

The Structure of Criminal Networks

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Abstract

Crime is a social activity, creating networks of individuals. Networks are a fundamental part of human social behaviour, and similar processes will occur with any groupings of people. Group processes, organizational behaviour and economic theories have all been used to examine criminal networks, each with their own limitations and strengths. Each approach taps into part of the underlying social structures that shape and influence the behaviours of individuals, their networks and the markets in which the networks operate. A wide variety of research has been carried out that implicitly studies the structure of such networks. The problem with the majority of the previous research is that assumptions are made about network structures. Before categorizations based on the structure of criminal networks can be developed, the structure itself must be studied. The structural themes indicated by the previous literature raise a number of questions about the nature of criminal networks - how structured are such networks; what are the structural aspects of the networks, e.g. are there key individuals and core groups; is there any consistency in network structure between criminal networks within the same market, e.g. drug trafficking? The Structural Analysis approach, with techniques from Social Network Analysis, allow for the examination of patterns of interactions between criminals. Data was drawn from police intelligence files. Drug networks were found to be the most structured, e.g. key members in positions of control, distinct core groups, other distinct subgroups. Research on drug networks has highlighted the roles of leaders and core groupings, using other members of the network as "workers." This kind of structure is necessary to survive in the fluid, higher risk markets that make up the drug trade. Separation of leaders from actual involvement with drugs reduces risk. Property crime networks also featured key individuals, but core groupings were less frequent. Distinct subgroups were fairly common, with many members being only connected to key members. Property networks were generally less structured, as markets were lower risk, though still with differential levels of power and influence within the structure. Handlers features prominently in the networks, as central to the structures. Exploratory analysis of two organised sexual abuse networks had key members with overall structures forming simple chains and stars of associates. There are structures to criminal networks, and consistencies across those structures within network types. Such an approach is effective when studying legitimate entrepreneurial networks, and for understanding the hidden, informal and incredibly important networks that exist in formal organisations. Structural analysis of criminal networks can likewise benefit, both for academic research and for the practical benefits when used in intelligence analysis, with a number of practical applications for the Social Network Analysis techniques employed in the study.

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Chapter 1. Crime as Social Process

Few offenders operate in a vacuum, never interacting with other criminals. Specific crimes, such as armed robbery and burglary, often involve teams which can be viewed as small groupings of individuals interacting with each other (Walsh 1986). In a broader sense, the solo burglar must dispose of property taken, and so connect into a larger network made up of those who steal and those who handle stolen goods. Even those offenders who commit "solitary" crimes, such as child sex abuse, usually have previous convictions for other crimes and so are part of these larger networks (Canter and Kirby 1995). Offenders meet when serving time together. Friends and associates of offenders may also commit crimes though not with those offenders, also creating connections. These social connections can lead to sharing new methods of committing crime, identification of potential targets, information about police activities and opportunities to be part of specific criminal enterprises. Criminals, like all humans, are part of groups and these groups shape their behaviours. This does not detract from the study of the criminal as an individual. We can not, however, afford to ignore the social aspect of criminality, be it as explicit as professional armed robbers or the implicit groups of friendships and business associates. A number of approaches have been taken to try to come to terms with the role social processes play in criminality. The three most prevalent forms have been

- crime as a group activity - where individuals, usually in face-to-face interaction, act as a group to carry out their crimes, e.g. juvenile gangs and arson (Fritzon 1998)
- crime as an organisational goal - accounts of collective criminality which draw on organisational theory and research, e.g. traditional views on the Mafia - Sterling (1990), for example

- crime as taking place in a market system - where the crime examined are described in the economic terms of the market place, with financial transactions and supply/demand forces, e.g. the market in stolen goods (Sutton 1993)

These approaches are described in more detail below. Each catches the essence of the specific types of collective crime they address or some features of the sociality of crime. They are problematic in that they fail to cover the full spectrum of possible social interactions that occur amongst criminals. A fourth approach, the structural analysis of criminal networks, is given as an alternative that addresses the gaps inherent in the other three approaches.

