Evaluation of Efforts Funded by Project Safe Neighborhoods for the District of Colorado FY 2020: RAVEN and DPD Violence Interventions

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Introduction

Funding for Colorado's Project Safe Neighborhood programs is managed by the Colorado Department of Public Safety/Division of Criminal Justice (CDPS/DCJ) in partnership with the United States Attorney's Office (USAO) for the District of Colorado and the Project Safe Neighborhoods Board. Because of delays resulting from the COVID-19 pandemic, funding decisions for the FY 2020 PSN funds did not occur until December 2021 with results being communicated to awardees in early 2022. The Regional Anti-Violence Enforcement Network (RAVEN) program and Denver's Crime Gun Intelligence Center (CGIC) were the only applicants and sites to receive funding. With slightly different emphasis, and some degree of intersection, both proposals focused on improving the capacity of funded agencies and partners to pursue a forensic- and intelligence-led approach to addressing gun violence. The purpose of the present report is to document, as best possible given the data provided, the efforts funded under the grant and provide an assessment of the effectiveness of these and recommendations for how future efforts and partnerships might be improved in an evidence-based and data-driven way. Towards this end, the first part of the report provides an overview of each agency's efforts based on proposals, reports and discussions with key stakeholders as they sought to implement their interventions. The second part of the report presents analysis of data provided by the funded entities, and as best possible given limitations or absence of data, offers insights into whether efforts at the funded sites are consistent with PSN objectives and how these and PSN partnerships might be improved moving forward.

Project Safe Neighborhoods Core Principles

Project Safe Neighborhoods (PSN) programs are centered around four key principles: 1.) Engaging local communities to build trust, improve communication, and facilitate collaboration; 2.) Supporting local strategies to proactively address violent crime and its underlying causes before it occurs; 3.) Leveraging of focused and strategic enforcement through intelligence-led strategies for identifying prolific and likely violent offenders; 4.) Holding law enforcement agencies accountable for pursuing evidence-based strategies and achieving measurable outcomes. Each of the PSN funded initiatives in Colorado aspires to operate in a manner consistent with these principles, with a strong focus on principles #2 and #3.

Collaboration with the PSN Research Partner

As described in the PSN Technical Training and Assistance Blueprints for success, the research partner is valuable in the following ways: "Local or state law enforcement agencies may have crime analysts who can provide some of these functions, and ideally RPs will work closely with law enforcement agency analysts. However, successful documentation and evaluation of PSN initiatives typically require more than reliance on existing crime analysis resources. The RP may be able to develop metrics and provide reports on the "organizational efficacy" of the PSN partnerships. The RP can also help PSN teams in the development of their strategic plans." Other guidance found in the guide produced by Michigan State University and BJA entitled "Identifying and Working with a Research Partner"[1], notes that research partners offer specialized knowledge

[1] https://psn.cj.msu.edu/tta/researchpartnerqa_version-2_june2017.pdf

and ability, objectivity, credibility, and an outside perspective. Additionally, the guidance states: "Unlike traditional research involving neutral observation, research partners are to be fully engaged in the problem-solving process. A good research partner is part facilitator, part researcher, and part program specialist."

The guidance provided by BJA and Michigan State University further suggests that: "You should be looking for a research partner who believes that the problem-solving process is a collaborative one between the research partner and the team. In this philosophy, team members are all seen as experts and (the) research partner(s) works closely with them throughout the process of understanding the gun violence problem, designing interventions to deal with the gun violence problems, documenting interventions, developing performance measures, interpreting evaluation findings, and making recommendations for program improvement. *The goal of such research and evaluation is to improve the program, not to declare the program a success or failure*. More formal names for this philosophy include "action research", "participatory evaluation," "utilization-focused evaluation," and "empowerment evaluation." This can be considered both "research informed practice" and "practice informed research."

Funded entities provided data for the purposes of evaluation and the research partnership and were dutiful in responding to questions from the research partner; however, there is much room for improvement in the integration of the research partner into ongoing PSN efforts. Potential ways in which the collaboration and integration of the research partner into PSN efforts are discussed in a dedicated section below. Below is a brief overview of the activities undertaken by each awardee under FY 20 funding from PSN in collaboration with the research partner.

Aurora Police Department's RAVEN Task Force

RAVEN is a task force initiative operationally housed within the Aurora Police Department and staffed through memorandums of understanding (MOUs) between 16 partnering law enforcement agencies in the Denver Metro area, as well as other partners and CGICs (e.g. Denver PD's CGIC). The management of operations is primarily coordinated by the Aurora Police Department (APD) and Federal Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), with support from the USAO. The stated mission of RAVEN is: "*To forensically identify and focus investigative, prosecutorial and community resources to remove and disrupt violent criminals, gangs and drug traffickers that plague our neighborhoods."* Towards this end, RAVEN uses a plethora of traditional and cutting edge forensic and investigative tools to investigate weapons violence and groups and individuals involved in it. Central to these efforts is utilizing these tools and resources to identify the individuals and groups responsible for the highest volume of violent weapon offenses and focusing limited resources on these individuals. National Integrated Ballistics Information Network (NIBIN) is a critical tool for identifying and pursuing these offenders. Likewise, central to the RAVEN model is consistent collection and rapid entry of forensic evidence into the NIBIN system by partnering agencies to provide timely and actionable intelligence. Funding for the FY 20 PSN grant primarily supported the purchase of specialized equipment and subscription to law enforcement tools used to more efficiently and effectively identify forensic or intelligence leads on violent offenders.

Denver Police Department

Denver's CGIC was created in partnership with the ATF in 2013 as the first crime gun intelligence center in Colorado, with a focus on improving the collection and entry of forensic firearms evidence into the NIBIN system. Like RAVEN, the efforts undertaken by Denver CGIC are centered around the utilization of forensic evidence and intelligence to identify leads related to incidents of gun and gang violence. Denver's efforts to address gun and gang violence are further supported by partnerships with GRID, GREAT and other community-outreach and prevention entities to which offenders are referred. For the FY 20 PSN funding, a significant share of the funds requested were identified as necessary to improve the capacity of the Denver Police Department Crime Lab for entering evidence into NIBIN and processing gun-related crime scenes. Based on a three-year average increase in violent-, weapons- and gang-related offenses, it was anticipated that additional resources would be needed to maintain existing levels of activity and efficacy. Consistent with this, a sizable share of the funding awarded went to the purchase of additional equipment for processing crime scenes where forensic ballistics evidence exists. Funding was also utilized to support intelligence-led operations by the Special Operations Resource Team (SORT) to engage in enforcement and surveillance operations focusing on known violent offenders and targeted areas of Denver with significant violent crime. The strategy also includes partnerships with the Gang Reduction Initiative of Denver (GRID), Denver's gang outreach and prevention program, to refer eligible individuals to prevention or rehabilitation services.

Analysis

For the funding period examined, each of the funded entities provided selected data relating to violent crime and offenders under their purview. Each data source was leveraged as best possible to speak to the ongoing efforts as described by the entity and as reflected in their proposals. The data and analysis for each funded entity is presented in dedicated sections below.

RAVEN – The Broader Denver Metropolitan Area's Crime Gun Intelligence Center

Based on discussions with RAVEN command staff and contract analysts, it was determined that RAVEN was able to provide data from two sources: the RAVEN Greenbook, and NESS Data Extracts for Colorado (2022). All provided data were anonymized or redacted to remove individual identifiers but preserved randomly generated id's and incident or case #s for analytical purposes.

The Greenbook is an administrative tracking tool used by RAVEN to document cases with information about: seizures of weapons drugs and other contraband, fugitive status, charges for related offenses, and outcomes for cases where available.[2] These data serve as the basis for administrative reports produced by RAVEN and therefore primarily focus on outputs rather than outcomes. Specifically, there is no ability to trace cases from beginning to end, or the ability to select appropriate comparable cases. While useful for administrative reporting, these data ended up having limited utility because of the inability to connect them to earlier or subsequent case

[2] Because cases are often ongoing due to the nature of investigative and prosecution efforts, the Greenbook is actively updated. 2022 was selected because it focuses on the funded period and because a significant amount of time has elapsed for most cases, making them less subject to ongoing cases.

outcomes or processing which could speak to the processing of cases from shooting to prosecution.

