus on the evidentiary paradigm shifted to a more premonitory focus that is directly supportive of goals and methods of intelligence-led policing. This section will assess more recent NJSP initiatives that engaged in an ongoing set of innovations to extend the forensic capabilities of the NJSP and regional forensic labs to better support criminal investigations and address firearm violence reduction programs. An example of this is the Rapid Assessment into NIBIN (RAIN) program that extended data collection efforts, integrated systems, and further supported the implementation of interagency and cross jurisdictional responses to violent gun crime.

The third part of the study analyzes the development and operation of the New Jersey State Police's current integrated statewide crime gun intelligence systems and the support they can now provide to law enforcement agencies through more detailed analysis and criminal intelligence support. The study examines the integration of gun violence data, forensic evidence, and additional crime-related information into a statewide system designed to reduce gun violence and crime more generally.

Throughout the period under study New Jersey maintained lower levels of gun homicide violence than other large states and the nation as a whole. Figure 1 shows gun homicide rates for

New Jersey, the top ten most populace states and the nation for the period 2007 to 2021 (Data for

Figure 1. During this period New Jersey exhibited lower gun homicide rates than the nation as a

whole and the top 10 largest states and this difference increased during the Covid epidemic with

New Jersey showing a lower increase in gun homicides than other large states and the nation (see

also Appendix Table 1 for Figure 1 data).
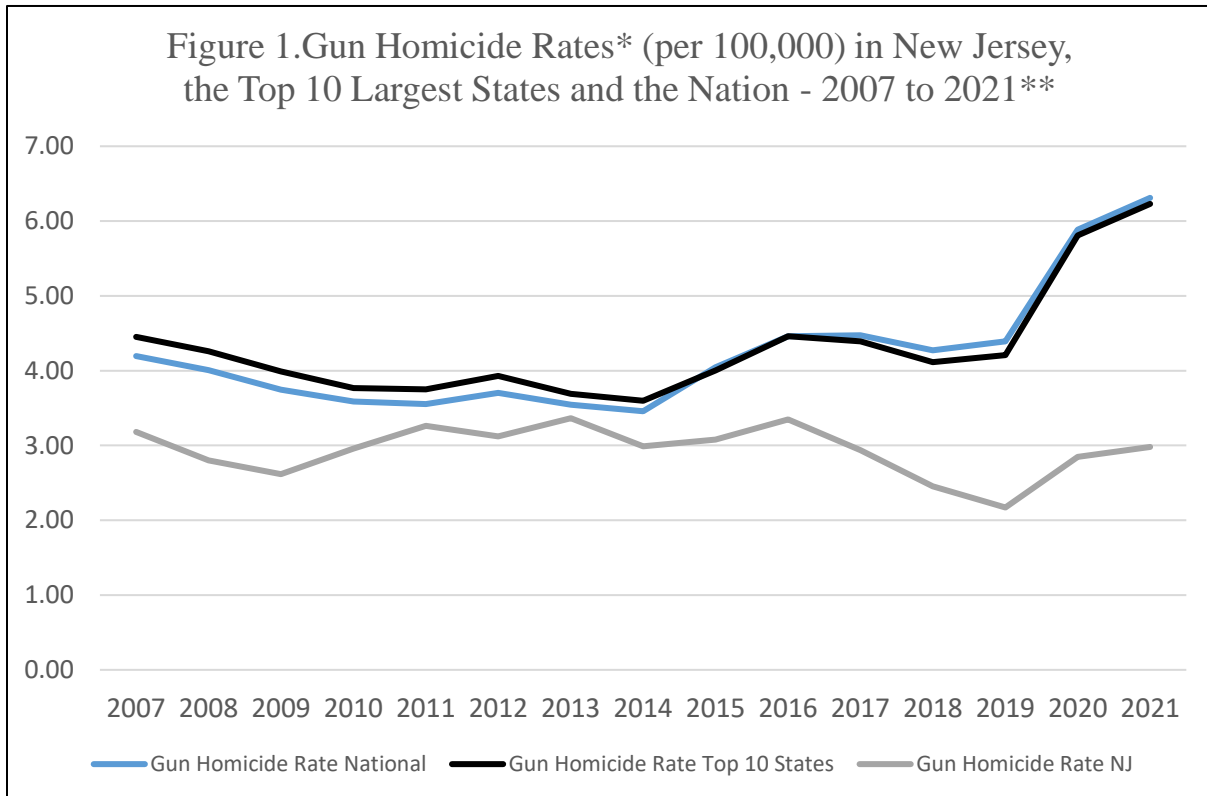
Figure 1. Gun Homicide Rates* (per 100,000) in New Jersey, the Top 10 Largest States and the Nation - 2007 to 2021**

* Gun homicide data and population data were obtained from the National Center for Health Statistics Mortality Data on CDC WONDER (https://wonder.cdc.gov/Deaths-by-Underlying-Cause.html)
**The top ten most populous states in 2021 were CA (California), TX (Texas), FL (Florida), NY (New York) , PA (Pennsylvania), IL (Illinois), OH (Ohio), GA (Georgia), NC (North Carolina), MI (Michigan), with a population of 179 million residents. New Jersey was the 11th most populace state in the nation.

Most recently in 2021, the last year CDC homicide data is available New Jersey's gun

homicide rate was at least 50 % lower than the top 10 largest states except for New York state

which had a comparable gun homicide rate. Seven of the top ten states and the nation as whole

had gun homicide rates more than double that of New Jersey's (see Figure 2).
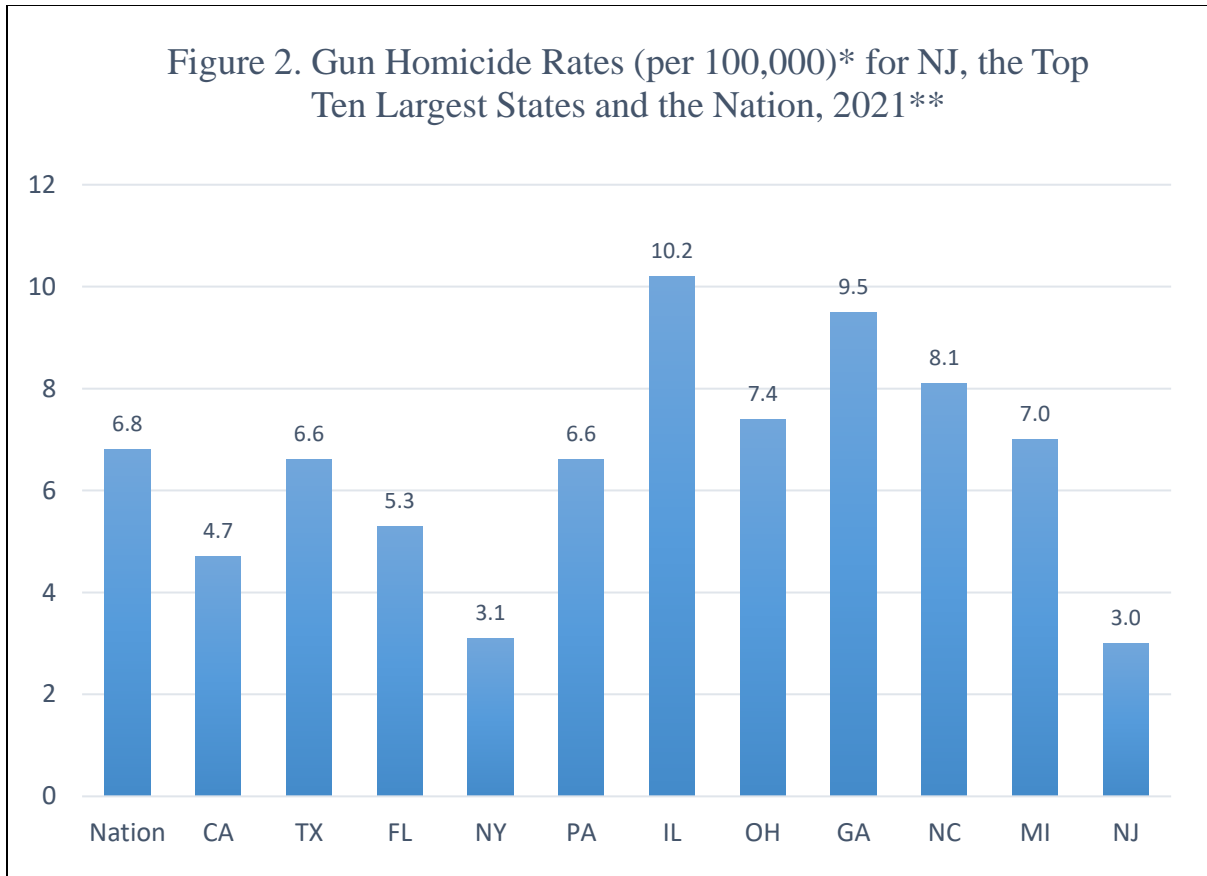
Figure 2. Gun Homicide Rates (per 100,000)* for NJ, the Top Ten Largest States and the Nation, 2021**

State	Rate
Nation	6.8
CA	4.7
TX	6.6
FL	5.3
NY	3.1
PA	6.6
IL	10.2
OH	7.4
GA	9.5
NC	8.1
MI	7.0
NJ	3.0

* Gun homicide data and population data were obtained from the National Center for Health Statistics Mortality Data on CDC WONDER (https://wonder.cdc.gov/Deaths-by-Underlying-Cause.html)
**The top ten most populous states in 2021 were CA (California), TX (Texas), FL (Florida), NY (New York) , PA (Pennsylvania), IL (Illinois), OH (Ohio), GA (Georgia), NC (North Carolina), MI (Michigan), with a population of 179 million residents. New Jersey was the 11th most populace state in the nation.

The New Jersey State Police Commitment to ILP

ILP Historical and Organizational Context

Few states were affected more than New Jersey by the September 11, 2001, terrorist attacks that murdered 3,000 Americans. The attack significantly impacted the state of New Jersey and the state troopers who worked in northern New Jersey. Future ROIC commander, Ray Guidetti was a state police detective in the intelligence section at that time, who was detailed to the FBI's Joint Terrorism Task Force (JTTF). The State Police also assigned Guidetti to assist with the investigation of the United Airlines Flight 93 hijacking out of Newark International

Airport. This event had a profound impact on the way Guidetti and the NJSP valued interagency

collaboration and information sharing (Guidetti, personal communication, August 10, 2022).

As a whole, the New Jersey State Police (NJSP) knew that they had to innovate, in order

to meet the new challenges brought about in the post-9/11 era (Ratcliffe & Guidetti, 2008). The

executive leadership of the NJSP at the time embraced innovation that allowed subordinate

members, including Guidetti, to advance innovation. Colonel Joseph Fuentes, during this period,

was the Chairman of the IACP Homeland Security Committee. A review of an article he wrote

for IACP's Police Chief Magazine entitled, *Demands and Capacities of Protecting and Policing*

the Homeland (Fuentes, 2008), signaled what he was envisioning for an intelligence-led police

organization at the state level.

To address these investigative challenges, the NJSP adapted the 3i Model of ILP created

by Professor Jerry Ratcliffe – a former police officer in the United Kingdom and a principal

architect of ILP (Ratcliffe, 2003; Ratcliffe, 2016). ILP is an approach to policing and resource

allocation that emphasizes the *interpretation* of the criminal environment in order

to *influence* decision-makers and create desired *impacts* on the criminal environment (Figure 3).

Figure 3. 3i Model of Intelligence Led Policing
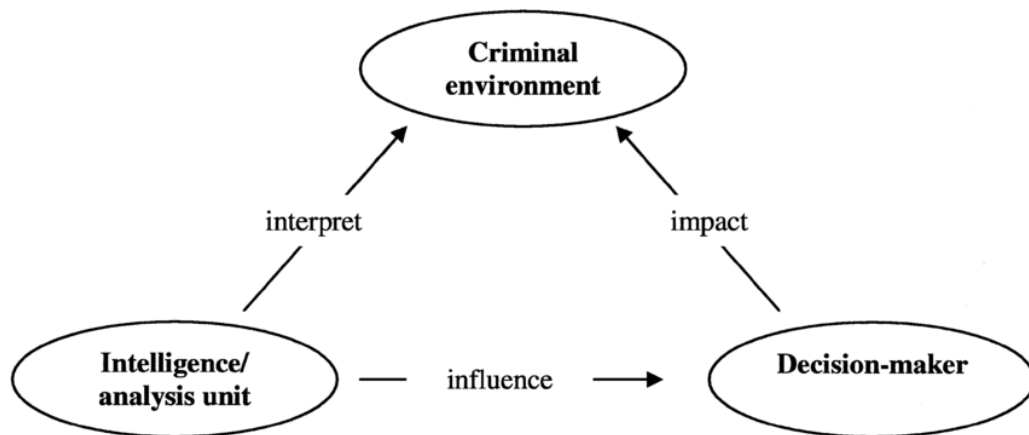
Source: Ratcliffe, 2003

Professor Ratcliffe visited the NJSP Investigations Branch many times to help implement the 3i Intelligence Model for New Jersey (Ratcliffe & Guidetti, 2008; Ratcliffe, 2016). Guided by this model, the NJSP began to systematically collect and analyze information to produce intelligence products. Decision-makers began to use these information products to implement their strategic, operational, and tactical initiatives more effectively. From Guidetti's association with Ratcliffe, the idea of transforming the operations of the New Jersey State Police began to take shape. To create buy-in amongst the troops, NJSP commanders had to find street-level champions that could use these strategies in crime suppression operations (Guidetti, personal communication, August 10, 2022).

Importantly, the concept of an intelligence-driven criminal investigative approach matched well with the ILP vison of the NJSP leadership. Colonel Richard Fuentes and Deputy Superintendent Frank Rogers became the organizational champions for substantial organizational change within the New Jersey State Police as well as externally with other agencies (Guidetti, personal communication, August 10, 2022). The NJSP created an environment that incentivized information sharing across agencies as well as using new investigative methods, such as debriefing suspects and tracking crime guns. These complementary perspectives from multiple leaders in the state police department created a cohesive leadership team that was crucial from a change management perspective and formed a powerful guiding and supportive coalition (Kotter, 2012).

Another organizational characteristic that strengthened this change strategy was the stability of agency leadership over the long term. Police agencies often have a high turnover of their police executives (Peak and Glensor, 1999; Rainguet and Dodge, 2001). Colonel Fuentes was the superintendent of the NJSP from 2003 to 2017 (New Jersey State Police, 2022), an

unusually long period for police leaders. Consistency of leadership is a key element of effective and sustained policy implementation (Finkelstein & Hambrick, 1990; Kingdon, 1995), which is a key element in the New Jersey experience.

The statewide collaboration of senior-level stakeholders and ongoing commitment to this overall strategy are key factors that made NJSP's approach to ILP unique. This approach also involved collaboration across criminal justice disciplines (e.g., police, forensics, prosecutors, probation, parole, etc.). Many other firearms reduction efforts, such as Operation CEASEFIRE (Braga & Pierce, 2005; Fox et al., 2015; Kennedy et al., 2001) and Project Safe Neighborhoods (Grunwald and Papachristos, 2017; McGarrell et al., 2009) have concentrated on one city, reducing some of the complications of adopting ILP. In New Jersey, the strategy involved multiple cities across the entire state. Along with investing time and effort in developing statewide strategies to reduce crime and firearm related violence.

NJSP also developed a series of complementary guides, policy directives, and initiatives that used intelligence and information sharing as a key element to helping direct and support law enforcement tactics and strategies. One of the documents that came from key stakeholders in the NJSP was *The New Jersey State Police Practical Guide to Intelligence-led Policing* (Fuentes, 2008). This document concludes with the following statement: "The NJSP's ILP implementation marks the tipping point in a new era of law enforcement, one in which the law enforcement community adopts a more advanced approach to not just being first responders for crime and terrorism, but instead becoming *first preventers*." This document represented a fundamental paradigm shift in policing and is emblematic of the series of sweeping changes that have taken place in law enforcement organizations across New Jersey over the past fifteen years. These widespread organizational changes worked in tandem with a successful implementation of

programs and a fierce commitment to a policing philosophy driven by the sharing of information and dissemination of intelligence has resulted in New Jersey law enforcement becoming a national model and a pioneer across a number of different policing outcomes.

The NJSP defines intelligence succinctly as: Information/Data + Analysis = Intelligence (Fuentes, 2006). In order to accomplish this, there was a need to optimize resource allocation. The NJSP's firm commitment to comprehensive information-sharing, improved communication, and the coordination of effort is founded on the belief that this would lead to more effective policing and crime control. The successful adoption of the ILP process by the NJSP was characterized by the simultaneous implementation and ongoing support of five primary ILP components (Fuentes, 2006):

1. an architectural realignment of the organization to remove barriers and promote intelligence and information exchange,

2. a cultural shift to embrace intelligence-led policing philosophies and practices,

3. the re-tooling of the distribution and management of an information hub known as the Statewide Intelligence Management System (SIMS),

4. and the creation of a "fusion center," known as the Regional Operations and Intelligence Center.

5. the implementation of regional accountability plans for managing intelligence and enforcement operations related to organized criminal activities.

The Development of a Statewide Crime Data Information Infrastructure to Support ILP

Regional Operations and Intelligence Center (ROIC)

The formation of this center was a natural extension of the intelligence work that the organization had been performing to combat organized crime. The ROIC was a blending of the assets that made up the existing New Jersey Emergency Operations Center (EOC) and

this new component called a fusion center. The original EOC in New Jersey was rudimentary

interagency information sharing which was likened to many other EOCs at the time

(Guidetti, personal communication, August 10th, 2022; Brennan, personal communication,

August 10th, 2022).

In the wake of 9/11, the ROIC needed to undertake intelligence work in this new

arena called Homeland Security. Since the NJSP had not only a traditional criminal

enforcement mission but an understanding of organized crime intelligence, the development

of information sharing in the ROIC was a natural outgrowth of their investigative support

mission to improve crime reduction capabilities. State legislation and executive directives

provided additional support for the NJSP's intelligence-led policing efforts. Two notable

actions were Governor Corzine's A Strategy for Safe Streets and Neighborhoods in 2007 and

New Jersey Attorney General's Directive on Crime Guns in 2008, These directives paved the

way for two innovative databases to better understand and combat firearm crime: NJ POP

and NJ TRACE.

Governor Corzine's A Strategy for Safe Streets and Neighborhoods

An early initiative to enhance crime intelligence data collection was made by the

governor's Strategy for Safe Streets and Neighborhoods Program (Corzine, 2007) that required

> "Mandatory reporting of all shootings – Accurate and timely information about the
> incidence of gun violence is crucial to developing, assessing, and modifying anti-gun
> violence strategies. Such information is currently unavailable at a statewide level.
> Accordingly, the Attorney General will mandate near-real time centralized reporting of all
> incidences of shootings, including any aggravated assaults, attempted murders, or murders
> with a firearm." (Corzine 2007, p10).

This marked New Jersey as an early adopter of tracking statewide shooting incidents. The

NJSP previously established an Office of CEASEFIRE Operations modeled after some of the

best practices used in the Newark and Irvington area. This strategy expanded CEASEFIRE programs to 14 areas in the state.

Significantly, the Corzine report also called for the development of shooting investigation teams across the state and tasked county prosecutors with investigation teams to respond to all nonfatal shootings in their jurisdiction. They aimed to treat these cases with the same seriousness that homicides receive, including full ballistics evidence collection, submission, and analysis. In addressing this, collaborative investigative teams were created between local police detectives and prosecutors while complementing the ongoing work of gang, gun, and drug task forces in these areas. While these investigative teams saw some success through these interagency partnerships, they could not withstand the evolution of time as investigators returned to their home agencies when administrations changed.

In support of the legislative goals, between 2007 and 2008, the New Jersey State Police Information Technology section built a front-end interface, NJ Trace to enable police agencies to seamlessly enter crime gun data such as make, model and serial numbers for each gun seized. In addition, as a previous business process improvement, this facilitated the reporting of crime intelligence by police agencies by providing a more straightforward and less complicated online submission format (versus the previous paper basis format.

In sum, the Strategy for Safe Streets and Neighborhoods elevated the fusion center's role in advancing crime gun intelligence. Despite the advancement of this policy document outside of establishing a fragile foundation for intelligence analysis in violent crime, little was done to formally integrate forensic technologies to provide greater intelligence to investigators across the state. However, New Jersey Attorney General Anne Milgram 2008 directive to New Jersey police agencies specifically mandated NJ law enforcement agencies to query recovered firearms

through the National Crime Information Center (NCIC) to determine if the weapon was stolen (Milgram, 2008). In addition, it requires police departments to enter eTrace-related firearm data into NJ Trace as well as have seized crime guns test-fired and the results entered in ATF's NIBIN ballistics imaging network. It further required that departments enter previously recovered firearms and cases back to January 2004. This attorney general directive set legislation precedent that the NJSP would be able to leverage in 2014 to galvanize the state's law enforcement community toward building a model crime gun intelligence capability. Yet, that would not happen for many years and the NJSP would see additional initiatives come forward that would all be further enhanced and mobilized in 2014 and later. This directive paved the way for NJ POP, NJ Trace, VEST, and Project Watchtower.

NJ POP 2007

While the phrase 'crime gun intelligence' was not in mainstream use yet, the NJSP, through their fusion center, initiated a major analytical capability designed to collect and share statewide firearm violence data in real-time. The NJ POP Collective, a project named by a former analyst referring to "pins on paper," is the main component of NJ's crime gun intelligence strategy (Guidetti & Morentz, 2010; State of New Jersey, 2014). Created in 2007, NJ POP arose from a collaboration between the Analysis Element, the NJSP Information Technology Bureau, and the NJ Office of CEASEFIRE Operations designed to be a statewide real-time "shooting hit/ shooting murder" tracker. The effort stemmed from Governor Corzine inquiring of the Attorney General, who inquired to the Colonel of the State Police about how many shootings occurred in the City of Camden in the last few months. No one could answer this question at the state level in a timely manner (Miller, 2008). Additionally, the FBI's crime reporting system, the Uniform Crime Reporting (UCR) data did not provide near real-time

shootings in each area. The recognition there was a lack of timely data gun violence was not unique to New Jersey, as similar crime reduction efforts in cities such as Rochester, NY (DiPoala, 2018), Hartford, Bridgeport, and New Haven CT (Lambert, 2021), and Boston (City of Boston, 2022) also recognized the need to develop homegrown shooting databases. However, New Jersey's program differed for these systems in that it went beyond individual cities to include the entire state.

