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Social Network Analysis of Organized Criminal Groups

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Overview

This entry discusses the state of the art in the application of network analysis methods to the study of organized criminal groups. It provides an overview of the development of the field from both the academic and law enforcement perspective and discusses the current approaches in the literature. Particular attention is given to methodological issues (data sources, type of network analysis) and to the discussion of the limitations of the application of social network analysis to criminal organizations. In the light of the current state of the art, the entry also discusses the recurrent claim that network analysis may help the law enforcement agencies to more efficiently disrupt criminal networks. Finally, it attempts to identify the future trends in the application of network

methods in the study of organized crime, while suggesting some promising paths from both a research and policy perspective.

Introduction

The use of social network analysis (SNA) in criminology is a relatively recent trend compared to other social sciences. Among the multiple possible applications of SNA in criminology, it may be hard to identify trends and specific fields. Carrington (2011) has identified three main topic areas where network methods have found significant application in criminology: The first is the analysis of the influence of personal networks on delinquency and crime which, according to the author, is "the most common use of social network analysis in criminology" (Carrington 2011, 236). The second area is the influence of neighborhood networks on crime in the neighborhood. The third area is the organization of criminal groups and activities. In turn, the latter may be framed into three fields: The first concerns the application of SNA methods to terrorist networks; the second deals with street gangs, youth gangs, and delinquent groups (Carrington 2011, 244–246); and the last, discussed in this entry, concerns organized criminal groups.

The application of SNA methods to organized crime has a background which is based on the history of both research and law enforcement.

From the research side, the idea that organized crime may be better understood as a network rather than a hierarchical and structured organization is not new in criminological literature. The reaction against the alien conspiracy approach, which suggested to analyze organized crime as a bureaucratic organization, organized along a formal hierarchy and with detailed rules for its functioning, soon led to the alternative hermeneutic perspectives leaning towards more flexible and informal mechanisms. For example, Albini argued that organized crime is "a system of loosely structured relationships," mainly based on patron-client relations (1971, 288); the works of Ianni suggested that mafia-type organizations should be better understood as social systems based on shared social cultural and ethnical relations. He explicitly mentioned network analysis, as "an anthropological tool that is used to chart social interactions" (Ianni 1973, 4). Ianni analyzed a number of Puerto Rican and African-American criminal groups as networks, although the application was quite far from current use. Overall, although the concepts of network and network analysis were recurrently evoked to describe the functioning and structure of organized crime, there were very limited empirical applications using network analysis methods (Ianni 1973).

From the law enforcement side, since the mid-1970s there has been a growing attention on the processing and analysis of intelligence data in organized crime. In this context, link analysis (visual representation of the structure of a criminal group performed through manual or computer-assisted drawings) was increasingly applied by law enforcement agencies and a private industry quickly developed offering methodologies and training courses (Lupsha 1983, 63). Link analysis allowed to "establish the relationships that exist among individuals and organizations from bits and pieces of available evidence" (Harper and Harris 1975, 158). It became increasingly popular thanks to the development of intelligence software. The step from link analysis to SNA was relatively short.

Academic interests on organized crime networks gradually met with law enforcement network analysis attempts. Not surprisingly, Ianni and Reuss-Ianni, who had refuted the bureaucratic approach to organized crime for the social system approach, contributed to a volume on criminal intelligence analysis suggesting it be applied to organized crime (Ianni and Reuss-Ianni 1990). Indeed, from the very beginning, this idea was linked with its operational exploitation for law enforcement, at a time when the focus on strategic intelligence and analysis of organized crime was very strong.

Indeed, the first contributions in this field, dating back to the first half of the 1980s, already focused on the opportunities offered by network analysis in the strategic analysis and enforcement of criminal organizations (Davis 1981; Lupsha