NESS is ATF's NIBIN Enforcement Support System and contains extensive information about ties between weapons, offenders, and incidents from participating local agencies. NESS and NIBIN data are an integral component of RAVEN's operations. All data in the system have some connection to a weapon which has been recorded within the NIBIN system. A limitation of these data is that it does not contain direct information about non-NIBIN cases investigations which, based on data from the Greenbook, comprise over 50% of cases. Additionally, data do not contain suitable linking identifiers for RAVEN cases which allow connection to the NESS data.[3] Despite this, the NESS data are an important source of information upon which cases investigated by RAVEN are triaged to different levels. Given this, a substantial amount of attention was focused on these data and whether they are capturing those cases which are more pivotal and central to the broader network of gun offenders and incidents.

Analysis of RAVEN Efforts

Examination of the NESS/NIBIN data provided by RAVEN yielded several interesting insights into the nature of connections between guns and how RAVEN's triage processes intersect with these. As described above, these data were exported from the NESS system and contain hierarchically structured information about people and incidents connected to guns recorded in the NIBIN database. The data included all guns which were active in 2022 and all previously known incidents and people tied to each of these guns as of July 21, 2023. These data therefore allowed examination of both pre-existing ties and additional ties that accrued after the focus period of the 2022 calendar year. In total, 1493 guns were included in the dataset, with information about ties to 10,319 people in 2,716 incidents. Data were processed and analyzed and visualized using R with the igraph package and other related packages.

In total, there were 1971 ties between the 1493 guns in the network, indicating that on average each gun was tied to 1.32 other guns via shared connections through persons or incidents.[4] The network was sparse in terms of network measures, only containing .18% of all possible ties between guns if every gun were connected to every other gun in the network. The longest path across all pairs of nodes was 20, indicating the relative breadth of the network is about 20x what a fully connected network would be (i.e. 1 being the longest path). The average path between any two guns was about 6.8, suggesting that any two guns can be connected by ties between 7 guns.[5] Despite the prior measures which indicate a relatively sparse network, perhaps reflecting a generally random connection, there is evidence of significant clustering (or 'transitivity') among triads present in the network, with 64% of all possible triads forming a

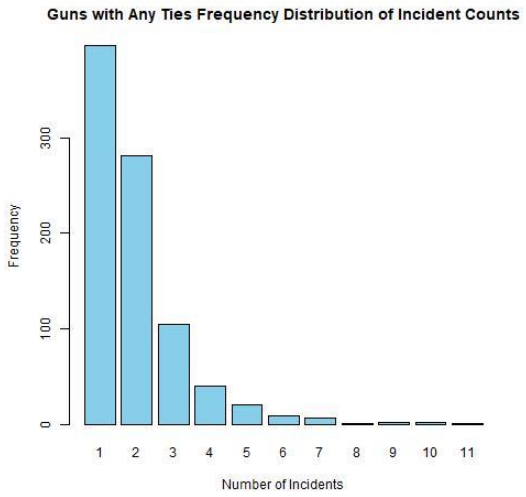
[3] After extensive discussions with the RAVEN contract analysts, it was determined that it might be possible to connect Greenbook and NESS data using the serial #'s from weapons; however, these are not always known (e.g. where only shell casings are entered and no weapon has been recovered), and where present these are included in the notes along with other information which makes them more challenging to extract. Moving forward, RAVEN might consider integrating more linking identifiers into the Greenbook to make them more amenable to analysis for the purposes of evaluation and case tracking from beginning to end.

[4] The examination of ties between guns within incidents and also via people across incidents help to paint a more complete picture of the connectedness of guns in Colorado. This is because only examining ties between guns within incidents risks masking the effects of indirect ties where guns were used by multiple parties, often associated with gang or other organized criminal activities.

[5] This approximates what is commonly referred to as "six degrees of separation", which has been posited to be the functional distance between all human beings on the planet, based on observations from Stanley Milgram's "small world" experiment in which he found that all individuals could be connected to one another in less than 6 steps.

triangle. Stated another way, aside from a significant number of guns that are largely isolated or otherwise disconnected, a substantial proportion of guns are connected to at least two other guns in the network.

Seeking to understand how common repeated use of weapons was within the data, I examined the # of incidents associated with each gun in the network. As illustrated in Figure 1 below, almost 60% of the guns were only associated with one incident in the data. Of the remaining 40% of weapons (n=604) involved in multiple incidents, most were involved in only 2 incidents (66% or n=399) or 3 incidents (20% or n=121). The maximum number of known incidents a single gun was connected to was 11.



Of the 1493 guns in the data, 865 (57.9%) had one or more ties to other guns. Only 10% of guns with ties were exclusively tied to other guns within a single incident, while another 40% (n=338) were involved in only one incident but had ties to other guns via involved persons. Overall, 29% of guns (n= 434) had ties to multiple guns across multiple incidents forming the core of guns repeatedly used in weapons offenses within the data. These guns (29%) account for about 64% (1,746 of the 2,716) of incidents in the data. While it's not possible to estimate the percentage of offenders responsible for using these guns, the observed disproportion is not as large as one might expect given common wisdom about other chronic/repeat offenders.[6] Despite common wisdom, this suggests that gun/violent crimes may actually be perpetrated by a lower proportion of repeat offenders than other crimes, which makes sense given that a substantial number of these offenses are likely domestic in nature. Given the focus of RAVEN and other CGICs on weapons and persons involved in multiple incidents, I sought to further examine how such weapons were handled via RAVEN's triage processes.

[6] Wolfgang's classic study found that 6% of boys in a birth cohort in Philadelphia were responsible for around 50% of the offenses (i.e. 8.3x disproportion), suggesting that there is a small percentage of the population that are chronic/repeat offenders. This principle is commonly referenced in relation to efforts which seek to identify the most prolific offenders. Recognizing that a small proportion of the population engages in violent crime, at least with regards to the share of active guns within one year, the disproportion of guns within the network is lower than might be otherwise expected.

Within network analysis there are a number of methods for measuring one's structural position within the network. These are defined by the mathematical relationship between various nodes based on the observed ties between individuals in the network. They capture the network potential of individuals to influence other actors in the network by acting as hubs, authorities, bridges, etc. Applying these principles, criminologists have examined the role of a variety of measures of network position on firearms violence and networks. These studies have found that various measures of network position are likely to play a role in the transmission of violence from one party to another. Stated another way, those who are more deeply enmeshed in the network are more likely to be either a perpetrator or victim of gun violence, and being more socially proximal to these individuals increases one's risk. Using the NESS data, several measures of network position were calculated for each node/gun and each person in the network, including: degree, betweenness, closeness, hub/authority.

Using data on network position, I examined the correlation of these measures with various outcomes of interest, including: roles in incidents, demographic factors, victimization and arrest outcomes (data not shown). Within the network of people, there were few correlations of interest with network position; however, a number of interesting correlations were observed between various factors. Not coincidentally, there was a positive correlation between the # of incidents an individual was involved in and being a known suspect or arrestee in relation to weapons offenses. Likewise, the number of times one was recorded as a victim was also positively correlated with the number of incidents one had been involved in. Incident counts were also positively correlated with being associated with a triaged gun, with the strongest correlation between the highest triage level (level I) and the number of incidents. Taken together, this suggests that repeated involvement in weapons involved incidents is likely to correspond with garnering official attention in the form of triage. Seeking to understand how network attributes influence the triage processes used by RAVEN, we examined how several factors varied by triage level. Results are presented in Table 1 below.