The lack of this type of information at the state level arises in part from law enforcement's historic reliance on the FBI's statistical Uniform Crime Reporting Program (UCR) (Uniform crime reporting program — FBI [UCR], 2004). The UCR was a nationwide effort of more than 18,000 law enforcement agencies who voluntarily reported data on crimes. The Return A component of the UCR program collected agency-level aggregate reports on eight Part I offenses known to law enforcement and did not provide location or suspect information on gun assaults. In addition, UCR Index crime data did not distinguish between gun assault threats (with no injury) and gun assaults where victims were injured/shot by a firearm. The UCR also collected Supplementary Homicide Report (SHR) on national data concerning the age, sex, and race of murder victims, the weapon used, and the circumstances surrounding homicide offenses. These data are also collected on an agency level. However, these reports do not provide information on the specific location of homicide incidents or specific information on homicide suspects or victims and hence are not useful to homicide investigations (UCR, 2004).

To address the absence of data on shooting from the UCR, New Jersey's NJ POP program was developed by the ROIC to collect and disseminate information on gun-related homicides and gun-related assaults (i.e., a victim was shot but was not killed, which is referred to as 'hit' in the NJ POP system).

The NJ Pop Collective project established a virtual platform for analyzing, mapping, and exchanging shooting hit data. NJ Pop allows New Jersey law enforcement agencies to report and share information about shooting incidents, including the victims and suspects, their gang affiliations, recovered crime guns, and motives, across jurisdictional boundaries. Importantly, analysts assigned to the NJ ROIC conduct a deeper analysis of the reports to produce intelligence products highlighting hotspots of criminal activity involving the use of firearms across the state. These products typically contain temporal and spatial analysis, and information about gang involvement, recovered weapons and crime gun trace information, crime patterns and trends, and law enforcement recommendations. (NJSP information handout on NJTRACE, NJ POP and NIBIN(U.S. Department of Homeland Security, 2010).

NJ POP began in the three cities of Irvington, Camden, and Paterson in July 2008 due to concerns of violent crime in those areas. The ROIC used troopers with knowledge of those areas as their on-the-ground information collectors. Eventually, the NJ ROIC moved to use open source data collection and internet news alerts to assist with tracking shootings.

Statewide Implementation of NJ POP

The NJ POP initiative did not take root quickly. Because the NJSP had both uniform and investigative resources in Camden and Irvington , New Jersey, it would be "easier" to collect shooting data in those areas (New Jersey State Police Commander, 2021, Joseph Brenan communication). In addition, the Paterson Police, collaborative partners in Operation CeaseFire, shared shooting data in a timely manner. After several months of collection and analysis from these three cities, the Newark Police Department began to share their shooting event data. Meanwhile, ROIC personnel would monitor media alerts about shootings around the entire state and contact individual agencies to gather more information. As these efforts progressed, other

police agencies began contributing shooting data. ROIC personnel estimated that within the first year of NJ POP, the fourteen urban areas including Jersey City and Trenton were submitting incident data to the fusion center, providing a more reliable and valid snapshot of firearms violence in the state. The NJ POP effort created a statewide database of shooting incident data that included reporting information, shooting location, weapon, victim, and suspect data.

The combination of direct partnerships and outreach efforts enabled NJ POP to quickly expand the number of cities and towns in NJ that report to the ROIC. The reporting on non-fatal[1] and fatal data increased from 15 to 78 between 2007 and 2009. Additionally, the number of non-fatal and fatal victims increased from 306 to 1082 (Table 1). After 2009, the number of cities and towns reporting cities and towns in New Jersey ranged between 72 and 93 communities with most years at 80 or more. Table 1 also presents information on the major types of actors NJ POP collects and reports on, including shooting incident victims, suspects, and starting in 2014 witnesses and other unspecified individuals.

Table 1. NJ POP* Nonfatal and Fatal Shooting Reports** 2007 to 2022						
Year	Reporting Agencies	Incidents	Victims	Suspects	Witnesses	Other
2007	15	251	306	143	0	0
2008	31	801	919	341	0	0
2009	78	906	1,082	409	0	0
2010	80	1,072	1,276	369	0	0
2011	85	1,280	1,530	308	0	1
2012	79	1,316	1,569	351	0	0
2013	93	1,275	1,502	408	0	0
2014	89	1,117	1,381	260	72	187
2015	89	1,155	1,341	293	10	15
2016	79	1,114	1,338	372	60	56
2017	88	1,116	1,353	405	73	48
2018	72	840	1,045	334	34	29

2019	74	785	1,006	260	19	23
2020	84	1,045	1,301	394	14	21
2021	88	1,112	1,403	416	38	35
2022	110	878	1,062	352	13	22
Total***	328	16,063	19,414	5,415	333	437

*Data provided by NJSP
** Authors changed the terminology from the NJSP's original shooting hit and shooting murder categories to non-fatal and fatal, to conform with CDC definitions.
*** Total count statistics for the more fully implemented NJ POP period 2009 to 2022 are 15,011 for incidents, 18,189 for victims and 4,931 for suspects. Total statistics may also vary by small margins depending on the presence of missing information for d attributes. Some statistics for the 2009 to 2022 period may vary slightly depending on which attributes are examined. The reporting total is for any agency that reported over the 2007 to 2022 time period.

A more direct comparison of NJ POP and CDC homicide data coverage is available by comparing NJ POP gun homicide data with CDCs intentional homicide with a firearm (ICD10 codes X93-X95, *U01.4), which includes homicides where a gun was the weapon used by any offender and the death was not the result of legal intervention. NJ POP and CDC's Fatal Injury Reports programs (https://wisqars.cdc.gov/fatal-reports) both collect data on firearm homicide victims. Table 2 compares NJ POP shooting homicide reports with those of FBI Supplementary Homicide Reports for New Jersey for the years 2009 to 2020. The table presents NJ POP statistics on gun homicides from 2007 to 2021 compared to aggregate gun homicide data collected by the CDC. We expect NJ POP firearm homicide death estimates to be generally slightly lower than those based on CDC data because some NJ POP reports that are identified as a non-fatal gun injury may become a homicide if the victim subsequently dies at a later point in time. CDC gun homicide data are based on death certificates. Table 2 shows after the program's initial startup (2009 and later) of the NJ POP program, NJ POP reported gun homicides are generally five to ten percent lower than CDC estimates for most years between 2009 and 2021.

Table 2. Comparison of NJ POP to CDC Gun Homicide Reports – 2007 to 2022			
Year	NJ POP murder victims*	CDC Gun Homicides**	Percent NJ POP gun homicides of CDC gun homicide
2007	39	276	14.1
2008	195	244	79.9
2009	230	229	100.4
2010	251	260	96.5
2011	271	288	94.1
2012	273	276	98.9
2013	299	298	100.3
2014	239	265	90.1
2015	249	273	91.2
2016	275	297	92.6
2017	242	261	92.7
2018	190	218	87.1
2019	160	193	82.9
2020	230	253	90.9
2021	249	276	90.2
2022	207	**	**

* CDC gun homicide data were obtained from National Center for Health Statistics Mortality Data on CDC WONDER (https://wonder.cdc.gov/Deaths-by-Underlying-Cause.html)
** CDC gun homicide data not yet available for 2022.

NJ POP was designed to collect data on both fatal and nonfatal shooting incidents throughout New Jersey. The latter category represents shootings where a victim was shot but was not killed. The latter category is typically systematically collected by states on a state-wide basis, but obviously represents an important public safety threat in addition to persons shot and killed. Table3 presents data on the number of NJ POP fatal shootings (persons killed) and nonfatal shooting (persons injured but not killed) in New Jersey for the years 2009 to 2022. Not included are 2007 and 2008 because these were start-up years for the NJ POP program.

As Table 3 shows, throughout the 2009 to 2022 period 18.4% percent of all shooting victim were fatal and correspondingly 81.6% were nonfatal shooting victims over this period.

This means that on average, there were about 4.4. nonfatal shooting victims for every fatally shot victim over the 2009 to 2022 period (i.e., 14,066 nonfatal shooting victims to 3, 162 fatal shooting victims).

Table 3. NJ POP Gun Shootings Victim Outcomes (Nonfatal and Fatal Shootings)*					
Year	Nonfatal Shootings	Fatal Shootings	Total Shootings	% Deaths of All Shootings	% Nonfatal Shootings of All Shootings
2009	869	230	1,099	20.9	79.1
2010	1,035	251	1,286	19.5	80.5
2011	1,266	271	1,537	17.6	82.4
2012	1,306	273	1,579	17.3	82.7
2013	1,216	299	1,515	19.7	80.3
2014	1,150	239	1,389	17.2	82.8
2015	1,097	249	1,346	18.5	81.5
2016	1,071	275	1,346	20.4	79.6
2017	1,121	242	1,363	17.8	82.2
2018	859	190	1,049	18.1	81.9
2019	848	160	1,008	15.9	84.1
2020	1,073	230	1,303	17.7	82.3
2021	1,164	249	1,413	17.6	82.4
2022	852	207	1,059	19.5	80.5
Total	14,927	3,365	18,292	18.4	81.6

*Data provided by NJSP

The 4.4 ratio of nonfatal to fatal shooting victims exhibited in NJ POP data is similar to ratio's calculated based on public health records of gun assault injuries. In the United States data was reported on both fatal and nonfatal assault injuries for the years 2009 and

2012. Fatal firearm homicides are based on death certificate data and nonfatal firearm assaults are based on emergency department visits. Nonfatal emergency data was not published after 2012. Based on the CDC 2009 to 2012 data the ratio of firearm homicide deaths to nonfatal the ratio of fatal injury shooting to nonfatal injury shooting was 4.7 (i.e., 45,261 gun homicides to 212,825 nonfatal gun assaultive injuries for a 4.7).[2] This indicates that the NJ POP reporting system is collecting similar amount of data on nonfatal gun assault injuries compared to fatal gun homicide as public health administrative data systems in the United States. Interestingly, the NJ POP system is somewhat higher ratio of nonfatal to fatal gun assaults the public health systems collect in Canada [3]

Collecting accurate fatal and nonfatal gun assault data enables NJ POP the ability to provide New Jersey with timely and more comprehensive estimates of changes in gun violence over time. Figure 4 presents over time trends of fatal and nonfatal gun assaults between 2009 and 2022 in New Jersey. As the Figure 4 shows overtime change is more clearly identifiable in examining both fatal and nonfatal shootings, where the combined total of fatal and nonfatal shooting victims declined by 25% between 2021 and 2023 in New Jersey. This is even greater than the substantial decline in fatal gun shooting victims alone (a 17% decline from 249 fatal shooting victims in 2021 to 207 in 2022).

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[2] WISQARS Fatal and Nonfatal Injury Reports (cdc.gov)
[3] Research in Canada for 2016 to 2020 using three administrative databases identified 933 firearm homicides, 1,546 hospitalizations for firearm assault and 779 emergency department visits for firearm assault. These data show a ration of assaultive gun death to assaultive gun injuries of 2.5 gun homicides to nonfatal gun assaultive injuries (i.e., 933 to 2,325). Toigo, S., Pollock, N.J., Liu, L. et al. Fatal and nonfatal firearm-related injuries in Canada, 2016–2020: a population-based study using three administrative databases. Inj. Epidemiol. 10, 10 (2023). https://doi.org/10.1186/s40621-023-00422-z

Figure 4. Fatal and Nonfatal Shooting Victims in New Jersey 2009 to 2022*
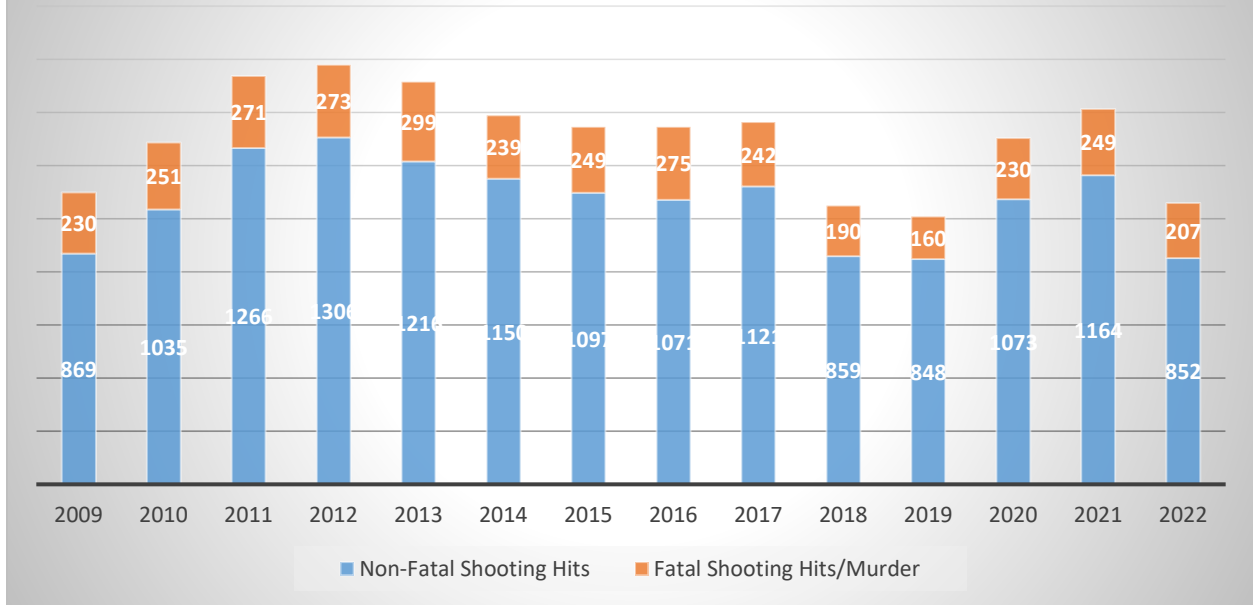
*Data provided by NJSP

After NJ POP's initial startup (years 2007 and 2008), over the 2009 to 2021 period, NJ POP obtained at least one report on a victim shooting from 328 New Jersey cities, towns, and townships.[4] As shown in Table 4, over this period, 25 cities and towns accounted for 90.7% of the shooting hit and homicide victims with other303 reporting communities (not listed above) accounting for an additional 9.3% of all shooting hit reports. The statewide coverage of fatal and nonfatal firearm shooting collected by NJ POP provides a more complete and timely geographic view of the occurrence of firearm crime in New Jersey than might otherwise be possible with only a subset of city reports.

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[4] The total number of reporting cities, towns and townships can potentially increase in the future if agencies who did previously report a shooting incident record such an incident.

Table 4. NJ POP Top 25 Cities Shooting Incident Reports – 2009 – 2022*			
NJ Cities Towns	Frequency	Percent	Cumulative Percent
Newark City	4,208	26.7	26.7
Camden City	1,953	12.4	39.1
Trenton City	1,593	10.1	49.2
Paterson City	1,242	7.9	57.1
Jersey City	1,177	7.5	64.6
Atlantic City	527	3.3	67.9
Elizabeth City	512	3.3	71.2
Irvington Twp	445	2.8	74.0
Pleasantville City	426	2.7	76.7
East Orange City	283	1.8	78.5
Plainfield City	265	1.7	80.2
New Brunswick City	225	1.4	81.6
Orange City Twp	223	1.4	83.0
Asbury Park City	198	1.3	84.3
Bridgeton City	183	1.2	85.5
Millville City	172	1.1	86.6
Willingboro Twp	122	0.8	87.3
Salem City	107	0.7	88.0
Vineland City	102	0.6	88.7
Passaic City	71	0.5	89.1
Hamilton Twp	59	0.4	89.5
Linden City	56	0.4	89.8
Penns Grove Boro	47	0.3	90.1
Pennsauken Twp	46	0.3	90.4
Lakewood Twp	44	0.3	90.7
All Other Cities/Towns	1,463	9.3	100.0
Total	15,749	100	

*Data provided by NJSP

Below, Figure 5 shows the distribution of fatal and nonfatal shooting victim in New

Jersey in 2022. This type of geographic data is available on a real time request basis for NJ POP

shooting information. Authorized administrators, crime analysts, investigators and other law

enforcement actors can examine this type of geographic information for selected time periods,

geographies (e.g., state, county, city/town, street level), and type of event (e.g., nonfatal

shooting, fatal shooting). The system can investigate individual events and connect to other

crime related data information.

Figure 5. Distribution of Nonfatal and Fatal Shooting Victims in New Jersey for 2022
(Map provided by NJSP)
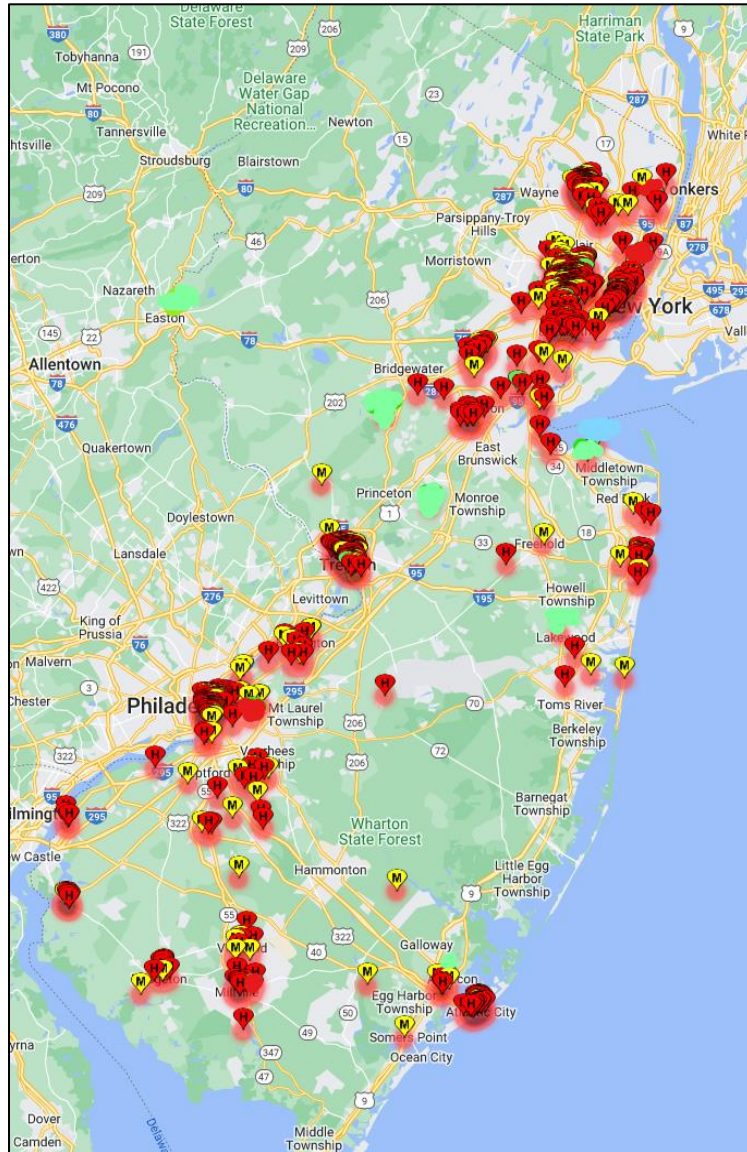
In addition to information on location, time and type of shooting incident, NJ POP

also collects data of direct use to investigators including investigative case number, names of

suspects, victims, and witnesses. Over the 2009 to 2022 period as shown in Table 5 this type

of information is generally provided when a shooting incident is first reported but is not

typically updated after the initial information on a shooting is provided or collected.

Table 5 Distribution of NJ POP Nonfatal and Fatal Shooting for Victims and Incidents of 2009 to 2022		
Victim and Incidents	Frequency	Percent
Shooting Nonfatal Victims	14,926	82.0
Shooting Fatal/Murder Victims	3,280	18.0
Total Victims	18,206	100.0
Shooting Nonfatal Incidents	11,898	79.2
Shooting Fatal/Murder Incidents	3,130	20.8
Total Incidents	15,028	100.0

Data provided by NJSP.

NJ POP also regularly provides data on the extent of violence associated with

shooting incidents beyond the nonfatal and fatal characteristics of an incident. In particular,

NJ POP provides data on the number of victims associated with shooting events. As Table 6

shows 15% of shooting incidents in New Jersey involve two or more nonfatal or fatal

shooting incidents and approximately 30% of all shooting victims.

Table 6 Number of Victims in NJ POP Incident Report 2009 -2022*				
Number of Victims per Incident**	Incidents		Victims	
	Number	Percent	Number	Percent
1	12,815	84.59	12,815	69.67
2	1,738	11.47	3,476	18.90
3	409	2.70	1,227	6.67
4	124	0.82	496	2.70
5	39	0.26	195	1.06
6	12	0.08	72	0.39
7	6	0.04	42	0.23
8	2	0.01	16	0.09
9	2	0.01	18	0.10
10	1	0.01	10	0.05

14	2	0.01	28	0.15
Total	15,150	100.00	18,395	100.00

* Data provided by NJSP
** 657 records did not have data on the number of victims

NJ POP Analytic Services to Support Local and Regional Law Enforcement

The purpose of this program is to collect, analyze and disseminate data on shootings throughout the state to identify patterns and relationships between events. For instance, many shootings are retaliation for previous violent crimes among rival criminal groups, therefore capturing data on victims, witnesses, and suspects often provides links between events (U.S. Department of Homeland Security, 2010). In parallel with the acquisition of shooting hit data, the New Jersey State Police ROIC began publishing shooting hit notifications to police agencies in Essex County such as Newark and Irvington. This analysis and dissemination effort was first utilized during Operation Watchtower discussed below. Analysts provided reports on shootings, crime gun recovery, and potential motivations for shooting events and then other ROIC and RTCC analysts could query the NJ POP system to examine local, regional, and statewide patterns of criminal firearms use. In 2010 NJ POP transitioned from the CJIS NJ POP component of Crime Track to the Tetrus web based application (Lt Colonel Joseph Brennan, communication, March 2023).