1980, 1983). In his 1980 contribution Peter Lupsha suggested that effective enforcement of organized crime required a move towards strategic analysis of groups and operations. He suggested some "first steps that departments might engage in to move from a tactical to a strategic analysis perspective" (1980, 37). Among such steps, he included network analysis as an "essential and necessary step" (1980, 38). One year later, FBI Special Agent Roger Davis provided a first hypothetical example of the application of network methods to a criminal organization, using some basic network concepts, such as density and centrality, to a fictional criminal organization (Davis 1981, 18). One of the first empirical network analyses of a criminal organization was carried out by Lupsha (1983). The study focused on "The New Purple Gang," a group trafficking in heroin and cocaine active in the New York City metropolitan area in the second half of the 1970s and composed of Italian-Americans with connections to La Cosa Nostra. The author maintained that his study was an application of network analysis and actually developed matrixes and graphs. Rather, the study merged broad concepts familiar to network analysis, such as reciprocity and ego network structure, with other approaches and data. Interestingly, some of the most common network analysis concepts, such as centrality, were barely mentioned. As a result, Lupsha's study provided a first exploration of network analysis of organized crime, demonstrating how multiple methods could help to extract relevant information from police data.

In the following years, some scholarly contributions advocated the application of network methods to criminal organizations (among the first contributions Ianni and Reuss-Ianni 1990; Sparrow 1991). However, most of these nowadays "classic" contributions, albeit with some exceptions (e.g., Lupsha 1983), did not engage in empirical analysis of criminal groups, possibly due to the limited availability of datasets and software. Interestingly, Mastrobuoni and Patacchini (2010) and Papachristos and Smith (2011) have recently demonstrated that old law enforcement databases and archives may provide valuable opportunities for the application of SNA to organized crime. Not surprisingly, only 10 years ago, Coles still complained about the "failure by criminologist to adopt Social Network Analysis techniques and concepts in the investigation of criminal networks, particularly of organized crime".

Only in the last decade the use of network analysis in the study of organized crime has seen significant developments. Since the beginning of the 2000s, interest in this specific field has significantly increased and contributed to opening new research directions in the study of criminal organizations. Indeed, the number of articles and papers on criminal, illicit, or, more generally, "dark" networks has grown only since the 2000s. Significantly, a special issue of a specialized academic journal was dedicated to SNA and organized crime (*Trends in Organized Crime*, Volume 12, Number 2/June 2009). Studies on criminal organizations are now an important sector in this increasing trend. The following sections of this entry attempt to review the current state of the art of the application of SNA to organized crime groups and to discuss present issues and future trends.

Criminal Organizations and Markets

In a very rough categorization, most current applications of SNA to organized crime have adopted either a "micro" or a "macro" approach.

Studies within the "micro" approach have normally focused on one organization or network with a relatively low number of nodes. One of the first examples was Natarajan's study of a cocaine trafficking organization (2000). The study provided a detailed analysis of the structure and functioning of a criminal organization, through a mix of multiple methods (contact analysis, task analysis, status analysis, and network analysis). As to SNA, Natarajan applied some network concepts (centrality and density) and demonstrated that a systematic quantitative analysis of law enforcement and judicial sources could complement more traditional research methods in the study of higher-level drug trafficking.

In the following years, further empirical works have contributed to analyzing criminal organizations using network analysis. Most of them focused on drug trafficking (Morselli 2005, 2009; Calderoni 2012; Malm et al. 2011; Bright et al. 2012), but some studies analyzed car-rigging organizations (Morselli and Roy 2008), extortion/money-laundering activities (Varese 2006), or the structure or evolution of a prominent criminal within a New York mafia family (Morselli 2005).

As to drug trafficking, the application of SNA has provided unprecedented insight in the structure of trafficking organizations. In most drug-trafficking networks, a subset of nodes concentrated the majority of criminal contacts and communications. This emphasized that drug trafficking was mostly conducted by a subset of highly connected and active individuals who were able to bring different people and resources together. In general, these subjects were skilled criminal brokers tasked with the management of drug-smuggling operations. Conversely, the majority of nodes involved in drug-trafficking groups appeared to be marginal players, involved only in one specific operation or task. On the one side, the results revealed a specific organizational structure of drug trafficking. This was a rather horizontal structure, ideal for a flexible and fast-changing environment, where criminal activities and illicit partnerships depended more on criminal opportunities than on any internal organizational arrangement. On the other side, the mentioned structure did not correspond to an extremely elaborated hierarchy where different organizational layers/ranks could be observed and where bosses delegated to underbosses or capos who in turn command soldiers. Signals of structure and hierarchy did not emerge from the network analysis, but rather from complementary methods highlighting the informal division of tasks and differences in status among the participants. Overall, leaders/brokers were actually in contact with most of the other individuals in the criminal networks and maintained direct control over the criminal activities. Hardly any traces of delegation and rigid organizational layers were found, and this is probably due to the highest risks that may be faced due to information dispersion, lack of trust, and difficulties in controlling subordinates.