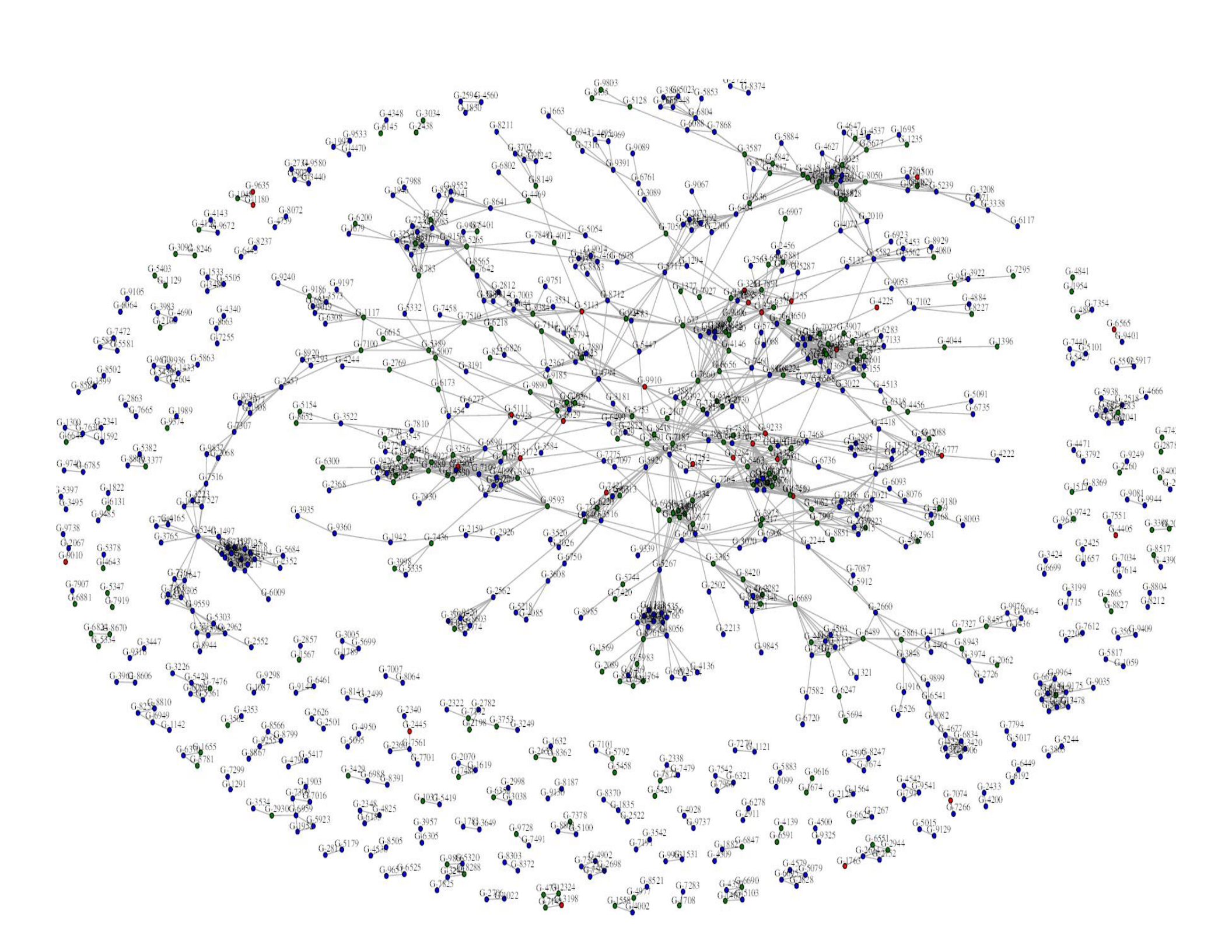
Table 1. Variability by Triage Level

	Tier_I	Tier_II	Tier_III	No_Tier	Overall
Degree	4.01	2.66	1.46	4.04	2.64
Betweenness	1,152.64	492.71	125.99	667.08	537.51
Closeness	0.19	0.26	0.33	0.12	0.25
Hub/Authority	0.03	0.01	0.01	0.00	0.02
Arrest	0.62	0.36	0.35	0.34	0.43
Suspect_Named	0.75	0.54	0.53	0.62	0.60
Homicide_Gun	0.14	0.08	0.06	0.14	0.10
MultiTie_Gun	0.47	0.37	0.14	0.28	0.29

Table 1 above also presents the averages for each measure of network position and various attributes (binary indicators) by triage levels used by RAVEN. There are 3 triage levels utilized by RAVEN which represent descending priorities from Tier I (highest) to Tier III (lowest triaged level), and guns may also remain unassigned. Per discussions with RAVEN's contract analysts who are primarily responsible for assigning and tracking triage levels, triage levels change over time in relation to the priorities of RAVEN, new evidence/leads and emerging crime trends.[7] For example, when armed robberies recently became a concern, these cases were triaged as Tier I where they might have otherwise had a lower priority in the absence of 'solvability factors', including NIBIN entries. However, in general, triage levels correspond with the availability of evidence in NIBIN and associated level of ongoing threat to the community based on underlying information available to analysts. As illustrated in Table 1, measures of network position vary such that higher tiers have higher scores reflecting more connectedness in the network. For example, the average degree (# of ties to each gun) of Tier I guns was 4 versus 2.7 for Tier II and 1.5 for Tier III. Similar patterns can be observed for closeness, hub/authority, and betweenness. This suggests that consistent with PSN objectives and the stated goals of NIBIN, RAVEN is focusing on guns which play a more central role in the broader network of weapons in the Denver Metro area (and the state overall). Moreover, the results in Table 1 further suggest that guns with named suspects, involved in homicides, and with multiple ties are more likely to be assigned a higher tier. Taken together, this suggests that RAVEN's case screening procedures, despite shifting with priorities, do seem to be focusing on the most deeply enmeshed, frequently used guns with the most leads/ties, likely to be used in repeated incidents by violent offenders.

Based on discussions with RAVEN analysts and command staff, Tier I cases are are most likely to receive dedicated resources.[8] While it was not possible to link individual guns with subsequent RAVEN case processing/tasking because of data and tracking limitations, the data allow some potentially useful inferences about what happened with guns (and other connected guns and people) that were assigned to Tier I. In total 423 guns in the data (around 30% of all guns for 2022) were classified as Tier I during the period for which data was available. Among these, 52.2% had an arrest associated with these guns; however, most arrests either preceded or were concurrent with classification as Tier I. Around 8% of Tier I guns (n=37) had arrests recorded after classification as Tier I; however, about half of these (n=18) were guns that were largely isolated from the broader network. Stated another way, this faction of Tier I guns seems to be related to guns which were used in limited incidents; however, garnered the attention of analysts and merited being triaged as level I because of other factors not observable in the data. Figure 1 below provides an illustration of how Tier I cases with (red) and without (green) subsequent arrests are distributed in the network.

[7] In part, these priorities also account for the fairly substantial share of cases investigated by RAVEN which do not have corresponding NIBIN entries (e.g. armed robberies often involve guns, but seldom is evidence suitable for NIBIN collected unless an arrest is made; therefore, investigators must rely on other sources of information besides NIBIN).
[8] RAVEN is also involved in cases that don't have direct links to NIBIN/NESS data and are separate from the usual triage process.



A closer examination of the Tier I guns further reveals that while Tier I guns generally have higher betweenness in the network, the Tier I guns where an arrest occurred after being triaged had an average betweenness score of 3563. By comparison, Tier I guns which only had arrests recorded prior to being assigned to level 1, only had a betweenness score of 804, while guns with lower (or no) triage levels had a score of 294. It's unclear whether the high betweenness scores were a result of higher triage guns being linked to other guns subsequent to arrests, or pre-existing connections drove the higher classification; however, the data anecdotally suggest that RAVEN is generally honed in on the types of cases that hold the most potential to have a broader impact on gun violence – specifically, those that play a bridging role in the network, connecting offenders and guns.

"Hidden Ties" and Untapped Potential of NESS Data

During the course of examining the network data above, it was noted that slightly different effects were observed depending upon what data were used to identify ties between guns. Specifically, there were a number of guns with ties to one another which were assigned to different tiers. Ties can be formed from any two of three sources: guns, incidents, and persons. Ties between both guns and people tend to be nested within incidents, and where there is joint involvement of persons or guns in an incident, a tie is considered to exist. However, this potentially masks deeper ties between persons and guns which might exist in the network. Specifically, it is possible for multiple guns to be connected to one or more persons, but never be used in the same incident. This is especially true where a gun becomes too 'hot' to continue possessing after involvement in a homicide or other serious offense and are either sold or traded. Where incidents are exclusively relied upon as the source of information about ties, the ties between these guns connected via persons may be obscured; however, by utilizing a tripartite representation of the underlying data, the ties between guns and persons are better reflected in scenarios like those noted above. For the present report, rather than using a strictly incident-centered method of identifying ties and network structure, we utilized tripartite information about ties between guns via either incidents or people. Stated another way, inasmuch as a gun was tied to a person or incident any other guns tied to that person or incident were considered to have a tie. Utilization of the data in this manner revealed some interesting findings in comparison to relying on strictly incident-based ties between guns.