Analysts developed a series of daily, monthly, and periodic intelligence products that informed investigators and policymakers on the criminal shooting environment in New Jersey (U.S. Department of Homeland Security, 2010; IIR, 2014). This represented the completion of the intelligence cycle, the formal data-driven decision support process where data collection leads to data analysis, production, and dissemination of finished intelligence. Providing timely intelligence to investigators and patrol officers enables them to build their criminal cases. More

importantly, it reinforces the utility of collecting shooting data for the street-level officers and detectives who are the collectors, as this information is disseminated in a timely manner to law enforcement investigators, crime analysts and administrators.

Regular timely communication is a key element promoting higher levels of engagement and coordination among different law enforcement professionals. Law enforcement organizations often task police officers with supplying information to commanders and policymakers without any obvious benefit to the actors collecting the relevant data. In many cases, officers never see the result of their work. In the case of NJ POP, this intelligence supported their investigations, reinforcing the importance of accurate and timely data collection. NJ POP data provided incident details to supplement NIBIN potential matches as well. For instance, NIBIN reports often did not contain incident specifics such as the victim or suspect names, and locations of the shooting, whereas NJ POP data captured that information. NJ POP reports provided detectives with identification of hot spots by region, provide temporal and spatial analysis across jurisdictions, illustrate gang-involved shootings, and provide associations between recovered firearms, repeat offenders, and incidents (IIR, 2014). While NJ POP examines shooting offenses in the major cities as discussed, NJ Trace focused on characteristics and patterns of recovered firearms.

NJ Trace 2008

The ATF eTrace system is an internet-based submission application to request a trace of specific firearms through ATF's National Tracing Center (NTC) (ATF, 2021). Crime gun intelligence from eTrace provides investigators with information on crime guns from the original manufacturer or importer through the commercial supply chain, including the last retail purchaser of the firearm. It assists in identifying problem gun dealers, potential gun traffickers,

and straw purchasers. Data from eTrace can detect both in-state and intra-state patterns for firearms that are involved in criminal conduct. Officer-submitters provide information on the make, model, serial number, and the type of firearm recovered along with information on the circumstances of the recovery. such as date, city, and state of recovery.

The state of New Jersey enhanced the submission process by developing a middleware web interface as part of their state Criminal Justice Information System (CJIS) firearms data entry connected to stolen weapon checks. Rather than ask police officers to complete a paper form to submit data to eTrace, NJSP created a gun tracing screen to collect firearms information. The NJ Trace model, established while working with both the ATF's National Tracing Center and the FBI National Crime Information Center (NCIC), offered a unique opportunity for the two independent federal initiatives to benefit from statewide evidence collection. The patterned use and frequency of NCIC made it easy to run a crime gun through the federal database.

Thus, NJ Trace improved the collection process for requesters and created a database within the state of New Jersey that allowed the ROIC to develop both strategic and tactical intelligence products regarding trends and patterns for crime guns across the state. For instance, analysts can assess the percentage of crime guns purchased within or out of state to examine trafficking patterns. Eventually, NJ Trace was expanded to include data on ballistics, time to crime, and links between crime gun possessors and shooting incidents in New Jersey (Miller, 2008, New Jersey State Police, 2008).

The NJ Trace program enabled New Jersey to collect evidence on crime related firearms recovered by law enforcement on a statewide basis. The program collected information on types of firearms recovered included, firearm possessors, recovery location, and some data on criminal circumstances. Equally important data was collected for the entire state of New Jersey. Table 7

presents information on the number of crime related firearms recovered and the number of

firearm possessors identified by law enforcement over the period 2013 to 2022.

Table 7. NJ Trace Crime Related Firearms Recovered by Law Enforcement and Gun Possessor in New Jersey 2013 to 2022*		
Year	Total Firearms	Gun Possessors
2013	3,444	2,001
2014	2,715	1,603
2015	3,171	1,926
2016	3,435	2,126
2017	3,549	2,180
2018	3,500	2,032
2019	3,380	1,871
2020	3,372	1,849
2021	3,970	2,312
2022	4,282	2,590

* Data provided by NJSP, Major Michael Smith, Executive Officer, Regional Operations & Intelligence Center Section, New Jersey State Police

Integration of Firearms Evidence and Analysis to Support ILP

A critical component of New Jersey's crime gun initiatives has been the integration of

firearms evidence such as ballistics imaging and shooting incident data with criminal

intelligence. In fact, the New Jersey project has one of the strongest analytical elements in the

crime gun initiatives that we reviewed.

In large part, this is due to the intelligence-led policing focus of the New Jersey State Police and

the involvement of its fusion center in crime reduction efforts (Fuentes, 2006: State of New

Jersey, 2014).

The Regional Operations and Intelligence Center's central role in this long-term implementation of crime gun intelligence efforts was a defining pillar for crime suppression programs over almost two decades.

The National Crime Gun Intelligence Governing Board (2020) issued *Crime Gun Intelligence: An Evidence-Based Approach to Solving Violent Crime* as a best practices guide for the implementation of crime gun intelligence programs across the United States. As part of its section on Crime Gun Intelligence Enforcement Team, the board recommends the inclusion of an intelligence analyst to provide tactical intelligence products that assist the identification and prosecution of violent criminals and the support of ongoing investigations. They promote the use of local, state, and federal data sources such as trace data, multiple firearms sales, and secondary market data to enhance crime gun investigations. Interestingly, these sources are ATF-centric datasets. State and local crime analysts have a greater scope of criminal investigative data such as calls for service, incident data, automated license plate system and motor vehicle data that can inform gun investigations. Based upon the New jersey experience, these types of information sources have formed a robust analytical capability to support crime gun investigations.

However, not all of the crime gun intelligence initiatives implemented across the country have such a strong intelligence-led policing element. While many sites have some intelligence functionality, none seem to have the depth of analytical expertise that New Jersey has committed. For instance, the Phoenix Crime Gun Intelligence Center (Katz, et. al, 2021) did not use its intelligence unit to support the project but did assign an intelligence analyst. Similarly, the Los Angeles CGIC relies upon an ATF Intelligence Research Analyst (IRS) to develop NIBIN lead information. Kansas City had both an ATF Intelligence Research Analyst as well as Kansas

City crime analysts. So, while these other CGIC projects had some analytical capability, none built in the level of analytical knowledge that New Jersey's strategy provided.

New Jersey's approach to crime gun investigations involved multiple analysts at the ROIC in addition to analysts assigned to their real time crime centers. These analysts became local criminal environment experts as they were involved with state and local investigators across a range of criminal offense types beyond violent crime.

State police analysts at the ROIC and real time crime centers had developed trusted relationships with police departments in their area of responsibility as a result of the investigative support and tactical analysis these analysts provided for violent crimes. Analysts could provide information on suspects, vehicles, locations, and other key investigative data to busy detectives that "took information searches off their plates" and provided analytical products to assist investigations back in return. They used a multiple shooting in Bridgeton Township, Cumberland County in 2021 (Gray, 2021).

In that shooting, three people were killed and eleven wounded as a result of a confrontation among several groups at a house party in that community. Investigators recovered over 40 shell casings and nine firearms at the scene. Analysts working with investigators at the scene were able to develop criminal histories and potential gang affiliations on potential suspects and victims. Authorities connected firearms to another shooting a month earlier in Franklin Township through ballistics imaging of those shell casings.

Analysts were able to sift through a large volume of information from an incident where there were more than a hundred attendees at this party.

Crime analysts in New Jersey examine the NIBIN Leads data forwarded from the crime lab and assess it in conjunction with the NJ POP shooting data and other intelligence sources

they have access to. Before the development of an integrated data repository like BackTrace, analysts were able to examine associations with guns related to multi-jurisdictional incidents and guns related to other guns or multiple guns from same incident as the Bridgeton case illustrates.

Analysts could review suspects and victims identified in NIBIN reports in relation to NJ POP suspect and victim identifications (Lambert interview with ROIC analyst, November 2, 2021). Analysts look for connections between people, places, and events.

For example, they try to connect suspects or victims with crime locations and incidents. Finding a suspect or victim involved in a shooting incident can assist in developing a criminal history profile for involved individuals which can then lead to connections to other incidents or weapons, possible associations with criminal groups or gangs. Access to other information sources such as driver license and motor vehicle ownership records, criminal histories, arrests, probation, and parole records assisted investigators in developing a pattern of life summary of individuals involved in shooting incidents. Analysts can visualize these connected dots using link analysis software that form a picture of criminal relationships.

These types of visualizations can assist investigators and prosecutors in comprehending the often complex relationships between people, places, events, and weapons.

This subject matter expertise combined with the use of ballistics imaging and other firearms evidence greatly enhances the ability to connect people, places and things when developing investigative leads. Analysts know the key players in the criminal environment, understand violent crime trends and can identify regional patterns of violence whereas some of the other CGIC projects are more city specific.

In addition, the ROIC developed other analytical products that further institutionalized the concept of information sharing between a fusion center and municipal, county, state police

and prosecutors. For instance, ROIC analysts and troopers assigned there produced a Daily

Crime Gun Recovery Report that outlined statewide arrests for violent crime, firearms recovered

from crime scenes as well as arrests. Using the NJ Trace crime gun tracing system, analysts

could identify illegal gun possessors with enhanced information on their prior gun arrest

histories. Sharing this strategic intelligence with police agencies across the state provides

investigators, prosecutors, and policy makers with a broad view of the violent crime environment

in New Jersey.

Analysts can connect crime guns to suspects and locations that may provide leads for

other shooting cases.

GUNStat Reporting System

GUNStat is a monthly report produced by ROIC analysts modeled upon information

sharing concepts adapted from COMPSTAT (see Figure 6). GUNStat was designed to inform not

only criminal justice policymakers but also the public. On April 6, 2018, New Jersey Governor

Phil Murphy signed Executive Order 21 mandating the publication of information relating to

firearms that were involved in violent crimes (Insidernj.com, 2018; State of New Jersey, 2018).

This executive order proposed to include:

- City of firearm recovery
- County of firearm recovery
- Type and caliber of firearm
- Types of shooting victims
- Total number of weapons recovered.

The data is extracted from the state's NJ Trace firearm recovery system which collects

recovered illegal firearms from police throughout New Jersey. NJ Trace is a data collection

system that eventually passes crime gun data to the ATF's National Tracing system, eTrace. It

also provides a summary of shooting victims extracted from the NJ POP data system. This

analytical product is another information sharing device that provides users with strategic

intelligence monthly and illustrates the value added by crime analysts at the fusion and real time

crime centers.

Figure 6. GUNStat Report*
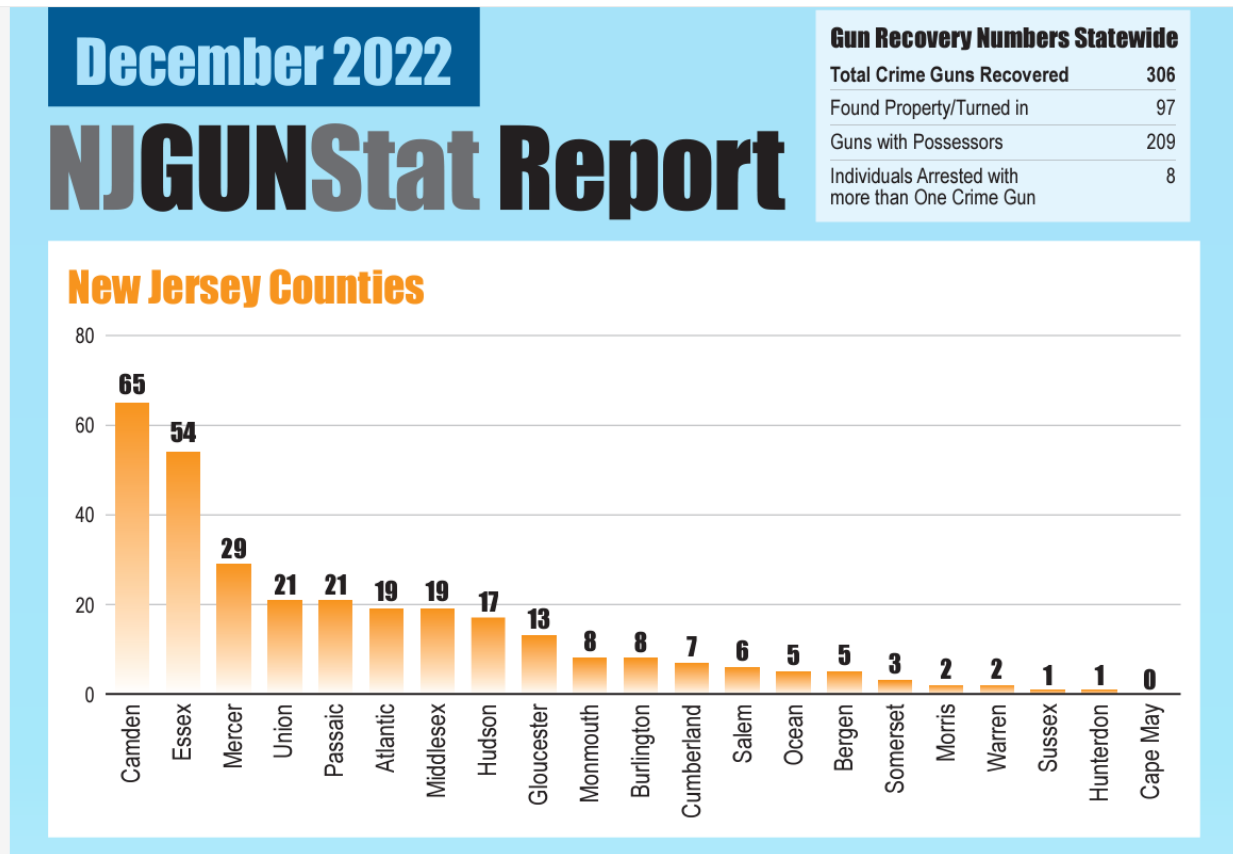
*Report provided by NJSP.

Based upon the evaluations presented, it appears that few of these CGIC projects

followed a structured intelligence-led policing approach. Like many traditional enforcement

efforts, these agencies had some intelligence analysis capability, but these efforts are primarily

focused on examining NIBIN leads. It is difficult to assess the depth of analytical work being

conducted in these other projects based upon the limited information provided in these evaluations.

Violent Enterprise Source Targeting (VEST) 2008

The New Jersey ROIC supported a federal initiative, the Violent Enterprise Source Targeting (VEST) program in 2008. VEST was described as a unique "pulling together" of the city, county, state, and all federal agency leaders in a COMPSTAT-style bi-monthly working group. VEST was federally supported by the ATF, FBI, ICE, US Marshals, and United States Attorney's Office as well. Within New Jersey, participating agencies included the New Jersey State Police, New Jersey Division of Criminal Justice, Newark Police Department, Essex County Prosecutor's Office, Essex County Sheriff's Office, and Newark Housing Department.

In this collaboration, both coordinated and planned enforcement efforts into a focused, systematic, and sustained strategy against the violent crime plaguing Newark (DEA, 2008). This was quickly expanded from Newark to other cities in the state, such as Jersey City, Paterson, Perth Amboy, and Trenton in 2009, and Camden in 2010 (Guidetti, 2010; IIR, 2014). VEST operated in the New York – New Jersey High-Intensity Drug Trafficking Area (HIDTA), another federally funded information-sharing effort.

VEST targeted the most violent and prolific offenders in the region such as Operation Wetlands in 2010 in the Jersey City area that led to the arrest of 46 individuals associated with the Sex Money Murder (SMM) set of the Bloods street gang (New Jersey Office of the Attorney General, 2010; New Jersey State Police, 2010). This multi-agency initiative illustrated the efficacy of information sharing in targeting violent and drug crimes. It was one of the first collaborative efforts to share criminal intelligence across jurisdictions in New Jersey.

Project Watchtower

The New Jersey Regional Operations and Intelligence Center (ROIC) developed Project Watchtower to share information and intelligence among state and local police agencies regarding shootings, guns, and potential suspects involved in gun crimes (Guidetti & Morentz, 2010). Project Watchtower consisted of three core initiatives, NJ POP, a gun violence tracking system, NJ Trace which tracks the source of crime guns used in violent crime and NJ TAG or Targeting the Activities of Gangs. This effort sought to collect data on shootings, crime guns, and gang members across the state and leverage the analytical expertise of the ROIC to provide intelligence products to investigators working on these violent incidents. Analysts were able to produce both tactical and strategic intelligence products such as routine, monthly, and on-demand reports on the shooting environment in New Jersey based on data collected through these 3 components (U.S. Department of Homeland Security, 2010).

CorrStat Initiative

CorrStat is a multi-jurisdictional information-sharing project initiated in North New Jersey along the Rt. 21 corridor. The corridor runs through the Essex and Passaic County areas including cities such as Newark, Elizabeth, Jersey City, Paterson, and 20 surrounding communities. This region comprises less than five percent of the state but is responsible for more than 50% of the state's homicides and gun crimes (Fuentes, 2017). The senseless killing of an off-duty Newark police officer in Paterson triggered this project. Key stakeholders within the law enforcement community proposed a regional information-sharing effort that would enable police departments to collect and share information across agencies. The CorrStat staff conducted extensive interviews with police departments to determine intelligence requirements, settling on

what they termed, the "Five Deadly Sins" for the CorrStat region, robbery, shooting, burglary, auto theft, and carjacking (IJIS, 2014).

The CorrStat program added two additional elements to New Jersey's ROIC program. CorrStat implemented a set of monthly executive meetings as well as three times per week information sharing conference calls with investigators, analysts, and prosecutors in other justice agencies. These meetings and other regular communication channels have helped eliminate many of the information silos that existed across the numerous public safety agencies charged with crime prevention and reduction (Morrall, 2018; Police Executive Research Forum, 2017). Second, the analytical component of CorrStat is supported by the Regional Operations and Intelligence Center (ROIC).

To assist CorrStat information-sharing effort, the Real Time Crime Center North (RTCC-North) was established in 2014 at the Newark Police Department (Nixon, 2014). The RTCC -North is staffed with officers and analysts from Newark, and NJSP, as a satellite of the ROIC. The ROIC provides leadership, direction, and guidance to the RTCC-North and facilitates access to advanced analytics and additional personnel. Staff performs tactical intelligence analysis to support violent crime investigations for CorrStat agencies. They conduct record checks, query criminal and intelligence databases, and integrate data from license plate readers from various jurisdictions as well as NJ Trace and NIBIN data. In addition, The Real-Time Crime Center – South (RTCC – South) was opened in March 2017 to service the Camden to Atlantic City corridor, as well as other south New Jersey communities. As another satellite of the ROIC, the RTCC-South provides a monthly information-sharing meeting like CorrStat that is titled South Jersey Status (SJ-Stat).

It is important to recognize that the venue the CorrStat program utilized at the outset and continues today is hosted by the Northern New Jersey Urban Area Security Initiative. Bringing diverse law enforcement entities together to share information is never easy. Having the infrastructure to promote these larger meetings inclusive with the right audio-visual technology is necessary for convening varied law enforcement agencies with the only incentive for gathering hinges upon a voluntary partnership (Fuentes, 2019).

Targeted Integrated Deployment Effort (TIDE)

The Targeted Integrated Deployment Effort (TIDE) was an intelligence-led crime suppression program that leveraged NJSP assets to support local policing efforts in areas where violent crime was increasing in 2013. TIDE focuses on enforcement, investigative, and prosecution efforts among local, state, and federal law enforcement in urban areas that are plagued by illicit drugs, gangs, and firearm violence. This application of intelligence-led policing focused on recidivist offenders, hot individuals, and hot spots that were responsible for violent crime spikes.

The use of criminal intelligence for investigative support and community outreach efforts led to an unprecedented level of information sharing across community stakeholders. It provided a platform to coordinate crime reduction efforts among local, state, county, and federal justice entities bringing their investigative resources together in specific urban areas. This project served as a proof of concept for the use of criminal intelligence toward repeat violent offenders. Strategies included high-visibility uniformed patrols with NJSP troopers along with warrant sweeps and traditional drug, gun, and gang investigations.

Historical Development of NIBIN

ATF in a recently released national report, ATF National Firearms Commerce and Trafficking Assessment, 2023 Vol. 2, provides a definitive documentation of the NIBIN forensics, data submission and assessment process. Descriptions of the NIBIN forensics and processing of ballistics evidence are drawn directly for ATF' national report.

The Forensics of Firearm and Toolmark Identification

As described in the ATF's NFCTA Volume 2,

> "Firearm and Toolmark Identification is possible because the surfaces of a fabricated item, such as a firing pin or a barrel, will initially, because of the manufacturing process and then augmented by subsequent wear and tear, have tiny imperfections and irregularities at the microscopic level even when manufactured to rigorous specifications. These microscopic dents, burrs and other minute blemishes are transferred to different parts of the ammunition and are what allows the Firearm and Toolmark Examiner to establish a link between the firearm and ammunition. For example, when semi-automatic pistols are fired, they typically discharge a cartridge case to clear the chamber making way for the next live cartridge to be fed from the magazine, seated, and ready for the next firing. The firearm leaves distinct markings on the cartridge case including the firing pin impression (FP), breech face marks (BF), and the ejector mark (EM)…"(ATF National Firearms Commerce and Trafficking Assessment, 2023 Vol. 2, Part 1, NIBIN, p4.)

New Jersey's efforts to address violent gun crime overlap with many developments in technology that helped add intelligence capabilities as well as make the evidence more intuitive for investigators. This section overviews some of the historical developments of The National Integrated Ballistic Information Network (NIBIN) as it pertains to advancing gun crime intelligence, which New Jersey has used in its effort to combat violence across the state. This section examines the historical and technological development of NIBIN, how NIBIN operates, and the four critical steps to NIBIN's success. This history is important to help contextualize how this technology impacted firearm crime prevention programs, ballistics analysis, and legislation in New Jersey.