This picture was substantiated by evidence coming from different studies on drug networks from a variety of countries and typologies of criminal organizations, such as the United States, Canada, Spain, Australia, the UK, and Italy. These findings were consistent with, and provided further empirical evidence to, previous drug-trafficking research.

Studies within the "macro" approach have developed in very recent years, possibly because they were based on larger and more complex databases. They have generally analyzed larger networks, focusing on specific national or regional criminal markets or offender categories. This research has aimed at analyzing specific aspects of criminal networks and population. Malm and Bichler studied a network of 2,197 individuals derived from law enforcement intelligence data in Canadian Pacific Region (Malm et al. 2009; Malm and Bichler 2011; Malm et al. 2011). They used multiple networks (co-offending, kinship, formal organization, and legitimate association) and this allowed to focus on the interplay of different types of connections (e.g., family relation or partnership in legal business) within a large network of individuals involved in criminal organizations (Malm et al. 2009). In another study, they focused on a subset of 1,696 individuals involved in drug trafficking and analyzed the network characteristics of specific market niches (i.e., specific tasks within the drug-trafficking chain) (Malm and Bichler 2011). They have also explored the extent of co-offending patterns among criminal groups of different (ethnic or nonethnic) origin (Malm et al. 2011). Heber (2009) studied a sample of 127 serious drug offenders (principal offenders) in Sweden and further enlarged her network including the principal offenders' co-offenders and eventually the co-offenders of the latter. As a result, her network included several thousands of offenders allowing an analysis of their distribution across the Swedish territory and of the structure of drug-trafficking activities. Some further contributions focused on American

organized crime, namely, in Al Capone's Chicago (Papachristos and Smith 2011) and La Cosa Nostra in 1960 (Mastrobuoni and Patacchini 2010).

Overall, network studies have pointed out that the majority of drug-trafficking (and other criminal) groups are flexible and rapidly changing organizations, hardly fitting the typical pyramidal picture which is frequently suggested by the media and sometimes by law enforcement. Network analysis has contributed critically to the production of empirical evidence in this field.

Methodologies

Compared to the most advanced application of SNA in other social sciences, the methods currently applied in most criminological contributions may appear somewhat simpler. This may be due to the relatively recent development of network approaches in this specific field. In turn, this may imply a limited experience of most criminologists in the application of SNA but also, and more critically, a limited scientific acceptance of such methods within the discipline. Not surprisingly, in the past years most criminologists applying SNA have experienced difficulties in publishing in mainstream peer-reviewed journals. Another reason for the relative lag in the application of more complex network methods to organized crime may inherently relate to the this specific field. Indeed, available data on criminal organizations and criminal markets rarely allow to apply more complex analyses such as dynamic network analysis (DNA), multiplexity (multiple types of relations, e.g., co-offending, phone communications, and kinship), and exponential random graph models which would allow to study the evolution of organized crime networks in time and structure. Notwithstanding these difficulties, some studies have applied ERGMs and multiplex relations (Malm et al. 2009) and one recent paper announced further developments in the field of organized crime (Papachristos and Smith 2011).

Concerning data sources, the majority of studies relied on secondary data. Most micro studies used judicial documents, intelligence reports, or investigation files. Macro studies have used intelligence databases collected by law enforcement agencies (Malm and Bichler 2011; Malm et al. 2009; Heber 2009) or databases created through archival analyses (Mastrobuoni and Patacchini 2010; Papachristos and Smith 2011).

As for the types of SNA, most of the literature on organized crime groups has worked with complete (or whole or full) networks rather than the ego networks, differently from other main areas identified by Carrington (2011). Indeed, the complete network approach is naturally suited to the analysis of criminal organizations or criminal markets. Nevertheless, some studies used ego network approaches for studying the career of a prominent La Cosa Nostra member (Morselli 2005) or the impact of drug dealers' personal networks on their survival and success (Bouchard and Ouellet 2011) and the co-offending patterns among different typologies of criminal enterprises (Malm et al. 2011).

