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Social Networks and Gang Violence Reduction

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Abstract

This review traces the origins, development, and use of social network analysis in gang research and gang violence reduction strategies. Although early gang scholars intuitively recognized the networked nature of gangs and gang violence, such insights were not always leveraged by gang violence reduction efforts that became increasingly enforcement-centric throughout the twentieth century. This review describes these historical shifts, the recent advent of social network analysis in research and gang interventions, and future directions that research and interventions can take to develop a more victim-focused approach to gang violence reduction.

INTRODUCTION

The street gang occupies a unique, almost mythical position in American society. For some, street gangs are public enemy number one, a scourge on cities and a representation of the decay of contemporary youth culture (Chic. Crime Comm. 1995). For others, gangs represent a reality of everyday life—at times a necessity—for young people trying to feel safe or empowered as they walk dangerous streets in disadvantaged and disempowered neighborhoods (Garot 2010). Regardless of where one might fall on such a spectrum, few deny that certain gang behaviors—especially violence—represent a serious social problem. In cities like Chicago (Papachristos & Kirk 2015), Boston (Braga et al. 2014), and Los Angeles (Tita et al. 2010), gangs are involved in somewhere between 30% and 60% of all homicides annually. Such figures say nothing of the fear instilled in community residents by acts of gang violence that often occur on neighborhood streets, involve firearms, and include a greater number of perpetrators and victims (Curry et al. 2002, Maxson et al. 1985).

How we conceive of gangs greatly influences society's approaches to gangs and gang violence. If gangs are seen as wayward youth or lost boys, we might consider a softer touch, including diversion programs, social services, and educational or employment opportunities to get young people back on track. If gangs are nothing more than “urban terrorists” (Penley 2011), however, then one might feel less inclined to glove the heavy hand of the criminal justice system. Complicating matters is the manner in which conceptions of gangs are influenced by the intersection of race, gender, and geography (Ludeke 2006, Papachristos & Hughes 2015, Petersen & Howell 2013): The solution to gang violence might well vary with the skin color or neighborhood of the gang member in question.

The social sciences have much to say about street gangs and can provide important nuance to sweeping generalizations of gangs. For example, most street gangs in the United States are not highly organized, corporate, drug-dealing enterprises but rather small, informal groups that are limited in size, scope, and capacity for crime (Howell 2012, Klein 1995). Yet rigorous research on street gangs has not always led to equally nuanced policy recommendations or gang violence reduction programs. At times—especially during the 1960s and at some points in the 1990s—gang research was central to the design of gang violence reduction efforts. At other times, however, especially in the 1980s, social science was largely absent from such discussions. Today, policy makers and funding agencies have once again made a cognizant (at least external) push toward the promotion of data-driven solutions to social and policy problems, creating, perhaps, an important moment for scientists to engage in such pressing debates.

This article examines how one area of science—social network analysis—can play an important role in informing efforts to reduce gang violence. In an era of almost ubiquitous digital interconnection, many confound the ideas of social media and social networks; the former refers to digital platforms that allow us to connect with our social relations, whereas the latter refers to the tangle of kinship, friendship, and other relationships that comprises our social worlds. The field of social network analysis has been around since at least the 1930s, but the massive proliferation of handheld devices, the advent of Big Data, and exponential increases in statistical computing power have spurred the proliferation of network analysis as a tool for asking new questions and revisiting old ones. Indeed, some have argued that a new field of network science has emerged that transcends traditional boundaries of the physical, social, and hard sciences, with similar models, theories, and methods now being used to explain brain organization (Bullmore & Sporns 2009), the spread of disease (Eubank et al. 2004), and the social contagion of political influence (Kahler 2015).

Although criminology has long theorized about the role of networks qua criminal or deviant groups, the field is a latecomer to the implementation of network methods in the study of gangs (Papachristos 2011, Sierra-Arévalo & Papachristos 2015a). The history of gang research is rife with examples of network thinking; some of the earliest studies recognize that the gang as a group is constituted by the connection between its members. Recent advances in data, methods, and computing power have enabled these foundational insights to be reexamined and have given new life to our understanding of gangs, gang structure, and gang behavior.

We believe network science can advance theoretical and empirical investigations of street gangs, both academically and in practical attempts to reduce gang violence. Social network analysis also holds potential for new approaches to gang violence reduction. By measuring (rather than assuming) the underlying structure of street gangs (McGloin 2007, Morselli 2009), gang violence reduction efforts can provide a roadmap that can more strategically identify the groups and individuals driving gang violence—a much-needed reprieve from overly broad policies like stop-and-frisk that generate massive societal inequities (Pettit & Western 2004, Wakefield & Wildeman 2016, Western & Wildeman 2009).

GANGS, NETWORKS, AND GANGS AS NETWORKS

What Is a Gang?

Any academic study of street gangs must spend the obligatory ink on the definitional debate, the longstanding attempt to decipher what does and does not constitute a gang. To summarize, the central points of contention in this debate are the extent to which any definition is (*a*) structural, based on group organization or leadership, especially its structure or organization; (*b*) behavioral, focusing on the involvement of the group in specific behaviors, usually related to crime and delinquency; or (*c*) some combination therein (Bouchard & Spindler 2010, Spindler & Bouchard 2011).

Although both structure and behavior are important elements for conceptualizing what is and is not a gang, we need not definitively adjudicate between these aspects of the gang for the purposes of this review. Instead, we start from the premise that the gang is first and foremost a social network. A gang, both theoretically and empirically, is defined by the social relationships of its members with each other and with those outside the group. Though it is true that gangs exist as groups in part because there are those that are not in the gang, it is crucial to recognize that gangs and gang members are embedded in a complex web of social relationships that cut across social, geographic, and even virtual space (Fleisher 1998, Pattillo 1998, Sierra-Arévalo & Papachristos 2015a). As such, though the relationships between gang members that share a group identity, neighborhood, and set of conflicts are important, so too are the relationships of the gang's members to other gangs, friends, parents, schoolmates, and the police. It is precisely this constellation of relationships that social network analysis is suited to measure and analyze.