NIBIN is a national computer-assisted ballistics imaging and information sharing

network managed by the ATF, which utilizes a technology called the Integrated Ballistic

Identification System (IBIS). After evidence is collected from crime scenes or test-fired from

recovered firearms, the NIBIN system scans the unique markings, such as the breech face, firing

pin, and ejector markings, transferred to pieces of ballistic evidence during the discharge of the

firearm. This technology then stores, compares, and transmits two as well as three-dimensional

images of the evidence. After data is collected and stored, algorithms calculate correlations to

compare the initial scanned piece of evidence and other previously recovered evidence from the

NIBIN database. This information is then transmitted in ways so that the investigators can

analyze. The overall goal of NIBIN is to use the unique markings on ballistics evidence to link

firearms and criminal events, stop the flow of trafficked weapons, and aid in criminal

investigations as well as prosecution (Police Executive Research Forum, 2017).

The Evolution of NIBIN Technology

NIBIN evolved from two earlier ballistics information systems used by the FBI and the

ATF (Integrated Ballistics Identification System). DRUGFIRE was established by the FBI in

1992. This system originally specialized in identifying cartridge cases and later developments

included projectile analysis capabilities (Boesman & Krouse, 2001; King et el., 2013; Office of

the Inspector General, 2005). In 1992, in parallel with DRUGFIRE, Forensics Technology

Incorporated (FT) developed "Bulletproof", the predecessor of IBIS, capable of imaging,

processing, and comparing fired bullets collected from crime scenes and recovered crime guns.

In 1995, FT added a software and hardware combination called "Brasscatcher" to its

CEASEFIRE program for the imaging, processing, and comparison of fired cartridge cases

collected from crime scenes and recovered crime guns that were integrated with the Bulletproof

platform. FT branded its integration of Bulletproof and Brasscatcher the Integrated Ballistic

Identification System (IBIS). Soon after, a bullet processing solution was added to the FBI's

DRUGFIRE System.

In 1997, ATF and the FBI merged their ballistics programs and created NIBIN along with

a three member NIBIN Governing Board. In 1999, the NIBIN Governing Board established a

unified system using IBIS equipment and convened a technical advisory group to provide advice

on feasible technological changes and user preferences. (Boesman & Krouse, 2001). The 1999

agreement called for the national deployment of a new NIBIN system—the remote data

acquisition station (RDAS)—to replace the currently deployed DRUGFIRE and IBIS systems

(Office of the Inspector General, 2005). This second generation of IBIS technology provided

higher resolution 2-D images, enhanced correlation algorithms, and improved automation to

support the entry and analysis of evidence (Office of the Inspector General, 2005). At

approximately this time, 231 state and local law enforcement agencies had acquired 2nd

generation IBIS technology for their use in imaging, comparing, and sharing firearm evidence

with the NIBIN system (Office of the Inspector General, 2005). In 2003, the FBI's role in

NIBIN, other than that of a participating partner under the NIBIN program, ceased.

Consequently, the ATF became solely responsible for all aspects of the NIBIN program (Office

of the Inspector General, 2005).

In 2007, FT released an updated 3rd generation imaging technology titled IBIS TRAX 3-

D. This improvement upgraded the 2-D scanning resolution and added a 3-D scanner, which

made it possible to review ballistic evidence typographically. In addition, there were also further

improvements in the matching algorithm (across different pieces of ballistics evidence, e.g.,

cartridge casings). More advanced matching algorithms, increased operator ease of use, and

increased ease of analyzing evidence provided by the 3rd generation IBIS technology enhanced

the investigative potential evidence NIBIN by providing more accurate and timely analysis of

evidence. In addition, system automation decreased operator errors, and the amount of work that

could be done by a technician increased due to the new system's intuitiveness and ease of use.

As a result, processed evidence increased, and backlogged evidence awaiting processing in many

departments decreased.

Despite improvement in ballistics imaging technology, in 2009, the ATF removed and

redistributed NIBIN sites, which lowered the total number of sites from 228 to 203 (King et al.,

2013). Due to budget constraints, in 2011, the ATF slashed NIBIN's budget by 50% and closed

sites that either did not generate many leads or were not in high-crime areas to conserve

resources. These budget cutbacks further reduced the NIBIN system to 140 sites in the United

States (King et al., 2013).

In 2013, FTS released its fourth-generation software titled IBIS TRAX-3DHD (3-

dimension - high definition) launched with improvements that included improved high definition

and in-depth visualization, refined data correlation, system integration, and process optimization.

The 4th generation of IBIS technology is what is currently being used by most departments with

these systems. Most recently Ultra FTS has released additional enhancements to the IBIS system

(see ULTRA Forensic Technology, A Brief History 30-Year History of IBIS, n.d.). In

2019 the 5th generation of IBIS technology began to emerge. IBIS BULLETTRAX was

introduced featuring easier bullet-mounting process, and wider field of view and in 2023 the

IBIS system will introduce BRASSTRAX upgrade featuring improved 3D imaging quality and

full 3D headstamp. Figure 7 provides a summary timeline of the ongoing evolution of IBIS

technology from the 1990s to the present. As of 2022, nearly 10 million cartridge cases and

bullets have been acquired into IBIS from hundreds of governments, organizations, and agencies

worldwide depend on IBIS technology for effective and reliable solutions that help solve and

prevent firearm-related crime. Overall, continual advances in IBIS technology increased the

potential of these to support active investigations and crime analysis. The increasing resolution

of ballistic imaging (from 2D to 3DHD system scanning) the introduction of topographical 3-D

images for online review by ballisticians, and the development of more advanced correlation

algorithms, all contributed to the potential relevance of ballistics evidence for active

investigations almost in real-time. As the technology improved, the IBIS sub-systems were

modularized, and the size of these machines used to process the evidence was greatly downsized.

Equally important, more of the processes were automated making the systems more intuitive to

ballisticians, thus requiring less training and personnel (Gagliardi, 2019. p155-158).

In addition, in 2016, ATF created the National Correlation and Training Center (NNCTC)

in an effort to better train officers and ballisticians in using this NIBIN equipment Currently, the

center assists over 1400 law enforcement agencies and provides training to become certified

ballistician trainers, allowing law enforcement agencies to train their own officers without

having to attend the National Training Center (NIBIN National Correlation and Training Center,

n.d.) . Equally important, the NNCTC also "conducts ballistics image correlations and returns

investigative leads to more than 1,400 law enforcement agencies across the nation. This accounts

for roughly 30% of all ballistic image acquisitions in the United States (NIBIN National

Correlation and Training Center web site retrieved from https://www.atf.gov/firearms/nibin-

national-correlation-and-training-center).

Figure 7. Brief Overview of 30-Year Evolution of IBIS System Capabilities*

1ˢᵗ Generation *(1990s)*
- **Main Characteristics:**
  - 2D Low-resolution imaging
  - Data segmentation from class characteristics
  - Basic image comparison algorithms
  - Standalone system

2ⁿᵈ Generation *(Mid-1990s to 2000s)*
- **Main Characteristics:**
  - High-resolution 2D imaging
  - Specialized image comparison algorithms
  - National networks and large database capabilities

3ʳᵈ Generation *(2000s)*
- **Main Characteristics:**
  - 3D imaging and comparison algorithms
  - Automated image acquisition
  - Dynamic visualization and quantitative measurements
  - Security infrastructure
  - International Networking

4ᵗʰ Generation *(2010s)*
- **Main Characteristics:**
  - High-Definition 3D cartridge cases
  - Refined correlation
  - In-depth visual comparison
  - Process optimization

5ᵗʰ Generation *(2020s)*
- **Main Characteristics:**
  - Faster acquisition
  - Smaller form-factor
  - Stronger correlation performance
  - Cloud infrastructure.

*Figure 7 adapted from ULTRA Forensic Technology, A Brief History 30-Year History of IBIS, n.d.)

The NIBIN Process

Currently some Federal. State. local, and tribal police departments use ballistic imaging networks to combat violent crime by adding intelligence via evidence acquisition and data entry into the NIBIN network (Bureau of Alcohol, Tobacco, Firearms, and Explosives, 2021). This process can help establish criminal connections across jurisdictions, aid active investigation, and provide leads that may help initiate investigations.

The NIBIN process is founded in forensic science and encompasses four fundamental tasks: 1) Evidence Collection and Submission, 2) NIBIN Acquisition, 3) Data Analysis and 4) NIBIN Lead and Hit Dissemination. [(ATF National Firearms Commerce and Trafficking Assessment, 2023 Vol. 2, Part 1, NIBIN, p5)](.).

Standardized guidelines for using the NIBIN process from the ATF allow departments to submit evidence in a single, universally interpretable way (ATF CGI Best Practices Handbook, 2020).Ballistics Evidence Collection

Ballistics Evidence Collection

The ballistics imaging process starts with the comprehensive collection of firearms and related evidence, primarily cartridge casings.

This process starts when evidence is collected, whether that is ballistic evidence found at a crime scene or a recovered firearm that has been test-fired. This evidence is then submitted to a NIBIN site for processing.

NIBIN Site Processing

ATF in a recently released national report, ATF National Firearms Commerce and

Trafficking Assessment, 2023 Vol. 2, provides a definitive documentation of the NIBIN data

submission and assessment process. Descriptions of the NIBIN processing of ballistics evidence

are drawn directly for ATF' national report. NIBIN processing is divided into two phases, 1.

NIBIN evidence collection and evidence analysis/assessment. The two phases are documented in

ATF national report and presented below.

NIBIN Data Entry and Correlation

"Upon submission, trained technicians input key data about the case or investigation including the date and type of crime (referred to as a NIBIN case) and associated firearms if recovered (referred to as a NIBIN Firearm) into the NIBIN acquisition station. Highly automated technology captures two- and three-dimensional high-definition (HD3D) images of the unique markings left on the base of the fired casings during the discharge process of the firearm (referred to as a NIBIN Acquisition). Once images are captured, they are uploaded to NIBIN. The technology extracts an "electronic signature" from each image, and multiple algorithms compare the submitted exhibit image signatures with the other similar types of exhibits in the NIBIN system. This comparative process is referred to as the correlation process. It scores and ranks the matching potential of the questioned exhibit to other similar ones in the system. Comparison features of the technology allow for rapid elimination of non-matching candidates and in-depth analysis of markings from potentially matching cartridge casings, giving law enforcement a preliminary determination whether that firearm was used previously." (ATF National Firearms Commerce and Trafficking Assessment, 2023 Vol. 2, Part 1, NIBIN, p5)

The Assessment of NIBIN Correlation Results.

"Firearm examiners and trained NIBIN technicians then conduct a review of the list of correlation results and images on a second piece of equipment called a correlation review station. Technicians compare images of potential matching candidates' side-by-side on high-definition monitors. When a qualified firearm examiner or NIBIN technician identifies a match between exhibits, this indicates the casings were discharged from the same firearm. Such matches are referred to as NIBIN leads. It is important to note that acquisition and correlation review stations do not have to be physically located in proximity to one another. NIBIN being a national network, allows trained technicians working across the country to compare images and make links without jurisdictional constraints." (ATF National Firearms Commerce and Trafficking Assessment, 2023 Vol. 2, Part 1, NIBIN, p6)

NIBIN's Four Critical Steps

The success of the NIBIN systems is predicated on four foundational principles (Police

Executive Research Forum, 2017; Ultra Electronics Forensic Technology, n.d.):

1. Comprehensive data collection and entry,
2. Timeliness,
3. Investigative follow-up, and
4. System feedback.

The first principle asserts that all partner agencies must collect and submit all ballistics

evidence suitable for NIBIN (Police Executive Research Forum, 2017). This includes not only

all recovered and seized firearms, but also bullets and cartridge casings from scenes. Ideally,

police departments will collect spent casings from shots fired calls where there may not be a fatal

or nonfatal injury, but additional evidence that a specific firearm was used in other violent

incidents. The second principle speaks to the need for the quick turnaround of the evidence.

Many times, departments are backlogged with evidence awaiting entry into NIBIN (King et al.,

2013). However, if the goal is to aid investigators and lower violent crime, there needs to be a

timely turnaround of 24-48 hours, which studies have found can provide important support for

active criminal investigations (King et al., 2013; Police Executive Research Forum, 2017). Other

research finds that "delays in processing ballistic evidence are the single greatest threat to the

utility of NIBIN as an investigative tool" (King et al., 2013). The third principle discusses how

linking previously associated crimes offers investigators a better chance to identify and arrest

shooters before they re-offend (Police Executive Research Forum, 2017). Lastly, without any

feedback in this process, key stakeholders cannot know how these processes are aiding

investigators, lowering, crime, or helping the community, which is certainly necessary for
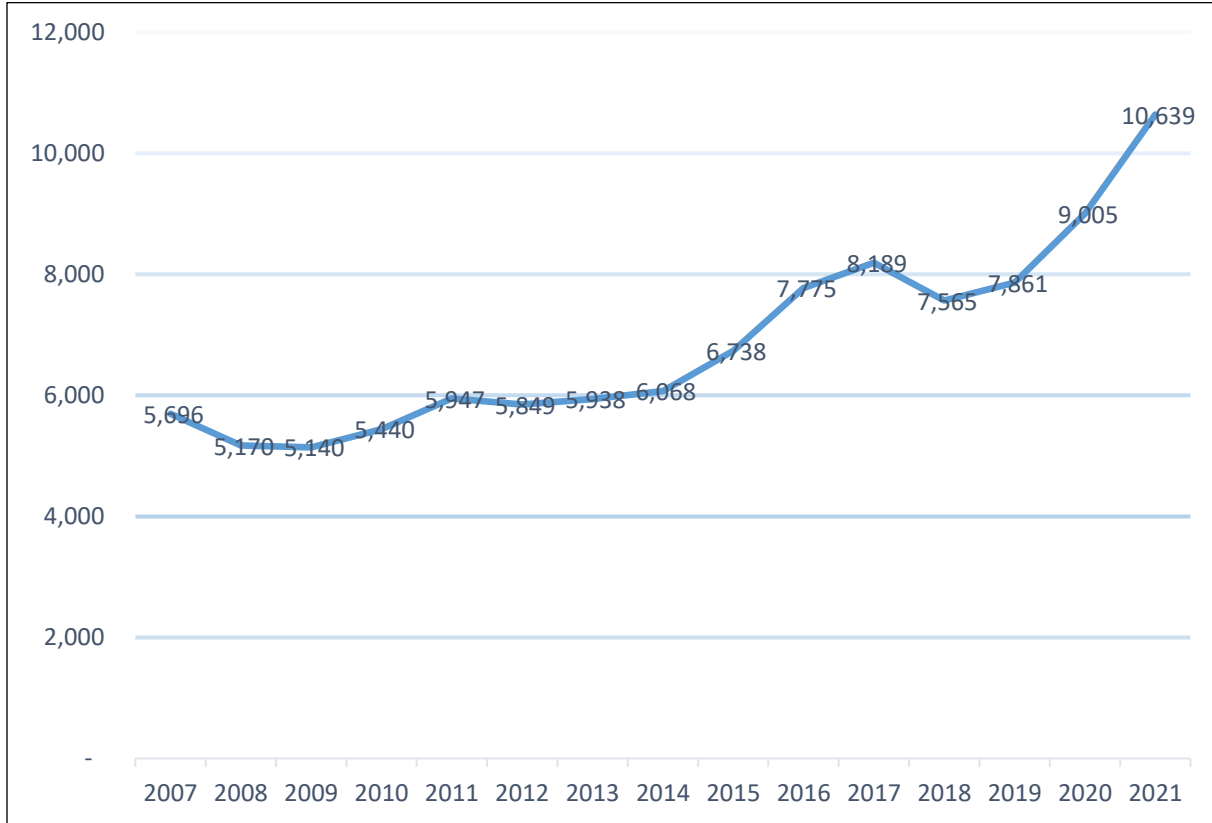
sustained success and improvements (Police Executive Research Forum, 2017; Ultra Electronics Forensic Technology, n.d.).

The Operation of NIBIN in New Jersey

NIBIN casing acquisitions data for New Jersey for the period 2007 to 2021 are presented in Figure 8. These data are available for all states in the nation from ATF's National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two, PART I: National Integrated Ballistic Information Network (NIBIN)[5]. Over this period half of this period, NIBIN casing acquisitions remained relatively consistent ranging from 5,606 in 2007 to 6,068 in 2014. After 2014 the number of NIBIN acquisitions rose by 75% by 2021 (i.e., rising form 6,068 in 2014 to 10,639 in 2021). Nationally NIBIN acquisitions rose even more, but New Jersey NIBIN acquisitions may have already been higher than the nation average as will be examined.

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[5]National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two, PART I: National Integrated Ballistic Information Network (NIBIN), Table NIB-01: NIBIN Acquisitions by State/Territory, 2005 – 2021, https://www.atf.gov/firearms/national-firearms-commerce-and-trafficking-assessment-nfcta-crime-guns-volume-two

Figure 8. New Jersey NIBIN Acquisitions 2007 to 2021*

Rapid Assessment into NIBIN (RAIN) Protocol

In 2013, there was increased public concern about firearm-related violence in New Jersey. To help mitigate gun-related violence, issues related to crime gun intelligence needed to be addressed. In particular, there were concerns with the collection and analysis of crime gun data and the timely processing of ballistic evidence.

In addition, New Jersey's concerns were fairly common across the states. In many crime laboratories across the country, the lack of forensic resources to keep pace with law enforcement's demand for services. Lipsky (2010) discussed the reality of street-level workers,

such as forensics personnel, having to ration available resources to meet the expanding demands

for their services. Strom & Hickman (2010) argue that laboratory resource limitations and the

resulting processing backlogs have impeded the collection and analysis of evidence across all

areas of forensics. Evidence processing backlogs are a long-standing problem in forensic

laboratories Durose, 2008; Peterson and Hickman, 2005). In many forensic science labs, analysts

give priority to cases that are moving forward with prosecutions or at least have known suspects.

For incidents such as found weapons that do not have suspects or even crimes initially associated

with them, lab managers are less likely to analyze these cases when ready-for-trial cases require

an immediate response. Studies (Lovrich et al., 2004; Strom and Hickman, 2010) have indicated

that law enforcement agencies are hesitant to submit evidence in no suspect cases given existing

laboratory constraints. Often investigators overlooked the analysis of evidence for intelligence

purposes as an investigative tool (Ribaux et al., 2006).

       These issues were a top concern to Camden County law enforcement who reported the

NJSP ballistics lab took months (sometimes up to 10 months) to process the county's ballistics

evidence. The county believed that these processing delays significantly reduced the value of

their ballistics evidence for investigative purposes, which is supported by research that finds that

the timeliness of forensic evidence is an essential factor impacting case success (Strom &

Hickman, 2010; Bond, 2007, 2009; Police Executive Research Forum, 2015).

       To address public and law enforcement concerns about gun violence and the inadequacy

of related data, New Jersey enacted legislation centered on crime gun control and enhanced

collection and reporting of crime gun data. On September 18, 2013, New Jersey Public Law

2013, Chapter 162 was approved and implemented on January 1st, 2014. The statute codified

elements of the Attorney Generals' 2008 directive that focused on utilizing forensic firearms

evidence and technology as well as sharing intelligence across law enforcement entities (N.J. Stat. § 52:17B-9.18, 2014; N.J. Stat. § 52:17B-9.19; Milgram, 2008). New Jersey Public Law 2013, Chapter 162 required law enforcement departments and agencies to collect and submit firearm evidence related to crimes to the NJSP promptly in 24-48 hours, participate in inter-jurisdictional information sharing and crime analysis programs, and submit as well as utilize firearms evidence databases provided by federal law enforcement agencies, including ATF's eTrace system and the FBI's National Crime Information Center (NCIC), ATF's eTrace, and ATF's NIBIN (New Jersey State Police, 2014).

The new public law authorized the Attorney General and the Superintendent of the New Jersey State Police to establish protocols for police agencies to follow in order to comply with the new requirements. To meet the requirements of New Jersey's new crime control legislation regarding the collection and processing of ballistics evidence (Public Law 2013, Chapter 162) and to help address concerns raised by New Jersey Police agencies such as Camden County over NIBIN processing delays, the NJSP began the development of the Rapid Assessment in NIBIN (RAIN) protocol and initiative in early 2014. The RAIN initiative involved three broad phases; 1) identifying and reducing inefficiencies within the NJSP Ballistics Unit to improve the quality and timeliness of evidence, 2) expanding the evidence collection covered in the RAIN Protocol, and 3) extending RAIN standards to the entire state of New Jersey.

RAIN– Reducing Processing Inefficiencies in the NJSP Ballistics Unit

The NJSP Ballistics Unit is the provider of ballistics services, including NIBIN, to all New Jersey law enforcement agencies except those with their own in-house services. Considering that there were only 7 other NIBIN service sites in the state at that time, the NJSP is responsible to provide ballistic services for a large area of the state.

Therefore, to meet the requirements of New Jersey's new crime control legislation regarding the collection and processing of ballistics evidence (Public Law 2013, Chapter 162) and to address concerns raised by New Jersey Police agencies such as Camden County over NIBIN processing delays at the NJSP Ballistics Unit, the NJSP: 1) conducted a self-assessment of Ballistics Unit NIBIN processing procedures, and 2) held numerous meeting from January and March of 2014, with key stakeholders in the NJSP, subject matter consultants and other forensic experts. These efforts resulted in the development of the RAIN protoco**l.**

Before the implementation of the RAIN program and the RAIN protocol, recovered firearms passed through several different forensic sections within the NJSP Crime Lab to extract forensic evidence requiring 10 or more processing steps. NIBIN was not the priority and was placed in the queue after other types of forensic processing, such as latent fingerprints, trace evidence, and DNA (Noble, 2014). Each one of these units placed the evidence in a queue which often became backlogged and extended evidence processing time NIBIN lab procedures had several choke points that significantly slowed the processing of evidence. Incoming cases would be assigned in line with previously submitted cases awaiting examination (pre-RAIN column item 3). The processing of ballistics evidence could be delayed when waiting for other types of forensics evidence to be processed (e.g., DNA, fingerprint analysis) which slowed the entire process.

Delays were unfortunate in more than one way. Thus, it could take six months or more to know whether the gun being examined had been used in a murder or series of murders, or whether the suspect associated with the gun was involved in other serious gun crimes.