Crime as Group Activity

A number of researchers have examined social criminality in terms of activities carried out by groups. This covers a wide range of research, including work on juvenile gangs and co-offending, as well as work on small groups of offenders who work together to carry out specific crimes, e.g. armed robbery. When describing the process by which these groups function, the general approach has been to draw on social psychological theories of "group." Individuals within any group that forms for some reason, be it circumstance or towards a particular goal, take on certain roles. Essentially, they become actors in a loosely constructed script that revolves around belonging to that group. The more involved and complex the group is, the stronger the likelihood of more complex and varied roles. In a sense, the scripts created merely by the existence of the group can take on something of a narrative - a story or stories that enables the person involved to make sense of their life and events around them (McAdams 1988; Pondy 1983). These narratives shape both perceptions of the group and how individuals interact. Professional armed robbers, especially those who are part of group that repeatedly offend together, would have narratives not only of themselves as individual actors 'of the role of the "armed robber," but also as part of the team. This would include the impact of the group on his life and how much it is central to his life, probably including how successful they are and how they form a sort of elite in the criminal world. Terrorist groups and cults are just the extreme end of submergence into the group narrative. Our narratives are not constructed around who we see ourselves as, but also what we see ourselves belonging to. The narratives allow us to construct personal identities based on social constructs (Hogg and Abrams 1988). These identities, in turn, impact on intra- and intergroup behaviour.

Research on groups can be broadly divided into three groups - research on the effects of the individual on the group, the group on the individual and general group processes and

behaviour. Individual influence on groups includes work on different leadership styles, such as the tripartite division of authoritarian, democratic and laissez-faire styles (Lippit and White 1943), and the difference between task-orientated and socio-emotional leaderships (Slater 1955). Work on group influences on the individual has explored processes for indoctrination when joining groups, as well as such phenomena as "Groupthink" (Janis 1972) and polarization of attitudes. General group processes that have been focussed on have included biases in favour of in-group individuals over out-group individuals (Tajfel, Flament, Billig and Bundy 1971), competition and cooperation between groups (Sherif 1967) and how centralised and decentralised structures impact on performance in simple and complex tasks (Shaw 1981).

Much of the work on juvenile gangs has been based on the concept of them as groups. Gangs are perceived as collections of youths who spend a significant amount of time together, engaging in a wide range of behaviours only some of which are specifically criminal in intent (Warr 1996). Reiss (1986) described two different roles individuals involved in delinquent groups take on - recruiters and joiners. Recruiters actively seek out new members, promoting the survival of the group. Joiners contribute to the gang, but do not carry out efforts to secure new members. Warr (1996) found that about 90% of delinquent incidents began with one member of the group. The instigator was usually older than the other members, usually male, tended to have more previous offences, and was usually a close friend of all the joiners. Both recruiters and instigators are constructed as leaders of their groups, as described in the social psychology literature on leaders - they encourage the development of the groups and they initiate the delinquent activities. Hoghughi (1983) argued that leadership roles were not so clearly defined, nor were delinquent groups that well defined, and were consistently shifting and changing. The author did feel the group nature of delinquency was a key factor. Collective activities, delinquent or otherwise, were "more fun." To Hoghughi, group interaction was so important that the best way to reduce delinquent behaviours was by putting delinquents in prosocial groups. Thornberry, Lizotte, Krohn, Farnworth and Jang (1994) carried out

a longitudinal study of delinquents, with the role of delinquent peers being one are of focus. The authors presented three models of the causes of delinquency:

- socialization - where delinquent behaviour comes out of beliefs and peer influence
- selection - beliefs and peer choice come out of delinquent behaviour
- interactional - both socialization and selection take place, building on one other.

Analysis of the relationships between delinquents peers, beliefs and actions for a sample of 841 youths found that the interactional model was most effective. Delinquent actions led to contact with delinquent networks that, in turn, led to more delinquent acts.