What Is Social Network Analysis?

Social network analysis (hereafter, simply SNA) refers to a set of theoretical and methodological tools focused on observing and modeling the relationships among actors (Carrington et al. 2005, Wasserman & Faust 1994). SNA is based on graph theoretical notions of networks that consist of two (or more) types of data: vertices, often visualized as points or nodes that represent the actors under investigation, and edges, depicted as lines or arrows that represent the relationships among

the actors.¹ In combination, these vertices and edges display the sets of relationships between actors, and the resulting visualization of these connections is referred to as a network graph, or sociogram.

More practically, SNA tries to understand how social relationships affect what we feel, think, and do. From its beginnings in field-driven anthropology and group-focused social psychology and sociology, SNA has developed into a much broader field of network science that currently stretches from theoretical physics and computer science to public health interventions and popular culture. Network methods and models have been used to describe a whole range of phenomena, including the diffusion of ideas and technologies (Angst et al. 2010, Cho et al. 2012, Ferrier et al. 2016), the spread of disease (Christakis & Fowler 2007, Eubank et al. 2004), political and organizational behavior (Boushey 2010, Elliott et al. 2014), and friendship and romantic relationships (Ball & Newman 2013, Bearman et al. 2004, McFarland et al. 2014).

Though scholars of crime, law, and deviance arrived a bit late to this network turn in the academy (Papachristos 2011), a growing body of work recognizes the salience of relational concepts and methods in the study of street gangs. With the increase of computing power and the development of more advanced network methods, SNA is being used to ask new questions about gangs and gang behavior, as well as to revisit and reorient long-standing questions about gang structure, membership, cohesion, and violence. In fact, this recent work echoes the long-standing insight of storied gang scholarship that identifies the importance of intra- and intergang ties not only to gang life but to the role of gangs in neighborhood and urban life more broadly.

THE EARLY YEARS: THE GANG AND STREET CORNER SOCIETY

Fredric Thrasher and the Gang

In what is widely considered to be the first scientific study of gangs, Fredric M. Thrasher [2013 (1927), p. 3] summarized his *raison d'être* for studying gangs: “The gang, in short, is *life*, often rough and untamed, yet rich in elemental social processes significant to the student of society and human nature.” For Thrasher, the gang was a subject worthy of scientific investigation not only because it was a unique social phenomenon that demanded its own classification and explanation but also because understanding of the gang stood to shed light on social processes that affected urban life as a whole. In his sprawling study of 1,313 gangs in 1920s Chicago, Thrasher plants the flag for gang research within sociology and establishes the foundational notion of gangs as part of the social fabric of cities. The gangs studied by Thrasher are not alien invaders of urban neighborhoods but rather the by-products of the same social forces that generate other social groups within the industrial city; though gangs are unique entities within the city’s broader ecology, they are but one piece of an interconnected urban tapestry.

Although Thrasher does not use formal network methods, models, or terminology, he spends many pages discussing the connected nature of the gang and gang life. For example, he describes how gangs can form in the context of a sports team or club, solidified through common interests or their shared expulsion/exclusion from neighborhood institutions. Thrasher also recognizes that gangs and gang members are indelibly tied to the social and geographical interstices of the city—the gaps and fissures between dominant social institutions and physical spaces. These places become part of gang identity—Forty-Seventh Street is synonymous with the Bat-Eyes, just

¹See Wasserman & Faust (1994) for a discussion of the mathematical underpinnings of SNA, as well as Scott & Carrington (2011) for an updated account of SNA’s historical and methodological development.

as Sixty-Third Street is Dirty Dozen territory—and are crucial to delineating the contours of intergang relationships. As Thrasher describes, alliances and feuds are maintained because of and across space, such as in the alliance between gangs in Bucktown to more effectively fight rivals across the river in Pojay Town. Even without the aid of network methods, Thrasher’s view of gangs, gang conflict, and life in the gang reveals an implicit relational understanding of the connected nature of the gang and its activities, as well as the gang’s relationship to local businesses, schools, politics, and the broader ecology of the city.

William Foote Whyte and Street Corner Society

Whereas Thrasher went for breadth in understanding the relationships between the gang and an entire city, William Foote Whyte’s classic, *Street Corner Society*, went for depth by documenting the relationship between street corner groups and Boston’s Northend community. Like Thrasher, Whyte presents many important findings that are relevant to today’s gang scholar; one of Whyte’s more significant contributions is what is perhaps the first known network analysis of a street gang—the Nortons. Beginning with the deceptively simple declaration, “The Nortons were Doc’s gang,” Whyte [1969 (1943), p. 3] highlights leadership, collective identity, and the grouped nature of the gang, laying out topics that have interested gang scholars for decades.

Key to life in Cornerville are the “street corner groups,” such as the Nortons’ gang. Although Whyte does mention conflict and even a few fights, the bulk of his description of the Nortons and its members centers on the group and its groupness. True to his anthropological roots, Whyte describes how group structure orients life for street corner groups, his analysis focusing on the groupness of the Nortons and the connections between individuals, groups, and institutions in Cornerville that perpetuate and interact with these street corner groups. As such, Whyte does not exclusively talk about Doc and the others that make up the Nortons; instead, he situates the intragroup relationships of the street corner gang within a broader conceptualization of the Cornerville ecology, and he also describes the relationships of members to non-Norton friends, romantic interests, family members, political actors, local institutions, and other street corner groups. Though, like Thrasher, Whyte does not discuss the nodes, ties, or formal network structural patterns that typify modern network studies, Whyte’s analysis of Doc’s gang nonetheless yields a sociogram of the Nortons’ underlying structure (see **Figure 1**).

