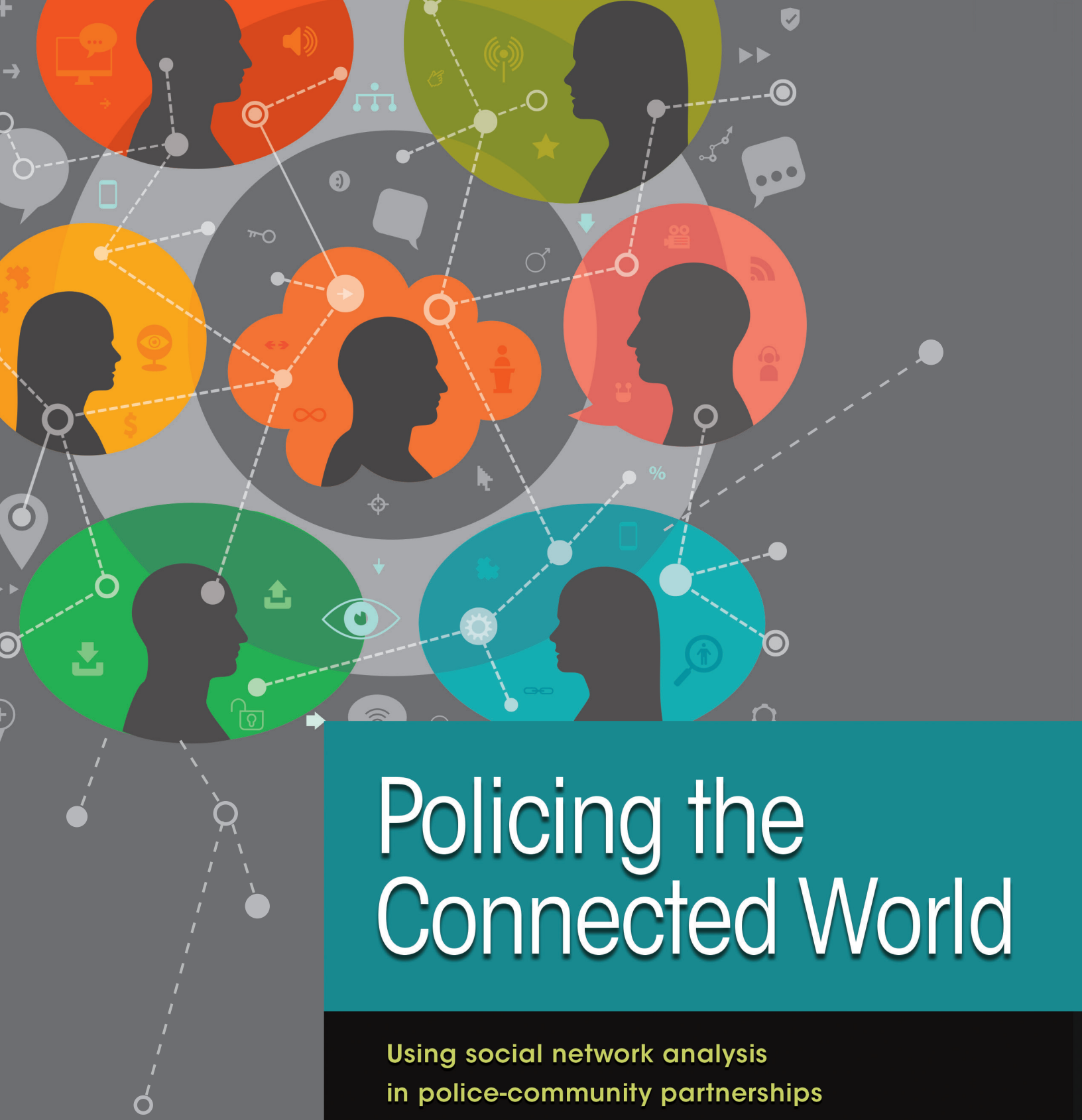

Policing the Connected World

Using social network analysis in police-community partnerships

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COPS
Community Oriented Policing Services
U.S. Department of Justice

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Letter from the Director

Colleagues:

Local law enforcement continually seeks e-strategies to address the violence that plagues our cities and towns. Many agencies have shown interest in a method that has proven very effective for both the prevention of and response to crime: social network analysis (SNA).

A data-driven focused deterrence method that relies on gathering and analyzing information from arrest records and other sources, SNA improves law enforcement's ability to predict criminal activities. But as with any technology based on data collection, both the effectiveness and public approval of SNA depend upon its implementation.

This report focuses on the use of SNA in police-community partnerships and how this approach can reduce crime while building local trust. As the authors demonstrate through examples in Chicago, Illinois; New Haven, Connecticut; and East Palo Alto and Stockton, California, gathering information from local residents and service providers allows police to gain actionable insights into which individuals and groups are at the greatest risk of being victims or perpetrators of violence.

When law enforcement agencies can target their deterrence efforts, they increase the efficiency and effectiveness of their operations. Moreover, by partnering with area residents to collect information and letting the community know how it will be used, agencies can build support for their crime fighting strategies.

In the following pages, readers will find a detailed description of SNA and its use in community partnerships, practical examples of how it can be applied to a variety of common public safety problems, and a discussion of potential challenges.

On behalf of the COPS Office, I thank the New Haven Police Department, Yale University, and the New Haven community, all of whom contributed to the development of this informative report through their work for Project Longevity, a violence prevention initiative supported by the COPS Office. I also commend the fine work of the police departments of Chicago, East Palo Alto, and Stockton in providing data to support this important project.

Though SNA is not a cure-all for the violence that continues to grip our nation, it provides an important tactical tool that, when properly implemented and used in partnership with the community, can have widespread benefits for our nation's law enforcement agencies and the people they serve.

Sincerely,

Phil Keith
Director
Office of Community Oriented Policing Services

Acknowledgments

The authors would like to thank all of those involved with Project Longevity in Connecticut, including Tracey Meares, David Kennedy, Tony Cheng, Robin Engel and the University of Cincinnati Policing Institute, and our research partners at the University of New Haven. In addition, we would like to thank the New Haven (Connecticut) Police Department, the East Palo Alto (California) Police Department, the Stockton (California) Police Department, and the Chicago Police Department for their expertise and assistance in data collection.

About This Project

In 2013, the US Department of Justice's Office of Community Oriented Policing Services (COPS Office) entered into a cooperative agreement with Yale University to support two key activities. The first included the implementation of social network analysis (SNA) through direct technical assistance to the pilot site of a statewide violence prevention initiative in New Haven, Connecticut. The violence prevention initiative—named Project Longevity—applied a focused deterrence framework to address group and gang violence. In cooperation with the New Haven Police Department, the US Attorney's Office, and local service providers and community members, the research team (1) gathered group-level information on location, membership, illegal activities, and the relationships between street groups and (2) mapped the relationships between these groups to identify the most violent groups in New Haven and guide the implementation of the violence reduction strategy.

The second key activity included the production of evaluation reports and scholarly publications related to the use of SNA in violence reduction contexts, as well as the development and execution of training curricula focused on helping law enforcement learn how to employ SNA in their operations. Specifically, the project team (1) developed a series of training materials and software that enable easy and practical implementation of SNA in law enforcement operations and (2) used these materials to administer training workshops to law enforcement practitioners to expand the analytic capacity of their agencies.

This publicly available publication represents one of several written products produced as part of the cooperative agreement between the COPS Office and the research team. Additional reports and publications associated with this project are listed in the references section at the end of this publication.

Executive Summary

Social network analysis (SNA) is based on the premise that the relationships between individuals can inform and even predict an individual's behavior. SNA is used to examine many behaviors including organizational behavior, the spread of infectious diseases, dating and romantic relationships, and employment patterns. In much the same way, SNA can be applied to criminal justice and policing to analyze the capacities of criminal networks, how such networks affect criminal activities, and the diffusion of violent crime within a community or across a population.

Following an introduction to the concept of SNA, chapter 1 provides a brief theoretical and terminological primer on SNA.

Chapter 2 describes in detail several uses for SNA and provides practical examples from cities such as East Palo Alto and Stockton, California, and New Haven, Connecticut, to describe how SNA can provide actionable insight into which individuals and groups are at the greatest risk of being victims or perpetrators of gun violence. This chapter also covers the growing body of scholarly evidence that documents how SNA is helping police-community partnerships to effectively reduce crime and violence in cities across the United States.

As useful as SNA is as an analytic tool, it is not a cure-all for the problems that police and communities face. Chapter 3 considers more generally some of the potential pitfalls of SNA and predictive analytics and provides suggestions for how police agencies can responsibly implement SNA in their operations. This chapter also discusses how SNA can make enforcement efforts more strategic and targeted, allowing police interventions to be both more efficient and more effective. Because the data-driven insights provided by SNA can aid in narrowing the focus of intervention and prevention efforts, law enforcement agencies can have fewer, fairer, and more effective contacts with citizens that, in turn, can enhance police legitimacy. Finally, chapter 3 suggests that police-community partnerships like the focused deterrence efforts described in this publication always be adapted to the unique challenges of a given municipality and also be subject to on-going research and evaluation so that all the partners engaged in enhancing public safety—be they police, community members, or researchers—can understand what data is being collected, how it is being used, and whether a given intervention is achieving its intended goal.

Introduction

The cops-and-robbers films of the 1950s were never quite complete until the police chief uttered the phrase "round up the usual suspects." Following these words, police rushed out in search of individuals who, according to the officers' firsthand experience or intuition, were the most likely troublemakers and ne'er-do-wells. Suspects were questioned about their whereabouts at the time of the crime and were either checked off as improbable perpetrators or else detained as potential suspects. This cinematic imagery captures something very real about the practice of policing: police rely on their first-hand experiences and knowledge of the people they police when making decisions about suspects, victims, and their associates. They search their own memories, looking for connections among people, places, and events.