Compared to an incident-based model, a persons-based or tripartite method suggested that 29.6% of all guns and 51% of guns with ties had at least one tie to another gun that was not immediately apparent via incidents. Ties between these guns account for 67% of the ties between all guns. These hidden ties (8% of all ties between persons) also seem to be especially prevalent among a small percentage of the population (3% of people in the data) that has repeat involvement in weapons offenses, which is exactly the population of greatest interest to RAVEN and other CGIC initiatives. While the overall density (proportion of all possible ties) remained low overall, the person-based method of constructing ties resulted in a network structure that has around 1.7x density than the incident-only methods (i.e. the guns were more connected). Transitivity (i.e. clustering)

within the graph was also somewhat higher for the person-based graph (.758 vs .745). Interestingly, the average path between any two nodes in the person-based network was longer than in the incident-based networks (16.4 vs. 10.9), likely reflecting the reality that there is often transmission of weapons violence where one person uses a gun on someone and that person then uses another gun on another, etc. Table 2 below further illustrates how the different methods influence the structural position of nodes and their centrality to the network.

Table 2. Differences in Centrality by Method of Constructing Ties

	Person_Based Ties		Incident_Based Ties			
	Mean	**S.D.**	**Mean**	**S.D.**	**T**	**P**
Degree	6.66	5.00	2.89	3.20	13.36	0.00
Betweenness	1,957.91	4,262.55	728.66	2,660.31	5.14	0.00
Authority	0.02	0.13	0.02	0.11	0.02	0.99

As illustrated in Table 2, guns had significantly higher degree and betweenness scores when using the person-based method versus the incident-based method. Degrees, or ties to other guns, in the person-based network (6.66) were significantly higher than in the incident-based network (2.89) representation. Betweenness was also substantially higher in the person-based network (1957.91) than the incident-based network (728.66). Notably, the standard deviations in network position measures were also significantly larger in the person-based network, suggesting that this method captures many potentially hidden ties for some nodes, but relatively few for other nodes. Again, this makes sense given that hidden ties are substantially more likely to exist among the small percentage of the population that is deeply involved in firearms offenses. Interestingly, authority/hub scores were not significantly different. Hub/authority scores are indicative of a node's probability of being tied to all other nodes, with higher values indicating more influence. Given the relative lack of density in the network and the fact that these measures are better suited for directional networks, which are not easily constructed with the present data, this is not surprising.

Figure 2 below provides an illustration of how the method of examining ties between guns has an influence on the network. All guns for which additional ties were present in the person-based method but absent in the incident-based method are colored orange, while the missing ties are red (ties present in both network methods are grey). The graph plot below clearly illustrates how these undetected ties are especially prevalent in the most dense component of the network. These results suggest that formal consideration of 2nd order ties between guns via persons, rather than merely incidents, could yield potentially

useful insights for identifying networks of offenders of interest. That said, RAVEN analysts and operations personnel likely capture this informally via field-knowledge and other intelligence-gathering tools (e.g. social media, cell phones, etc.). In fact, evidence within the data suggests that these guns are already 2.4x as likely to be triaged as level I cases, again supporting the notion that RAVEN is focused on the guns and people who are most deeply involved in gun violence. Figure 3 applies the person-based method to illustrate ties between guns (red) and people (people), adjusting the size of each node based on its betweenness score. The plot illustrates how metrics like betweenness scores might be useful as a formal mechanism in conjunction with person-based ties for homing in on key guns and people within the network.

Figure 2. 'Hidden Ties' Between Guns

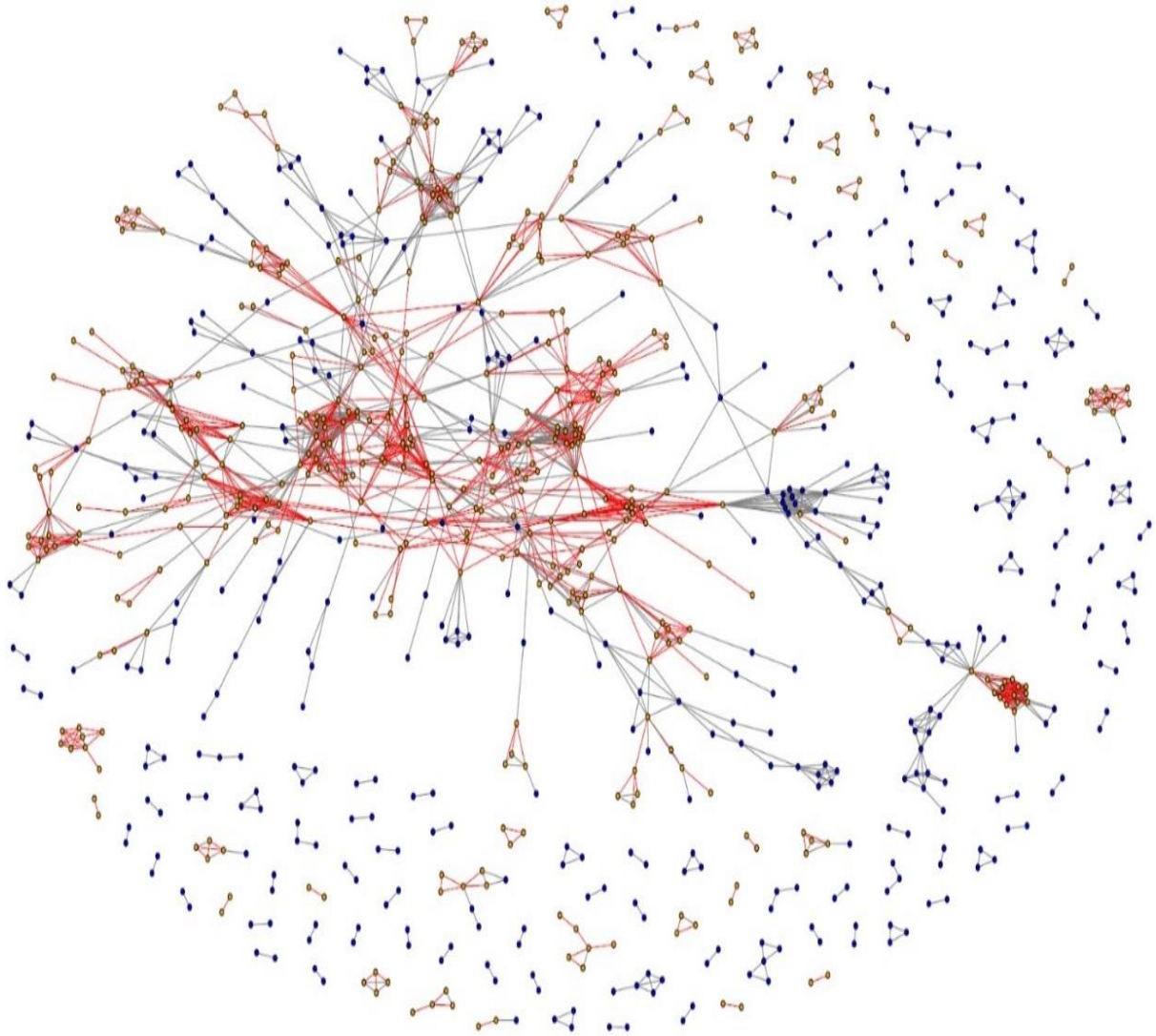
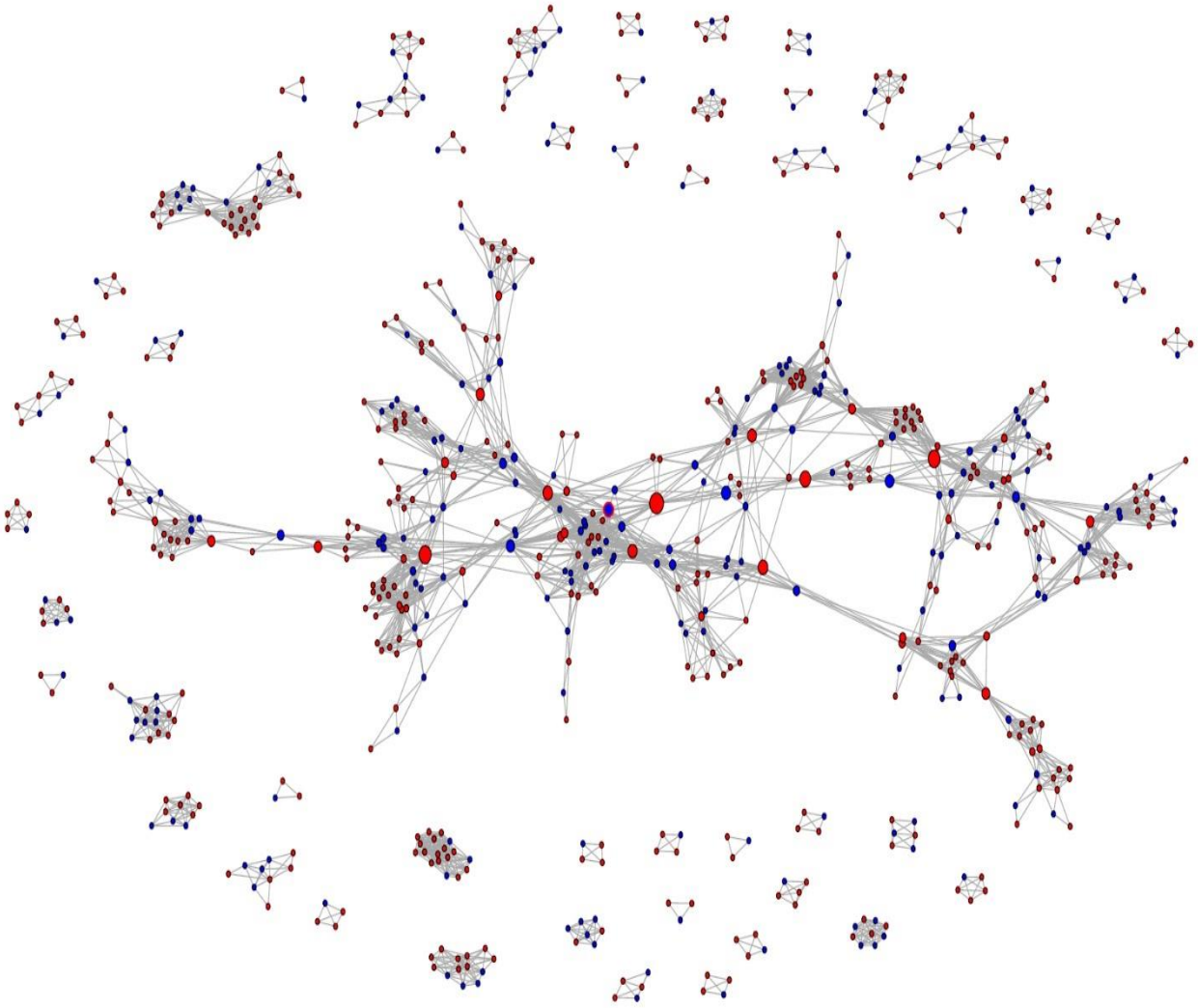