Whyte’s discussion and depiction of Doc as being at the top of the Nortons’ social hierarchy provide one of the first academic descriptions of gang structure. Moreover, Whyte’s visualization of the underlying structure of the Nortons—all based on his detailed observations of the group over time—uses the position of members to explain their relative status in the group. By combining the links between Norton members and showing how these connections relate to intragroup status, Whyte emphasizes the interaction between group structure, status, and leadership. Far from that of a democratically elected leader, Doc’s position as the Nortons’ leader is a product of his relationships with various group members, such as his physical domination of Nutsy to assume control of the Nortons [Whyte 1969 (1943), p. 4]. Although he was not a network scientist in the modern sense, Whyte’s anthropological approach and hand-drawn sociogram privilege group processes and structure in his exploration of the gang, its members, and their relationship to other community actors and institutions.² Coupled with his ethnographic analysis, this early network analysis of the Nortons helped shape the way scholars to this day conceptualize and measure gang life.

²It should be noted that Whyte’s earlier anthropological predecessors pioneered early versions of network diagrams, though not in the context of cities or street gangs (see White & Johansen 2005).

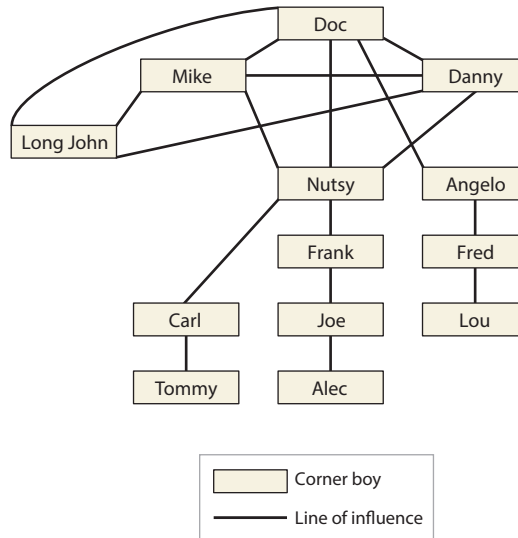


Figure 1

Social network diagram of Nortons’ street gang from William Whyte’s (1943) *Street Corner Society*. Each box represents a member of the Nortons’ gang, and each of the ties represents a channel through which communication, resources, and influence travel between individuals. The position of the boxes indicates relative status of the Nortons’ members as determined by Whyte, with higher-positioned boxes denoting higher status. Adapted with permission from Whyte 1943.

THE 1950s AND 1960s: SUBCULTURE, GROUP PROCESSES, AND STREET OUTREACH

Beyond his important contributions to the academic understanding of street gangs, Whyte’s study of the Nortons and Cornerville parallels and informs subsequent developments in gang violence prevention efforts. For example, Whyte documents how Doc was tapped by Mr. Smith, the head of the Cornerville Settlement House—a neighborhood institution that housed social workers, provided services, and offered a recreation area—to run one of three recreation centers. With Doc spending his time in the center, “[t]he remaining Nortons responded by spending some of their time in the center, but this changed the nature of their activities” and pulled them off the corner as well [Whyte 1969 (1943), p. 43]. Though we cannot conclusively know that Mr. Smith planned to change the Nortons’ behavior by way of influencing Doc, it is clear that the same status and respect afforded to Doc as leader of the gang were channels through which the settlement house facilitated changes in the Nortons’ activities.

Whyte’s example is an early instance of an approach to gang intervention work that persists to this day: leveraging individuals with insider or gang experience as potential avenues for intervention (Spergel 2007). These insights into gang behavior and how to affect it became vitally important to the gang research—as well as the popular fascination with gangs—that gathered steam in the 1950s as cities boomed and rates of juvenile offending rose in the postwar United States (Bursik & Webb 1982, Monahan 1961, Teeters & Matza 1959). Looking for answers to growing public fears over the future of America’s youth, pundits and politicians pointed to potential causes ranging from the dissolution of the American family to comic books, television, and rock ‘n’ roll (Gilbert 1988, Wertham 1954). To make matters worse, horrific (and widely publicized) cases of gang

violence perpetrated by young men, such as the infamous Cape Man murders in New York City, fueled public fear of young, violent street gangs (Schneider 2001).

Recognizing the need for concerted academic attention to rising rates of crime and delinquency, several gang scholars cooperated with locally embedded outreach workers to glean better understanding of the group processes and structures that set the bounds of the gang and gang life. Beginning with Clifford Shaw's Chicago Area Project in the 1930s—credited by some as the first time so-called indigenous workers were used to make connections with delinquent youth (Kobrin 1959, p. 27)—the mid-twentieth century saw the rise of “detached worker” programs (Klein & Maxson 2006, p. 164). These programs employed individuals from the neighborhoods under study, often with previous gang involvement themselves, leveraging their position within the community to forge relationships with delinquent boys and reintegrate them into prosocial institutions (Spergel 1995).³

Recognizing the value of these individuals (also termed street or outreach workers) for gaining entrée into the lives of delinquent gang members, several noted gang scholars cooperated with workers to rigorously study group structure, leadership, membership, and cohesion. For example, research in Boston (Miller 1957, 1962), Chicago (Short & Strodtbeck 1963, 1965; Spergel 1966), and New York (Cloward & Ohlin 1960, N.Y. City Youth Board 1960) was all done in cooperation with outreach workers, representing rare exceptions to gang research that often takes place in a “policy vacuum” (Decker & Van Winkle 1996, p. 9).⁴

At roughly the same time, the roots of what would eventually come to be formal SNA were also taking hold in the social sciences with social psychologist Jacob Moreno's (1941) development of sociometry. Conveniently enough, Moreno's first bit of sociometry analyzed runaway girls from a juvenile detention facility, thus offering criminologists an easy extension to the study of delinquency. Malcolm Klein, another central figure in gang research, was inspired to incorporate network thinking into his own work on gangs in Los Angeles.