Within the full network perspective, the overwhelming majority of the reviewed contributions have focused on one-mode networks with individuals as nodes. Exceptionally, some contributions used two-mode networks with individuals and specific positions in the drug-trafficking chain (Bouchard et al. 2010), while another study, focusing on the world drug-trafficking market, elaborated a full network with world countries as nodes (Boivin 2011).

As already pointed out by Carrington (2011, 244), most network analyses of organized criminal groups are not particularly concerned with the testing of specific criminological theories. Nevertheless, most studies are concerned with the verification of hypothesis and concepts suggested by previous literature on organized crime (Natarajan 2000, 2006; Varese 2006; Morselli 2009; Malm et al. 2011). The existing literature shows a wide variety of approaches and different methods as to the network measurements and concepts. The most popular concepts are density and centralization, the analysis of subgroups (e.g., factions, cut-points, core-periphery), and the centrality of individuals (e.g., degree, betweenness, flow betweenness, eigenvector,

closeness, clustering coefficient). Some contributions have merged network analysis with other methodologies such as script analysis (Morselli and Roy 2008), the content analysis of transcripts (Natarajan 2000; Varese 2006; Natarajan 2006; Calderoni 2012; Campana 2011), or spatial analysis (Malm et al. 2008).

Finally, a number of contributions discussed the theoretical, methodological, and practical repercussions of the application of SNA to organized crime groups (e.g., Morselli 2009). These works signal the ongoing meditation about the implications of network analysis in the study of organized crime.

Problems and Issues

One of the main problems encountered in studies applying social network analysis to organized crime is data validity and reliability. The different data sources used in the literature are all exposed to possible biases. Indeed, most of them are secondary sources originating from judicial cases, law enforcement, or intelligence databases. Inevitably, the analysis based on such sources will reflect the perception of law enforcement. Interestingly, however, most of the abovementioned problems seem to be inherent to organized crime research in general. The biases affecting network analysis are often likely to occur also when using alternative methodologies. Indeed, scholars using network methods frequently reported difficulties in controlling for law enforcement biases, and they discussed the possible limitations of their analyses in detail (Morselli 2009, 44–50; Bouchard and Ouellet 2011, 83–85; Varese 2006, 45–47; Calderoni 2012; Malm et al. 2009, 70–71). A recent contribution further explored how the selection of different judicial sources affects the extracted networks (Berlusconi 2013). In general, authors appeared aware of the limitations of their studies. This has not spared criticism and skepticism towards the uncritical use of network methods in the study of organized crime. Undeniably, some contributions have exploited the growing interest in network analysis and have inserted it in

the titles, abstract, or keywords, but without actually using any network analysis concept. This may suggest that the increasing use of network analysis may have generated some side effects, not excluding the unnecessary abuse of network-related terminology and techniques, just because this has become "fashionable." Besides such collateral effects, critics have rarely pointed out what alternative methods could replace the advantages provided by SNA. In fact, an increasing number of scholars are using network methods and concepts and applying them to the study of criminal organizations in different countries. This general trend suggests that SNA may actually bring significant added value to this field.

Concerning the risk of biases related to the law enforcement perception of crime, this appears to be a major issue particularly for studies adopting a macro approach. When trying to analyze regional or national markets, these studies most often reflect law enforcement knowledge of markets and criminal networks. The validity and reliability of the sources relate to the effectiveness of law enforcement and to the quality of the databases. Inevitably, however, any law enforcement source is inherently incomplete. Individuals and activities not (yet) uncovered or investigated by law enforcement will be missing (Sparrow 1991, 268; Bouchard and Ouellet 2011, 84; Malm et al. 2009, 70–71).

Also studies adopting a micro approach, focusing on specific groups or networks, may be affected by the mentioned problems of validity and reliability. However, these problems may have a lower impact than in the case of macro studies. Focusing on particularly long and detailed investigations is likely to reduce the risk of missing data in a criminal network. When law enforcement has been intercepting and monitoring a criminal group for months, if not years, the chances for some skilled criminal to avoid detection are likely to be low (Morselli 2009; Calderoni 2012). Nevertheless, the risks that law enforcement may have misunderstood or misjudged the relevance of specific nodes remain and so also the possibility of a willing omission by the police (e.g., this may be the case of informants or undercover agents which have not yet been disclosed).