Figure 3. Betweenness and Ties Between Guns and Persons



As illustrated in Figure 3 above, several guns (large red dots in the center) and people (large blue dots) appear to serve as important bridges in the overall network, indicating that these weapons (and their possessors) are unusually influential in bridging different segments of the network of offenders/guns with one another.

Denver Police Department Gang and Violence Suppression Efforts

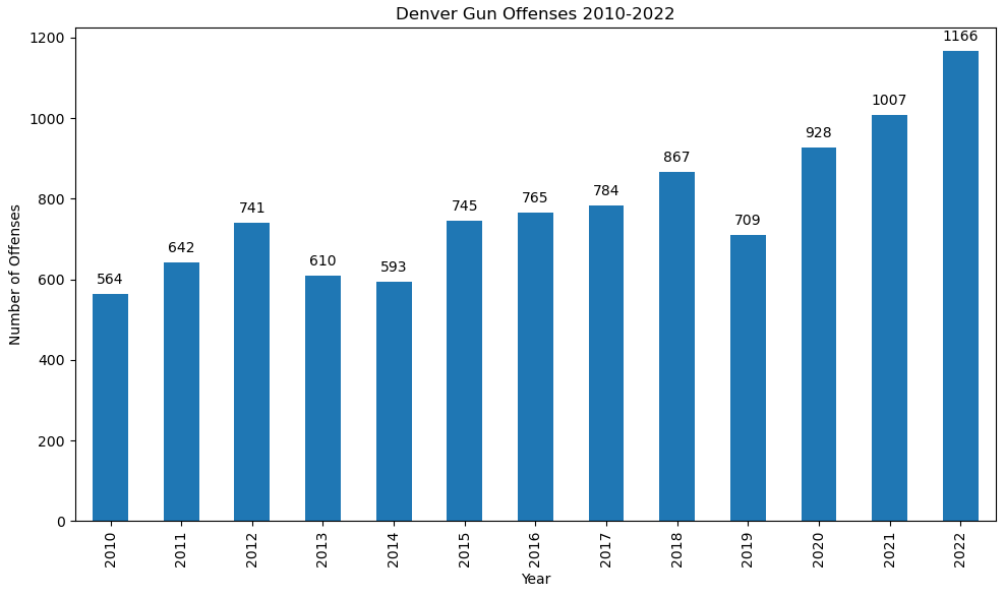
After Denver received the PSN award for FY 2020 funds, efforts were made to coordinate the exchange of data with the research partner. After some preliminary discussions via email, a meeting was held (April of 2023) with me and representatives from DPD's Data Analysis Unit and GRID. During the meeting we discussed the purpose and role of the PSN research partner and the desire of the PSN board and DCJ to get closer to evaluating outcomes from PSN funded initiatives. After deliberating on some of the data limitations and identifying some potentially useful data, all parties agreed there was value

in more closely examining outcomes and agreed to investigate these respective data sources. Unfortunately, when I followed up on the prior discussion several weeks later, I received a response indicating that the DAU staff member's email, my primary point of contact for coordinating data gathering, was not being monitored. After inquiring with another contact at DPD who is a member of the command staff, I learned that the staff member had taken a position with the Denver District Attorney's Office and was no longer with the department. Gratefully, my DPD contact who is a member of the command staff agreed to serve as a point of contact for coordinating data moving forward.

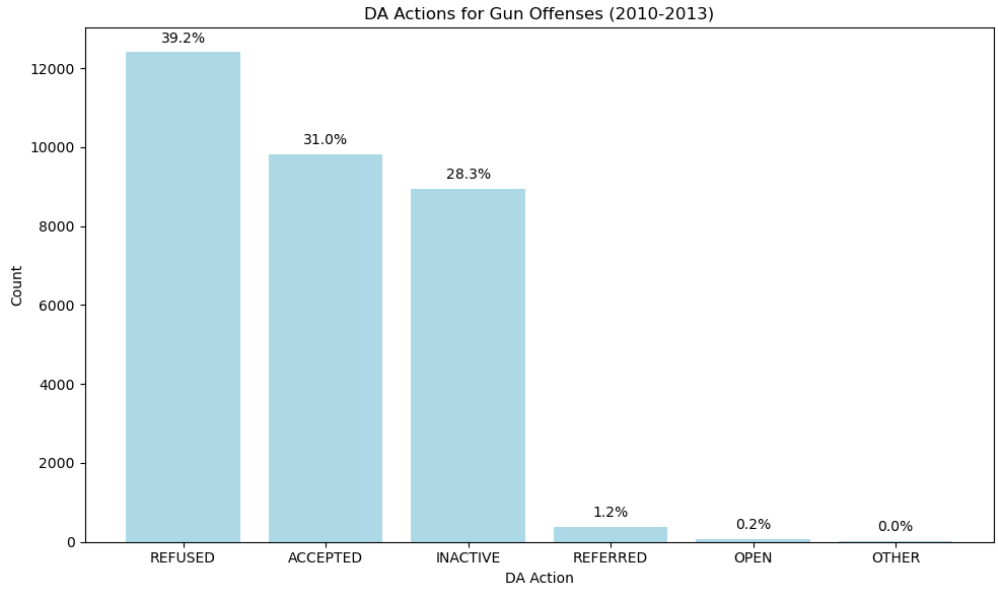
Since Denver had yet to implement their operational interventions (e.g. SORT operations and referrals to GRID), we focused on identifying baseline data that could be easily updated and spoke to the objectives of these efforts. This yielded some data from the Denver Crime Lab relating to NIBIN and RMS data for 2010-2022 by late May, which I was able to begin examining and preparing for subsequent analysis while Denver carried out the planned interventions (esp. use of overtime). Additional data that more directly documented the interventions was identified (e.g. when/where overtime hours were expended), with the understanding that these data would be provided subsequent to completion of the grant activities and close-out of the grant, anticipated before June 2024. Consistent with this the DCJ grant manager reached out in February 2024 indicating that Denver was still actively implementing their efforts through March 31, 2024. In early April 2024, I followed up with my DPD contact who was brokering the data exchange for follow-up data. While my contact put the requests in the queue, Denver was undergoing significant staffing shortages and turnover in DAU and a coinciding hiring freeze which resulted in adoption of a data request triage system which prioritized operational and administrative requests. Unfortunately, my request was classified as having the lowest priority, and despite numerous efforts to acquire the data by my contact, the request remains in the queue with the lowest priority.