In cooperation with outreach workers who produced contact reports detailing where, when, and with whom they contacted “576 male Negro gang members,” Klein & Crawford (1967, p. 63) were able to, for the first time, measure and visualize variation in gang cohesion—the connection between members and members' connection to the group—using relational data. This, to our knowledge, produced the second known sociogram of a street gang. Like Whyte's early sociogram of the Nortons' group structure, Klein & Crawford's use of relational data shows that gangs are not homogeneous social groupings and are instead composed of smaller cliques and subgroups operating within the larger clusters that street outreach workers observed. Further, their analysis provides one of the earliest demonstrations of how variation in gang structure is related to differences in offending: More cohesive gangs, according to Klein & Crawford (1967), were more delinquent.

Unfortunately, although these cooperative endeavors between research and outreach workers provided the means for important advances in the academic understanding of gangs and their behavior, this did not ensure that contemporary gang outreach programs themselves benefited from such insights. In fact, as Klein (1971) argues in a review of pre-1970s gang literature, outreach programs that depended on the relationships between street workers and gang members

³See Kobrin (1959) for a more thorough description of the theoretical and practical motivations behind the use of detached workers for street outreach work.

⁴See Hughes (2015), Maxson (2015), and Moule (2015) for a more thorough discussion of these research projects, as well as the legacies of these notable gang scholars more generally.

instead of rigorous research showed little (if not counterproductive) effects on gang deviance (Klein & Maxson 2006, pp. 90–91). And though stalwarts like Irving Spergel (1966, 1995; Spergel & Grossman 1997) kept the flame of research-outreach collaborations alive, a lack of rigorous program assessment has produced limited evidence that outreach workers can reduce gang violence (Spergel 2007). This lack of rigorous evaluation of such outreach-driven interventions highlights the gap between gang research and gang interventions that expanded throughout the coming decades, and which extends to the present day (Klein 2011).

THE 1970s TO THE 1990s: DRUGS, LEGAL INTERVENTIONS, AND THE WAR ON GANGS

Following the 1960s, negative perceptions of welfare programs (Gilens 2010), postindustrial economic change (Wilson 1987), and rising gang violence (Block & Block 1993, Hagedorn 1998) combined to justify a punitive turn in criminal justice away from the “rehabilitative ideal” of earlier decades (Garland 2002). In some cities, Chicago in particular, increasing levels of postindustrial gang violence were accompanied by restructuring of some gang organizations (see Venkatesh 1997 and Levitt & Venkatesh 2000), with post-1960s gangs that became heavily involved in the underground drug economy becoming more corporatized and violent to control lucrative drug-dealing turf.

In the wake of Nixon’s declaration of drugs and drug abuse as “public enemy number one” (Friedersdorf 2011), approaches to gang intervention (and social ills more generally) took an increasingly punitive turn. Rather than address root causes of poverty, crime, and addiction, aid and outreach workers were replaced with police and prosecutors. This move to the truncheon in lieu of assistance is part of the broader shift from the War on Poverty to the War on Crime described by historian Elizabeth Hinton (2016), and it had profound effects on how gangs and drugs were addressed. As the War on Drugs intensified throughout the 1970s and 1980s, intervention evolved to attack a gang problem that quickly became a “gang and drug problem” (Coughlin & Venkatesh 2003, p. 43; Rosen & Venkatesh 2007). At the street level, specialized gang units began to form as early as the 1960s (Katz 2001), and curfew laws (*Harvard Law Review* 1994) and no-knock search warrants (Allegro 1989, Balko 2013) became key weapons in what became a veritable War on Gangs.

Legislatively, a popular method to combat the gang-drug problem was the use of civil gang injunctions. Civil injunctions do not require that gangs be involved in serious crime or violence and instead rest upon a definition of gangs as “public nuisances” (Rosen & Venkatesh 2007). California led early implementations of such injunctions in cities like Los Angeles and Oakland (Yoo 1994), making it an arrestable offense for gang members who were part of an injunction to congregate in public, be in specified zones, or wear clothing or colors associated with gang membership (Maxson et al. 2003). In much the same way, Chicago modified its anti-loitering laws to keep known or suspected gang members off of street corners [*City of Chicago v. Morales* (1999)].⁵ Although ultimately deemed unconstitutional by the Supreme Court, Chicago’s gang loitering laws epitomized the criminalization of a wide range of gang behaviors beyond those associated with violence—and in many cases individuals not directly involved in gangs at all.

Federal agencies also innovated in the War on Gangs. In an effort to curtail gang criminality, especially drug dealing (whether or not it was accompanied by violence), prosecutors turned to

⁵ As Rosen & Venkatesh (2007) discussed, gang injunctions are rooted in logic drawn from Kelling & Wilson’s (1982) theory of broken windows, which suggests that controlling low-level (gang) infractions can reduce more serious crime and violence.

the RICO (Racketeer Influenced and Corrupt Organizations) statute that was previously used to prosecute organized crime families. In keeping with the legal requirements needed to win a RICO conviction, police and prosecutors were required to show that a gang had a hierarchical structure and that the gang collectively used criminal activity to stimulate profits (Gerber 1987). However, most gangs are in fact not highly organized criminal conglomerates (Decker et al. 1998, Hagedorn & Macon 1988, Huff 1998). As such, RICO-based prosecutions face great difficulties when trying to fit stark legal frameworks to the much greater number of small, fluid gangs that engage in nonspecialized, cafeteria-style offending (Klein 1968, 1995; Needle & Stapleton 1983; Short & Strodtbeck 1965).