While these sorts of human network searches can and do frequently yield useful information, they are also highly limited. The human brain can contain a surprising amount of information—approximately 2.5 million gigabytes. But humans only know what they know. For example, an officer might have deep knowledge of individuals in his or her beat, neighborhood, precinct, or district but probably lacks comparable information about residents in other jurisdictions with which they are less familiar. Furthermore, while it is true that officers frequently rely on intuition in the course of their investigations, reliance on intuition to the exclusion of empirical facts can enable implicit and explicit biases to tinge police behavior in ways that impede fair and effective policing.[1]

Over the last two decades, the growing field of social network analysis (SNA) has emerged as a new approach to understanding and analyzing patterns in human social relationships and their consequences for behavior.

Over the last two decades, the growing field of social network analysis (SNA) has emerged as a new approach to understanding and analyzing patterns in human social relationships and their consequences for behavior.[2] SNA provides a versatile set of tools that has been used to explain the votes we cast, the people we marry, the things we buy, and the illnesses we catch. Thousands of academic articles and dozens of popular books have been written on the subject and the effect of social networks on what we think, feel, and do.

1. Correll et al., "The Police Officer's Dilemma;" Goff et al., "The Essence of Innocence;" Hall, Hall, and Perry, "Black and Blue."
2. Barabasi, *Linked: How Everything Is Connected;*" Christakis and Fowler, *Connected;*" Kadushin, *Understanding Social Networks*; Watts, *Six Degrees*.

The importance of social networks and social relationships has long been acknowledged by criminologists.[3] However, only recently has SNA been integrated into policing operations, such as criminal investigations[4] and police-community partnerships to reduce gun violence.[5]

This publication is written at a time of rapidly advancing technological change, which requires police executives to seek new approaches to address challenges in modern policing.[6] As described in the following pages, law enforcement is increasingly using SNA to address issues of crime and violence in cities across the country. From small and medium-sized cities like New Haven and Boston[7] to major urban centers like Chicago,[8] SNA is helping police to not only pinpoint where limited resources could more effectively help reduce serious violence but also strengthen its relationship to the community and enhance the legitimacy of law enforcement.

That said, SNA is not a cure-all for America's crime problem, nor will it magically solve longstanding issues of police-community relations. But SNA can more strategically focus policing efforts, especially when it comes to the number and types of contacts police might have with community members. In other words, SNA can provide data-driven insights to guide efficient allocation of finite resources to the practitioners responsible for implementing fair and effective solutions to public safety problems. By having specific and data-informed reasons for particular interactions with citizens—and, more importantly, sharing those reasons, rationale, and procedures with the community—police might bolster trust and enhance the legitimacy of their actions and agencies.[9]

It is equally important to keep in mind that SNA is a tool and as such can be used in a variety of ways and toward various ends. The same information that can help to sharply focus police and violence prevention efforts can also be misused to unfairly target individuals, especially when the data being used is biased or of poor quality. Further, these data and statistical tools can be used to justify wide-ranging and poorly focused strategies that waste valuable police resources and that can damage the relationship between police and the communities they serve.[10]

3. Warr, *Companions in Crime*.
4. Johnson et al., "Social Network Analysis."
5. Sierra-Arévalo and Papachristos, "Social Network Analysis and Gangs;" Sierra-Arévalo and Papachristos, "Social Networks and Gang Violence Reduction."
6. President's Task Force on 21st Century Policing, *Final Report*.
7. Braga, Hureau, and Papachristos, "Deterring Gang-Involved Gun Violence;" Sierra-Arévalo, Charette, and Papachristos, "Evaluating Effect of Project Longevity."
8. Papachristos and Kirk, "Changing the Street Dynamic."
9. Tyler, "Enhancing Police Legitimacy."
10. Ferguson, "Big Data and Predictive Reasonable Suspicion;" Brayne, "Surveillance and System Avoidance."

By the same token, when law enforcement uses data and analytic approaches like SNA carefully and transparently, agencies can address public safety issues and help repair trust between police and the public. By basing SNA-informed enforcement efforts on a data-driven approach—and making its data and approach known to the community—police can ensure that the stops they make, the arrests they pursue, and the programs they support are directed not at entire communities (especially those communities with long histories of abuse at the hands of the police) but rather toward those small number of individuals who are involved in crime and violence. In this way, police can more effectively address public safety problems while also enhancing their legitimacy in the community.

This potential good is explicitly addressed in the final report of the Task Force on 21st Century Policing:

> The use of technology can improve policing practices and build community trust and legitimacy, but its implementation must be built on a defined policy framework with its purposes and goals clearly delineated. Implementing new technologies can give police departments an opportunity to fully engage and educate communities in a dialogue about their expectations for transparency, accountability, and privacy.[11]

Ultimately, SNA is a tool that can help make sense of the world around us. The same applies to understanding crime and violence in US communities. From within a framework of democratic and constitutional policing, one can be hopeful that police will use SNA and other tools judiciously, as well as advance a collaborative and transparent agenda to improve public safety in communities with respect and fairness.

When law enforcement uses data and analytic approaches like SNA carefully and transparently, agencies can address public safety issues and help repair trust between police and the public.

11. President's Task Force on 21st Century Policing, *Final Report*, 2.

1. What is Social Network Analysis?

Social network analysis uses a set of theoretical and methodological tools that make sense of the social world by focusing not on individual actors, but on the relationships between those actors. Drawing on principles central to mathematical graph theory, social network analysis uses statistical and visualization techniques to describe how social actors are affected by those around them and, in turn, how these individuals affect the actors they are connected to, and how the set of actors and relationships between them affect real-world behavior.[12]

A social network comprises (at least) two basic elements: actors and the relationships among them.

Within such a social network paradigm, humans are not atomized beings who make decisions at random as if they were pulling a bingo ball out of a jar. Context matters. Relationships matter. The people you know, the family to which you belong, the school you attend, and the neighborhood in which you live influence how you think and act.[13] For example, the people with whom you become romantically involved tend to live in the same social circles or are just a few handshakes away—that's why you most often meet them at a friend's party or through an acquaintance.[14] Getting a job, getting promoted, passing a piece of legislation, adopting a new technology, winning an election, and even being the victim of a gunshot injury are all influenced by the company you keep, or more formally the people in your social networks.[15]

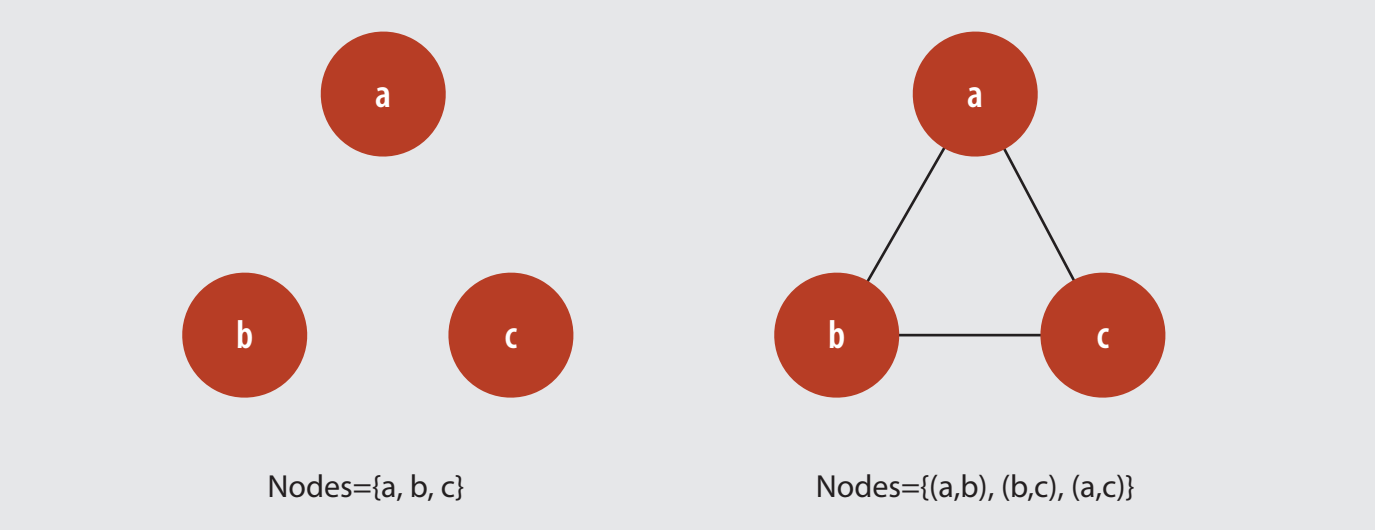
To be more specific, a *social network* is defined as "a finite set or sets of actors and the relation or relations defined on them."[16] Thus, a social network comprises (at least) two basic elements: actors and the relationships among them. *Actors* refers to the basic unit of analysis, such as students in a classroom, police officers in a department, employees in a business, web pages on the internet, or members of a street gang. *Relations* refers to the different types of ties or associatons that link together the actors, such as friendship among students or joint involvement in an organization. Relationships can be *directional* (meaning there is a sender or receiver, as in someone sending an email to another person) or *binary* (meaning a tie is or is not present, as in whether two individuals are or are not family members).