Additional lab bottlenecks or chokepoints were found in the Ballistics Unit. Firearms were processed in the order in which they arrived. Post-RAIN, firearms related to a shooting or violent crime were given priority and processed and ballistics imaged first.

The firearms and related evidence were often returned to the originating police department and requested to be re-submitted if in the future potential NIBIN matches were discovered.

Sometimes, the recall of evidence had to be coordinated among the multiple agencies having custody of it. Chokepoints could develop in the recall and receipt of evidence causing compounding delays.

The back and forth of the physical evidence was required by the internal protocol in place at the time. All potential NIBIN matches had to be microscopically examined and confirmed as a NIBIN Hit.

This requirement was eliminated in RAIN because, advancements in the IBIS technology utilized by NIBIN, such as high-definition 3D imaging and powerful new matching algorithms, gave forensic experts the confidence to identify high-confidence matches directly from images displayed on the NIBIN system monitors (Guidetti, personal communication, August 10th, 2022). Post-RAIN, such high confidence matches could be reported as a NIBIN investigative lead in a much timelier manner. Critically, using the new RAIN protocol, the State Police were able to reduce the NIBIN turnaround time for firearms evidence from 6 – 10 months to 24 – 48 hours.

Figure 9 is adapted from Lt. Geoffrey Noble, 2014 presentation, Ballistics Overview & Rapid Assessment in NIBIN Program, provides a summary overview of the major choke points/bottlenecks the RAIN initiative eliminated or reduced in processing NIBIN evidence.

Figure 9 illustrates that the revised NIBIN submission protocol eliminated four important choke points that slowed the processing of NIBIN submissions.

Figure 9. RAIN Initiative's Reduction of Bottlenecks in the NIBIN Acquisition and Analysis Process*

1. NIBIN Process Before RAIN with Choke Points
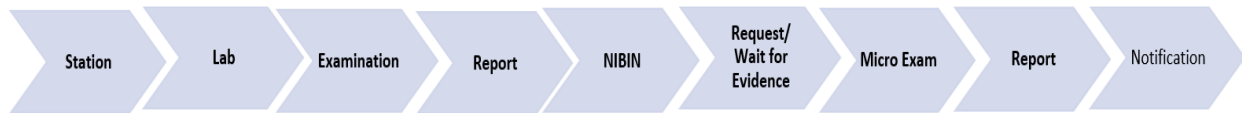
2. NIBIN Process after RAIN with Chokepoints Removed

24 to 48 Hour Turn Around
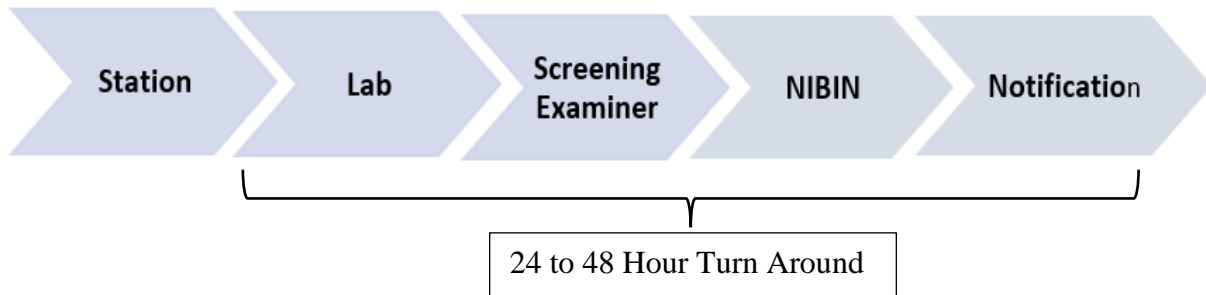
*Adapted from Ballistics Overview & Rapid Assessment in NIBIN (RAIN) Program, ppt presentation by Lt. Geoffrey Noble (NJSP), 2014.

Expanding the Evidence Collection Covered in the RAIN Protocol

In late 2014, it was found that many recovered, and test-fired guns were later discovered to be associated with a crime. However, during the test-fire process with some of these firearms, the evidentiary value of trace evidence, latent fingerprints, and DNA could become contaminated, which meant that there needed to be procedural changes. In January of 2015, there was an expanded crime gun protocol that drew resources from the NJSP Crime Scene Investigations Units (South, Central, North) and the New Jersey State Police Forensic Photography Unit to examine crime guns for evidence before subjecting them to the RAIN process. This expanded gun protocol dealt with identifying and preserving potential forensic

evidence associated with crime guns, which meant instituting proper processing procedures. This set guidelines for processing weapons for trace evidence, DNA, Latent Prints, and Defaced Serial numbers before entry into NIBIN (Noble, 2015).

Using crime scene technicians assigned to the NJSP Ballistics Unit to examine and recover evidence from the recovered firearm, they were able to conduct comprehensive forensic processing (visuals for trace evidence, DNA Swabbing, and latent fingerprint search) of individual firearms in 45 minutes (Gagliardi, 2021). After this, the ballistics evidence went immediately to the Ballistics Unit for NIBIN processing and then stored for any future investigative needs.

This expanded protocol was a vast improvement from having the firearm wait, sometimes for weeks, in the evidence queue of each specialized forensic unit in the lab. The use of crime scene technicians to perform these additional and more comprehensive forensic examinations at the NJSP Ballistics Unit, allowed the NJSP to expand their internal RAIN protocol, while most remarkably continuing to meet their targeted turnaround time for NIBIN processing of 24 – 48 hours.

Extending RAIN to the Entire State of New Jersey

The NJSP internal RAIN protocol was developed to achieve the timely turnaround of ballistic evidence entered into NIBIN. However, at that time there were seven other NIBIN sites throughout the State that provided NIBIN services to the law enforcement agencies within their areas of responsibility. They faced some of the same delays caused by some of the same bottlenecks that the NJSP Ballistics Unit faced.

Moreover, New Jersey Public Law 2013, Chapter 162, tasked the Attorney General and the Superintendent of the New Jersey State Police to establish the protocols for police agencies to follow in order to comply with the new requirements.

From their initial internal RAIN planning and implementation, the NJSP explicitly recognized the need to achieve statewide agreement on data and evidence processing standards. The standards included what information had to be collected, the data collection and analysis process, the timeliness of the process, and the integration of evidence from communities across the state and at a later point integration across all available forensic evidence (e.g., ballistics, DNA, fingerprints, trace evidence).

The development and implementation of RAIN across the state was a complex evolving iterative process that required working with officials in the federal, state, county, and local law enforcement agencies. Other key stakeholders involved in the development of RAIN included ballistic lab personnel from each of New Jersey's seven NIBIN sites, and high-ranking command officials (e.g., NJSP, ATF, and Ultra Forensic Technology) and from New Jersey's seven sites existing at that time. RAIN required translating the mandates of the new legislation into an organizational system that involved integrating the intelligence of different agencies. The task was further complicated because it required the timely and comprehensive collection of crime gun evidence from New Jersey's local law enforcement agencies (of which there are over 500 in the state) and mandated the production and dissemination of actionable crime gun intelligence back to appropriate local, county, and other law enforcement stakeholders. This iterative process involved numerous meetings between these stakeholders regarding the new law and concerns around the state. The process entailed extensive planning and community outreach before the protocol implementation and the later expansions of RAIN to include other types of forensic

evidence. The section outlines the development of the statewide RAIN protocol that was

comprised of 5 major interconnected phases:

1. Community outreach and engagement
2. Implementation of the final RAIN protocol
3. Project 360 - Enhancing Training and Expanding NIBIN Services
4. Standardization & Facilitation
5. NIBIN Evidence Drop Off Centers

Community Outreach and Engagement.

 A key component of the planning and engagement process was a formal program of

outreach to key law enforcement stakeholders. Between May and July 2014, the NJSP initiated a

set of four seminars at NJ's Attorney General's Advocacy Institute, to inform New Jersey

stakeholders (i.e., forensic, police, prosecutorial, and judicial professionals) on new enhanced

methods of ballistic evidence analysis as well as educating on the new law, RAIN guidelines,

and other advances directed at reducing firearm violence (New Jersey Attorney General

Advocacy Institute, 2014).

 The four workshops hosted forensic, police, investigative, and prosecutorial professionals

from each of the four different areas in the state. A core presentation provided in this training

was based on the book entitled: *The 13 Critical Tasks: An Inside-out Approach to Solving More

Gun Crime*[6] to illustrate the utility of ballistics imaging through the NIBIN system as well as the

use of eTrace to identify firearms trafficking. After the outreach programs finished, a revised

finalized protocol in September of 2014 and a Ballistics Community of Interest of New Jersey

forensic professionals were established to monitor and improve practices (New Jersey State

Police, 2014).

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[6] P. Gagliardi, the 13 Critical Tasks: An Inside-Out Approach to Solving More Gun Crime, 3rd ed. Cote St-Luc, QC: Ultra Forensic Technology Inc., 2019.

Implementation of the Final RAIN Protocol.

In September 2014, the final protocol set guidelines for submitting and storing firearm data, such as found firearms, test-fired cartridges cases, and for analyzing found cartridges cases. The protocol was applied to cases involving unlawful possession of a firearm(s), firearms recovered as found property, and discharged cartridges that have been recovered from scenes involving "shooting-hits" (a person was struck), "shooting-murders," and "shots fired" where there are no arrests or identified suspects (New Jersey State Police, 2014). The protocol standards for the information that must be submitted to NIBIN include:

- Firearm make, model, serial number, and caliber
- Date of test fire
- Identity of the person who completed test-fire,
- Submitting agency name and address,
- Submitting agency case and exhibit number,
- Date and location of the offense,
- Location of the found firearm,
- Test load description,
- Suspect information,
- Investigator information (New Jersey State Police, 2014).

Project 360 - Enhancing Training and Expanding NIBIN Services

RAIN approach to improve ballistician training on ballistics evidence analysis and practitioner outreach on evidence collection and adding new NIBIN technology across the state (Gagliardi, 2021, Guidetti, 2014). This program improved police training as it sent NJ ballisticians to the NIBIN National Correlation and Training Center (NNCTC) where they completed their training to be NIBIN technical trainers. This meant that NJSP could now train their own NIBIN technicians instead of sending them to the NNCTC to be trained. This is a far cheaper option and a better allocation of state resources. During this period, the Camden County Police Department obtained an IBIS system, and the New Jersey State Police received a second

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IBIS system. Along with additional technology supplied by the ATF, the State Police and ATF trained additional IBIS technicians within the NJSP and major cities to improve the efficiency of ballistics imaging services.

Standardization & Facilitation of Crime Gun Evidence Collection.

New Jersey, like other states in the country operates under a decentralized law enforcement model with 550 state and local police agencies operating independently (Reaves, 2011). Within that framework, forensics resources are also decentralized, though to a lesser degree. In the case of ballistics imaging forensics capabilities, currently New Jersey has 6 NIBIN there, the largest being the New Jersey State Police ballistics unit within their Investigations branch. Since 2018, the NJSP Ballistics Unit processed just over 50% of the NIBIN submissions in New Jersey (see Table 8).

To institutionalize the use of firearms evidence to support investigations, the NJSP facilitated the development of a Ballistics Community of Interest that linked the six ballistics units across multiple police agencies in the state. This provided a common platform to share information and best practices. Furthermore, this platform is linked to the NJSP ROIC, providing a direct link to investigators, ballisticians, and analytical staff to support gun crime investigations across the state.

In February 2015, an official pilot meeting to form the ballistics community of interest occurred. In this meeting, there was much discussion on automated standardized reports into NIBIN, the development of a speed distribution list-serv email to accompany the automated report into NIBIN, and changes in policy regarding changing NIBIN confirmed matches to potential NIBIN matches.

In June of 2015, in response to meetings on the standardization of reporting, the ballistics community of interest created a standardized NIBIN Alert form that the labs could use to disseminate investigative leads back to detectives in the field. This allowed all the crime labs in New Jersey to collect and share common data needed to support investigations. This report included drop-down menus of the type of incident, location, and type of evidence that was gathered (see Figure 10).

Figure 10. Statewide Standard NIBIN Information Alert Screen
(Screen image provided by NJSP)

This report was automated to send the NIBIN hit report to a listserv email, which included prominent stakeholders in the NJSP, ATF, FBI, and local investigators in the area who

identified themselves as authorized persons who need to know or want to know in their official capacity. (Guidetti, 2015). Furthermore, this also entailed a policy change from issuing only NIBIN confirmed matches to potential NIBIN matches, which though not verified by firearms examiners, could be shared with investigators in a timelier manner. From a prosecutorial perspective, confirmed ballistics matches are critical, but for investigative purposes, timely dissemination of probable matches is sufficient. In the end, the ballistic community of interest developed a business process that defined a NIBIN Hit as a microscopic analysis of the ballistics evidence that confirmed a match between two or more evidence items. They defined a potential NIBIN Hit as an unconfirmed NIBIN correlation that is useful for investigators but is not definitive (Guidetti, 2015).

NIBIN Evidence Drop-off Centers.

In a similar timeline as the final RAIN protocol, the NJSP initiated other forms of assistance to local law enforcement agencies concerning submitting their ballistics evidence. In September 2014, a pilot program was established to increase the number of regional drop-off sites for ballistic evidence (Gagliardi, 2014). This was done to improve the timeliness of submissions and reduce the time required to submit evidence by police departments that are not close to existing ballistic labs.

Introducing these new sites meant that local police officers from agencies that are further distanced from ballistic labs no longer had to drive hours to drop off evidence but rather send it to a local site where it would be transported and then processed. These regional sites include the Hamilton Technology Complex, the regional headquarters in Totowa, outside of Paterson and Buena Vista, in South New Jersey (Guidetti, Noble and Gagliardi, 2016).

The Impact of NJSP's Ballistic Unit and RAIN on NIBIN Data Acquisitions

The actual planning and implementation of RAIN was a multi-year effort. As the timeline presented in Figure 11 shows, the planning and development period for RAIN extended from January 2014 to about July 2015, and the implementation process extended for approximately one year after that to approximately June 2016. Figure10 presents data on the monthly number of cartridge casing submissions to NJSP's Ballistics Unit in Hamilton between 2008 and 2021.

The NJSP Ballistics Unit serviced approximately half of the counties in New Jersey and approximately 40% of cartridge casing submissions by law enforcement agencies. The impact of the RAIN initiative on the submission of ballistics cartridge evidence to the NJSP lab appears very significant. Specifically, following the final implementation of the RAIN program in June and July of 2015, the number of cartridge cases submitted over the next year from law enforcement agencies in New Jersey rose sharply to approximately 75% of their previous level of submissions.

Figure 11. RAIN Planning and Implementation and Monthly Cartridge Casing Acquisitions to the NJSP Ballistics Unit in Hamilton*, New Jersey 2008 to 2022
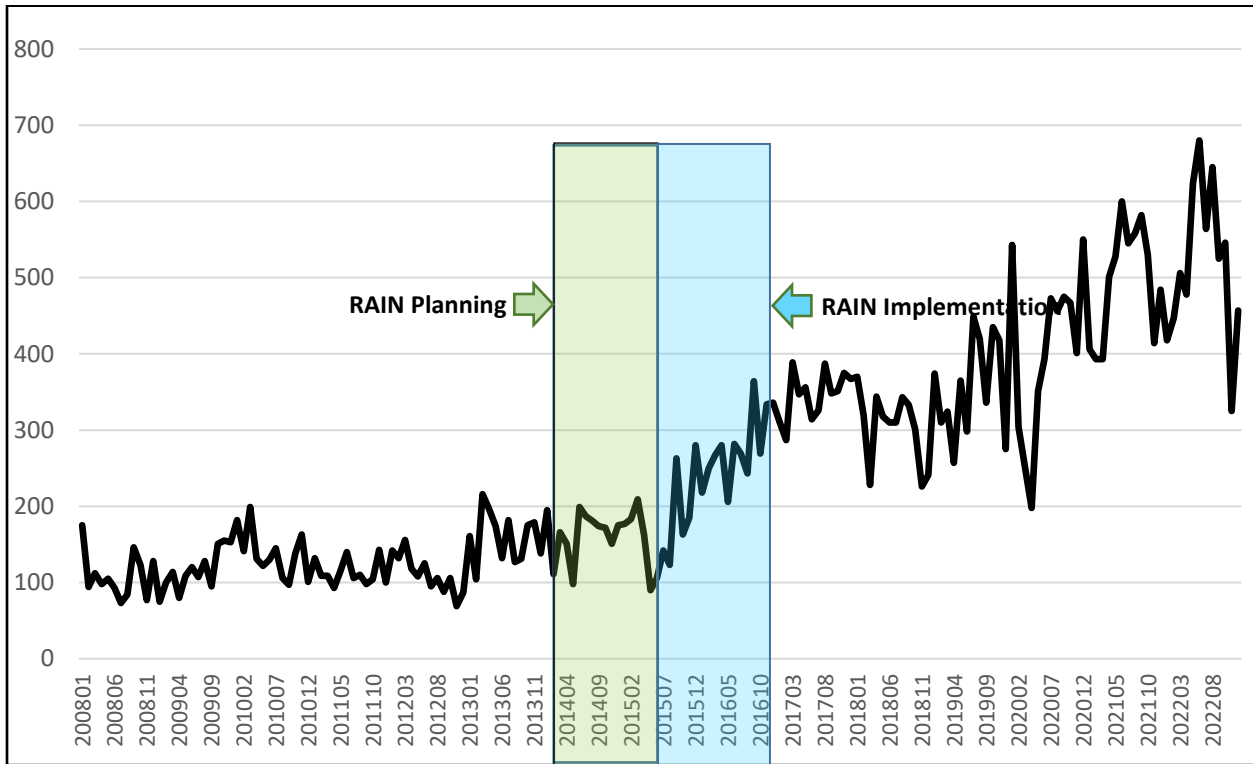
* Data from New Jersey State Lab Monthly NIBIN Progress Reports

Year	NJ State Lab NIBIN Acquisitions*	Percent of NIBIN Acquisitions by NJ Lab of Total NJ Acquisitions	Total NJ NIBIN Acquisitions**
Table 8. Annual NJ State Lab NIBIN Acquisitions and the Percent of NIBIN Acquisitions by the NJ Lab of the Total NJ Acquisitions			
2008	1,308	25.3	5,170
2009	1,387	27.0	5,140
2010	1,655	30.4	5,440
2011	1,359	22.9	5,947
2012	1,332	22.8	5,849
2013	1,916	32.3	5,938
2014	1,960	32.3	6,068
2015	2,083	30.9	6,738
2016	3,318	42.7	7,775
2017	4,157	50.8	8,189
2018	3,643	48.2	7,565

2019	4,260	54.2	7,861
2020	4,863	54.0	9,005
2021	5,934	55.8	10,639

* Data from New Jersey State Lab Monthly NIBIN Progress Reports.
** Data from National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two, PART I: National Integrated Ballistic Information Network (NIBIN), Table NIB-01: NIBIN Acquisitions by State/Territory, 2005 – 2021, https://www.atf.gov/firearms/national-firearms-commerce-and-trafficking-assessment-nfcta-crime-guns-volume-two

An important consequence of increased NIBIN acquisitions is that the number of potential leads generated by NIBIN leads (links of a firearm to different incidents) also increased.

Figure 12 presents annual statistics on the number of leads generated from NJ State Lab acquisition data from 2015 to 2021 and show that the number of NIBIN leads generated by the NJSP Lab rose dramatically over the 2017 to 2021 period. Data were provided by the ATF.
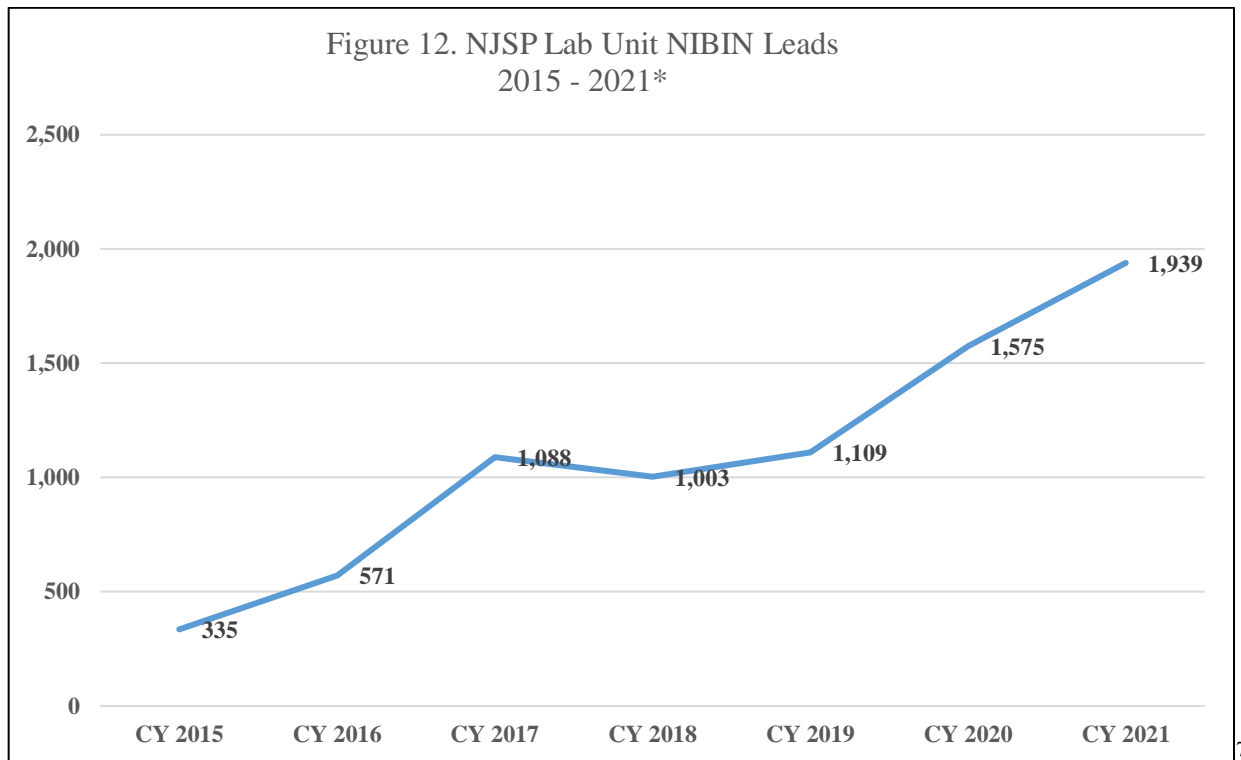
Figure 12. NJSP Lab Unit NIBIN Leads 2015 - 2021*

The Impact of the RAIN Protocols and Complimentary Services on Forensic Evidence Collection in New Jersey

In the recently released National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two report, (https://www.atf.gov/firearms/national-firearms-commerce-and-trafficking-assessment-nfcta-crime-guns-volume-two) ATF provides data on the number of NIBIN acquisitions and the number of NIBIN cases associated with those acquisitions for all states for the years 2017 through 2021.