Interestingly, recent studies have demonstrated that network properties and measures are strong even if tested for missing data (Morselli 2009, 48; Malm et al. 2009, 70–71). Although these findings are encouraging as to the validity and reliability of network methods applied to organized crime, there is a need of further research in this direction.

Social Network Analysis as a Tool for the Enforcement of Criminal Organizations

As already discussed, one of the main drivers of the development of network studies on criminal organizations has always been its possible application in law enforcement. Scholars have claimed the operational benefits of network analysis for intelligence and investigations for years. Given the increasing interest in network analysis of organized crime, a number of law enforcement agencies have started to apply SNA in their criminal investigations, and some contributions from law enforcement analysts acknowledged the use of network methods in the enforcement of criminal organizations. However, operational results so far appeared quite weak and many law enforcement agencies showed some skepticism towards the application of network methods in organized crime cases. Although this may be related to some difficulties in cooperation between law enforcement and academics in general (an issue which is not limited to the application of network analysis and which goes largely beyond the scope of this entry), discussion with law enforcement analysts (from Germany, the United Kingdom, the Netherlands) who have actually experimented network analysis in their job provides more detailed information. According to their experience, the current applications of network analysis are not likely to provide critical advantages to law enforcement agencies in their everyday investigations. Indeed, in long-lasting investigations, the police normally acquires a detailed knowledge of the case. Each individual is monitored, her/his background scanned, and phone and e-mails are frequently intercepted. The application of SNA can hardly provide any additional knowledge to the officers and prosecutors working daily on the case. The idea that SNA can effectively identify the most important actors and show the police the most efficient way to disrupt a criminal network does not take into account that the police normally has a far better insight on the case than any researcher. More often than not, scholars identify the most important individuals, the best targets for network disruption, and the "usual suspects" that law enforcement had already identified.

This may explain the skepticism so far shown by some law enforcement professionals (some of which are increasingly being trained in SNA methods) when claims are made that SNA can help the police to identify the best targets. Network analysis can assist a researcher in reconstructing a network and in making sense of the structure and functioning of a criminal organization. While these analyses have provided unprecedented academic insight on the structure and functioning of criminal organizations, the risk is that current applications may have limited interest for law enforcers.

The above considerations should not lead to hasty conclusions about the futility of SNA and the enforcement of organized crime. Rather, they suggest that the exchange of experiences between academics and law enforcement should be improved. Notwithstanding the operational limits of current analyses, SNA concepts and methods have gained the interest of many law enforcement agencies around the world. As with most new techniques, it will take time to have it accepted and applied. The future trends discussed in the next section suggest that the use of SNA in the enforcement of criminal organizations may become a reality.

Future Issues and Trends

As already mentioned, the application of SNA to organized criminal group is a very recent phenomenon. Therefore, it is likely that further developments will come in the next years. Some trends may be reasonably anticipated.

The number of publications will increase. The rate of publications applying SNA to criminal organizations has been significantly growing, and this trend should continue, if not increase, in the coming years. Hopefully, this may improve the overall quality and standards in this specific field. It will also prevent and eventually remove the inappropriate exploitation of the word network analysis in contributions which do not actually make any use of SNA methods and concepts. Eventually, this may provide SNA applications wider academic acceptance in this specific field and reduce skepticism about the network methods.

Further, the increase in the number of published works will likely provide more empirical studies of specific organized crime groups (micro approach) and/or markets (macro approach). At the moment, the promising results produced by the first papers need further support or verification with other groups and countries. The replication of methodologies and analyses will play an important part until a critical mass of criminal networks and datasets will be analyzed and available.

The methodology will improve. As already mentioned above, so far most SNA studies on organized crime have applied relatively basic measures and concepts. Although this is not necessarily a problem, since also very basic analyses have provided valuable results, the forthcoming years will likely bring new, more complex network methods to be applied also in the study of organized crime groups. Inevitably, the main challenge in this direction will be data availability and, ultimately, the improvement of data collection procedures by law enforcement. The availability of new and better data sources will likely allow the application of advanced SNA techniques such as dynamic network analysis, multiplexity, and ERGMs. These will provide new avenues for analyzing the structure of complex networks and their evolution through time.