These enforcement-centric efforts demonstrate how the criminal justice system focused on structure to the exclusion of group processes and superimposed a crude legal typology predicated on hierarchical organization. Although there are indeed cases of successful RICO prosecutions of sophisticated gang organizations (Bonney 1993, p. 604; Gibeaut 1998), the promulgation of the largely inaccurate view of gangs as “groups with national power affecting the nation’s economic and political structure” (Bonney 1993, p. 606) only fanned the moral panic around gangs and violence, increasing political and public pressure to make arrests and increase sentences (Barkow 2005, Moore 1990). Under this pressure, criminal justice agents across the country continued their punitive efforts without the nuance provided by social science research—much less a networked understanding of gangs and gang violence.

POST-1990s: THE BIRTH OF NETWORKED GANG INTERVENTIONS

Despite the dramatic rise in enforcement-centric strategies after the 1960s, adult and juvenile homicide trends continued to rise throughout the 1980s and early 1990s (Fox 1996, Fox & Zawitz 2007). Recognizing that said strategies were not a cure-all for gang violence, cities like Boston—where homicides increased from 100 in 1990 to 152 in 1991 (Braga et al. 2001a)—looked for new alternatives. Drawing on research that showed that street violence concentrated in particular places and was driven largely by young males involved with gangs or drug crews (Braga 2003, Cook & Laub 2002), a team of researchers and practitioners in Boston looked to reduce the breadth of legal intervention while fostering cooperation between police and community stakeholders.

Instead of enforcement strategies that target gangs and gang behavior broadly, or RICO-like statutes that necessitate hierarchical gang structure, the Boston effort developed a focused deterrence framework that begins from the assumption that addressing gang violence depends on targeting specific gangs and gang members (Kennedy 1997). This logic drew from a widely recognized idea that the majority of violent crime in any particular community is usually driven by a small population of active and repeat offenders (Kennedy 1997). For example, although a city might have dozens of gangs or groups that engage in illegal activity, there is variation in any gang’s involvement in street violence, and there are many nonviolent gangs as well (Kennedy et al. 1997, Sierra-Arévalo & Papachristos 2015b). Furthermore, only a small number of individuals within any gang are likely to be actively engaged in violence. A focused deterrence approach narrows the scope of gang violence reduction (Braga et al. 2001b, Kennedy et al. 1996) and funnels limited law enforcement, social service, and community resources to those gangs and their members that are actually involved in street violence.

The Boston effort also employed formal network analysis to help focus its intervention. To identify violent groups, the Ceasefire team developed a process known as a group audit, a focus group-style data collection session used to gather information on the location, membership, and activities of gangs in the city from gang “experts” in each jurisdiction (Kennedy et al. 1997, Sierra-Arévalo & Papachristos 2015b). A key component of the audit records data on which groups are

actively involved in violent crimes (especially those involving firearms), as well as information on the alliances or violent relationships between gangs that undergird reciprocal gang violence (Decker 1996, Papachristos 2009, Papachristos et al. 2013). In other words, the audit gathers data on the precise network structure of gang conflict in a city: which gangs are involved in conflict with which other gangs. These relational data support network analyses that can measure and display neighborhood- or city-wide gang conflict networks, as well as the group-level structure of individual gangs (Kennedy et al. 1997, Sierra-Arévalo & Papachristos 2015b).

In turn, these network maps are used to guide which groups are to be included in the focused deterrence intervention, termed the call-in. The call-in is an hour-long meeting between members from violent groups and a collaborative group of law enforcement; social service providers; and community stakeholders, such as clergy, ex-offenders, and family members of gun violence victims (Braga et al. 2008, Pegram et al. 2016, Sierra-Arévalo et al. 2016). At this meeting, invitees receive a message that emphasizes a unified, moral voice against violence, offers connection to social services, and makes clear the legal consequences for individuals and groups that continue to engage in violence (Crandall & Wong 2012).

Focused deterrence strategies stand out not simply for their departure from the single-minded application of criminal justice resources but also because of their explicit use of network data and methods to guide interventions. Theoretically, this model reengages with the importance of intragroup processes and leverages informal dynamics within the group to encourage behavioral change. Specifically, the intervention focuses on group accountability for violence and looks to engender group self-policing of violence to prevent law enforcement attention from being focused on the group and its members (Kennedy 2011, Natl. Netw. Safe Communities 2013). With the support of formalized network analysis that can capture these processes and structures with concrete network metrics like centrality, density, and cohesion, focused deterrence's cooperative involvement of law enforcement, social services, and the community has shown promising results in small and large US cities (see review by Braga & Weisburd 2015).

NETWORKED GANG RESEARCH

The use of network data and methods in gang violence reduction efforts parallels the growing use of SNA in gang research. Over the last decade, a handful of researchers began applying formal network methods to the study of street gangs and criminal offending, such as in work by Morselli (2009, 2010), which investigates the role Hells Angels members play in a drug distribution network, or by McGloin (2007), who draws on relational data gathered in interviews to concretely map the underlying structure of street gangs in Newark, New Jersey. Additionally, these methods have been used to revisit and revise our understanding of central gang concepts around group structure and processes.⁶ For example, Hughes (2013) uses relational data gathered on Chicago gangs by Short & Strodbeck (1965) to test the relationship between gang cohesion and deviant behavior. In contrast to the finding that more cohesive gangs engage in more delinquency and violence (Klein 1995, Klein & Crawford 1967), Hughes finds that gang cohesion is unrelated to delinquency, but that members of less cohesive gangs are more likely to engage in violence. Similarly, Papachristos (2006) recodes Suttles's (1968) ethnographic observations of the ERLS gang and uses network concepts like centrality, cohesion, and structural equivalence to nuance previous depictions of leadership, status, and group structure.