The ATF NFCTA describes a NIBIN acquisition as: ". . . individual pieces of ballistic evidence (casings and test-fires) that are entered into NIBIN acquisition stations as part of a NIBIN case."

The ATF NFCTA describes a NIBIN case as: "The input of key data concerning shooting or crime gun recovery incidents, including the date and type of crime, results in the creation of a NIBIN case. Generally, a NIBIN case includes at least one recovered casing or test-fire, and tracking data for the submitting LEA."

These two types of NIBIN related data (i.e., number of cases, and acquisitions associated with cases) provide a basis for calculating the ratio of NIBIN Acquisitions to the number of NIBIN cases by state and by year. This provides a measure of how much NIBIN acquisitions evidence is collected on average per case. The higher the ratio presumably the more evidence is collected per case. This also assumes that the number of firearms associated with gun crime incidents is relatively constant across states and years.

The ratio of NIBIN acquisitions to NIBIN cases for New Jersey and the Nation for 2017 to 2021 is presented in Table 9. The data indicates that on average about 1.86 NIBIN acquisitions

are submitted for each NIBIN case in New Jersey compared to 1.40 NIBIN acquisitions are

submitted for all NIBIN cases in the nation. Using this measure, on average New Jersey over the

2017 to 2021 period performed about 33 percent (i.e., 1.86 to 1.40) more NIBIN acquisitions

then the rest of the nation.

Table 9. Ratio of NIBIN Acquisitions to NIBIN Cases to for New Jersey and the Nation – 2017 to 2021						
New Jersey						
	2017	2018	2019	2020	2021	Total
NIBIN Cases*	4,459	3,966	4,169	4,987	5,667	23,248
NIBIN Acquisitions*	8,189	7,565	7,861	9,005	10,639	43,259
Ratio: Acquisitions to Cases	1.837	1.907	1.886	1.806	1.877	1.86
Nation						
NIBIN Cases*	206,069	238,716	282,404	361,706	418,076	1,506,971
NIBIN Acquisitions*	290,507	334,006	398,010	505,154	576,930	2,104,607
Ratio: Acquisitions to Cases	1.41	1.40	1.41	1.40	1.38	1.40

* Data from National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two (https://www.atf.gov/firearms/national-firearms-commerce-and-trafficking-assessment-nfcta-crime-guns-volume-two), PART I: National Integrated Ballistic Information Network (NIBIN), Table NIB-03: All States and Territories of LEAs Submitting NIBIN Cases, 2017 – 2021 & Table NIB-06: All States and Territories of LEAs Submitting NIBIN Acquisitions, 2017 – 2021

A second method to estimate the relative level of NIBIN acquisitions by states or other

communities is to compare the number of NIBIN acquisitions to the level of gun violence in a

geographic region. This method compares the number of NIBIN acquisitions (provided by ATF

see above) by state to the number of CDC gun homicides by state for the years 2017 2021. The

number of CDC reported Gun homicides are used as a "proxy measure"[8] for gun violence in a

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[8] A proxy measure is an indirect measure of a variable instead of the variable of interest when that variable of interest cannot be measured directly. In this case a good measure of firearm crime incidents could be both fatal and nonfatal shooting incidents. However, this type of data is not available in most states. As a result, we have employed CDC gun homicides as a proxy measure.

geographic region and it assumes that the relative number of gun homicides to all gun related

assaults (with injury) is relatively constant across geographic regions.

The method is intended to create a basis for examining the differences in levels of NIBIN

data acquisition compared to levels of gun violence. Although not ideal, gun homicides are

probably the most reliable measure of intentional gun injuries currently available. As noted,

under the FBI's UCR Return A crime reporting program, aggravated gun assault statistics

include both injuries and threats (without an injury) with guns.[9] In addition, the FBI changed the

method of collecting and reporting crime data during the 2017 to 2021 period. Given these data

limitations we have developed a measure of NIBIN acquisitions to gun violence based on CDC

reported gun homicides. Better measures could be developed based on actual reported incident of

gun violence, but presently these are not available consistently across communities or states.

Figure 13 presents the average number of NIBIN acquisitions per gun homicide for New

Jersey in the nation over the period 2007 to 2021. Throughout this period. New Jersey shows a

consistently higher level of NIBIN acquisitions per gun homicide than the nation as a whole.

Starting in 2007, New Jersey performed on average approximately 50% more NIBIN

acquisitions than the nation (i.e., NJ's 20.6 average acquisition to the nation's 13.7 acquisitions).

By the end of the 2007 to 2021 period the difference between New Jersey and the nation had

closed somewhat, but New Jersey on average performed approximately 40% more NIBIN

acquisitions than the nation (i.e., NJ's 38.5 average acquisition to the nation's 27.5 acquisitions).

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[9] See U.S. Department of Justice—Federal Bureau of Investigation, Fall 2019, Crime in the United States, 2018, https://ucr.fbi.gov/crime-in-the-u.s/2018/crime-in-the-u.s.-2018/topic-pages/aggravated-assault.pdf

Figure 13. Average Number of NIBIN Acquisitions* to Gun Homicides** for New Jersey and the Nation - 2007 To 2021
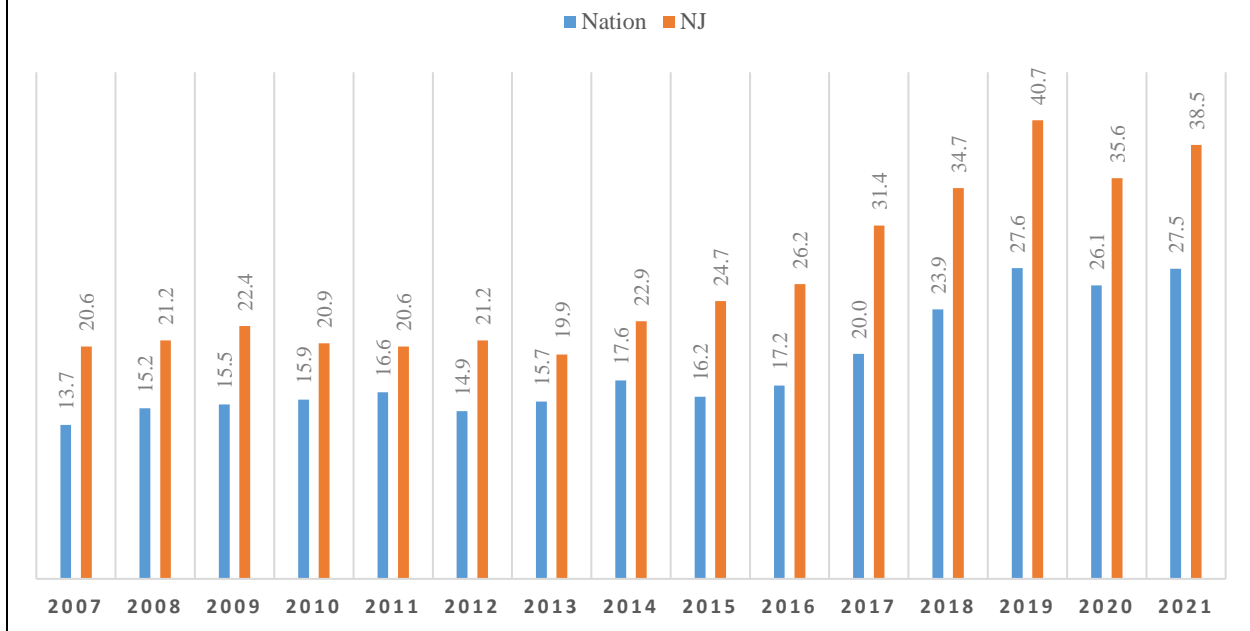
* Data from National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two, PART I: National Integrated Ballistic Information Network (NIBIN), Table NIB-01: NIBIN Acquisitions by State/Territory, 2005 – 2021, https://www.atf.gov/firearms/national-firearms-commerce-and-trafficking-assessment-nfcta-crime-guns-volume-two
** CDC Gun homicide data were obtained from National Center for Health Statistics Mortality Data on CDC WONDER (https://wonder.cdc.gov/Deaths-by-Underlying-Cause.html)

With available CDC gun homicide data and ATF published NIBIN acquisitions data the average number of NIBIN acquisitions to gun homicides can compared across states. To establish a more stable proxy measure of gun violence across states we aggregated gun homicide and NIBIN acquisitions over the five-year period 2017 to 2021. Figure 14 presents the analysis of NIBIN acquisitions to gun homicide data aggregated for the five year period 2017 to 2021. This represents the last five years these data are available, and this period also represents a period of significantly increasing levels of NIBIN evidence acquisition across most states. Figure 13 presents the average number of NIBIN acquisitions per gun homicide for the nation's top ten largest states in the nation and New Jersey which is the 11th largest state. Over the 2017 to 2021

period New Jersey on average acquired a higher level of NIBIN casing acquisitions compared to gun homicides than any other of the top 10 largest states in the nation and compared to the nation overall. two states in the top 10 had numbers somewhat comparable to New Jersey, specifically New York and Ohio.

Figure 14. Average Number of NIBIN Acquistions* to CDC Gun Homicides **for the Nation, the 10 Largest States & NJ for 2017 to 2021

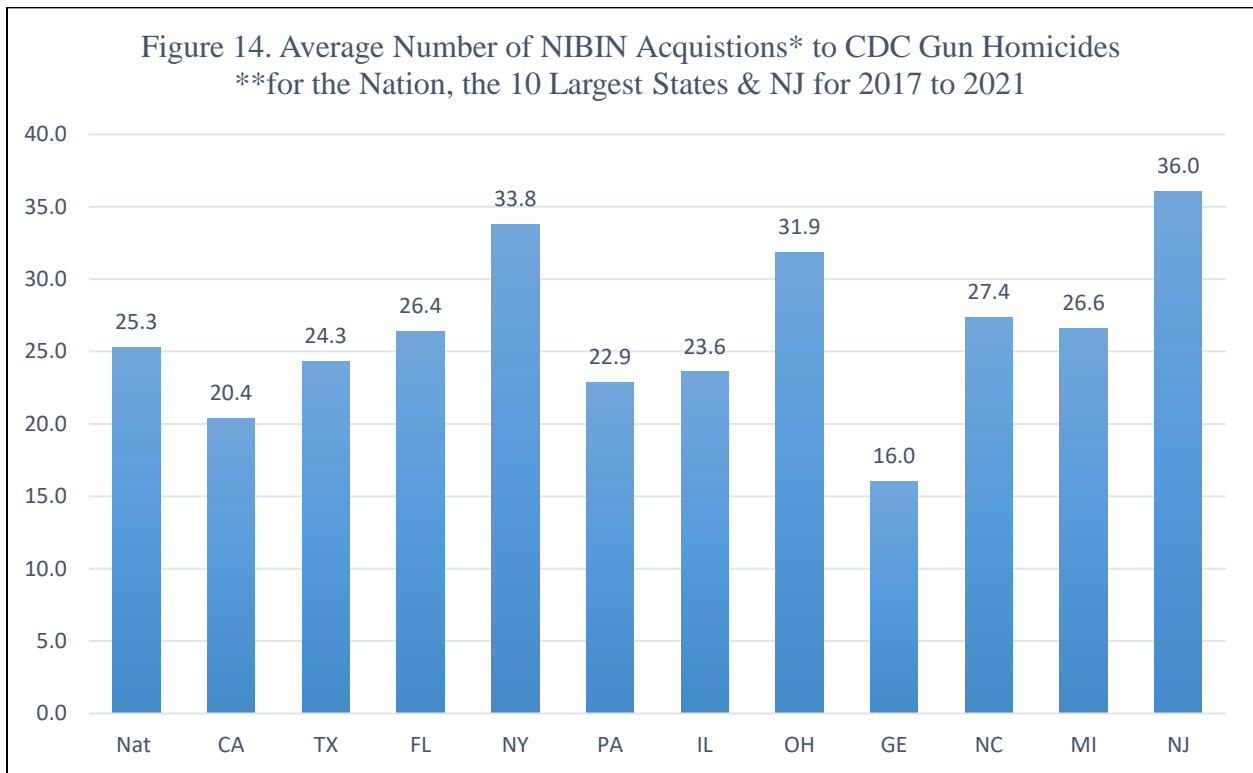|	Nat	CA	TX	FL	NY	PA	IL	OH	GE	NC	MI	NJ
	25.3	20.4	24.3	26.4	33.8	22.9	23.6	31.9	16.0	27.4	26.6	36.0

* Data from National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two, PART I: National Integrated Ballistic Information Network (NIBIN), Table NIB-01: NIBIN Acquisitions by State/Territory, 2005 – 2021, https://www.atf.gov/firearms/national-firearms-commerce-and-trafficking-assessment-nfcta-crime-guns-volume-two
** CDC Gun homicide data were obtained from National Center for Health Statistics Mortality Data on CDC WONDER (https://wonder.cdc.gov/Deaths-by-Underlying-Cause.html).

Characteristics of New Jersey NIBIN Lead/Hit Reports

The present analysis is based on data on 2,472 NIBIN cases involving crime related firearms evidence linked to two or more crime incidents between 2021 and July 2022. NIBIN

Hits are the same as ATF Leads[10] in that both refer to NIIBN firearms that are linked via either NIBIN hits/correlations that represent a match between two pieces of casing evidence or a match between a casing test-fire and a piece of casing evidence. A match indicates that that the two casings were fired from the same gun.

NIBIN can help authorities identify fired evidence casings (cartridge cases) collected from crime scenes that were fired from the same gun. For example, NIBIN can be used to identify a casing from crime scene A to a casing from crime scene B as being fired from the same gun, even though the actual description of the firearm that discharged them may be unknown at that time. In that case, Backtrace will assign a unique identifier to virtually represent that firearm.

NIBIN can also help authorities connect a recovered suspected crime gun to a crime or series of crimes. In the case described above, NIBIN could be used to link a casing (cartridge case) test-fired from a recovered suspected crime gun to the evidence previously submitted from crimes A and B. In that case, Backtrace will append the unique identifier previously assigned to the "virtual" gun with the identifying information (e.g., make, model, serial number, etc.) from

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[10] National Firearms Commerce and Trafficking Assessment (NFCTA): Crime Guns - Volume Two PART VI: NIBIN & Ballistic Evidence Overview, p 9. (https://www.atf.gov/firearms/docs/report/nfcta-volume-ii-part-vi-nibin-ballistic-evidence/download) for an description of NIBIN lead generation "NIBIN's imaging technology captures the unique markings that firearms make on ammunition cartridge casings as they are fired; the system then conducts automated comparison analysis of other images in the network to identify potential preliminary matches between imaged casings from different shooting crime scene events and imaged test-fires from recovered crime guns. These potential matches are then reviewed by highly trained NIBIN technicians. Technician-identified NIBIN matches are often referred to by law enforcement as NIBIN "leads." NIBIN leads indicate the recovered casings were likely fired from the same firearm. Through comparison of a test-fired casing from a recovered firearm, NIBIN also allows the matching of an image from a recovered casing, linking the recovered firearm to the shooting."

the recovered crime gun that NIBIN helped identify as the gun that fired the evidence in crimes A and B.

NIBIN Hit reports also record whether a linked event involved a fatal shooting victim or nonfatal shooting victim. Thus, NIBIN connections between crime related incidents can be based on firearm evidence where a murder/fatal injury occurred, where a nonfatal assault injury occurred, a victim not injured or any combination of these circumstances. The present analysis is based on data on 2,472 NIBIN cases with firearms evidence linked to two or more crime incidents entered into Backtrace between 2021 and July 2022. Firearm linked in cases could involve a fatal assault injury, nonfatal assault injury or casing evidence where no injury occurred or any combination of these circumstances Thus firearm evidence could link an incident with a fatal injury(s) and another with a nonfatal injury(s) or an incident where no injury was incurred, i.e., only casing evidence was recovered.

Table 10 examines the distribution of different types of crime incidents associated with NIBIN cases available in Backtrace. The incidents can involve fatal shooting victim(s), nonfatal shooting victim(s) nonfatal victims with injuries or shootings in which was injured. associated with incidents linked by firearm evidence. The three types of shooting outcomes can occur in any of seven different combinations for a given shooting incident. Specifically NIBIN shooting incidents can involve: 1. no injuries from a firearm, 2. nonfatal injury(s) but casing evidence, 3. fatal injury(s) only, 4. a combination of nonfatal injury(s) and no injury(s), 5. a combination of fatal injury(s) & no injury (s), 6. a combination of fatal injury(s) and nonfatal injury(s), and 7. a combination of fatal injury(s), nonfatal injury(s) & no injury(s) but there was casing evidence of

at least one additional linked gun, In addition, there were 174 cases excluded from analysis is ballistics evidence not linked to a crime shooting incident.

Table 10 shows that 17.7% of all NIBIN reports linked to cases associated with at least one fatal injury, specifically, categories 3, 5, 6 and 7. NIBIN reports that are linked to firearms involved nonfatal injuries but not with fatal injuries (categories 2 and 4) represent a combined 41.5.8% of NIBIN reports). Thus, NIBIN reports involving fatal and/or nonfatal shooting account for 59.2 percent of all reports and are clearly provide important to law enforcement. However, Table 10 also shows that a large proportion of NIBIN reports (40,8%) are associated with cases where no injury occurred but the cases linked by a gun (although such may be linked to incidents where firearm injuries are inflicted). Typically, guns in such cases are referred to as virtual guns because no firearm was recovered in their linked incidents, i.e., the firearm is linked across incidents via shell casings. However, evidence in such cases is potentially important when examined in the context of other data or intelligence and can also be of value if linked to future incidents. As noted by Guidetti et. al.:

> It has been shown time and time again that even seemingly insignificant firearm-related events can provide the missing link to solving gun crimes. A successful murder investigation in a metropolitan area could very well hinge upon the actions of a police officer in a rural town 20 miles away investigating a vandalized stop sign used for "target practice" or finding a gun tossed by the roadside. Therefore, a regional approach to the collection and management of firearm-related evidence is often essential to a successful firearms investigation. (2016, p. 4)

Table 10 also supports the value of New Jersey's implementation of the RAIN program, establishment of the Ballistics Community of Interest as well as the state's earlier deployment of NIBIN capacity that has helped support a more comprehension collection and submission of ballistics evidence data (including casing only evidence).

Table 10. Types of Incidents Associated with NIBIN Lead Reports in New Jersey, 1/2021 to 8/2022*		
Types of Incidents Associated with NIBIN Hits Reports**	NIBIN Lead Report	Percent
1. No injuries (casing evidence only)	781	40.8
2. Nonfatal injury(s)	334	17.5
3. Fatal injury(s)	77.0	4.0
4. Combination of nonfatal injury(s) & no injury(s)	460	24.0
5. Combination of fatal injury(s) & no injury(s)	110	5.8
6. Combination of fatal injury(s) & nonfatal injury(s)	81	4.2
7. Combination fatal injury(s), nonfatal injury(s) & no injury(s)	70	3.7
Total Shooting Incidents	1,913	100.00
Not a Shooting incident***	144	
Total	2,057	

* Data provided by NJSP

** A Hit involves a link between at least two pieces of evidence from different shooting incidents

*** Excluded from analysis is ballistics evidence not linked to a crime shooting incident

Casing evidence can also be important in developing a more comprehensive picture of the geographic distribution of firearm shooting. Figure 15 shows a map of shooting incidents with recovered (and test fired) firearms and shooting incidents with firearms recovered but where casings were found, and test fired for the period 1/1/2022 to 11/30/2022 from Backtrace's crime gun recovered location data dashboard and provided by NJSP. The time period is a single point in time selected to illustrate the importance of comprehensive data collection regarding different types of evidence and across all communities. For the example provided it is interesting to note that in southern New Jersey there seems to be a hot spot of shooting incidents with unrecovered firearms (only casing evidence).

Figure 15. Map of the Geographic Distribution of Recovered and Unrecovered NIBIN Lead
Guns in New Jersey between 1/2022 to 11/30/2022 (map image provided by NJSP)
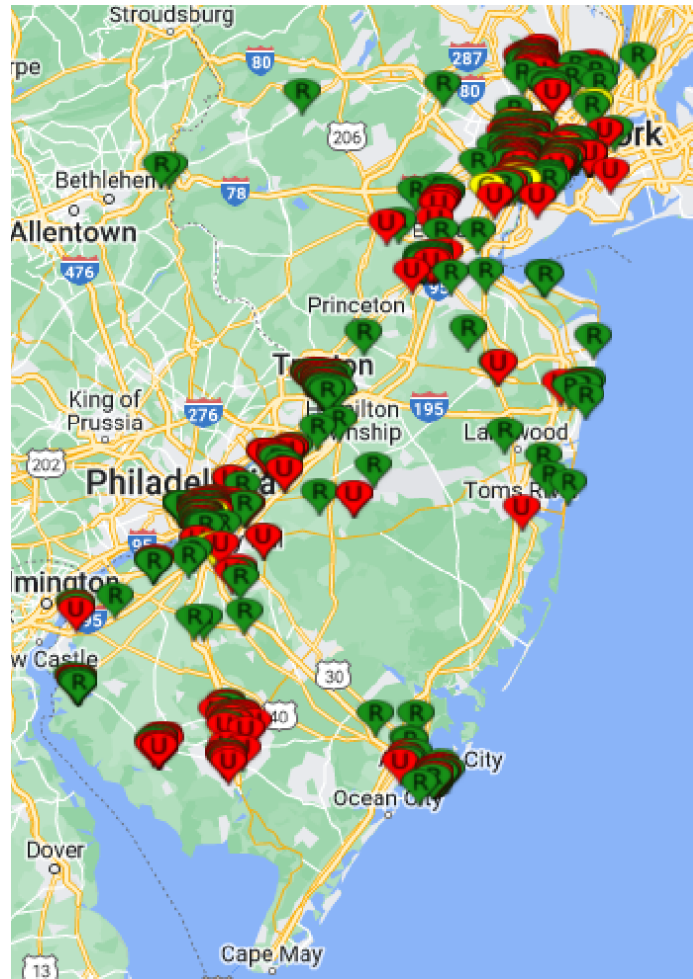
NIBIN Leads Triage – The Last Mile

The submission of analyzed ballistics imaging evidence from recovered firearms,

projectiles and cartridges to NIBIN enabled the ATF to build a repository of firearms evidence

for later use by investigators.