Network analysts measure these networks by creating a network graph (also referred to as a *sociogram* or *network map*) in which the actors (also called *vertices*) are displayed as nodes, while relations (sometimes called *arcs* or *edges*) are displayed as lines between nodes (see figure 1). Network analysts use network graphs to visualize and interpret patterns of relationships to examine how the relationships among actors influence

12. Wasserman and Faust, *Social Network Analysis Methods and Applications.*
13. Christakis and Fowler, *Connected*; Watts, *Six Degrees.*
14. McPherson, Smith-Lovin, and Cook, "Birds of a Feather."
15. See Bearman, Moody, and Stovel, "Chains of Affection;" Bond et al., "A 61-Million-Person Experiment;" Papachristos et al., "The Company You Keep?"
16. Wasserman and Faust, *Social Network Analysis Methods*, 20.

what they feel, think, and do. For example, the analyst studies how someone's network of past sexual partners could lead to a sexually transmitted disease spreading,[17] how friendships and school networks could influence underage drinking among adolescents,[18] and how classroom seating in the police academy might affect attitudes about diversity and race relations.[19]

Figure 1. Example of nodes (actors) and edges (relations) in a network graph



The idea that networks are important in understanding crime, delinquency, and violence is an old one, and criminologists and practitioners alike acknowledge that delinquency is a group phenomenon.[20] Indeed, classic criminological theories such as differential association and social learning implicitly recognize network concepts of contagion and understand the importance of connections between individuals and within groups as a means to transmit information and to foster (or inhibit) criminal activity.[21]

Network analysts use network graphs to visualize and interpret patterns of relationships to examine how the relationships among actors influence what they feel, think, and do.

In the context of street gangs, for example, joining or forming a new gang is affected by group processes and the relationships between individuals: Joining a gang requires a connection to an existing network that contains gang members, while forming a new gang requires a collection of individuals who

17. Adams, Moody, and Morris, "Sex, Drugs, and Race."
18. Kreager, Rulison, and Moody, "Delinquency and Structure of Adolescent Peer Groups."
19. Conti and Doreian, "Social Network Engineering and Race."
20. Warr, *Companions in Crime*.
21. Papachristos, "The Coming of Networked Criminology?"

likely know one another through nongang relationships and who are mutually committed to forming new relationships based around a common gang identity. The connections between gang members and the relationships between rival gangs affect criminal activity and cycles of reciprocal gang violence.[22]

Social network analysis allows for the measurement of these important relationships and offers a way to understand how unseen but nonetheless consequential networks of relationships structure behavior in the real world. Importantly, whether the group of interest is a street gang, an outlaw motorcycle club, or an organized drug-trafficking ring, analysis of the underlying social structure of a group requires data that appropriately captures the constellation of individuals and relationships that make up that group.

Finding and understanding network data

Suitable data for SNA can come from a variety of sources, such as arrest and court records, interviews, surveys, autobiographies, emails, or shipping manifests. Regardless of the source, data for SNA must include information on both the set of actors of interest and the relationships among them. Email and shipping records, for instance, contain information on at least two unique actors—the sender and the receiver—who are connected to one another by a shipment or email exchange. Interviews and autobiographies often contain detailed information on a set of individuals' familial relationships and friendships. Arrest records contain information such as the involved individual's name, age, and residence. If two or more people are arrested for committing an offense together, a co-arrest tie is also often captured in the data.

Getting data into a format suitable for SNA is often the biggest obstacle for the network analyst and requires basic database skills—especially familiarity with relational databases and the ability to extract data from multiple sources. At its simplest, SNA requires creating a data set that relies on a matrix or edgelist that captures the actors and the sets of relationships, or ties, among them.[23] For simplicity's sake, this publication covers only the edgelist format because it is the easiest way to process large amounts of data in current software programs; however, all of the principles and analytics are the same regardless of whether the structure of the data is a matrix or an edgelist.

To illustrate the basic structure of network data, figure 2 uses a data set comprising three actors: Sara, Lee, and Ned. It is important to note that each actor must have a unique identifier (e.g., there is only one Sara). On the left side of figure 2, the raw data appears in edgelist format; the actors are divided into two columns, and each row represents a single tie between two people. The analyst then uses various software to transform the edgelist into a network graph, as shown on the right of figure 2. This graph shows a perfect clique in which all of the actors are tied to one another.

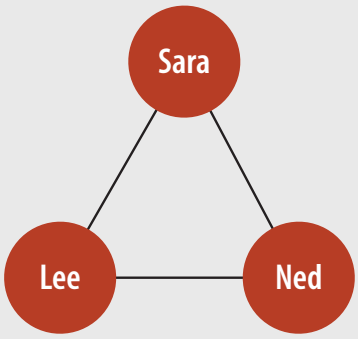
22. Hughes, "Group Cohesiveness;" Papachristos, Hureau, and Braga, "The Corner and the Crew."
23. Wasserman and Faust, *Social Network Analysis Methods*.

Figure 2. Example edgelist and its associated network graph with three actors

Edgelist

Ego	Alter
Sara	Lee
Sara	Ned
Ned	Lee

Network graph



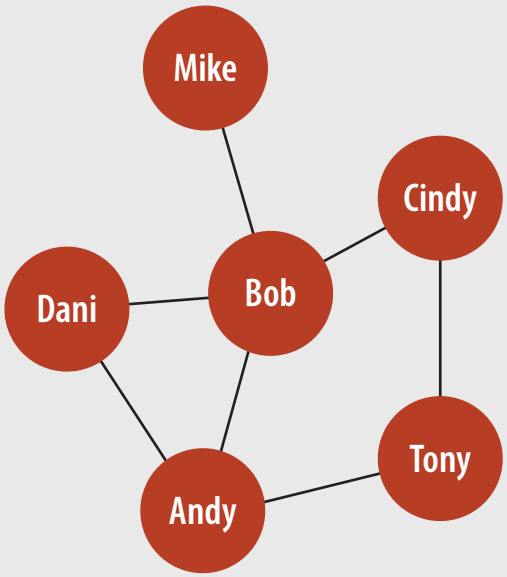
While the example in figure 2 is rather simple, the same logic applies to an edgelist of any size. Figure 3 gives a slightly larger example with six unique actors and eight ties among them—the principles are the same, but the resulting network structure is slightly more complex. For example, figure 3 shows a complete clique (i.e., Dani, Bob, and Andy) as well as an individual loosely tied to the network through only a single tie (i.e., Mike). In addition, all six actors are connected to each other either directly or indirectly via another person in the network: At the most, any actor in figure 3 is merely one "handshake" (tie) removed from any other actor.

Figure 3. Example edgelist and its associated network graph with six actors

Edgelist

Ego	Alter
Andy	Bob
Cindy	Bob
Bob	Dani
Dani	Andy
Mike	Bob
Tony	Andy
Cindy	Tony

Network graph



2. The Use of SNA in Police-Community Partnerships

SNA has many current and potential uses within policing.[24] Law enforcement already uses SNA in criminal investigations, intelligence gathering, monitoring social media behaviors, and predictive analytics. Most of the current uses emerged as extensions of older policing and investigatory practices that centered around drawing connections between individuals, locations, and events. A growing market of software and database providers have emerged during recent years to meet the emerging interests and demands in network analytics in law enforcement.

Within the realm of police-community partnerships, the use of SNA can both enhance the efficacy of such partnerships and build trust between partners. In the context of violence reduction partnerships, specifically, SNA can achieve these goals in two interrelated ways. First, SNA can provide data-driven guidance for funneling limited law enforcement and community resources toward the individuals who are at the highest risk of being victims or perpetrators of gun violence. Second, by focusing on a small number of high-risk individuals, SNA can enhance police-community trust by (1) helping law enforcement partners demonstrate that they can effectively reduce gun violence, and (2) reducing the overall impact of the criminal justice system on communities that have historically borne the brunt of overly broad and aggressive police tactics.

The following four sections—visualizing the violence landscape, visualizing the concentration of gun violence, understanding individual risk and contagion of gun violence, and visualizing the structure of street gangs—provide illustrative examples of how SNA can visualize the collection of individuals and groups who are at the greatest risk of being victims or perpetrators of gun violence. These network graphs can be used to focus resources on those at most immediate risk, which in turn avoids casting an intervention's net so broadly as to affect entire populations or communities.

This focus on those most at risk is especially salient given the decades of inequitably punitive criminal justice policies and practices, especially within disadvantaged communities and communities of color. The war on drugs, gang loitering ordinances, and stop-and-frisk policies have all disproportionately affected minority communities in the United States, so much so that, as found in one study, Black men aged 15–34 are more likely to be imprisoned than to graduate from college.[25] The application of SNA within community-police partnerships can help focus efforts on a small number of neighborhoods, street blocks, and influential actors who are the most at risk or pose the greatest risk to public safety; thus, SNA can help reduce the number of individuals contacted by and caught up in the criminal justice system.

24. Bichler, Lim, and Larin, "Tactical Social Network Analysis;" McGloin and Rowan, "Street Gangs and Co-Offending Networks;" Morselli, "Career Opportunities;" Randle and Bichler, "Uncovering Social Pecking Order;" Sierra-Arévalo and Papachristos, "Applying Group Audits."
25. Pettit and Western, "Mass Imprisonment;" Western and Wildeman, "Black Family and Mass Incarceration."

This net-narrowing approach follows the same logic that is often applied to geographic hot spots.[26] Using the micro hot spot analogy, focusing on the small geographic area that accounts for a highly disproportionate share of crime minimizes the risk of collateral damage associated with more broadly focused efforts. In addition, as former Police Chief Tom Casady said:

> We may be tempted to apply the same kinds of strategies that have dominated crime reduction efforts in troubled neighborhoods in the past—zero tolerance enforcement, saturation patrols, high-visibility arrest warrant sweeps, or field interrogations. However, allocating law enforcement resources to areas predicted to have increasing crime and disorder is filled with ethical trapdoors.[27]

Chief Casady suggested instead, "Rather than relying solely on a 'cops-on-dots' approach, police departments need to create strategies that change the conditions of the potential crime environment."[28] Similarly, a law enforcement agency can use SNA to better identify those most at risk and identify ways to disrupt or redirect relations rather than relying solely on arrests as a crime abatement tool.

The following four examples of using SNA in community-police partnerships are by no means exhaustive. They represent efforts by community stakeholders and law enforcement agencies to harness the analytic potential of SNA to support fair and effective efforts to enhance public safety.