Despite challenges getting the originally planned follow-up data, it was possible to do some analyses using the baseline data. Baseline data contained information from 2010-2022, with case dispositions which speak to how/whether case processing for gun offenses has changed over time. Additionally, Denver's incident #s are compatible with the NESS data provided by RAVEN making it possible to link offenses from 2022. This allowed examination of the impact of ballistic evidence on referrals and acceptance for prosecution. Additionally, it was possible to examine the network features for guns with ties to Denver incidents, providing some interesting anecdotal evidence about the degree to which Denver's CGIC is focusing on the right cases.

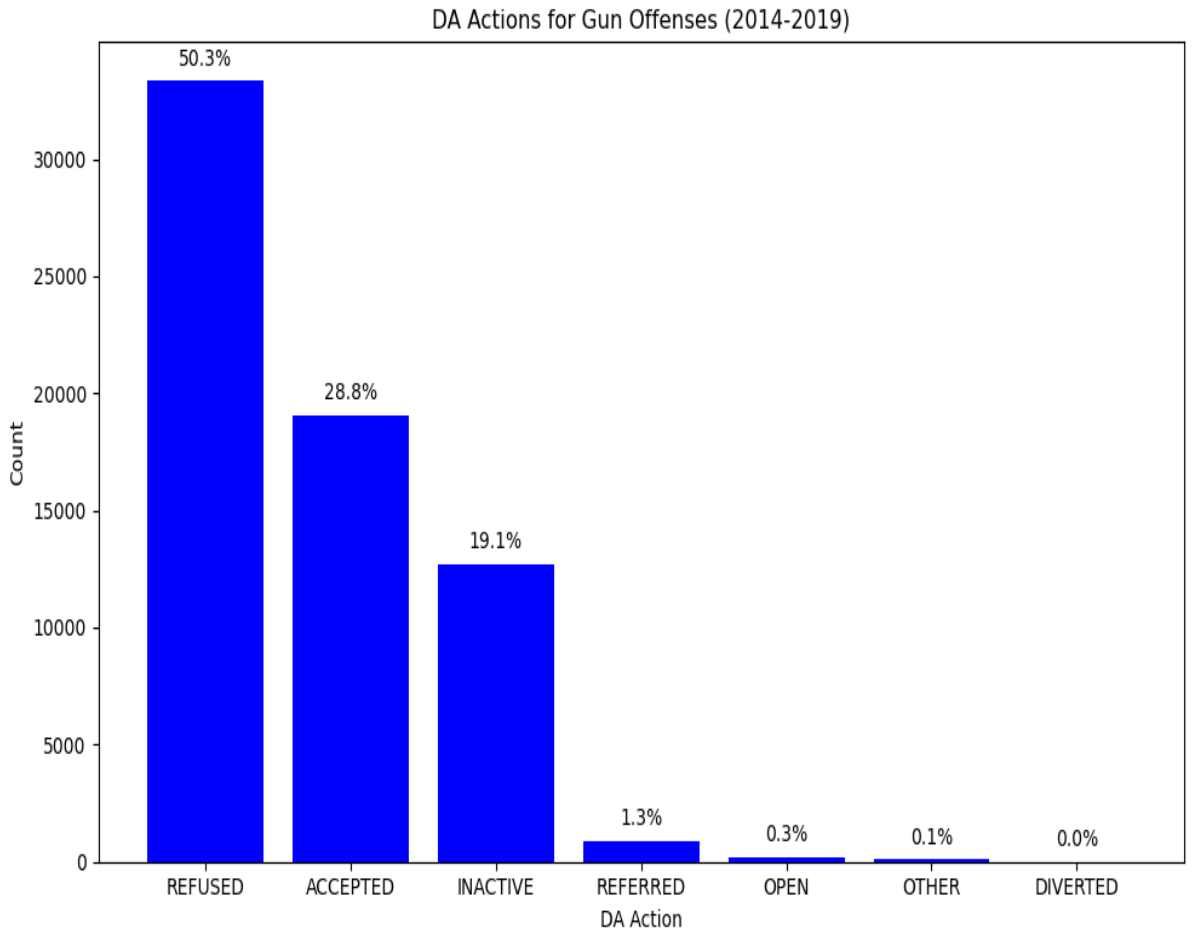
As has widely been observed, gun offenses have increased considerably in Denver, and nationwide since 2010. Between 2010 and 2022, there was a substantial increase in the # of gun offenses recorded by Denver (3.4X). Some of this increase is likely attributable to menacing and firing a weapon into vehicles or structures being recategorized to better track gun offenses, as these were often previously categorized as public disorder. Removal of these categories suggests, which are often not prosecutable, suggests that more serious offenses which have been consistently tracked still doubled (2.1x). The figure below shows the count of gun-involved offenses recorded in Denver's RMS system counts for each year.



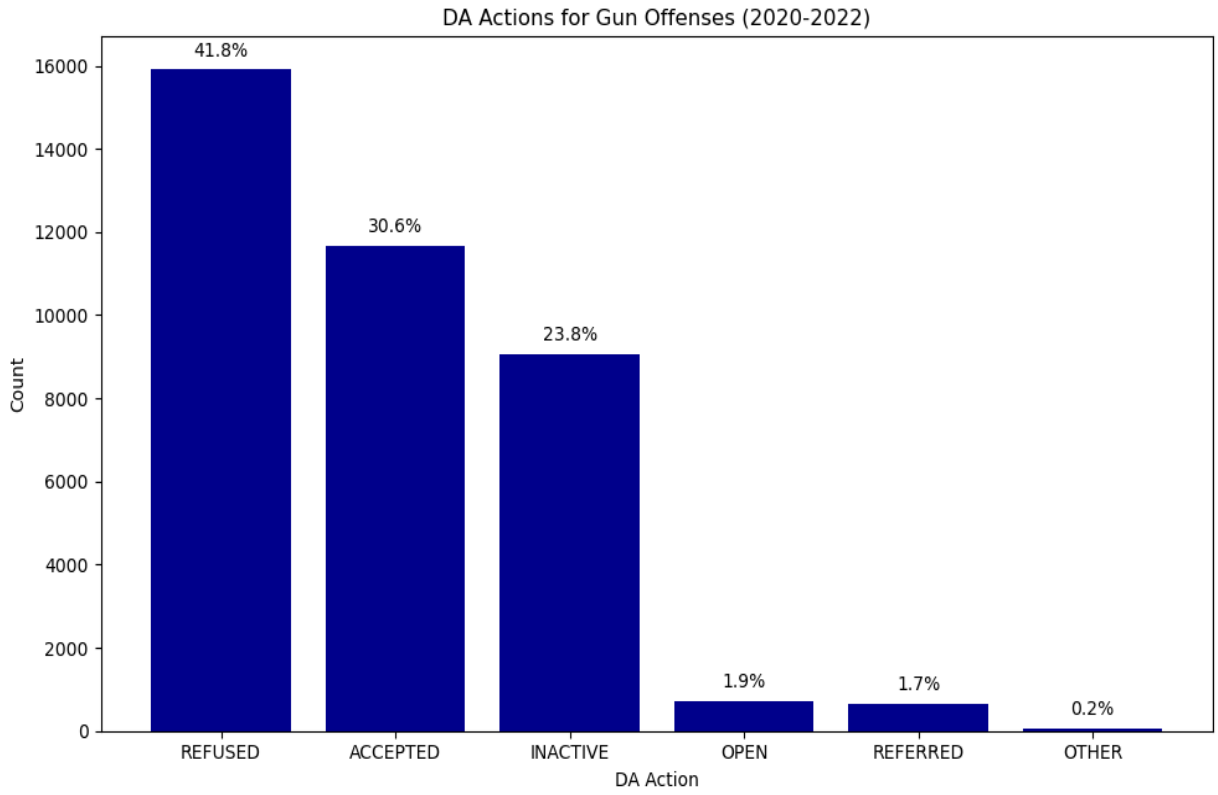
From 2010-2022, a number of changes occurred which were likely to have an impact on processing of gun cases, especially the increased use of NIBIN, the establishment of Denver's CGIC, and the pandemic/civil turmoil of 2020. As such, using the baseline data from Denver RMS, I examined the case dispositions for all gun offenses. In general, the dispositions of gun offenses didn't change considerably over time; however, there were a few notable differences. Between 2010-2013, prior to the establishment of Denver's CGIC or increased use of NIBIN, a substantial number of gun offenses were refused for prosecution (39.2%), with about 1/3 being accepted (31%) or referred (e.g. to Federal prosecutors). Another 1/3 of these cases were deemed 'inactive', suggesting no concerted attention was being paid to these, absent additional evidence emerging. The dispositions for 2010-2013 are presented in the figure below.