As more crime laboratories submitted ballistics evidence, the likelihood of matching

recovered guns with other cases based on projectiles or cartridges increased. As that occurred in

New Jersey, the ATF could complete the intelligence cycle by disseminating ballistics imaging

showing links between two or more evidence submissions such as shell casings to state and local

detectives (Gagliardi, 2022). The ballistics imaging report could link a shell casing to a

recovered and test-fired weapon or a projectile to a recovered shell casing from another incident.

The original NIBIN printout contained minimal information about the actual incident

beyond a description of the ballistics evidence and agency case number.

The original notifications of ballistics matches proved to be less helpful to on-the-ground

violent crime investigators due to the lack of specific investigative information. The original

ATF NIBIN report didn't have all the incident specifics that investigators and analysts would

need to generate leads. In New Jersey, crime gun intelligence staff wanted to add other data to

the notifications to provide more contextual information such as incident location, date and time.

They also proposed to add victim and suspect information if known. As the project evolved, the

New Jersey stakeholders determined that a standard statewide NIBIN Alert form would improve

the dissemination of NIBIN hits across jurisdictions. They created a template document, called

the Statewide Standard NIBIN Information Alert (Gagliardi, n.d.) that included additional data

relevant to connecting shootings across the region. The NJ NIBIN Alert became a much more

actionable intelligence product for officers in the field to assist them in prioritizing leads.

The effective statewide adoption of ballistics imaging as an investigative and

prosecutorial tool in New Jersey has created another challenge for policy makers.
 As more police agencies sign onto submitting firearms-related evidence to crime labs, this has

created a large number of NIBIN Leads (NJSP Last Mile, n.d.). In New Jersey, NIBIN

acquisitions rose from 8,189 in 2017 to 10, 639 in 2021, while NIBIN Leads stayed relatively

flat from 2, 016 in 2017 to 2,133 in 2021 (ATF, 2023). NIBIN Leads as a percentage of

acquisitions hover around 20 -25 % during this period, though still presenting a challenge to

disseminate these leads to multiple police agencies across the state. As discussed above, leads

being output by the NIBIN system are effectively a pointer system, with minimal investigative case data attached to the match between two or more pieces of ballistic evidence. Because the IBIS system cannot automatically send out NIBIN leads from potential correlations across pieces of evidence, crime labs, real time crime centers and crime gun intelligence centers have to manually collate this information.

In New Jersey, the Ballistics Community of Interest has standardized this notification process through a NIBIN Alert form that is completed by forensics staff then submitted to affected agencies. The development of this intelligence product is a labor-intensive process given the volume of NIBIN leads that are produced by the IBIS system.

As agencies have become more adept at submitting evidence for ballistics imaging, the amount of leads that IBIS produces in a state are substantial and not necessarily all of equal value. For example, a NIBIN Lead emanating from cartridges recovered from two "shots fired" events are not as much value to investigators as a match from a murder incident and an illegal possession of a firearm arrest and crime gun recovery. Some leads have greater crime solving value than others.

Even within a single jurisdiction, Crime Gun Intelligence Centers (CGICs) have found the need to triage NIBIN Leads as component of an effective case management strategy (Katz, Flippin & King, 2021; Koper, Vovak, & Cowell, 2019; Uchida, Quigley & Anderson, 2019). These triage guidelines are based upon seriousness of connected offenses and solvability factors.

ATF's CGI Best Practices Handbook highlights the importance of assigning a "Triage Coordinator" to perform the triaging function. The preferred candidate is someone with extensive investigative experience and the expertise to readily recognize the solvability factors relevant to crimes involving the use of firearms (ATF CGI Best Practices Handbook, 2020).

ATF has successfully employed Level III Contractors for this function. They triage all NIBIN leads and use the NIBIN Enforcement Support System (NESS) to document them according to a three-tied system: "1. Tier I: Highest Priority and/or Most Actionable for Investigative Follow-Up. 2. Tier II: Moderate Priority and/or Somewhat Actionable for Investigative Follow-Up. 3. Tier III: Lowest Priority and/or Not Actionable for Investigative Follow-Up" (ATF CGI Best Practices Handbook, 2020).

The ATF Triage Coordinator then follows more detailed guidance and specific reporting instructions on how to manage the leads most efficiently and effectively across the three tiers.

A variety of triage systems have been implemented in different cities. For example, Milwaukee has a tiered system of triage that includes priority for the most violent crimes that occurred more recently or for high-risk offenders. Solvability factors such as an identified suspect who is part of a criminal enterprise, a serial shooter or identified as Project Safe Neighborhood (PSN) or CGIC High Value Target make these cases the highest priority. Moderate priority cases include those that involve non-fatal shootings and violent armed robbers that have solvability factors attached. Lower priority investigations entail those NIBIN leads with identified suspects and / or problem locations, while the lowest priority NIBIN lead involves those cases that don't have any investigative leads, identify suspects, or require follow-up actions attached (Koper, Vovak, & Cowell, 2019).

In Kansas City they have a Crime Gun Intelligence Center (GCIC) investigative unit that screens NIBIN leads from the ATF's NIBIN National Correlation and Training Center (NNCTC). The Kansas City GCIC then assesses the lead and passes along an investigative lead packet with additional information to the relevant KC detectives (Novak & King, 2020). Each NIBIN site is developing their own guidelines for this prioritization of NIBIN leads.

New Jersey implemented a statewide triage guideline that local and regional investigative prioritization. New Jersey recognized that a high volume of acquisitions and NIBIN Leads would create a bottleneck for dissemination of those matches. The triage process developed by the New Jersey State Police and the Ballistics Community of Interest addresses the third Critical Step of NIBIN, Investigative Follow-up, and Prosecution. As New Jersey has widely adopted the use of NIBIN to inform criminal investigations, the volume of raw NIBIN Leads and then NIBIN Alerts has created a bottleneck at the dissemination of leads stage.

To address this analysis and dissemination dilemma, the New Jersey State Police convened a Statewide NIBIN Hit Triage Protocol Workshop to collectively develop a system to prioritize NIBIN Leads (Gagliardi, 2013; NJSP Last Mile, n.d.). Bringing together thirty commanders, investigators and forensic staff from the NJSP, ATF and county agencies to develop guidelines to triage NIBIN Leads.

The workshop created a triage system termed, the Public Safety Impact and Crime Solvability (PATCHED) index (NJSP Last Mile, n.d.). This guideline was designed to assist analysts and investigators with thinking about prioritizing which NIBIN Leads to investigate. It uses a combination of the seriousness of crime or public safety impact of the case along with the solvability of the offenses involved. The specific index components for consideration in prioritizing NIBIN leads are; Public impact, Agency authority, Time-between-hits, Crimes committed, Hits reported, Evidence quality & quantity and Distance-between-hits.

New Jersey stakeholders have designed an analytical process to collate NIBIN Leads with investigative data from other criminal justice systems such as NJ POP and NJ Trace. These systems provide added facts on victims, suspects, locations and incidents dates that are useful to investigators. Leveraging the expertise of ROIC and Real Time Crime Center crime analysts, the

crime gun initiative in New Jersey has developed a scanning process to identify daily arrestees that have violent crime histories as well as associations with NIBIN Leads, NJ POP shooting cases and other criminal justice interactions.

Once there was a consensus regarding the triage process, New Jersey policy makers pushed to automate this process using BackTrace as an information tool. BackTrace was developed to help identify high risk violent offenders related to shooting incidents in a manner that can assist investigators. It provides context to support associations connected to NIBIN Leads, thereby improving the triaging of offenders. The system provides a method to ensure investigative follow up and feedback, the third and fourth critical steps of NIBIN.

Backtrace & the Development of New Jersey's Crime Analysis, Precision Policing and Precision Prosecution

New Jersey's commitment to intelligence-led policing was accompanied by a complementary commitment to systematically collect and disseminate crime and in particular firearm-related crime data to support local and statewide law enforcement strategies, initiatives, and investigations. These objectives led to significant over time improvements in data collection and data quality, which were also supported by legislative initiatives and government directives. Increasing demand for more comprehensive crime analysis and data sharing motivated the NJSP to examine new crime related data systems.to support the larger New Jersey law enforcement community.

To address the evolving data analytic opportunities and needs of law enforcement the NJSP explored and contracted with a few companies to pilot test their various law enforcement data management and analysis systems. This project was motivated by a growing concern regarding violent crime and terrorism. Although many of the systems pilot tested provided useful

capabilities (Guidetti, 2023, Brennan 2023) each system had their own single position niche and did not adequately meet NJSP'S growing data requirements needed to support and assemble intelligence-led policing initiatives.

GTBM, a New Jersey software development company, was a logical choice to collaborate with NJSP to develop a more comprehensive crime and gun violence intelligence system for state and local law enforcement. GTBM has been involved in a diverse set of statewide and local law enforcement information management and analysis initiatives over the last 20 years. The development of Backtrace started over twenty years ago when GTBM developed a middleware application to assist patrol officers by providing a better interface for mobile data terminals in police cars. The aggregated queries overtime provided law enforcement officers with a more concrete understanding of serial offenders and their patterned criminal behavior.

Soon early efforts to combine daily arrest data with other law enforcement data sets began to yield an increased capacity to understand crime and criminal patterned behavior. The Backtrace program quickly expanded to include data form additional participating local law enforcement agencies, additional data sources and work with the NJSP ROIC. Given the limitations of earlier law enforcement information systems assessed by NJSP, Backtrace's successful field tests with local agencies and earlier GTBM and NJSP collaborations, NJSP and GTBM began a statewide rollout of the BackTrace system to statewide local, county, state and federal law enforcement agencies throughout New Jersey starting in 2019 (Guidetti, Brennan, Picolli, interview).

The Backtrace System

Information and data are essential resources for intelligence-led policing. The value of individual data resources is greatly strengthened when they are integrated with other relevant data sources. The value of integrated data is increased when information is available promptly and in a way that is readily accessible to persons with law enforcement but necessarily technical expertise (Brennan, personal communication, August 10, 2022). Currently, Backtrace continues to add crime-related data sources of potential value to law enforcement investigators, crime analysts, administrators, and public officials (Picolli, personal communication, August 10, 2022).

Today, the criminal justice data fully integrated into Backtrace include complete information on arrests, Combined DNA Index System (CODIS), traffic tickets, Computer Aided Dispatch/Records Management System (CAD/RMS) data, Automated Fingerprint Identification System (AFIS), the NJ POP shooting database, NIBIN, as well as many others, such as automated license plate readers (ALPR), prison, and parole records. . Equally important, Backtrace can quickly aggregate, filter, and display law enforcement information that officers and investigators would have to visit varied systems to retrieve. Below we review some of the types of information incorporated into Backtrace and how law enforcement is utilizing it.

Backtrace Law Enforcement and Crime Related Data

Arrest and Suspect Information

Although Backtrace was not fully initiated with the NJSP until 2019, key stakeholders were working on integrating arrest data with local law enforcement agencies beginning in 2015. The first database incorporated arrest records which were obtained from the NJSP. The daily arrest records originally were provided by NJSP in a spreadsheet format sent via email to law enforcement stakeholders.

As the system developed, this arrest data was automatically uploaded into Backtrace and made accessible to all authorized users. At the start, the arrest records only included the city of Newark, but was later expanded to the whole state. This data involved information on the individual arrestee, the crimes committed, the location, and other key arrest characteristics important to investigators. In addition, information was provided on arrest history (Picolli, personal communication, August 10, 2022).

In addition, CODIS data, which identifies the presence of DNA profiles in the statewide system, were incorporated into Backtrace in the following years. The crime laboratory originally sent out lists of arrestee DNA profiles as an automated email, but these were later linked and integrated into Backtrace with the arrest data. Investigators are now able to look at suspect records that illustrate whether they have been arrested and processed for DNA (Picolli, personal communication, August 10th, 2022).

NJ POP and NIBIN Data in Backtrace

Both NJ POP and NIBIN data were added to Backtrace, because of the continuing commitment and focus of NJSP and New Jersey on reducing violent firearm crime in the state. Integrating shooting data from the NJ POP system into Backtrace provides suspect, victim, location, and shooting type data that helps identify shooting patterns across the state. When combined with the other datasets in the system, such as arrest information, CODIS, and vehicle information, this becomes a strong tool for investigators. Investigators can now have real-time shooting data that is linked directly with multiple other datasets in one system (Picolli, personal communication, August 10th, 2022).

 Integrating NIBIN data occurred over a longer period that required several changes to the acquisition and standardization of NIBIN data required to develop a system that was

applicable to all forensic labs in the state. This development is important to note as other departments may seek to replicate the use of NIBIN in their business processes. Originally, NIBIN data was reported as the printout from the IBIS machine (Forensic Technology, 2011, p232). The printout was not ideal for investigative purposes, so the NJSP created a standardized PDF form (Brennan, personal communication, August 10th, 2022).

However, at this point, NIBIN PDF information was not stored in a repository that was readily accessible to law enforcement investigations. To address this problem the first iteration of NIBIN data into Backtrace included storage of current and previous NIBIN data back to 2021. This was done entirely online, and data was made searchable for investigative purposes. Currently, all submitted NIBIN data is uploaded into Backtrace via a web-based data entry screen for the technicians to input NIBIN data so that data is automatically stored in the Backtrace system (Picolli, personal communication, August 10th, 2022).

The incorporation of NIBIN into Backtrace has increased the usefulness and accessibility of NIBIN information for law enforcement investigators and crime analysts. Now NIBIN alerts/leads provide data on different types of shooting incidents(i.e., shooting murders, nonfatal shootings, shootings where this were no persons injured), gun, and evidence (cartridges) separately for each case that was linked together. These links provide a history that can be assessed individually and collectively, which is of significantly greater value to investigators.

In addition, the investigative value of NIBIN leads is increased given statewide coverage of NIBIN data in Backtrace and the data integration with other sources of law enforcement information. The integration of NIBIN into Backtrace happened over a period of nearly three years. Incorporating NIBIN data and NJ POP data and including them with other data sources in Backtrace is a useful contribution as it adds current investigative components that can be used to

combat violent crime and links investigators to each other (Brennan, personal communication, August 10th, 2022).

Vehicle Data

Vehicle data is an important information source for investigations. As Backtrace progressed, NJSP leaders asked GTBM programmers to incorporate other criminal justice sources, such as traffic tickets and infractions as well as ALPR (Picolli, personal communication, August 10th, 2022). Traffic violations were included in the dataset which could be matched to other data in the system if such links existed, including prior arrest information. Incorporating ALPR vehicle records enabled officers to identify the location and date and time of potentially suspect vehicles around crime incidents by time and locations. However, before the ALPR data was added to Backtrace, developers merged it with New Jersey's Department of Motor Vehicles (DMV) records to identify the owner of the vehicle along with the vehicle's registered location (Picolli, personal communication, August 10th, 2022). Additionally, a 3rd party application, which specialized in acquiring vehicle VIN numbers from the DMV, allowed for the entire documentation of manufacturer vehicle information to be added to the database. With this information you could search in the Backtrace database for cars with 137 specific features (Picolli, personal communication, August 10th, 2022). In the end, a vehicle that was linked either via traffic tickets or ALPR could be linked to location and vehicle specification data. This created a more robust vehicle record for investigators, which eliminated the need to search separate RMS and manufacturer vehicle databases separately (Picolli, personal communication, August 10th, 2022).

As the project team added more information sources to Backtrace, the utility of Backtrace increased for investigators. In 2019, the Google Maps API was integrated into Backtrace which

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allowed for all the location data, such as arrests, ALPR data, NIBIN incident information, NJ POP incident report information, to be spatially mapped. This increased investigative and analytical potential of the data source. Additionally, an API from the US Postal Service was included that checked to determine whether the address locations linked in the dataset were legitimate. This enhanced the data quality of location data housed in Backtrace (Picolli, personal communication, August 10th, 2022).s

Additional Law Enforcement Data Source Integrated into Backtrace

In 2020, prison and parole data were added to Backtrace. These two systems include information on who is currently imprisoned and released from custody as well as individuals who are on parole and later complete parole. This information currently requires monthly public information requests, however, the NJSP is working towards getting this data automatically integrated into Backtrace. Some of the latest expansions of Backtrace are real-time carjacking notifications, warrant details, and a mobile app for field investigators (Picolli, personal communication, August 10th, 2022). Concerning carjacking, the NJSP now has real-time data on carjackings that can aid investigators in the speedy recovery of vehicles. In addition, warrant information provides details on individuals who are wanted for specific criminal violations and are eligible for arrest, which can be a valuable lever to detain individuals who are being investigated for other firearms crimes. Warrant details combined with other data integrations in Backtrace increasingly add to the utility of this system. Lastly, a mobile app has been developed so that information can be used by investigators in the field (Picolli, personal communication, August 10th, 2022).

Backtrace Crime Data Integration

Backtrace currently provides a range of integrated criminal justice data on individuals, crime incidents, and crime locations to law enforcement and judicial stakeholders. The system integrates this data on a reasonably timely basis. Integrating different types of crime related evidence across persons, places, and time will typically increase the value of any single isolated piece of evidence.

For the present analysis, we will first examine linkages between different crime related data sources in the Backtrace system with a focus on firearm related crime and NIBIN data. Second, we will examine indicators of the utilization of Backtrace data by law enforcement investigators, crime analysts, and other criminal justice actors throughout New Jersey. Finally, we will examine how Backtrace and NIBIN data have been utilized by prosecutors.

Tables 16, 17 and 18 present statistics on the number of cross links between criminal gun related behavior or incidents and other related data sources incorporated into the Backtrace system for the years 2021 and 2022. The data links in Tables 16, 17, and 18 represent a subset of all possible Backtrace data and corresponding links. The tables are presented to illustrate the level of connection among persons, incidents and places that are potentially associated with firearms offences and violence and could conceivably add investigate or analytic value. Tables 16, 17 and 18 focus on potential links between crime data related to persons (Gun related arrests, NIBIN related hits, NJ POP shooting hit or murder victim or suspect, restraining orders for domestic violence, NJ Trace gun possessor, persons with CODIS related evidence, any arrest or prison record). The set of data is not an exhaustive set of possible links across persons with related criminal justice records in Backtrace and it is does *not* show links across to other type of entities such as crime related locations (which is possible with Backtrace). The analysis is only presented to help illustrate the type of potential links across different crime related data sources

possible within Backtrace . The focus is on potential links between three different types of gun

crime related records and other criminal justice records.

Table 11 presents the links found in Backtrace between a gun offense arrestee (someone

arrested for at least one firearm related fatal or non-fatal assault or illegal possession of a firearm

to other criminal justice related records individuals may have. Looking at the latest year 2022,

shows that of the 11,273 gun offense arrestees (some of whom could have been arrested more

than once) 783 were linked to an NJ POP shooting record as a victim of a fatal assault or an

assualt with injuries. Moreover, 582 were linked as an NJ POP suspect and these suspects were

also linked to 37,879 arrests including in this instance their firearms related Arrests. These same

individuals were also linked to 634 NIBIN leads/hits and 3,342 NJ Trace records as unlawful

possessors. Moreover, 7,476 of them had links to prison records, and 280 instances of links to

CODIS evidence.

Table 11. Gun Offense Arrestees Linked to Other Selected Backtrace Data Records*		
Data Sources	2021**	2022**
Gun Offence Arrestee (e.g., assault, possession) linked to:	10,135	11,273
1. NJ POP Shooting Hit or Murder Victims	761	783
2. NJ POP Shooting Hit Suspect	803	582
3. Arrest or Restraining Order for Dom. Violence	969	851
4. Any Arrest	36,881	37,879
5. NIBIN	457	634
6. Trace (Possessor)	2,567	3,342
7. CODIS	289	280
8. Prison	8,564	7,476

*Data provided by NJSP
**Gun offence arrestees linked to data sources, 1 through 8, for 2021 or 2022.

Table 12 presents the links found in Backtrace between a person associated with one or more NIBIN leads/hits (someone associated with a least one instance of a NIBIN acquisition linked to two or more incidents) to other criminal justice related records an individual may have. Looking at the latest year 2022 shows the of the 1,257 individuals associated with a NIBIN lead/hit in 2022 (some of whom could have been associated with NIBIN hits for different firearms), 507 were linked to NJ POP shooting hit record as a victim, 124 were linked as a NJ POP suspect. Moreover, these suspects were also linked to 3,066 arrests including in this instance their firearms related arrests. These same individuals were also linked to 839 arrests for unlawful gun possession, and 549 NJ Trace records as unlawful possessors and 35 instances of links to CODIS evidence

Table 12. NIBIN Hits Linked to Other Selected Backtrace Data Records*		
Data Sources	2021**	2022**
NIBIN Hits linked to:	1,247	1,257
1. NJ POP Shooting Hit or Murder Victims	640	507
2. NJ POP Shooting Hit Suspect	172	124
3. Arrests for Gun Possession	650	893
4. Arrest or Restraining order for Dom. Violence	17	26
5. Any Arrest	2,513	3,066
6. Trace (Possessor)	231	549
7. CODIS	65	35
8. Prison	587	436

*Data provided by NJSP
** NIBIN Hits linked to data sources, 1 through 8, for 2021 or 2022.