Visualizing the violence landscape

Street groups, which include gangs and crews, play a central role in gun violence in cities across the United States. In Chicago and Los Angeles, for instance, street gangs are associated with more than 50 percent of all gun-involved homicides.[29] In New Haven, Connecticut, street groups are involved in nearly 60 percent of all fatal and nonfatal shootings,[30] and gangs account for similar proportions of shootings and homicides in cities like Boston and New Orleans.[31]

Gangs versus Groups

Scholars have spent considerable effort on the various definitional components of what does and does not constitute a street gang or what distinguishes a gang from other delinquent or criminal groups.* However, the distinction between group and gang is not purely academic. For example, the National Network for Safe Communities defines gangs as a particular type of street group to stress that "an exclusive focus on gangs, which is often understood to include notions like organization and leadership, will exclude a significant number of groups that contribute heavily to serious violence, such as loose neighborhood drug crews."†

This publication uses *group* and *gang* interchangeably to emphasize that gangs are a *type* of street group and that not all street groups involved in gun violence fit the criteria used by academic or law enforcement agencies (e.g., particular colors or symbols) to define a gang.

* Curry, "The Logic of Defining Gangs Revisited," *The Handbook of Gangs.*

† National Network for Safe Communities, *Group Violence Intervention*, 2.

26. Weisburd and Telep, "Efficiency of Place-Based Policing."
27. Casady, "Police Legitimacy and Predictive Policing," 1.
28. Casady, "Police Legitimacy and Predictive Policing," 2.
29. Papachristos and Kirk, "Changing the Street Dynamic;" Tita et al., *Reducing Gun Violence.*"
30. Sierra-Arévalo, Charette, and Papachristos, "Evaluating Effect of Project Longevity."
31. Braga, Hureau, and Papachristos, "Deterring Gang-Involved Gun Violence;" Corsaro and Engel, "Most Challenging of Contexts."

As gun homicide rates soared in the 1980s and early 1990s, many cities—including Chicago and Los Angeles—passed sweeping gang ordinances aimed at reducing violence through the large-scale punishment of gang members writ large. For example, Chicago's 1992 Gang Congregation Ordinance, which the Supreme Court deemed unconstitutional in 1999, had empowered police to disperse groups of gang members who were loitering on street corners, and failure to comply was grounds for arrest.[32] In Los Angeles, gang civil injunctions forbade gang members from associating with each other, prohibited them from being in certain geographic areas, and even disallowed wearing certain types of clothes.[33]

Broad policies such as these target large segments of the population, especially young men of color living in high-crime communities, and inevitably ensnare many people who are not involved in crime or violence. Such policies also go against social science research that consistently demonstrates that violent crime tends to concentrate within small geographic spaces and small social networks, which suggests that policies should focus on those few places and individuals instead of whole neighborhoods and demographic groups.

Focused deterrence concentrates intervention, prevention, and enforcement efforts on small groups of high-risk individuals.

The focused deterrence approach that emerged in the 1990s continued to build upon the notion that crime is committed by a small subset of the population in highly localized areas.[34] Whereas traditional deterrence efforts were aimed at dissuading wide swaths of the population from offending or reoffending through swift, certain, and severe punishment of even low-level offenses,[35] focused deterrence concentrates intervention, prevention, and enforcement efforts on small groups of high-risk individuals.[36]

Focused deterrence started in the early-1990s when a collaborative team of researchers, academics, community agencies, and faith-based leaders in Boston came together to guide an intervention that directly focused a coordinated effort on the small number of street gangs responsible for the majority of Boston's street violence.[37] This program, originally called Operation Ceasefire, began with the goal of visualizing the gun violence landscape, which meant sitting down with gang experts and community members to determine which groups were actively involved in shootings. These efforts relied on using available data and resources, not just the assumptions or intuitions of police.[38]

32. *City of Chicago* v. *Morales*.
33. Maxson, Hennigan, and Sloane, "For the Sake of the Neighborhood?"
34. Braga, Papachristos, and Hureau, "Concentration and Stability of Gun Violence;" Kennedy, Piehl, and Braga, "Youth Violence in Boston;" Spelman, "Criminal Careers of Public Places;" Weisburd et al., "Trajectories of Crime;" Weisburd, Groff, and Yang, *The Criminology of Place*.
35. Gibbs, *Crime, Punishment, and Deterrence*; Zimring and Hawkins, *Deterrence: The Legal Threat*.
36. Braga and Weisburd, "Effects of Focused Deterrence Strategies;" Braga and Weisburd, "Effects of 'Pulling Levers' Focused Deterrence;" Braga and Weisburd, "Focused Deterrence and Prevention of Gun Injuries."
37. Braga, et al., *Reducing Gun Violence*; Kennedy, Braga, and Piehl, "The (Un)known Universe;" Kennedy, Piehl, and Braga, "Youth Violence in Boston."
38. Kennedy, Braga, and Piehl, "The (Un)known Universe."

The Boston team conducted a focus-group meeting and used a map of the city to detail the locations and associations of all the known gangs in Boston. The exercise relied on human intelligence; the experience of gang experts; and a stack of notepads, dry erase markers, and a whiteboard. With the common goal of identifying those individuals and groups involved in shootings (and those who were not), the Boston team created a network graph of gun violence throughout the city. As a result, the data collection technique that would come to be termed the *group audit* was born.[39]

Given the complexity and rapidly evolving nature of street groups and gun violence, individual police officers or outreach workers—while possessing an intimate understanding of who is involved in criminal activity, who is involved in a gang, and which groups are in conflict—cannot fully apprehend the complete constellation of street groups and intergroup relationships that not only extends beyond the officers' and outreach workers' beats but also can change at a moment's notice. The group audit process extracts and compiles the "experiential assets" of multiple experts, expanding the pool of available information on street groups beyond the bounds of a single person's knowledge base.[40] Importantly, the information provided by any one audit participant is cross-checked against that of every other participant, which ultimately results in a more complete and nuanced view of the evolving structure of street groups and violence.

Defining Group Audit

A *group audit* is a focus-group-style data collection method in which researchers cooperate with experts (e.g., police officers and street-outreach workers) to collect information on (1) the street groups involved in criminal activity; (2) the location, membership, and activities of identified groups; and (3) the set of conflicts or alliances among identified groups. Information from group audits is used to guide implementation of violence reduction strategies or police interventions and provides the relational data needed to produce social network analyses of intergroup conflicts (see figure 4 on page 12).

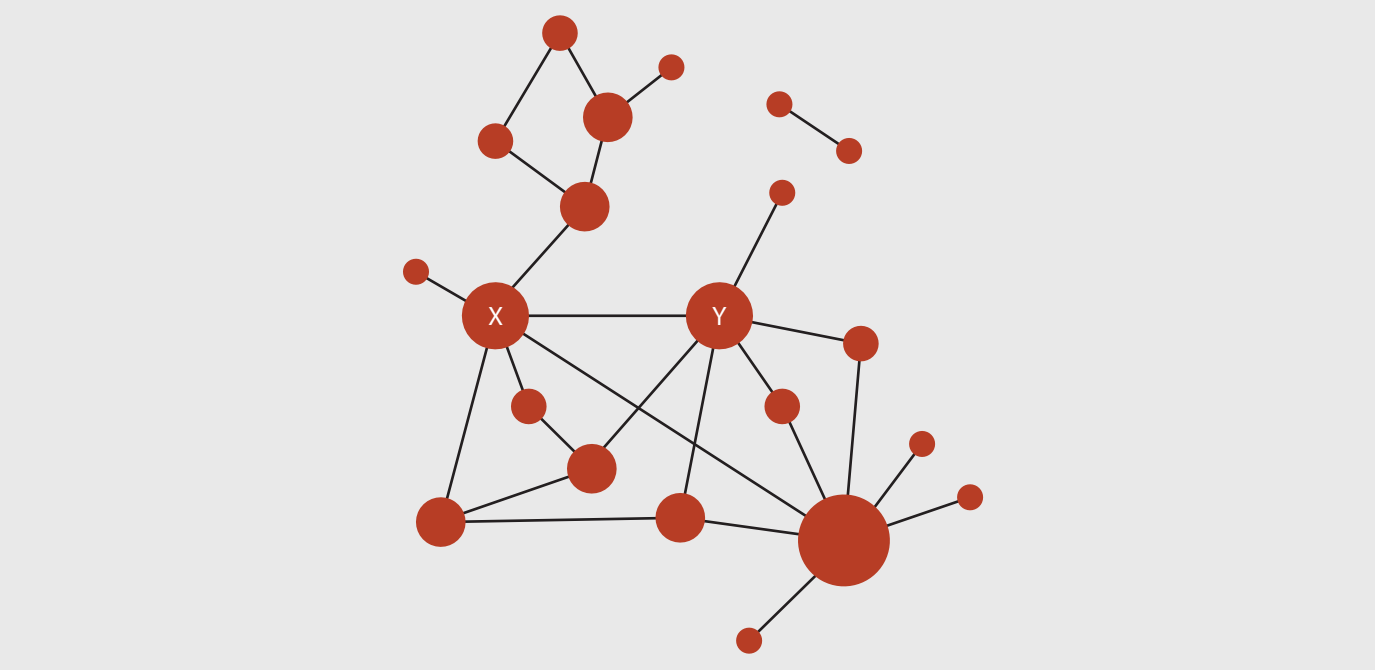
Sources: Sierra-Arévalo and Papachristos, "Applying Group Audits to Problem-Oriented Policing;" National Network for Safe Communities, *Group Violence Intervention*.

Figure 4 provides an example of a social network graph resulting from a group audit conducted in the fall of 2012 in New Haven, Connecticut,[41] as part of the Project Longevity focused deterrence effort modeled after Boston's Operation Ceasefire.[42] The New Haven audit identified 52 active groups present in nine out of 10 police districts. Of those 52 groups, 21 (40 percent) were involved in conflicts with other gangs, meaning less than half of all groups were responsible the majority of gun violence in New Haven.

Figure 4 on page 12 shows those 21 groups, with each node representing a unique gang and each line representing a unique conflict. The size of each node is scaled to its *degree* (i.e., the number of conflicts the node has); thus, larger nodes are involved in more conflicts. Of the 21 groups, 38 percent (N=8) were involved in a single conflict, 62 percent (N=13) were involved in either one or two conflicts, 24 percent (N=5) were involved in three conflicts, and only 14 percent (N=3) were involved in more than three.