⁶See Sierra-Arévalo & Papachristos (2015a) and Papachristos (2011) for more thorough discussion of this network shift in gang research and criminology more generally.

Network methods are also being used to extend research on the spatial concentration of gang violence that has previously been restricted to measurement at the neighborhood, street, or gang turf level (Block 2000, Braga et al. 2010, Brantingham et al. 2012, Tita & Greenbaum 2009, Tita et al. 2005). By reexamining how gangs are tied to one another through networks of violence and conflict, this research demonstrates how group processes like contagion and reciprocity influence gang violence that is simultaneously embedded in social and physical space (Braga et al. 2010, Papachristos et al. 2013, Tita & Radil 2011). Though gang turf boundaries continue to be important predictors of gang violence, this line of research emphasizes that intergang conflict must be understood as more than a collection of individual events—gang conflict creates an enduring network structure that transcends the individual, with the dominance struggles between groups culminating in individual acts of violence that reify the broader system of conflict (Papachristos 2009).

In addition to gun violence being highly concentrated in geographic space, recent research shows that violence is concentrated in social networks. In one high-crime Boston community, for example, 85% of nonfatal shooting victims can be found in a co-offending network of less than 5% of the community's population (Papachristos et al. 2012); in Chicago, 70% of fatal and nonfatal shootings can be found in a network that comprises less than 6% of the city's total population (Papachristos et al. 2015b). This work shows that individual victimization risk is a product of how individuals are connected to victims of violence—someone directly or indirectly tied to a victim (or multiple victims) is at an elevated risk of victimization compared with someone who is not. These studies also extend the link between gang membership and violent victimization (Peterson et al. 2004, Pyrooz et al. 2014) with the finding of a spill-over effect of gang membership: Being directly or indirectly tied to a gang member in one's network dramatically increases one's risk of victimization even if one is not a gang member oneself (Papachristos et al. 2015a).

NETWORKED GANG INTERVENTIONS

Just as many of the early insights on group processes helped shape some of the early outreach and intervention work on gangs, so too are recent networked insights on gangs poised to make meaningful contributions to intervention, prevention, and policy efforts. As McGloin & Rowan (2015) argue, not only can SNA be used to guide interventions through the identification of gang conflicts and influential members, it can also provide metrics for assessing the efficacy of a given intervention beyond a tally of shootings or arrests (see also McGloin 2005). In much the same way, we maintain that the ability of SNA to formally measure cohesion, membership, and structure in a relational way is invaluable for untangling what works, what does not, and what is doing more harm than good.

The successful use of network methods and relational data in focused deterrence interventions provides a useful case in point (Braga et al. 2013). We believe that other violence reduction efforts are similarly well-suited to employ SNA, especially if they extend beyond the traditional law enforcement focus and proceed in collaborative and transparent ways. For example, Spergel's (1995, 2007) long-running comprehensive gang model explicitly recognizes the importance of gang members' ties to social services and local institutions, and Cure Violence treats gang violence as a contagious phenomenon that can be strategically interrupted by outreach workers (Slutkin 2013). In effect, both of these highly regarded programs are operating under an implicitly networked framework: Spergel's model looks to build prosocial links between individuals and local institutions, and Cure Violence aims to disrupt negative ties between gangs. However, neither program uses formal network methods to guide its interventions or evaluate its effectiveness. The network foundation has already been set—what is needed now is a concerted effort to collect

relational data on gangs and their members and then use said data to guide and assess these gang interventions.

We suggest that data collection efforts like group audits can be used outside the focused deterrence framework to gather relational data and guide other gang violence interventions (Sierra-Arévalo & Papachristos 2015b). Such audits need not be restricted to law enforcement experts; instead, the audit process can (and should) be carried out with social service providers, street workers, teachers, and other experts who can speak to the tangle of gang members' overlapping relationships. Along similar lines, gang interventions would do well to take advantage of existing relational data, such as police data on arrests that have been used to assess individual-level risk of victimization (Papachristos et al. 2012, 2015a). These data are particularly useful in that the network analyses they support can help direct limited resources to individuals at a high risk of victimization, even if they are not themselves identified gang members.⁷

For instance, **Figure 2** provides an example of how a network analysis can provide insight into gang violence in the city of East Palo Alto, California. Using data on arrests, police field contacts, homicides, and gang membership from 2008 through 2013, we constructed a network in which each node represents a unique individual who was arrested or interviewed by police, and in which each tie represents an instance of coarrest or cocontact. The larger nodes represent identified members of a Norteño gang set, and darker nodes represent homicide victims. We restrict this network to the single largest component ($n = 266$) of the total network ($n = 4,370$).

Immediately apparent from **Figure 2** is the clustering of gang members in the network: Most of the identified Norteños are located in the large clusters near the center and lower-left areas and are tied either directly with or within a few steps of other Norteños. In practical terms, this network structure reflects that Norteño members tend to be seen and arrested together by police. That said, this network also makes it clear that Norteño members are not exclusively being seen or arrested with fellow members, and instead are hanging out and committing crimes (in some cases, exclusively) with non-Norteños—an insight supporting the long-standing ethnographic evidence that shows gang members are part of much larger social, familial, and neighborhood networks (e.g., Fleisher 1998).