Table 13 presents the links found in Backtrace between a persons with NJ Trace Possessor record to other criminal justice related records individuals may have. Looking at the latest year 2022 shows the of the 2,335 individuals identified in NJ Trace as a possessor of a firearm in a crime related circumstance in 2022, 221 were linked to an NJ POP shooting hit record as a victim, 126 were linked as a NJ POP suspect and these firearms possessors were also linked to any 2.321 arrests gun possession (not unexpected) and 6,190 arrest for an offence including in this instance, their firearms possession arrests. These same individuals were also linked to 282 NIBIN hits and arrests for gun possession, 549 NJ Trace records as possessors, 436 had prison records and 57 instances of links to CODIS evidence.

Table 13. NJ Trace Possessor Data Linked to Other Selected Backtrace Data Records*		
Data Sources	2021**	2022**
NJ Trace Data Linked to:	2,185	2,335
1. NJ POP Shooting Hit or Murder Victims	236	221
2. NJ POP Shooting Hit Suspect	161	126
3. Arrests for Gun Possession	2,206	2,321
4. Arrest or Restraining order for Dom. Violence	63	65
5. Any Arrest (Any other non-gun arrest if possible)	6,078	6,190
6. NIBIN	146	282
7. CODIS	61	57
8. Prison	94	53

*Data provided by NJSP
** NJ Trace data can linked to data sources, 1 through 8, for 2021 or 2022.

Table 14 shows the degree of mobility of arrestees across different communities in New Jersey. The table presents information on persons who were arrested five or more times over the period of January 1, 2015, to November 15, 2022. This of course is a subset of all persons who

are arrested in New Jersey for all types of crimes. However, it does show that 86% of the individuals arrested five or more times form the 2015 to 2022 period were arrested in two or more different cities and 24% of these arrestees were arrested in four or more different cities.

Table 14. Number of Different Cities of Arrest for Persons with 5+ Arrests between 1/12015 and 11/15/2022		
# of different cities	Count	%
1	4,056	14.0
2	10,276	35.5
3	7,472	25.8
4	4,030	13.9
5	1,715	5.9
6	766	2.6
7	317	1.1
8	148	0.5
9	64	0.2
10+	73	0.3
Total	28,917	100.0

*Data Provided by NJSP

Backtrace Utilization by Law Enforcement

Backtrace as it stands today is an ever-evolving system that is expanding to incorporate other data systems. Integrating these systems is designed to assist justice organizations in their violent crime reduction goals and initiative. This system is available to local police departments across the state at a reasonable cost, and training to use Backtrace is available for free online for officers in these departments that have annually purchased the software.

In addition to providing training Backtrace has also continuously developed the accessibility and utility of the system to authorized law enforcement clients. The system has an interactive dashboard that provide graphics and summary statistics on violent crime. Below is an example of one dashboard currently available to law enforcement clients (Figure 16). It presents geographic information of recent distribution of firearm incidents and summary statistical data on gun crime incidents.

Figure 16. Backtrace Dashboard Example
(Dashboard image provided by NJSP)

Dashboard information is typically of most use to administrators or other law enforcement leaders making strategic decisions or reporting on crime trends two public officials on the public. Information on individual crimes, criminal suspects and criminal incidents are of greater relevance to law enforcement investigators and crime analysts. Measuring the utilization of Backtrace by these actors is more difficult at this early point in time in the development of

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Backtrace. However, some summary utilization measures of the Backtrace system by law

enforcement actors are available through website monitoring statistics.

Table 15 presents utilization data by law enforcement clients of Backtrace in its first year

of implementation and its most recent year. The increase in utilization in terms of individual

searches has doubled from approximately 8,000,000 searches to 15 million.[11] At the same time

the number of users has increased from 1,709 to 2,954, an approximately 160 % increase, based

on 365 day comparison figures for 2021 and 2022.[12] The total hours of use by law enforcement

clients between 2021 and 2022 has increased by more than more 500% from 4,535 hours 26,706

hours, based on 365 day comparison figures for 2021 and 2022.[13] The year to year increase in

average number of hours used per day shows a similar increase (over 500%) between 2021 and

2022 (~13.3 hours to ~ 73 hours per day). Overall Backtrace has recorded a 160% increase in

active users between 2021 and 2022 and an even more significant increase in utilization of

Backtrace by law enforcement users.

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[11] The 2021 the number of total number searches in 2021 adjusted to a full 365 days (from 341) increases from an ~8,005,968 in 2021 to an estimated 8,574,392. The 365 day comparison of an estimated 8,574,392 searches in 2021 to 17,940,206 searches in 2022 represents a little over a 200% increase.

[12] The 2021 the number of total number active users in 2021 adjusted to a full 365 days (from 341) increases from to an estimated 1,709 in 2021 to 1,829. The 365 day comparison of an estimated 1,829 active users in 2021 to 2,954 in 2022 represents an approximately 160% increase.

[13] The 2021 the number of total number of hours of us in 2021 adjusted to a full 365 days (from 341) increases from an estimated 4,535 total hours in 2021 to 4,852. The 365 day comparison of an estimated 4,852 total hours of use in 2021 to 26,076 hours in 2022 represents a year to year increase of over 500%.

Table 15. Backtrace Utilizations Metrics for 2021 (341 days) , and 2022 (365 days)*		
Backtrace Usage Metrics	**Jan 1 -Dec 7, 2021 (341 days)**	**Jan 1-Dec 31, 2022 (365 Days)**
Volume of User Activity		
• Total Number of Searches:	~8,005,968	~17,940,206
• Number of Active Users:	1,709	2,954
• Average # of Users per day:		248
User Sessions Time		
• User's session times:	5 mins to 4.5 hours	3 mins to 7.2 hours
• Average session:	~ 20 mins	~17.7 mins
• The total number of user hours per day	~13.3 hours	~73 hours
• Tot. user hours on Backtrace :	~4,535	~26,706 hours

*Data provided by NJSP

Backtrace also tracks some of the types of information searched for by law enforcement active users. Table 16 presents statistics on some of the types of information searches made by law enforcment users in 2022. In 2022, there were 2,456 search for NJ POP information, 278 searches for NIBIN information (basd on indicator for those records in Backtrace). There were also over 8.000 searches for criminal incident case (record) numbers and over 8,000 searches for gun arrests and gun arrestee records. The number of searches for non-gun arrestees and non-gun arrests were approximatley 79,000 and 105,000 respectively. Future iterations of NJ CAP5 the New Jersey State Police may collect additional information on what law enfocement actors are using the system, what are they using the system for and what modifications/changes law enforcement actors indicate who enhance the value of data available through Backtrace.

Table 16. Backtrace Type of Information Searches for 2022 (365 days)	
Type of User Searches	**Number of Searches**
• # NJ POP searches (Based on Shooting Indicator):	2.456
• # NIBIN searches (Based on NIBIN Indicator):	278
• # of Arrests with Gun (Statute 2C:39-5)	
○ # Gun Arrest Records:	8,950
○ # Gun Arrestees:	8,357
• # of Non-gun Arrest Records	
○ # Non-gun Arrest Records:	105,131
○ # Non-gun Arrestees:	79,587
• # of searches with Case Record number filter:	8,619

*Data provided by NJSP

Backtrace Utilization by Prosecutors

A major new statewide initiative, New Jersey's Gun Violence Reduction Task Force (GVRTF), was created in October 2021, though it didn't become operational until November of that year (New Jersey Attorney General Directive NO. 2021-10, October 2021). The GVRTF intended to extend the use of intelligence-driven public safety to include state prosecutors in what policymakers have termed precision prosecution .

Decision makers proposed to identify the most violent offenders in New Jersey that were often re-arrested for crimes but not always recognized for their past violent histories at new arraignments or detention hearings. Following the GVRTF process, each day, analysts at the New Jersey Regional Operations & Intelligence Center (NJ ROIC) and real-time crime centers receive a list of arrests from the state's Automated Fingerprint Identification System (AFIS). Using a GVRTF module developed in BackTrace analysts can add shooting suspect and victim information to a pre-populated report that has pulled the arrestee's total arrests, gun arrests, felony convictions, and violent crime histories. The referral report also includes potential leads from the NIBIN system that link individuals to multiple shooting events along with DNA hits from the national Combined DNA

Index System. This type of forensic data had not been routinely available to prosecutors, or the information was not available in a timely enough fashion to inform criminal arraignments. Because analysts are based across the state, they have local knowledge of violent criminals, particularly in situations where data is not automatically imported into the referral report.

Table 17. Backtrace Referral Support for Prosecutors, 2022
Total individuals referred: 511
• 24 individuals were referred twice.
• 85 suspects were re-arrested after being referred and released.
The 511 individuals referred through the GVRTF in 2022 were responsible for:
• 6,044 total arrests
• 1,471 total gun arrests
• 551 total shootings
• 121 individuals were associated with a NIBIN hit.
• 343 individuals were also shooting hit victims.
• 208 individuals were also shooting suspects.
• 4 individuals were suspects in shootings after being referred and released

*Data provided by NJSP

Under the program's first full year (1/1/2022 to 12/31/2022) in operation a GVRTF 535 arrestees were referred to prosecutors. Of the 535 referred arrestees 511 were held for bail. Table 17 shows that the 511 individuals referred through the GVRTF in 2022 were responsible for 6,044 total arrests, 1,471 for gun related arrests, 551 total shootings, 121 individuals with NIBIN hits, 343 individuals who were identified as a shooting victim in NJ POP and 208 who were identified as shooting suspect in NJ POP.

Referrals to prosecutors under the GVRTF were made broadly across New Jersey. As Table 18 shows referrals were made to 17 of New Jersey's 21 counties in 2022. The greatest nunber of referrals were not surprisenly located in the higher population and larger volumn of crime counties.

Table 18. GVRTF Referrals by County 2022	
Atlantic	41
Bergen	4
Burlington	21
Camden	86
Cape May	3
Cumberland	29
Essex	124
Gloucester	10
Hudson	10
Hunterdon	0
Mercer	111
Middlesex	16
Monmouth	16
Morris	0
Ocean	3
Passaic	12
Salem	16
Sommerset	3
Sussex	0
Union	6
Warren	0
Total	511

*Data provided by NJSP

Backtrace Summary

Today BackTrace now supports intelligence led policing initiative and partnerships across the state with both law enforcement agencies and prosecutorial and judicial decision-making. This program surgically identifies criminal patterns, trends, violent recidivist offenders, and threat actors to develop and inform public safety programs, strategies, and initiatives designed to curtail crime and violence New Jersey Crime Analysis.

As the Backtrace has grown, NJSP and GTBM have focused on making Backtrace more comprehensive and intuitive to investigators. The NJSP's focus on integrating different law enforcement data systems increasingly added intelligence and investigative capabilities for

investigators, as they continually included different streams of information and analytic

capabilities such as geospatial analytics, to make the system as comprehensive as possible.

BackTrace and similar technologies have institutionalized the collection, processing,

analysis, and dissemination of criminal intelligence by creating a repository of data that informs

criminal investigations and prosecutions. Consolidating arrest, criminal history, suspect,

shooting and vehicle data in this repository reduces the labor-intensive searches that analysts and

detectives have to conduct from disparate databases. The technology behind BackTrace

automates the search and analysis process to create investigative packages that links gun

evidence, people, vehicles, places, and crime patterns. Reducing the time-consuming process of

conducting information searches creates opportunities for a greater number of investigators,

patrol officers and less experienced analysts to develop investigative leads and packages.

The transition from conducting investigative searches across multiple databases
and records systems to a person-based federated search system that encompasses major data
sources greatly enhances investigative efforts. Making subject searches easier to conduct without
significant analytical and or investigative skills and experience also substantially expands the
user base and assists in solidifying the utility of these types of technologies in the investigative
culture.

Conclusion

This is a study of a two decade effort by New Jersey to reduce gun violence and implement and

institutionalize intelligence lead policing. Given the organizational complexity and many

different actors involved in this initiative we have summarized the study into two major parts:

strategic initiatives and key empirical findings.

**Key Strategic Initiatives Supporting New Jersey's 15-Year Statewide
Program to Generate Enhanced Investigative Leads for Crime Gun Violence**

1. The New Jersey State Police (NJSP) leadership became the organizational champions for
   intelligence-led policing (ILP) and organizational change within the agency.

2. The stability of the NJSP leadership over the long term strengthened the agency's change strategy giving new and innovative policies the time to become institutionalized within the organization as the standard way of operation.

3. The commitment to ILP, coupled with technological innovations regarding information sharing and processing of firearms-related evidence, supported an environment of policing innovation that is sustained to the present day and provides a foundation for future change.

4. State policy directives such as the Governor's "Strategy for Safe Streets and Neighborhoods", mandating the statewide reporting of all incidences of shootings involving injury or death, and the Attorney General's 2008 Directive on the processing of Crime Guns through NIBIN, eTrace and NCIC, helped initiate and support innovative and effective programs and technological developments.

5. The statewide collaboration of senior-level stakeholders across criminal justice disciplines (e.g., police, forensics, prosecutors, probation, parole, etc.) supported and strengthened NJSP's approach to ILP.

6. The NJ POP Analytic Services to Support Local and Regional Law Enforcement Program, analyzes statewide shooting data, reported by state mandate, to identify and report on patterns and relationships between events. For instance, many shootings are in retaliation for previous violent crimes committed among rival criminal groups, therefore capturing data on victims, witnesses, and suspects often provides links between events. NJ POP operates on a web-based application.

7. Public Law 2013 Chapter 162, requiring all New Jersey law enforcement agencies to utilize federal firearms evidence databases including ATF's National Integrated Ballistic Information Network (NIBIN), ATF's eTrace system and the FBI's National Crime Information Center (NCIC) had significant impact on the way that crime gun intelligence was collected and processed.

8. The creation of a "Ballistic Community of Interest" made up of all NIBIN service providers in New Jersey formed a collaborative partnership to drive the adoption of NIBIN operational and reporting standards and support the continuous improvement of NIBIN services.

9. Shifting the focus of New Jersey's NIBIN program to a more investigation focused one directly supported the generation of timely investigative leads and the goals and methods of intelligence-led policing.

10. Rapid Assessment in NIBIN (RAIN) program reduced NIBIN turnaround time for firearms evidence from 6 – 10 months to 24 – 48 hours and involved three broad phases; 1) identifying and reducing inefficiencies within the NJSP Ballistics Unit to improve the quality and timeliness of evidence, 2) expanding forensic evidence collection from crime

guns, and 3) extending RAIN standards to the entire state of New Jersey.

11. The NJSP initiated a set of four seminars sponsored by the Attorney General's Advocacy Institute, to inform forensic, police, prosecutorial, and judicial professionals, on Public Law 2013 Chapter 162, the RAIN guidelines, and other initiatives directed at reducing firearm violence. The formal AG supported program of outreach sessions to key stakeholders across the state proved to be an efficient and effective way of obtaining stakeholder buy in for change.

12. The use of crime scene technicians to perform additional and more comprehensive forensic examinations (visuals for trace evidence, DNA Swabbing, and latent fingerprint search) on crime guns at the NJSP Ballistics Unit, allowed the NJSP to expand their internal RAIN protocol, while most remarkably continuing to meet their targeted turnaround time for NIBIN processing of 24 – 48 hours.

13. NJSP's development of a series of complementary guides, policy directives, and initiatives that used intelligence and information sharing as a key element to helping direct and support law enforcement tactics and strategies.

14. The development of a statewide comprehensive crime data information infrastructure to support intelligence-led policing strengthened the value of NJ Regional Operations and Intelligence Center (ROIC).

15. Daily, on a statewide basis, the Backtrace data management system comprehensively collects, stores, and manages a very board range of law enforcement and crime related data. The data includes arrest information, NIBIN and other forensic data, NJ POP reports (shooting incident data), NJ Trace information, motor vehicle records, and prison history.

16. Backtrace efficiently manages collected crime and law enforcement data to enable users of the system to integrate, analyze and disseminate relevant information in support of individual investigators, local, regional, and state ILP initiatives, and intelligence sharing collaboratives (e.g., CorrStat). Moreover, it helps prosecutors focus on the most dangerous suspects with precision and objectivity.

17. The implementation of the Backtrace helps to institutionalize the ILP initiatives and the overall data collection infrastructure that New Jersey has developed by providing efficient and standard methods for gathering and analyzing relevant information.

Key Empirical Findings: New Jersey's Statewide 15-Year Programs to Reduce Gun Violence

1. For the period 2002 – 2021, New Jersey had a consistently lower gun homicide rate than the nation and the average rate for the top ten most populous states. (Figure 1 and Appendix Table 1) and this difference increased after 2014, a period when New Jersey implemented several major programs to support NJSP crime and gun violence reduction initiatives. (See, Figure 1 and Appendix Table 1).

2. In 2021, the New Jersey gun homicide rate was 55% lower than the national gun homicide rate. (See, Figure 1 and Appendix Table 1)

3. Table 1 shows that after the NJ POP the shooting incident database became a statewide reporting system in 2009 an average of about 85 cities and towns reported at least one shooting incident per year. Over this period, NJ POP recorded information on 16,063 shooting incidents in New Jersey.

4. For the period 2009 to 2022, the ratio of nonfatal to fatal shooting victims averaged about 4.4 nonfatal shooting victims for each fatal shooting victim. (See Table 2 and Figure 4).

5. Between 2021 and 2022, fatal and nonfatal shooting incidents in New Jersey declined by 25% and fatal incident alone declined by 17% (see Table 2).

6. Table 4 shows that 25 cities and towns accounted for about 90% of the fatal and nonfatal shooting incidents in New Jersey over 2009 to 2022.

7. About 30% of shooting incidents in New Jersey have 2 or more victims (see Table 6).

8. NJ Trace collects evidence on crime related firearms recovered by law enforcement on a statewide basis. Table 7 shows that over the 2013 to 2022 period NJ Trace collected data on 20,490 crime gun possessors. NJ Trace also supplies monthly NJGUNStat reports of recovered crime guns and crime gun incidents in New Jersey.

9. Between 2007 and 2021, New Jersey NIBIN acquisitions nearly doubled from 5,698 acquisitions in 2007 to 10,639 in 2021. However, the great majority of this increase occurred between 2015 to 2021 following the implementation of the RAIN protocol (see Figure 8).

10. Following the implementation of RAIN in mid-2015 the number of NIBIN acquisitions by the NJSP Ballistics Unit more than doubled (see Figure 11). In addition, the proportion of all New Jersey NIBIN acquisitions submitted to NJ State Ballistics Unit grew from about 32% of all acquisitions in 2014 to 54% of all the state's total acquisitions in 2019 and after (see Table 8).

11. Table 9 presents data on the ratio of NIBIN acquisitions to NIBIN cases for New Jersey and the nation for the period 2017 to 2021. It shows that, on average New Jersey collected approximately 1.8 pieces of evidence per case compared to 1.4 pieces for the nation as a whole. This suggests that New Jersey was acquiring more NIBIN evidence per case than the nation.

12. Table 10 shows, that 40.8% of all the NIBIN lead reports in New Jersey between 1/2021 to 8/2022, were for incidents where only casing evidence was found, and no injuries were incurred. However, evidence in such cases is potentially important when examined in the context of other data or intelligence and can also be of value if linked to future incidents. Moreover, such evidence can be important in developing a better understanding of the geographic distribution of shooting incidents (see Figure 15).

13. Backtrace integrates numerous crime related data sources. As an example, Table 11 shows the number of links between 11,273 gun offense arrestees and other readily available Backtrace data. Gun arrestees were linked to the following; NJ POP shooting suspects (582), NJ POP shooting victims (783), prior arrests (37,879, some of which may been for gun offenses), restraining orders/arrests (851), NIBIN cases (634), NJ Trace possessors (3,342), CODIS evidence (280) and prison records (7,476). Such links can provide valuable leads or help validate existing information.

14. Table 14 shows that arrestees with 5 or more arrests are very likely to be arrested in more than one community, with 86% of these individuals being arrested in 2 more communities over 2015 to 2022. Such data illustrates the importance of cross jurisdictional information sharing.

15. Utilization of Backtrace by law enforcement has grown significantly since the systems introduction (see Table 15). Individual searches for data nearly doubled from approximately 8,000,000 to 17.9 million searches between 2021 and 2022. During this time, the number of users increased from 1,709 to 2,954, (based on 365-day comparison figures), and the total hours of use by law enforcement increased by more than 500% from approximately 4,500 to 26,700 hours.

16. Table 17 presents Backtrace information for prosecutors wishing to identify violent offenders at arraignments or detention hearings under the GVRTF program. During 2022, the program's first year in operation, 535 arrestees were referred to prosecutors for bail and 511 were denied. Table 17 shows that the 511 individuals were responsible for a total of 6,044 arrests. The total (6,044) included 1,471 gun related arrests, 551 arrests involving shootings, and 121 arrests with NIBIN hits. Moreover, 2022 NJ POP data identified 343 individuals as shooting victims and 208 as shooting suspects.

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Appendix for Table 1 for Figure 1. Gun Homicide Rates in New Jersey, the Top 10 largest States
and the Nation - 2000 to 2023

Table 1. for Figure 1, Gun Homicide Rates in New Jersey, the Top 10 largest
States and the Nation - 2000 to 2021

Year	Gun Homicide Rate National	Gun Homicide Rate Top 10 States	Gun Homicide Rate NJ
2007	4.19	4.45	3.18
2008	4.01	4.26	2.80
2009	3.75	3.99	2.62
2010	3.59	3.77	2.96
2011	3.55	3.75	3.26
2012	3.70	3.93	3.12
2013	3.55	3.69	3.36
2014	3.46	3.60	2.99
2015	4.05	4.00	3.08
2016	4.46	4.46	3.35
2017	4.47	4.39	2.94
2018	4.27	4.11	2.45
2019	4.39	4.21	2.17
2020	5.88	5.81	2.85
2021	6.31	6.23	2.98

Table 2 for Figure 1; Gun Homicide Rates (per 100,000) for NJ, the Top Ten Largest States, and the
Nation, 2021

Nation	CA	TX	FL	NY	PA	IL	OH	GA	NC	MI	NJ
6.8	4.7	6.6	5.3	3.1	6.6	10.2	7.4	9.5	8.1	7.0	3.0