39. National Network for Safe Communities, *Group Violence Intervention*.
40. Kennedy, Braga, and Piehl, "The (Un)known Universe," 220.
41. Sierra-Arévalo and Papachristos, "Applying Group Audits."
42. Sierra-Arévalo, Charette, and Papachristos, "Evaluating Effect of Project Longevity."

Figure 4. Network graph of conflicts between 21 groups in New Haven, Connecticut



Using SNA to map the violence landscape in New Haven highlights which groups cause the most trouble while underscoring that less than half of the city's 52 groups were involved in gun violence. The Project Longevity team, which comprised law enforcement, community stakeholders and organizations, and service providers, initiated a series of call-ins with the members of the city's most active groups, labeled in figure 4 as X and Y. The audits occurred semi-monthly to support ongoing call-ins but eventually turned into weekly intelligence meetings. With the audit information and network graphs being updated continuously, it became clear which gangs continued to remain at the center of the conflict network and which groups quietly faded from activity, with at least one ceasing to exist.

Focused deterrence gun violence reduction programs, like the one just described in New Haven, have produced fairly consistent results. Project Longevity was associated with a 73 percent decline in monthly gang-involved shootings after call-ins began. Evaluations in New Orleans,[43] Cincinnati,[44] and other cities[45] have shown similar results. A quasi-experimental evaluation of Boston's Operation Ceasefire used SNA to compare groups that attended call-ins versus those in similar network positions that did not; the results showed a 31 percent decrease in shootings among gangs that were part of the program versus those that were not.[46] An evaluation of Chicago's Violence Reduction Strategy that employed a similar network method found a 23 percent reduction in overall shootings and a 32 percent reduction in shootings among gangs that attended the call-ins than gangs that did not.[47]

43. Corsaro and Engel, "Most Challenging of Contexts."
44. Engel, Tillyer, and Corsaro, "Reducing Gang Violence."
45. Braga et al., *Reducing Gun Violence*; Braga, McDevitt, and Pierce, "Understanding and Preventing Gang Violence;" Braga and Weisburd, "Effects of Focused Deterrence Strategies;" Corsaro, Brunson, and McGarrell, "Problem-Oriented Policing;" McGarrell and Chermak, *Strategic Approaches to Reducing Firearms Violence*.
46. Braga, Hureau, and Papachristos, "Deterring Gang-Involved Gun Violence."
47. Papachristos and Kirk, "Changing the Street Dynamic."

Visualizing the concentration of gun violence

Just as gang audits revealed that much of the gun violence in US cities can be attributed to a few groups, gangs, or crews, researchers have documented a similar concentration principle in the spatial distribution of violence, whereby the majority of gun violence in cities is concentrated to within a few street blocks and corners.[48] Research has also determined the extent to which gun violence is concentrated within social networks. A series of studies have uncovered fairly consistent evidence in multiple cities that victims of gun violence can be located within city-wide or neighborhood-wide co-arrest networks. In one high-crime Boston community, for example, 85 percent of all fatal and nonfatal gunshot victims were part of a network of 763 individuals, which represents roughly 5 percent of the community's population.[49] Likewise, 70 percent of all nonfatal gunshot victims in Chicago over a five-year period were part of a co-arrest network of approximately 5 percent of the city's population.[50]

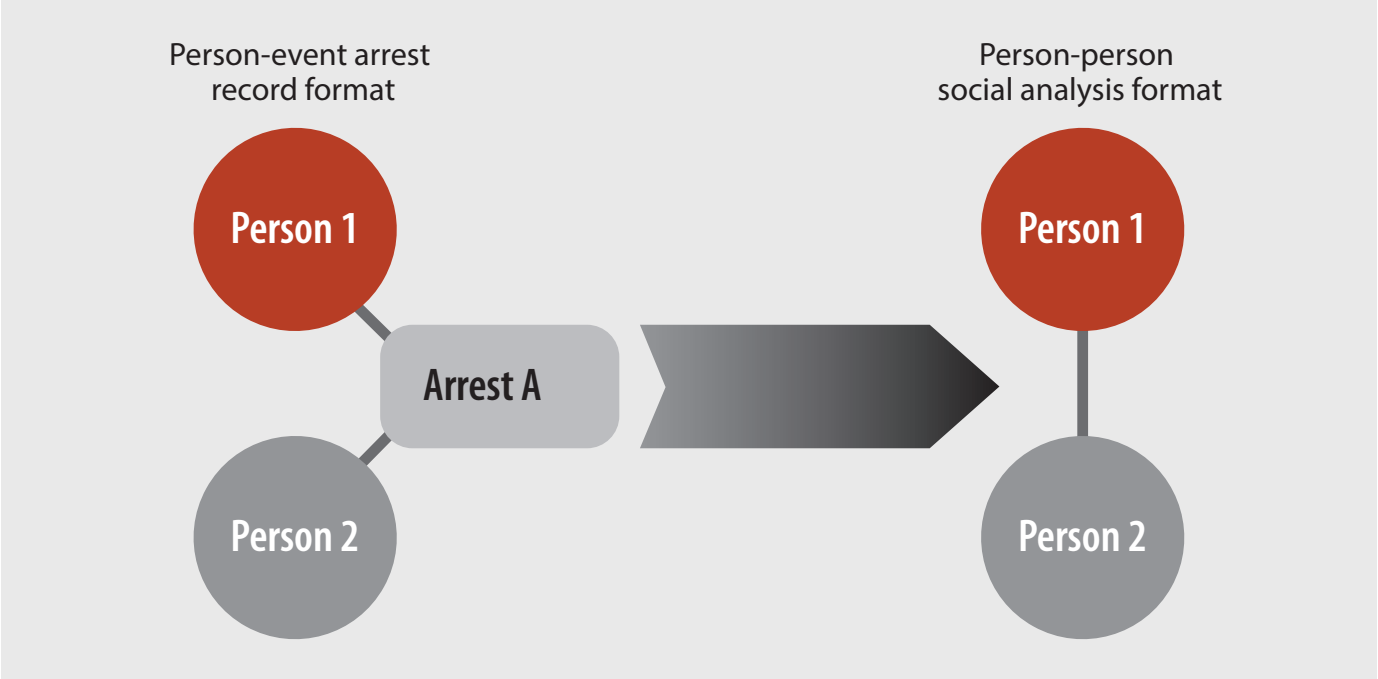
Analyzing this concentration of gun violence in social networks has thus far relied almost exclusively on police data and, as such, is circumscribed by all the limitations and biases inherent to that data, such as the underreporting of certain types of crimes, an inherent group bias in arrests, and the now well-documented racial biases in stop data.[51] Despite these limitations, a first step toward understanding the concentration of gunshot victimization within a city or neighborhood starts with the analysis of two sets of data that are often readily available: co-arrest records and gunshot victimization records.

Analysts can use data like co-arrest records to link individuals through events and create a snapshot of a behavioral network. Transforming arrest records into a format conducive to social network analysis requires converting data from a person-event format into a person-person format (see figure 5). Most police records management systems—even paper-based systems—assign a unique identifier, usually an alphanumeric code, to individuals who were arrested so they are easy to find in other records. Generally, arrest databases are formatted so that each record corresponds to a single individual: i.e., each record lists an individual along with a single arrest.

To build a network graph from this person-event data, the network analyst must find instances in which at least two unique individuals (e.g., Person 1 and Person 2 in figure 5 on page 14) have a common arrest (e.g., Arrest A), such as stealing a car together. After completing this matching, the analyst can link unique individuals, and their co-arrest is represented as a tie in the network graph. After identifying the events and ties, the analysts can examine the network to locate victims and those tied to them.

48. Braga, Papachristos, and Hureau, "Concentration and Stability of Gun Violence;" Weisburd et al., "Trajectories of Crime;" Weisburd, Groff, and Yang, *The Criminology of Place.*
49. Papachristos, Braga, and Hureau, "Social Networks and Risk of Gunshot Injury."
50. Papachristos, Wildeman, and Roberto, "Tragic, But Not Random."
51. Black, "Production of Crime Rates;" Brownstein, "Social Production of Crime Statistics."