Figure 2 also highlights the concentration of gun violence in an exceedingly small segment of the population. Out of the 36 homicides that occurred in East Palo Alto during the time period, 20% ($n = 7$) can be found in a network component of 266 individuals, or less than 1% of the city's population. Interestingly, though nearly 43% of the victims in this network component are gang members, the remaining victims are not. Much in the same way that the structure of this network belies an understanding of gangs as negating relationships outside of the gang, so too does it suggest that an approach that focuses exclusively on identified gang members is likely to miss important contours of a city's broader violence landscape.

THE FUTURE OF NETWORKS AND GANG VIOLENCE PREVENTION

Our example analysis of East Palo Alto demonstrates the possibilities of using police-generated data, but the application of SNA to understanding and doing something about gang violence can and should extend beyond criminal justice data and applications. Future research should explore how SNA can be extended to other administrative data, such as school records, or else implement

⁷This type of analysis has been used recently in individual-level “custom notifications” as part of focused deterrence efforts (Kennedy & Friedrich 2014), though to our knowledge there is no evaluation of this technique's effectiveness above and beyond that of program call-ins.

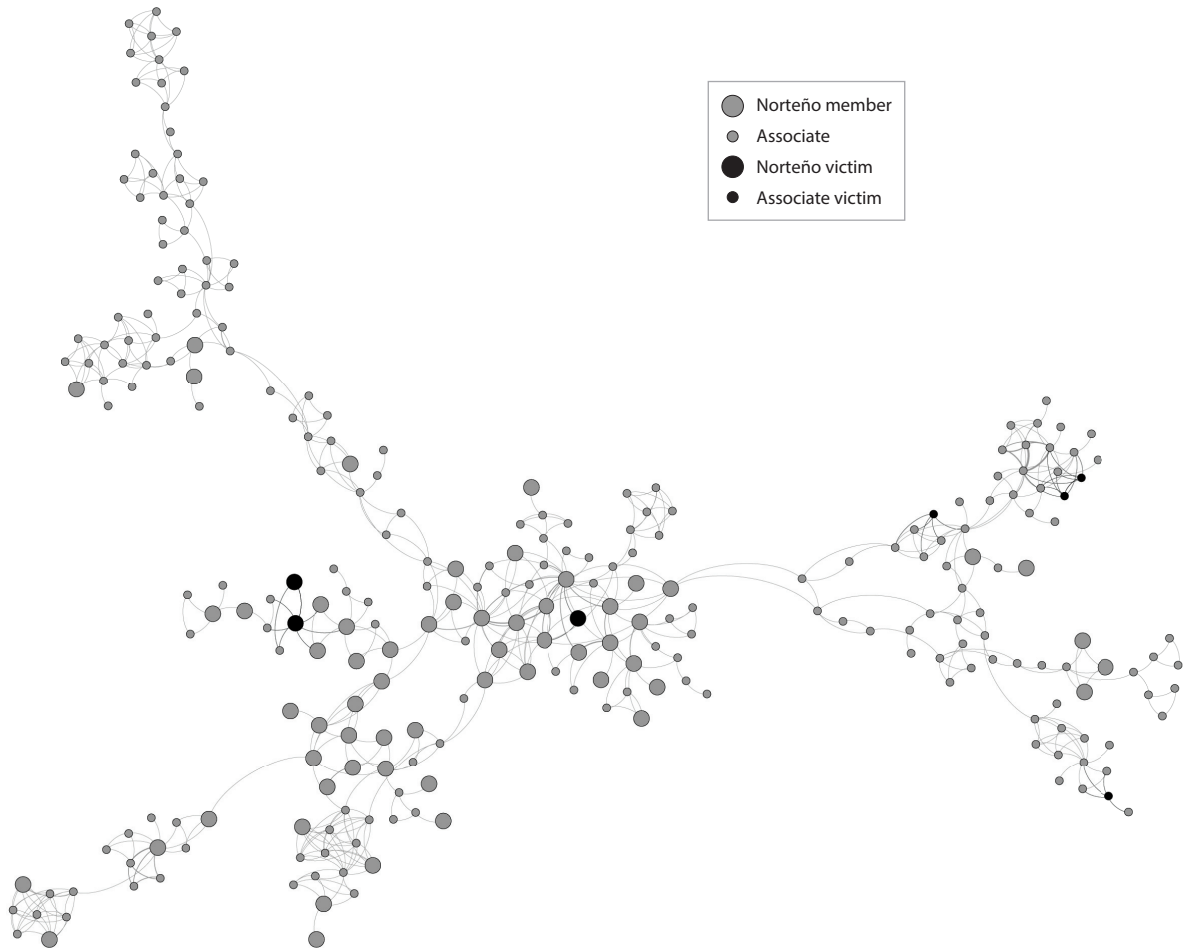


Figure 2

Co-arrest/co-contact network of Norteño gang members, associates, and homicide victims in East Palo Alto, CA. Each of the nodes represents a unique individual, and each tie represents an instance in which two individuals were arrested or contacted together. The network was constructed using East Palo Alto arrest field contact data from 2008 to 2013.

survey- or interview-based network questions within schools, social service agencies, and other institutions to capture and analyze gang members' myriad social ties. Additional administrative data (e.g., foster care, health services) might also provide information on system use that might otherwise disrupt or impede gang behaviors and negative network ties.

The insights provided by the networked gang studies reviewed here notwithstanding, these studies pay little attention to those individuals who, despite being embedded in gang networks, manage to avoid the negative effects of gang membership and conflict. That is, although past research clearly shows how gang membership or being tied to gang members is associated with a host of negative outcomes, we know markedly less about why some individuals—though embedded in the same high-risk networks as victims—appear to be resilient to victimization. For example, though we know individuals in **Figure 2** that are embedded in network clusters with more victims

are at an elevated risk of being shot, it is unclear why some individuals who are at a statistical disadvantage are not, in fact, shot or killed.