Co-offending research, such as the large-scale projects carried out by Farrington and associates (1990) are not explicitly aimed at examining the social processes that make co-offending occur. The aim is more of identification of trends in criminal careers of individuals. Their work does highlight some features that relate to groups of offenders carrying out crimes together. There is a general drop off in the amount of co-offending as individuals get older. When co-offending did occur, the crimes involved were typically property types - burglary and breaking into cars, for example. The length of time spent co-offending was generally found to be for short periods of time. This finding matches with research carried out by Warr (1996), which found that individuals draw on a pool of general associates to select co-offenders for any given crime. The pool itself is fairly consistent, but there is a great deal of variation in the subsets used to co-offend with. Hagell and Newburn (1994) found in a sample drawn from the Midlands and two London Boroughs that for 2885 offences, only 17.8% of the 531 young offenders had committed their offences alone. The problem with much of this research is that each focusses on a narrow subset of all the forms of criminal collective activities. They offer much in the way of insight into the immediate group processes involved in the interactions amongst members. There is less that can be drawn on to obtain a deeper understanding of criminals interacting with each other in less immediate ways. How can this approach deal

with complex networks such as those in drug trafficking? Waring (1993) made a number of points about the appropriateness of applying the concept of the group to collective criminal activities:

- Criminal activities often result in some offenders never meeting. As a result, classical definitions of a "group" would be inappropriate, as the members of the network may not see themselves as such.
- Any criminal activity that has a certain amount of specialisation and complexity, like some forms of white-collar crime, requires certain skills. More than one individual would be necessary to carry out the task, resulting in the development of complex networks rather than simple groups.
- It is difficult to apply traditional notions of static formal groups to criminal activities as they are often highly adaptable, and can easily alter or cease to exist (Powell 1990). This is particularly useful when carrying out illegal activities.

A number of researchers and journalists have identified a trend in gangs towards increased size, geographical spread and sophistication (Kleinman and Smith 1990; Hunt, Riegel, Morales and Waldorf 1993). As such gangs as the Bloods and Crips begin to take major roles in American drug dealing, for example, they can no longer be defined as gangs. They shift towards a form of proto-organised crime groups. "Organised crime" has continued to be the most researched form of criminal collectives. The approach taken towards it, however, is the extreme opposite of the group approach - viewing criminal enterprises as illegal corporations.

Crime as Organisational Goals

The second approach to the study of collective criminality has been based on a largely organisational view of their structures. The criminal organisation represents a diametrically opposite position to the work on criminal "groups." The organisational structure of the group, the roles and task specialisations of individual members, the chains of command all mimic processes found in research on corporations that engage in legal business transactions. Research on organisations has either been on the internal processes within organisations or the processes of interactions between corporations in external markets. A large section of the internal research on legal organisations has been on the degree of hierarchy in the organisational structure. The two classic structures are the U-shape or tall hierarchy and M-shape or flat hierarchy (Greenberg and Baron 1995). The former represents the most hierarchical, with each section of a level of the organisation answerable only to one person or section in the next level up. An obvious example of this is the military chain of command, where each level follows orders from their immediate superior over those of an equal rank to their superior, and there is a very specific ranking system. The M-shape is still hierarchical, but with multiple sections answerable to single individuals or sections higher up. An example would be a corporation where each manager is in charge of a number of branch offices. Another major area of interest is corporate culture - the norms, values, attitudes that individuals take on board when they become part of the organisational system (Hosking and Morley 1991). McDonalds has a culture of distinct separation between customer and staff (e.g. no tipping or table service) and the concepts of fast and "friendly" service delivery. Similarly, the Disney parks has a whole ethos built up around the Disney experience (see Huczynski and Buchanan 1991, pg 468). The culture is, as for group narratives, a series of scripts about appropriate behaviours and beliefs within the organisation. These scripts allow individuals to develop a sense of corporate identity, which is used by them to make sense of their work experiences (Pondy 1983; Brown 1995). Research on external transactions has

largely looked at competition, cooperation and the processes by which organisations merge. Mergers and takeovers, for example, have been described as taking four forms:

- vertical - two organisations at different stages in the same industry
- horizontal - two similar organisations
- conglomerate - wholly different organisations
- concentric - one organisation moves into a related field (Cartwright and Cooper 1992)

Takeovers can be friendly, contested, where issues have to be resolved before it can take place, or openly hostile. Mergers are when two organisations agree to join.