Figure 5. An example of linking individuals through arrest records



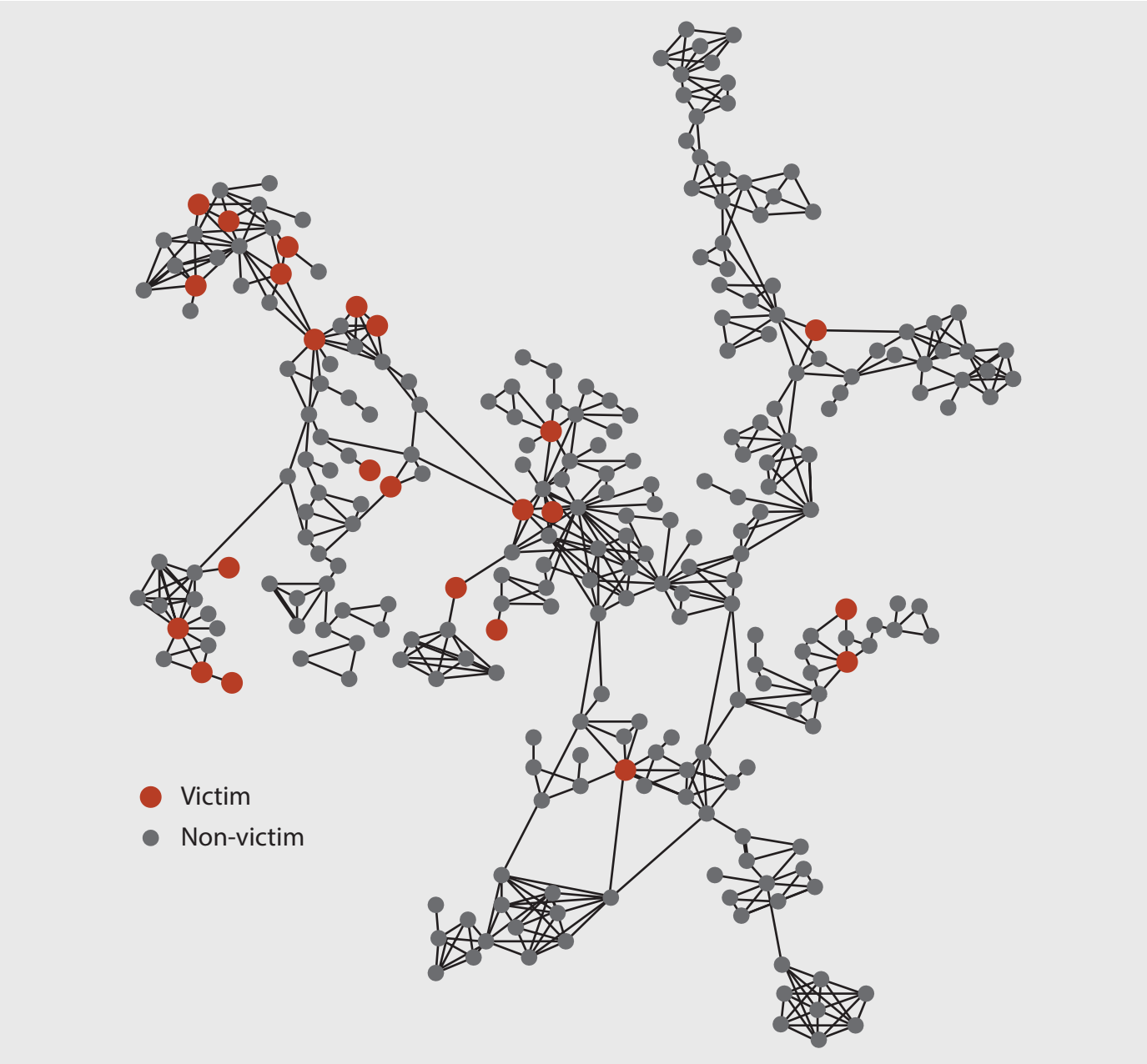
When at least two unique individuals (e.g. Person 1 and Person 2) have a common arrest (e.g. Arrest A), such as stealing a car together, their co-arrest is represented as a tie in the network graph.

Figure 6 shows the largest component of the co-arrest network and gunshot victims in East Palo Alto, California, a city of approximately 30,000 residents with a 2016 violent crime rate (606 per 100,000)[52] about 44 percent higher than the national average (386 per 100,000).[53] The term *component* refers to a subgraph, or subset, of the total network and has "a path between all nodes."[54] In figure 6, this component has 266 nodes, which represents about 6 percent of the total co-arrest network (n = 4,370). Each node represents a unique individual who was arrested, and each tie represents a unique instance of co-arrest. The larger, red nodes indicate those individuals in the network who were victims of a fatal or nonfatal gunshot injury in East Palo Alto.

In figure 6, the East Palo Alto network contains hundreds of individuals, many of whom exist in smaller high-density clusters. Although not displayed in figure 6, the co-arrest network contains multiple gangs, and co-arrest ties connect gangs across several geographic neighborhoods. However, figure 6 does reveal that gunshot victims (red nodes) tend to cluster close to each other in the network—i.e., the graph clearly shows pockets of victims, with individual victims either directly tied to one another or only a few ties away from another victim. Conversely, parts of the network show no gunshot victims (gray nodes). This clustering of victims underscores the patterns of victimization within these kinds of networks.

52. Federal Bureau of Investigation, "Table 6," *Crime in the United States, 2016*.
53. Federal Bureau of Investigation, "Table 1," *Crime in the United States, 2016*.
54. Wasserman and Faust, *Social Network Analysis Methods*, 109.

Figure 6. 266 co-arrest network and gunshot victims in East Palo Alto, California



It is important to remember that each node in the network is a real person and represents someone who has had contact with the criminal justice system as well as other social institutions (e.g., hospitals, schools, and social service agencies). The value of mapping these networks is that the pockets of victims and their associates become easily visible; an analyst can closely examine these networks and see who might very well be in harm's way. Likewise, an analyst can see who is not tied to these pockets of victimization, allowing for resources and violence prevention strategies to be directed strategically.

Understanding individual risk and contagion of gun violence

The concentration of gunshot injuries in social networks is itself a serious problem, as it exposes people to high risks of victimization. The idea of gun violence as a public health epidemic has gained traction over the past decade and for good reason: Rates of gun violence and the concentration of it in space and in social networks has many of the characteristics of other public health epidemics.[55] For example, a recent study of gun homicides in Newark, New Jersey, found that the spread of gun and gang violence over a 20-year period followed a diffusion pattern of infectious diseases, starting in the city with small point sources that spread outward over time.[56]

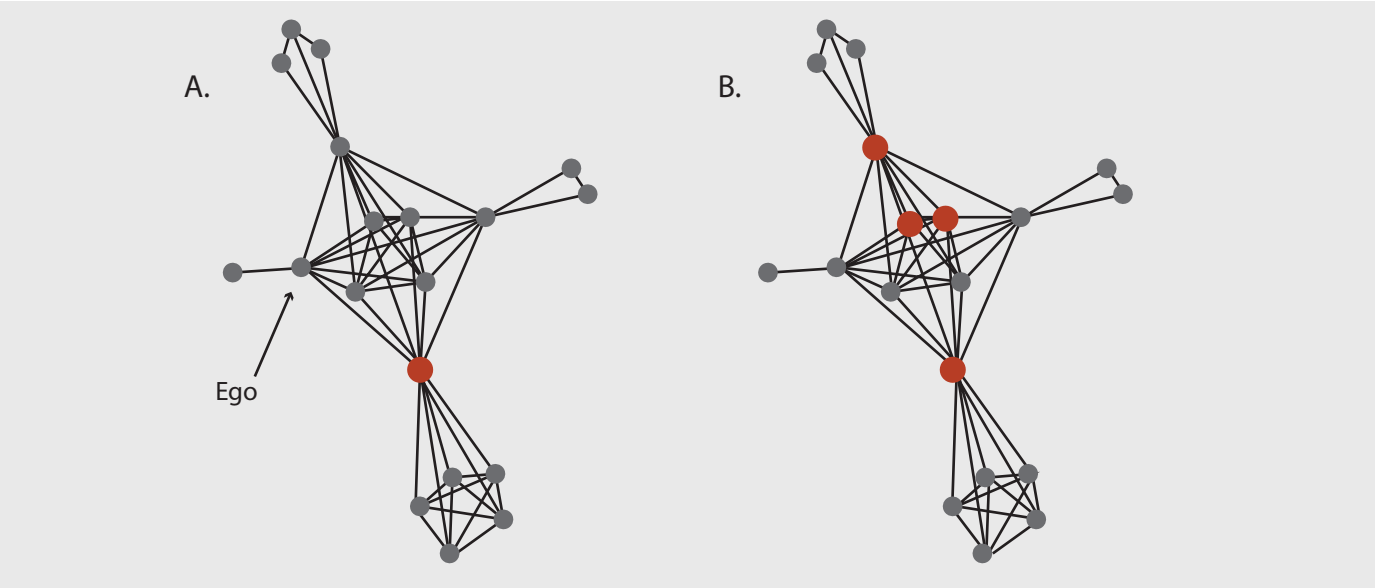
SNA of gun violence suggests that the public health framing of gun violence might be more accurate than research on the spatial patterning of gun violence suggested.[57] A series of research studies found that gun violence—just like an infectious disease—can be transmitted from person to person in social networks: i.e., exposure to gun violence not only can lead to a host of negative psychological and cognitive outcomes[58] but also increases the risk of individuals becoming gunshot victims themselves.[59]

Furthermore, individuals who associate with a greater number of gunshot victims are at an extremely elevated risk of being victims themselves. For example, a study of a high-crime Boston community found that being directly connected to a gunshot victim increased one's own probability of being a victim by 25 percent.[60] This exposure effect also extends to indirect associations—meaning you do not have to be directly connected to a victim to experience heightened risk of victimization. For example, one Chicago study found that each social tie closer to a gunshot victim increased one's probability of being shot by 57 percent.[61]

This correlation is illustrated in figure 7, which shows two networks constructed around the node labeled "Ego;" depending on available data or the goal of a given analysis, this ego could be a person of interest, informant, suspect, victim, etc. Both networks display the nodes connected directly to the ego and those that are two and three steps away from the ego. The ego networks contain the same number of individuals, but network A has one gunshot victim (shown in red), whereas network B has four. While the ego in both network A and B is at an elevated risk of victimization as compared to someone who does not have a gunshot victim in his or her social network, ego B is at a greater risk than ego A because of B's increased exposure to gunshot victims as well as increased pathways in the network through which one might be exposed indirectly.

55. Hemenway, *Private Guns, Public Health*; Slutkin, *Violence is a Contagious Disease.*
56. Zeoli et al., "Modeling the Movement of Homicide;" Zeoli et al., "Homicide as Infectious Disease."
57. Zeoli et al., "Modeling the Movement of Homicide."
58. Sharkey, "Acute Effect of Local Homicides."
59. Papachristos and Wildeman, "Network Exposure and Homicide Victimization;" Papachristos, Wildeman, and Roberto, "Tragic, But Not Random."
60. Papachristos, Braga, and Hureau, "Social Networks and Risk of Gunshot Injury."
61. Papachristos and Wildeman, "Network Exposure and Homicide Victimization."