One way to examine such resiliency would be to gather additional data on non-gang ties—such as those to family, school, employment, or church—that might inoculate individuals against exposure to violence, or that otherwise provide mitigating influences from outside the gang. In addition to learning more about how these ties might function as network conduits to resiliency-enhancing social capital, gathering such relational data has the benefit of more fully capturing the multiplex ties that link individuals embedded in overlapping social groups (Fischer 1982, Fleisher 1998, Pattillo 1998, Pyrooz et al. 2013), and which helps those at a high risk of victimization avoid such a fate. To gather these data, existing surveys and data collection efforts might be augmented with questions that gather data on individuals' broader social networks, as well as with questions pertaining to gang involvement and behaviors.

Gang scholarship and violence reduction efforts can also be enhanced by expanding the scope of the networks to include legal agents and institutions. Just as gang members are tied to non-gang community members and institutions outside of the gang, so too are they connected to legal institutions and agents such as police and probation officers. However, networks constructed from co-arrest or field contact information are largely restricted to those who have been arrested or contacted and neglect the role of those whose implementation of social control produces the data from which these networks are generated. Future work might investigate how officers' arrest decisions link them to gang members and other officers, and how the pattern of arrests by particular officers affects the structure of gang and violence networks. Similarly, how gang members are tied to probation and parole officers stands to enhance our understanding of how criminal justice monitoring is patterned within gang networks, and how the constellation of legal actors exacerbates or ameliorates the negative outcomes that concentrate in these networks.

Furthermore, technological advances that have increasingly blurred the boundary between the real and online world create new challenges. Namely, as the ability to communicate instantaneously and across space has been enhanced by the internet and social media, gang life increasingly plays out online (Lane 2016, Moule et al. 2014, Pyrooz et al. 2015). Where once taunts and insults had to be delivered face-to-face, today they are sent by way of smartphones and laptops, invectives posted publicly as fast as one can type or upload a video (Patton et al. 2016, Sierra-Arévalo & Papachristos 2015a, Stuart 2016). That these disputes now evolve by way of Facebook posts, tweets, or YouTube videos makes them no less dire—in fact, these technologies might vastly expand the audience that is privy to these disputes, in turn creating social pressure that demands real-world bloodshed.⁸

For those who hope to reduce gang violence, the fact that these online interactions are both public and recorded provides a potential source of relational data. Researchers and practitioners alike would do well to consider how they can use nearly real-time data on when, how often, and with whom individuals interact online to better understand how group processes like contagion, mobilization, and recruitment manifest digitally. Just as network models can be used to detect natural disasters and disease outbreaks through Twitter (Ashktorab et al. 2014, Christakis & Fowler 2010, Eubank et al. 2004), these methods can help diagnose how virtual gang conflicts move offline, as well as provide ways for online disputes to be monitored and interrupted long before shots are fired.

⁸See Collins (2007) for a discussion of how audiences influence the likelihood of arguments escalating to violence.

As promising as these sources of data are, there are real risks to blindly using data, be it from Twitter or the local police department. Though the advent of Big Data and predictive algorithms in criminal justice might help reduce bias in decisions otherwise made by fallible humans, it also raises grave ethical and constitutional concerns. What are the implications of arresting someone before a crime is committed, or enhancing a sentence because an algorithm spits out a result indicating someone is more likely to reoffend upon release? How are we to reconcile the legal standards of probable cause or reasonable suspicion with algorithms and data that are not publicly available (Barry-Jester et al. 2015, Ferguson 2015)?

Though we are certainly not the ones to definitely answer these crucial questions, we do believe that the potential costs of new data and methods must be considered carefully alongside their potential benefits, in both gang violence reduction and the criminal justice system more broadly. In particular, we argue that although networked approaches can support offender-centered efforts, they are best suited to support approaches that are victim centered (Green et al. 2017). Network analyses like those shown in **Figure 2** are frequently used in other public health interventions that deal with high-risk populations, such as intravenous drug users and sex workers (Luke & Harris 2007). Within such a public health framework, efforts to reduce gang violence should focus on victimization risk and harm reduction, not on apprehension and confinement. Such a victim-centered or risk reduction approach toward gang violence can reorient existing narratives around how to address gang violence: Saving lives and lowering levels of gun violence means saving the lives of young people who are often viewed only as offenders or criminals.

To be sure, no data set or analytic approach is without its weaknesses; when decisions can cost lives, it is all the more important for these weaknesses to be discussed openly and honestly. Any use of new data or network analysis that extends to gang violence reduction should be done as transparently as possible—information on what data are being collected and how they are being used should be a matter of public record, accessible to police, social workers, school teachers, and community members alike. Accomplishing this necessary transparency will require careful consideration and the forging of relationships among these varied interests, all of which are embedded in unique demographic, historical, and political contexts. As trying as this process may prove, the time to wrestle with these issues and to have these crucial discussions is now, before interventions are implemented in the real world.

Finally, we urge that the human element of addressing gang violence not be abandoned in its entirety. There is great value in the “experiential assets” of those who are most familiar with the gang members and the streets they spend time on (Kennedy et al. 1997). As sophisticated as SNA analyses have become, the nodes in every network graph will always represent people. Generating a network graph, circling a dense cluster of nodes, and going out to make arrests or provide outreach is ill advised, if not blatantly dangerous. Instead, we would do well to take heed of the example set by gang scholars who recognized the value of direct observation of gang members, as well as the knowledge of street outreach workers and police officers. Human relationships are far from static, and it would be folly to believe that any network picture can capture the totality of rapidly shifting, dissolving, and emerging relationships on the street. It is only by tempering our analyses with the expertise of teachers, street workers, and police that nodes and ties can become the individuals and relationships that can then be targeted to reduce gang violence.

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