Much of the work carried out on organised crime, taking the organisational approach, has been focussed on the Italian crime groups, i.e "the Mafia." The concept of a well-developed criminal organisation or underground has been a feature of popular concepts of crime since the Victorian era (Chesney 1970), but rose to prominence in the 50's and 60's in America with a series of federal hearings on organised crime (President's Commission 1967) and the research that emerged out of their findings. The first major proponent of this position was Cressey (1969). Work by Lewis (1967), Hess (1973), McIntosh (1975), Sterling (1990) and other researchers followed on from this, along with a deluge of journalistic accounts and biographies/autobiographies of Mafia members, such as the movie "Goodfellas." This model was supported, in the main, by law enforcement definitions of "organised crime:"

Organised crime is a society that seeks to operate outside the control of the American people and their governments. It involves thousands of criminals, working within structures as complex as those of any large corporation, subject to laws more rigidly enforced than those of legitimate governments. Its actions are not impulsive but rather the result of intricate conspiracies, carried out over many

years and aimed at gaining control over whole fields of activity in order to amass huge profits." (President's Commission 1967)

Each work took as a starting point the fundamental assumption that Mafia structure mirrored that of an American corporation, rather than actually attempting to determine if this assumption was accurate. Internally, it was asserted, the hierarchy of the Mafia had a very rigid structure. The family was composed of a series of levels. The head of the family, who was the final arbitrator and decision maker, has his underboss, a go between who could fill in as boss when required. At the same level as the underboss would be an advisor. Underneath the underboss were the "caporegime" who each supervise groups and act as intermediaries with the general "soldati." The bottom ranks ran individual enterprises and had contact with non-family members. There were also positions for enforcement of laws and corruption of public officials. This culture was one built around concepts of "made men," loyalty, secrecy and acceptable uses of violence and coercion. Made men were the inner core of any Mafia, those deemed worthy and trustworthy enough to occupy positions of worth. Loyalty and secrecy were absolutes, with failure receiving a violent response. Use of violence against those outside the organisation, when sanctioned, was expected and natural. Like any major, complex organisation, the Mafia was involved in a wide variety of activities, both legal and illegal (e.g. loan sharking, drug trafficking, prostitution, racketeering, entertainment). Externally, there were disputes between Mafia groups over territories or markets that led to violent conflict, but there was a "Commission," that acted as a council to prevent such situations from getting out of control. Takeovers manifest themselves as violent conflicts between rival factions or competing families. The most famous "takeover," which was used as the moment when the Mafia in America became corporate, was the "purge" that took place around 1931 resulting in the deaths of 30-90 old-style Mafia leaders. They were replaced by the men that would shape the Mafia into the organisational structure described above. This incident, along with the whole corporate structure to the Mafia, has been extensively examined and refuted (see Block (1978) for an excellent review of this non-historical

event). These violent takeovers often go on over long periods of time, with individuals on both sides being murdered. They differ little from legal ones in terms of time, as legal takeover bids are often two years in the making (Hunt 1988).

If we accept this approach (an issue discussed in more detail in chapter two), it suffers from the same problem as the group model. The types of criminal activity covered by the narrow definition of a rigid, highly complex hierarchy is such that very few cases of it would exist. Most cases of collective criminal behaviour would fail to meet the description of organised crime. More recently, a number of researchers have argued for a more flexible version of "organised crime." Reuter (1983) took the most extreme position, arguing that organised crime was largely a myth. Arlacchi (1988) put the Mafia in the context of capitalism, explaining how market forces played as much a part in the activities of organised crime as notions of tradition. This shift has also been reflected in law enforcement definitions. A more recent example of this was given by the Home Affairs Committee on Organised Crime (1994), who described the typical, but by no means standard features of organised crime:

- it is a group activity;
- undertaken for profit;
- involving long-term criminal activity;
- frequently international in scale;
- large scale;
- frequently combining both licit and illicit operations;
- involving some sort of internal discipline amongst the group, including use of violence and intimidation. (pg. x)

Contrast this with the first quote. A certain amount of hierarchical structure is possible within the definition, but it is no longer a defining feature to the point of being a corporation. Other work on organised crime has generally supported this broader view.