After the formation of Denver's CGIC and increased utilization of NIBIN (2013-Present), introduction of Shotspotter, and other intelligence tools, some changes could be observed in case processing. Notably, between 2014-2019, substantially more cases were refused for prosecution (50.3% vs. 39.2% in the prior time-period). It is unlikely these reflect differences in DA's exercise of discretion, as Morrissey was District Attorney between 2005-2017, during most of both periods; however, it could reflect differences resulting from McCann 2018/2019. This could also reflect the DA's office investing more time on fewer cases which were had better evidence, but which would have ordinarily been refused. Otherwise, referrals and accepted cases remained largely the same as prior periods, with most change occurring in the percentage of inactive cases (28.3% vs. 19.1% previously). This strongly suggests that the capacity of the DA's office presents a bottle-neck for prosecution of even the most serious offenses. It could also reflect more cases remaining or becoming active as NIBIN evidence began to more clearly illustrate connections. Additionally, both 2015 and 2017 saw significant increases in gang violence, which could have resulted in fewer of these cases remaining active. The figure below illustrates case dispositions for 2014-2019.

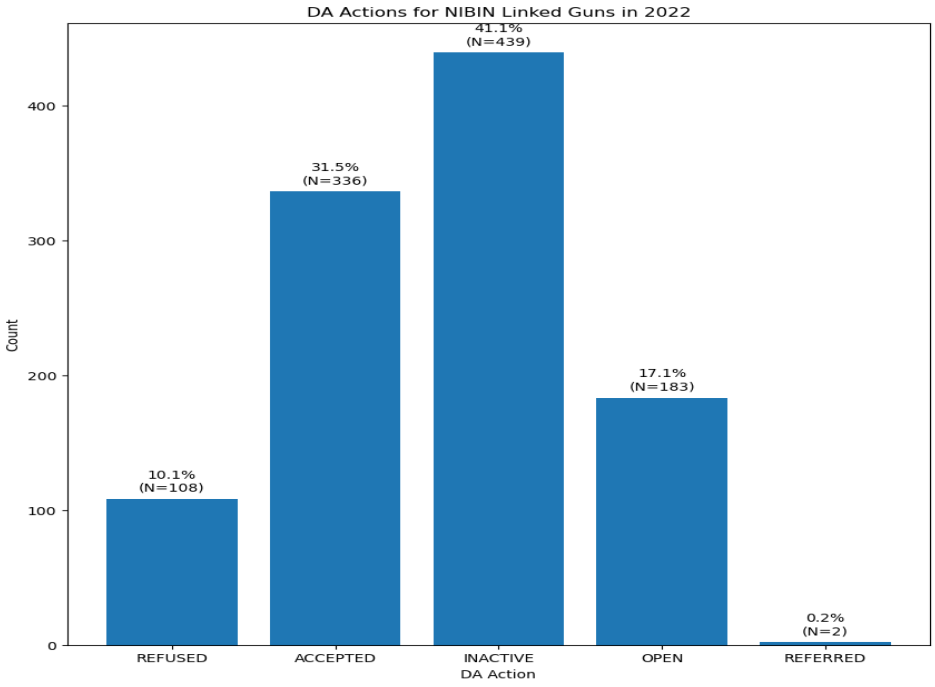


From 2020-2022, we begin to see a decline in refusals, despite the increased volume of cases from prior periods (41.8% refused between 2020-2022 vs 50.3% in the prior period). We also see an increase in the cases accepted (30.6% vs 28.8%) and referred (1.9% vs 1.3%) for prosecution. Inactive cases slightly increased from 19.1% to 23.8%.



Taken together, the subtle changes noted above potentially point to both the impact of increased volume and the benefits of increased evidence. Specifically, increased reliance and utilization of referrals is potentially reflective of making use of outside resources like Federal prosecution to address gun violence. This may in part be an adaptation to increased volume; however, it may also reflect the underlying partnerships that have been established via PSN, especially between local law enforcement and Federal prosecutors. Likewise, amidst increased volume between 2020-2022, the increased level of acceptance of gun offenses for prosecution is potentially an artifact of increased availability of ballistics evidence like NIBIN. Seeking to assess this further, I examined the degree to which Denver guns which had NIBIN connections recorded in NESS were processed.

Around 38% (n=1068) of the 2022 gun offenses recorded in Denver data had a link to NIBIN data. This is a substantial number which is a testament to DPD's commitment to entering ballistics evidence into NIBIN. Moreover, examination of the dispositions for these cases seems to suggest that having a connection to NIBIN evidence does have a substantial influence on case dispositions. The dispositions for 2022 gun offenses are presented in the table below.



Based on examinations of correlations between case dispositions and having a link to NESS data, significant but weak to moderate correlations were observed across the board (data not shown). The most notable difference was in refusals, with cases having a NIBIN link being considerably less likely to be refused for prosecution. Interestingly, far fewer cases seem to be referred to other agencies (e.g. Federal prosecutors), perhaps because the increased evidence makes prosecution of complicated cases easier, where referrals are often made when offenders can be charged on more clear-cut charges (e.g. violation of Federal weapons possession laws vs shootings). That said cases were only slightly more likely to be accepted for prosecution. Therefore, most of the shift seems to result in cases remaining open (~10x more likely)/inactive (~2x more likely) status when NIBIN evidence is present.

Seeking to further leverage the NESS data, I also examined the degree to which Denver cases identified within that data significantly differed from guns connected to other agencies. Interestingly, 58% of guns in the 2022 NESS data provided by RAVEN were directly involved in Denver incidents, with 69.1% of guns being from or tied to a gun from Denver. Denver guns were also frequently classified as Tier I (37.8%) by RAVEN. Denver guns also exhibited significantly higher indicators of centrality compared to guns without ties to Denver incidents. Table 3 below reports the network centrality measures which can be compared with Table 1 for all guns in the data. As illustrated in the table, Denver guns do not seem to significantly differ from those in the broader network. Only Tier I and Tier II Denver guns exhibit slightly higher degrees (connections to other guns) and betweenness scores.

Table 3. Variability by Triage for Denver Guns

	Tier_I	Tier_II	Tier_III	No_Tier
Degree	4.43	3.28	1.50	3.34
Betweenness	1,254.63	723.64	76.88	345.95
Closeness	0.19	0.22	0.32	0.15
Hub/Authority	0.04	0.02	0.01	0.00

While anecdotal, the evidence above suggests that the broader efforts of the Denver Police Department to participate in and contribute to NIBIN and utilize it in their enforcement efforts does appear to yield benefits in keeping gun cases active and perhaps improving the long-term odds of successful prosecution. Future efforts to document these efforts should look more closely at how prosecutorial handling and outcomes are influenced by the presence of NIBIN evidence.