In addition to more complex network techniques, future studies will likely mix network methods with other methods, both quantitative and qualitative. Network analysis can be complemented with other quantitative techniques

such as spatial analysis and hotspot analysis. Furthermore, the inherently quantitative approach implied in SNA may provide the best results when balanced by qualitative analyses. Studies within the micro approach may take advantage of a detailed analysis of the case studies, including interviews with law enforcement to verify possible biases, interviews with network participants, or content analysis of judicial sources and transcripts (Campana 2011). As anticipated by Morselli, "content analysis is indeed the next step toward enriching the various analyses conducted throughout this book" (Morselli 2009, 164).

SNA and the enforcement of organized crime groups. Notwithstanding the issues highlighted in the previous section, future improvements of network applications to organized crime groups may provide interesting developments for the operational/enforcement point of view. In particular, SNA may be applied not only within investigations, but across different investigations. This contribution may have a geographical and a chronological dimension.

From the geographical perspective, criminal organizations are frequently operating in different areas which may not always be within the jurisdiction of the same law enforcement agency. This is particularly true for large criminal organizations such as mafia-type associations which may commit crimes in different countries. Inevitably such extended criminal activity is likely to involve a number of different police forces and prosecutors' offices, with increasing problems in coordination and information sharing. Different cases and files are going to be opened. It may happen that a marginal subject in the investigation led by District A shows up to be a high-ranking criminal in the investigation conducted by District B. The application of SNA methods across investigations may provide critical information which would not otherwise be available to the single investigators/prosecutors. Through network analysis it may be possible to merge investigative data from a number of cases and provide an overall picture which may be otherwise too complex or difficult to achieve. The literature has already provided some examples

of SNA studies merging data from different investigations (Morselli 2009, Chaps. 8 and 9). Results demonstrated that network structure and positioning may significantly change when different cases are merged.

From the chronological perspective, some criminal investigations are capable to survive prosecution and convictions. Frequently, family ties and kinship provide important connections among the members, and this allows such criminal groups to last over years. Mafia-type organizations (e.g., the five families in New York) may last for years, notwithstanding constant law enforcement monitoring and repeated prosecutions. In these cases, it may be important to achieve a very good knowledge of the history of a criminal group. Surely, prosecutors and policemen achieve excellent knowledge of the most dangerous groups in their jurisdictions, but in some cases this important knowledge asset may be dispersed due to reorganization, retirement, transfer, or resignation. The application of network analysis may provide important strategic information about the development and structure of a single criminal organization through time. Furthermore, SNA may allow to assess the changes and reactions of criminal organizations as a reaction to law enforcement. In this perspective, Morselli and Petit showed that systematic drug seizures by law enforcement had a significant impact on a criminal organization, although the group was to continue its operations for months (Morselli and Petit 2007). Further studies may analyze the impact of arrests (either random or targeted) on criminal organizations, applying dynamic network analysis techniques to organized crime groups. Ultimately, this may allow law enforcement agencies to estimate the impact of different strategies and investigations on the evolution of the structure of large and continuing criminal organizations. SNA methods may represent a valuable quantitative benchmark in this evaluation.

In conclusion, organized crime is one of the last criminological areas where SNA methods have been applied. If Carrington has argued that "the use of social network analysis in criminology is in its infancy," this is even more relevant for the use in the study of organized criminal groups. In the last 10 years, important steps have been made. The progress are encouraging and it is likely that, through the trial and error which is one of the basic methods of science, SNA will play an important part in the study of organized crime in the next years.

Related Entries

▶ Gangs and Social Networks
▶ Neighborhood Effects and Social Networks
▶ Network Analysis in Criminology
▶ Social Network Analysis and the Measurement of Neighborhoods
▶ Social Network Analysis of Urban Street Gangs
▶ Spatial Models and Network Analysis

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Social Network Analysis of Urban Street Gangs

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Overview

This entry synthesizes the current state of network-related research on street gangs around the themes of network structure, network action, and network location. At their core, street gangs are social networks created by the coming together, socializing, and interacting of individuals in particular times and in particular places. The employment of social network analysis has the potential to examine patterns of interaction among gang members and gangs, illuminate structural variation across gangs, and measure the influence of gang networks on individual action. This entry includes an overview of social network analysis, suggestions and directions for future gang network research, a discussion of limitations, and a vision for how a social network approach to gangs might inform theory, research, and practice.

Introduction

Over the past decade, the field of criminology has increasingly employed both the theoretical and