Figure 7. Example ego-networks showing the concentration of gunshot victims



Ego networks like those in figure 7 can be easily drawn, analyzed, and leveraged for violence prevention purposes. For example, focused deterrence programs have begun visualizing ego networks around specific individuals to identify potential gunshot victims and determine which individuals should become part of an intervention. Police agencies might also consider how analyzing such ego networks during outbreaks of shootings might guide additional interventions and programing, especially when coordinating police-led intervention with civilian-led efforts like street outreach or social service provision. In particular, police might consider partnering with trauma specialists, social workers, violence interrupters, and educational professionals to help reach individuals inside high-risk networks and prevent victimization by offering a holistic, victim-centered approach.

Visualizing the structure of street gangs

The starting point for most gang-reduction efforts by law enforcement agencies is the gang (qua group) itself. When looking at gangs, police often try to identify some aspects of group structure—whether or not the group has identifiable leadership or a particular parcel of turf, for example. Often law enforcements' conceptions of gangs force gang members into a hierarchical structure with an identified leader, subleaders, middle managers, and so on. However, according to research, only a handful of street gangs possess such intricate organizational structures;[62] most gangs are loosely organized groups with fluid boundaries and even more fluid membership. Super-imposing structure when none exists might be useful for investigatory and prosecutorial purposes, but it misrepresents the true organizational nature of gangs and can fuel mischaracterization of gangs within law enforcement and in the general public.

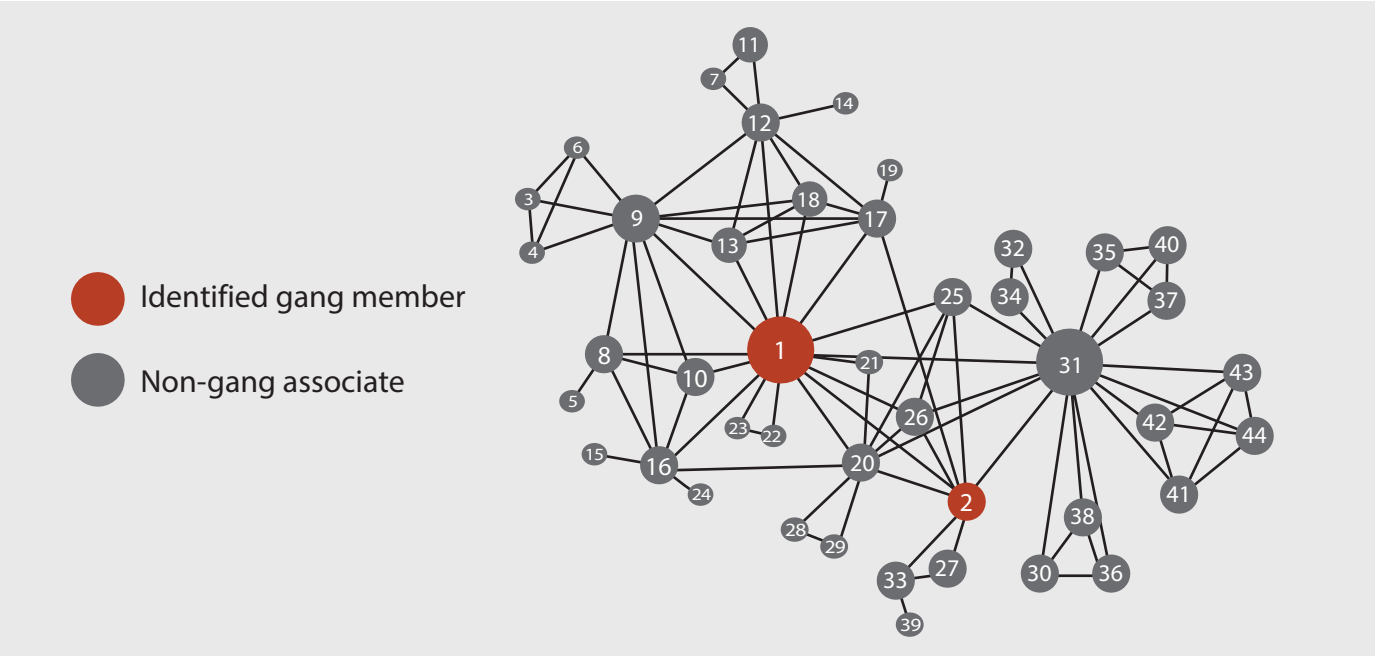
62. Levitt and Venkatesh, "Drug-Selling Gang's Finances;" Venkatesh, "Social Organization of Street Gang Activity."

SNA can provide law enforcement and violence reduction personnel with a data-driven starting point for their interventions. Using many of the same methods (e.g., mapping ego networks) and data (e.g., co-arrest records) described earlier in this chapter, SNA can trace the real-life links among gang members and their nongang associates and thus provide a social network graph based on behaviors and observations instead of prior assumptions. Rather than working from a potentially false starting point, SNA can provide a verifiable and reproducible methodological approach for analyzing the structure of gangs and other criminal groups, as well as more effectively orient intervention and prevention efforts.

To provide a basic example, figure 8 uses co-arrest data to map the social network of gang members and nongang individuals in Stockton, California. A violence prevention team identified two active members (nodes 1 and 2) of a Norteño gang faction and was interested in whether those active members were part of any other cliques or crews. The analysts extracted the ego networks around those two identified gang members in a fashion similar to the ego network example in figure 7—that is, figure 8 shows not only the nodes that are directly connected to the two gang members but also the nodes that are two steps away from them. In addition, the nodes in the network are scaled according to their degree;[63] the bigger the node, the greater the number of other nodes it is connected to.

Of the 44 nodes shown in figure 8, the network contained 42 unique nodes, none of which were identified by law enforcement as gang members. The network reveals that, while directly connected, the original persons of interest (nodes 1 and 2) are connected to unique clusters within the larger network. For example, person 1 is connected to 9, 10, 22, and 23, none of whom are connected to person 2. Similarly, person 2 is connected to 27 and 33, neither of whom has a connection to person 1.

Figure 8. Co-arrest gang network of Norteño gang faction in Stockton, California



63. Wasserman and Faust, *Social Network Analysis Methods.*

The network also suggests that one need not be an identified gang member to be highly connected in the network or to be important to the overall structure of the network. For example, though not identified as gang members, person 9 and 31 actually have more ties than person 2. In fact, person 31 is at the center of the cluster on the right side of the network; without person 31, much of the right side of the figure would not be connected to the larger network structure. Figure 8 also demonstrates that the network is not a hierarchy. Instead, the network looks more like a combination of distinct subgroups linked by both gang members and non-members.

In short, this network approach provides a markedly different assessment of the social structure of this Norteño gang faction than one would expect if looking for a hierarchical or corporate structure. Accordingly, the strategic choices made by law enforcement and violence reduction program personnel who begin with such a network would differ from personnel who assumed the gang had a hierarchical gang structure.

3. The Future of SNA in Policing

SNA is a powerful tool for focusing violence prevention efforts—a potentially important step away from programs and policies that cast law enforcement resources and personnel too widely. Narrowing the purview of criminal justice–related programs is increasingly important to alleviate the damage done to individuals, families, and entire communities as a result of mass incarceration and over-policing.[64] Across the entire criminal justice system, there is a dire need to limit contact with agents of the legal system and to ensure that when contact is made it is fair and just.

As discussed, the use of SNA to aid focused intervention and prevention efforts has proven effective in producing short-term crime reductions. But such efforts do not solve the larger (and arguably more important) social and economic factors underlying crime and delinquency. The lack of jobs and adequate training programs; failing public schools; massive health disparities; and the unequal distribution of a host of social, economic, and political resources represent persistent problems that no single law enforcement agency or violence reduction program can hope to solve. Although criminal justice agents can play a role in addressing some of these challenges—especially when working in concert with community stakeholders—these persistent structural problems will not be fixed through law enforcement interventions that largely deal with the symptoms of these social ills.

However, there is undoubtedly an important role to be played by law enforcement and its partnerships with the community. The United States is at an important turning point that has the potential to realize some of the most significant criminal justice reforms in a generation. Chief among these reforms is redefining how contact with the criminal justice system affects citizens' perceptions of criminal justice agents[65] and mending relationships damaged by officer-involved shootings and overly aggressive activities.[66] A string of research-based federal and state recommendations points to the deep-seated need for transparency and procedural fairness in the way officers interact with citizens and in the procedures that define and structure these interactions.[67] Accordingly, recommendations stemming from this research call for rethinking how officers interact with community members on a day-to-day basis, as well as changes in the organizational policies that govern these interactions.[68]

The benefits of SNA and focused deterrence efforts

SNA provides promising tools that can aid law enforcement in several ways. First, because SNA can be used to more strategically target law enforcement resources, law enforcement interventions guided by network analysis can become both more efficient and more effective. By focusing on the recorded and verifiable behaviors of the small population of offenders that drive broader patterns in crime and violence, law

64. Pettit and Western, "Mass Imprisonment;" Wakefield, Lee, and Wildeman, "Tough on Crime, Tough on Families;" Wakefield and Wildeman, *Children of the Prison Boom*.
65. President's Task Force on 21st Century Policing, *Final Report*.
66. Carr, Napolitano, and Keating, "We Never Call the Cops;" Desmond, Papachristos, and Kirk, "Police Violence and Citizen Crime Reporting;" Kirk and Matsuda, "Legal Cynicism, Collective Efficacy."
67. Higginson and Mazerolle, "Legitimacy Policing of Places;" Sunshine and Tyler, "Role of Procedural Justice and Legitimacy;" Tyler, Goff, and MacCoun, "Impact of Psychological Science on Policing."
68. President's Task Force on 21st Century Policing, *Final Report*.

enforcement can direct its limited resources at those most responsible for negatively affecting public safety. Beyond the direct benefit of reducing crime and violence, the effective tackling of a public safety problem can also enhance citizen perceptions of police legitimacy and their satisfaction with police services.[69]

Related to this legitimacy-enhancing benefit of SNA-aided initiatives, SNA provides insights that enable law enforcement to have fewer and fairer contacts with community members. The successful integration of SNA into focused deterrence efforts aimed at reducing gun violence highlights SNA's usefulness for enabling law enforcement to focus on the small number of individuals who drive gun violence patterns. Such an approach stands in contrast to more diffuse, poorly targeted strategies such as order maintenance or broken windows policing that not only fail to restrict their operations to the small number of offenders that drive trends in gun violence but also require repeated contact with community members that research has shown to damage the legitimacy of police.[70]

Beyond the efficacy- and legitimacy-enhancing benefits of using SNA in conjunction with cooperative strategies like focused deterrence, such initiatives are able to be adapted to the unique challenges that face a given municipality. In particular, techniques like the group audit and subsequent SNA are flexible and can make sense of the particularities of a municipality's crime or violence landscape. In addition, because these data are collected, cleaned, and updated over time, these cooperative initiatives can be subjected to on-going research and evaluation. This flexibility and continuous assessment ensures that police-community efforts are driven by data that reflect the street-level conditions that differ from context to context. This assessment also enables rigorous evaluation of public safety strategies that can inform law enforcement, community stakeholders, and policy makers as to what's working, what's not, and why.