Ongoing Improvement of PSN Research/Evaluation Efforts

Moving forward, the PSN research partnership could be improved in a number of ways to advance towards the ultimate goal of being able to evaluate and improve outcomes of PSN funded initiatives. Given Colorado's unique structure in which awards are made to multiple PSN projects via CO DCJ and the CO US Attorney's Office, I have previously noted that collecting adequate data as a research partner can be challenging, as agencies often view the research partner as an outsider. During the award period pertaining to this report, funded partners were more receptive to providing data as a result of joint efforts by DCJ grants management staff and myself to more clearly set up expectations for collaboration around data sharing early on. Despite this, there is still considerable room for improvement in the level of transparency, types of data shared and involvement of the research partner in PSN efforts. Considering this I offer several key recommendations.

More Explicit and Contractual Requirements Around Data Sharing. As a condition of accepting a PSN award, grant recipients all agree to collaborate with the research partner, including sharing data which speaks to the efforts for which they were funded. Ideally, this data sharing should include strong transparency and broad access to the same data that are used in problem-solving efforts and could potentially be utilized to speak to the efficacy of PSN funded initiatives; however, data sharing has often been limited with past reports largely relying upon publicly available data or data requested from other sources (e.g. State Court Administrative Office), while the present report did benefit from some additional data provided by funded entities it still fell short in many regards. Likewise, funded entities have yet embrace more direct involvement of the research partner in PSN initiatives, as was envisioned by the progenitors of the effort. In order to

avert these limitations moving forward, at minimum it would be useful to more specifically and contractually define what data are required by what dates.

Understandably, law enforcement agencies are reluctant to provide data that is considered 'sensitive' in nature, especially intelligence or criminal history data connected to individuals. However, such data are often essential for optimal evaluation and program improvement, and it's actually incredibly common for researchers to be given access to highly sensitive or confidential data in collaborative partnerships, including criminal history information. Generally, this is handled via an MOU between the agency and researcher (or the institution they are employed by) which details the parameters for what data will be shared, how data will be transmitted and kept secure, processes in the case of a security breech, and ultimately how/when the data will be purged. Arrangements can vary from only allowing on-site access, to storage on password protected and encrypted drives or servers, to redaction of identifying information. Considering this, requiring funded entities to enter into an MOU with the contracted research partner in conjunction with the MOU for the award could be beneficial in facilitating the exchange of data for the purposes of research and evaluation. Since data identified by agencies in proposals don't always meet the needs of rigorous evaluation or process analysis (see below), this MOU would ideally explicitly identify specific sources of data identified in a collaborative process between the research partner and funded entity to be completed as part of the development of a research plan (see below). Otherwise, I have provided some suggestions for data which should be routinely provided as a matter of course.

Given that the focus of most PSN funded initiatives occur over time and are either person or place-based interventions, longitudinal information about persons, places, and incidents or involvement with programs are essential to conduct an adequate evaluation. Moreover, information about comparable but untreated persons, places or incidents is equally important, because this serves as the source for counter-factuals or 'controls' and a key basis for comparison – i.e. did those individuals or areas intervened upon fare better/worse in terms of outcomes than those who were not subject to interventions. The ability to understand this is paramount in making valid inferences about program efficacy and identifying ways in which efforts might be improved. Therefore, inasmuch as possible, broad and long-term data (e.g. NESS data, RMS or CAD extracts in the case of LE agencies, case management data for programmatic interventions) with a high level of detail are necessary to construct an analysis that is capable of speaking to the efficacy of interventions. And, where this data is not readily available, a key focus of the work should be on putting into place effective data and measurement for the purposes of evaluation. Critical to these efforts and identifying the adequacy of data early on are the development of an evaluation plan.

Required Collaborative Post-Award Development of an Evaluation Plan. Even where data sharing is clearly spelled out, this does not guarantee that the existing data will be sufficient to make adequate inferences about program processes or outcomes. Therefore, additional measures are necessary to ensure that efforts are made to plan for evaluation and the collection of additional data as necessary. Currently, as part of the proposal process, PSN applicants are asked to identify measurable outcomes and the

sources of data which will be used to evaluate these up front and without having to consult someone like a research partner who holds specialized expertise in evaluation methods and statistics. In many ways, this seems to set up an expectation that the agency itself is responsible for determining the methodologies and data to be used in evaluating and documenting their efforts. While useful internally and administratively, this is problematic for a number of reasons.

First, while agency analysts offer many useful skills in terms of data management and analysis for tactical, operational and strategic purposes, they often lack the time and resources necessary to conduct a rigorous evaluation in addition to these duties (e.g. note Denver's challenges in providing follow-up data). Second, even where analysts may have the time and resources to conduct a rigorous evaluation, and even if efforts are made to avoid pressures, a conflict of interest still remains in that the agency employing them has a natural desire for their efforts to be perceived as effective. This is where the neutral role and skills and resources of the research partner are most valuable in supplementing available analytical resources. Given this, the research partner should be integral to the development of any evaluation plan and identification of data sources incidental to the award.

Given this, removal of the evaluation and measures component from the solicitation and RFP process could be advantageous for positioning the research and evaluation component as a part of the interim award process, which must instead be completed and approved by the funded entity, research partner and DCJ. This will help ensure better alignment between interests, better integration of the research partner into the implementation process (and ideally beyond), and provide more clarity around roles and responsibilities which allow the funded entities to focus on the intervention and analysis beneficial to operations, and allow the research partner to maintain an objective and neutral position and serve as an advisor and evaluator as the project is implemented.

Conclusion

Based on analysis of available data, and consistent with PSN objectives, RAVEN's triage process appears to be effectively distinguishing the more deeply enmeshed cases of violent weapons use. By necessity, effective prioritization of resources is essential to any successful intervention, and the early stages of screening and triaging cases by RAVEN seems to reflect such a prioritization is occurring. That said, further analysis of the network data also suggests that some ties between weapons that are not as immediately obvious could be being overlooked, as reflected in close connections between guns triaged as Tier I and other guns with lower levels of triage or no triage at all. While NESS reportedly contains some network visualization tools, as do other sources of information, it was unclear how much analysts utilize these to augment and support decisions about triage levels. Subsequent efforts should focus on looking more deeply into post-triage case processing and screening through prosecutorial outcomes to assess whether network metrics might serve as a valuable tool in case processing, as has been previously suggested by academic research.

While Denver started strong with providing requested data, these efforts were ultimately not followed through at the conclusion of the award period. In discussions with DPD partners, this was attributable to changes in key personnel at DPD, a hiring freeze which precluded hiring replacements, and adoption of a data request prioritization system. Such conditions are unavoidable in some regards, and it's understandable that the provision of follow-up data got dropped in favor of other priorities which have a more direct impact on public safety. Based in part on this experience, and observations of the relationship between research partners and agencies over the course of several years, I have offered a number of recommendations about how future efforts to involve the research partner in the planning and evaluation of PSN efforts might be improved. Central to these recommendations are clear contractual requirements for the sharing of specific sources of data, and the timelines for which these data should be provided by. Ideally, this is determined through a collaborative process between the research partner and funded entities between the notification of award and the completion of MOUs. Such an explicit integration of the research partner into the contracting sends a clear message about the centrality of research and involvement of the research partner is to Colorado PSN's efforts.

Taken together, and absence of data and potential improvement around the research partnership notwithstanding, my professional assessment of the Colorado Project Safe Neighborhood efforts is that all funded entities are making a good faith effort to use the resources as proposed and in a manner consistent with PSN objectives and consistent with their proposed projects. Although Denver's screening and prioritization of guns through CGIC was not empirically observable with the available data, a substantial share of NESS data are directly linked to evidence submitted by the Denver Police Department Crime Laboratory, to which a significant share of the funding was allotted. Moreover, at the ground level, based on discussions with operational personnel, it's my understanding that RAVEN and Denver CGIC closely collaborate with one another on mutually beneficial initiatives and investigations. As a result, there is likely a significant overlap and synergy between the cases prioritized by RAVEN and reflected in the data, and those pursued by Denver CGIC. This seems to have benefits in how cases with NIBIN evidence are processed. Thus, both Denver CGIC and RAVEN's ongoing focus on repeat violent offenders both continue to serve as a model utilization of NIBIN to drive investigation of violent offenses involving weapons. What is less certain and unfortunately was not empirically testable is whether the special operations proposed by DPD had any impact on the targeted areas or individuals, or what the outcome of referrals of individuals to resources like GRID via these initiatives had any impact. Future evaluation efforts should seek to assess these and related in the interest of project improvement.