The perils of predictive policing

As promising as SNA is for supporting efforts to reduce gang violence, all potential benefits can be undermined if the underlying logic and tools of SNA are misapplied or abused. For example, failure to be transparent about data and how it's used can undermine the trust needed to foster a meaningful police-community partnership. And closed-door, arrest-driven efforts can quickly lead to the perils, pitfalls, and panic associated with predictive policing.[71]

SNA provides insights that enable law enforcement to have fewer and fairer contacts with community members.

The idea of predictive policing—an algorithm-based approach to discern future crime hot spots or future offenders—has received increased attention and scrutiny as more sectors of society begin to rely on data to solve problems. Police have used mapping techniques and other sources of data to problem solve for a generation, with these data-driven efforts reaching a crescendo in the CompStat processes developed in New York in the 1990s.[72] However, people often use the term *predictive policing* to cover a wide range of ideas and methods, not all of which are in fact predictive in the true sense of the word.

69. Kochel, Parks, and Mastrofski, "Examining Police Effectiveness;" Weitzer and Tuch, "Racially Biased Policing."
70. Gau and Brunson, "Procedural Justice and Order Maintenance Policing."
71. Hvistendahl, "Can 'Predictive Policing' Prevent Crime."
72. Police Executive Research Forum, *Compstat: Its Origins, Evolution, and Future.*

For as long as there have been crime maps, law enforcement has actively put cops on the dots: i.e., focused law enforcement resources in geographic areas with higher crime rates.[73] The rise of computerized mapping software in the 1980s ushered in a series of geographic hot spot algorithms that identified nonrandom clusters of crimes in geographic space that could be as small as a single street corner. Numerous evaluations of hot spot policing have been positive, finding consistent crime reduction effects in the targeted areas with little or no spill over into nearby communities.[74]

But what happens when law enforcement agencies shift their analytic focus from street corners to people is unknown in the world of data-driven policing because there have been few formal evaluations of SNA-based interventions. Even within the geographic hot spot approach, there is little research on what exactly officers do once they get to the hot spot[75] and how such geographic information shapes the choices of which people officers choose to interact with at said hot spot and in what ways. Furthermore, while some assume the mere presence of police at geographic hot spots serves as a deterrent, this might very well depend on the type of crime being addressed or the type of police intervention.

Efforts to remove bias with cold computation . . . raises serious constitutional and ethical concerns around, for example, arresting someone before they've committed a crime.

One of the purported upsides of predictive policing is that enough supposedly objective information might help mitigate biases (implicit or explicit) endemic to law enforcement work, balancing officers' imperfect perceptions with administratively gathered and verifiable data. However, efforts to remove bias with cold computation runs its own risks and raises serious constitutional and ethical concerns around, for example, arresting someone before they've committed a crime or enhancing a sentence because someone is predicted to be more likely to reoffend.[76] What's more, the algorithms and data used in such predictive algorithms are often not made public, only fanning the flames of suspicion and distrust of the legal system. Making an arrest on opaque data and without vetting the biases in the algorithms used not only raises important questions about what constitutes reasonable suspicion and probable cause[77] but also poses the risk of fundamentally altering a legal system based on the presumption of innocence.

Avoiding the perils of predictive policing

Taking these risks into account, SNA and predictive analytics are not inherently biased or unjust. For example, public health monitoring and forecasting often employs SNA and predictive analytics to curb the spread of infectious diseases, including among high-risk or hard-to-find populations.[78] With the role of such analytic tools in the criminal justice domain still in its infancy, the time to discuss and wrestle with the perils and promises of integrating these methods into policies and programs is now.

73. Ariel and Partridge, "Predictable Policing;" Weisburd and Green, "Policing Drug Hot Spots."
74. Braga, "Hot Spots Policing and Crime Prevention;" Braga, Papachristos, and Hureau, "Effects of Hot Spots Policing on Crime."
75. Braga, "Hot Spots Policing and Crime Prevention," 336.
76. Barry-Jester, Casselman, and Goldstein, "New Science of Sentencing."
77. Ferguson, "Big Data and Predictive Reasonable Suspicion."
78. Christakis and Fowler, "Social Network Sensors;" Epstein, "Modelling to Contain Pandemics;" Garcia-Herranz et al., "Using Friends as Sensors."

Practitioners and policy makers would do well to avoid certain practices, such as blindly following computer printouts without using human experience or a vetting process to decipher the meanings and implications of said results. As powerful as data-driven analytics can be, these tools work best when predictive models are cross-checked against the expertise and domain-specific knowledge of real people. While a network analysis or predictive algorithm might be able to provide a list of names or gangs, it is the police officer, the social worker, and the community member who can tell *who* a given actor in the network is or *why* two groups are fighting. Without this human element, individuals who are no longer involved in crime or who might be on a list because of a data-entry error are indistinguishable from those whom street-level experts know to be actively involved in violence. Completely replacing the experience of dedicated practitioners with algorithms and databases is ill-advised and should be guarded against by law enforcement agencies, the public, and policy makers alike.

As powerful as data-driven analytics can be, these tools work best when predictive models are cross-checked against the expertise and domain-specific knowledge of real people.

One way to prevent such a potentially harmful development is through a careful and transparent review process of any and all analytic strategies. Law enforcement agencies *and* stakeholders should be aware of what data is being used, how it is being collected, and how it is being analyzed.

Another key aspect to consider as agencies think about predictive data analytics is the extent to which they are directly tied to specific interventions and policies. Generating a list for the sake of generating a list creates a dangerous incentive to criminalize individuals on said list. Instead, data analytics should be employed with specific goals in mind, such as those discussed in the examples throughout this publication regarding mapping gang structures or identifying individuals connected to victims of gun violence. Moreover, the interventions or policies themselves should directly relate to the sorts of data that are used and how the results are employed—factors that should be determined before (not after) any analysIs is undertaken.

These cautions and caveats aside, SNA has the potential to enhance the efficacy of police-community efforts across the United States, as well as improve the relationship between officers and the communities they are sworn to protect and serve. An ever more connected world with data being collected on an unprecedented scale provides new possibilities to improve the way on-the-ground police work is implemented. If done carefully and conscientiously, policing and violence reduction efforts based on SNA have the potential not only to address pressing public safety challenges but also to do so in a way that enhances the legitimacy of law enforcement and the criminal justice system.

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About the COPS Office

The **Office of Community Oriented Policing Services (COPS Office)** is the component of the US Department of Justice responsible for advancing the practice of community policing by the nation's state, local, territorial, and tribal law enforcement agencies through information and grant resources.

Community policing begins with a commitment to building trust and mutual respect between police and communities. It supports public safety by encouraging all stakeholders to work together to address our nation's crime challenges. When police and communities collaborate, they more effectively address underlying issues, change negative behavioral patterns, and allocate resources.

Rather than simply responding to crime, community policing focuses on preventing it through strategic problem-solving approaches based on collaboration. The COPS Office awards grants to hire community policing officers and support the development and testing of innovative policing strategies. COPS Office funding also provides training and technical assistance to community members and local government leaders, as well as all levels of law enforcement.

Since 1994, the COPS Office has invested more than $14 billion to add community policing officers to the nation's streets, enhance crime fighting technology, support crime prevention initiatives, and provide training and technical assistance to help advance community policing. Other achievements include the following:

- To date, the COPS Office has funded the hiring of approximately 130,000 additional officers by more than 13,000 of the nation's 18,000 law enforcement agencies in both small and large jurisdictions.

- Nearly 700,000 law enforcement personnel, community members, and government leaders have been trained through COPS Office–funded training organizations.

- To date, the COPS Office has distributed more than eight million topic-specific publications, training curricula, white papers, and resource CDs and flash drives.

- The COPS Office also sponsors conferences, roundtables, and other forums focused on issues critical to law enforcement.

COPS Office information resources, covering a wide range of community policing topics such as school and campus safety, violent crime, and officer safety and wellness, can be downloaded via the COPS Office's home page, www.cops.usdoj.gov. This website is also the grant application portal, providing access to online application forms.

Law enforcement agencies are increasingly using social network analysis (SNA) to understand the organization of gangs and other criminal networks, to identify their relationships, and to analyze data that can be used to focus crime prevention efforts. This report details the implementation of a SNA program developed by the COPS Office in partnership with Yale University. Created as part of a violence prevention initiative in New Haven, Connecticut, the Project Longevity SNA program emphasizes the value of community collaboration when gathering critical information such as the location and membership of these groups. Noting that transparency and community involvement in data collection encourage community support, the report also describes the benefits of focused deterrence activities, thereby reducing arrests and increasing efficiency. In addition to a detailed introduction to SNA and the ways it can be adapted to community and law enforcement needs, this report provides examples of SNA strategies used in other cities and practical guidelines for implementation.

Community Oriented Policing Services
U.S. Department of Justice

US Department of Justice
Office of Community Oriented Policing Services
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