Jenkins (1992) found that organised crime involvement in the amphetamine (speed) industry in Philadelphia was one of collaboration with "outside" parties, such as biker gangs, and conflict within. This broadening of the definition of organised crime has led to the inclusion of a variety of criminal groups - motorcycle gangs (Project Focus, RCMP 1994), expanding juvenile gangs (see above) and various ethnic groups, such as Russian-speaking organised crime (NCIS 1994). The general trend has been towards a view of organised crime as a series of businesses and entrepreneurial agents operating within various market places, in various states of competition and cooperation, such as the international drug trafficking industry (Williams 1993). This overlaps with the third approach to crime - as activities carried out in markets.

Crime as Marketplace behaviour

The third approach to criminal activities involving multiple offenders is to describe them as essentially economic acts, exchanges of items and money within a market. This is primarily an economic analysis approach to crime. Obviously, the definition of markets extends well beyond the concept of market places, with traders in stalls selling a wide variety of goods, though these environments are excellent opportunities for the passing on of stolen goods. Markets encompass any sort of social environment where there is an on-going exchange in goods and/or currency (Levacic 1991). Stock exchanges, the computer industry and the real estate trade are all markets. Most work on market is concerned with the economic details - trends in profits or losses, market growth or reductions and so on. Outside of this, much of the research on markets has been concerned with the role of various forces on how markets function. One of the basic concepts in market research is supply and demand - the relationship between those who produce items for a given market and those wanting to acquire those items (Marshall 1936). Each has an effect on the other. Increasing or decreasing demand can increase or reduce production, while a drop in supply can increase demand, e.g. the value of antiques is based partially on their rarity. Work has also been carried out looking at competition and cooperation. Competition is a natural part of the market process, where individual suppliers can be seen as in conflict over acquiring as much of the market as possible. Cooperation also occurs, where groups of suppliers can enter into alliances in opposition to other suppliers or where suppliers as a whole can work together to try to control the market, legally or illegally, through such methods as price-fixing (Baker and Faulkner 1993).

At its broadest levels, like most market research, this approach has been used for assessments of levels of drug importation (NCIS 1995) and drug prices and the amounts of money in use at street level drug markets (Edmunds, Hough and Urquiza 1996). At a

more immediate level, this approach has been used to examine the processes involve in the exchange of goods for money. Some of the research in the UK has specifically looked at the market in stolen goods (e.g. Kock, Kemp and Rix 1995). Sutton (1993) carried out a review of the literature on markets for stolen goods, finding that such markets had five main buyers:

- friends and neighbours
- auctions, car boot sales, classifieds
- unsuspecting/unquestioning 2nd hand dealers
- strangers in pubs and similar locations
- professional fences or others who can profit from having a market for the goods

The author argued that demand from these buyers creates the supply, i.e. a section of all burglary, theft and theft from automobiles. By targeting the demand for stolen goods, there would be a knock-on effect on crime rates. This is a typical form of market analysis, where the economic factors in criminal exchanges are examined.

A final angle in this approach to collective criminality has been the study of the informal (or underground or black market) economy. This research covers all economic systems operating outside of the mainstream, including informal, unreported bartering systems, any sort of "under the counter work" and out right illegal activities (Mars 1982; Gaughan and Ferman 1987). Henry (1978) found that such trading systems were endemic in the British economy, with regular exchange of cheap goods between family, friends and colleagues at work. Goods were not necessarily stolen, but large amounts were pilfered from work or acquired through other illegal channels. Much of the research has found that such activities centre around local areas and families and associates, reflecting social systems of networking and support. These kind of interactions resemble the work carried out on criminals' social groups described above - friendships and family. Most of the work in this area examines the structures of the broad markets in which individuals and

groups operate, rather than the specific groupings themselves. A fourth approach to social criminality, one that can be applied to all forms of criminal groups and at the various levels of interaction is Structural Analysis. This approach allows both implicit and explicit analysis of network structures, the latter through the study of patterns of interactions within the networks of criminals.

A Structural Approach to Criminal Networks

The fundamental weakness of the group, organisational and market approaches is that they each cover only a small proportion of the variety of forms of what can be criminal networks - the networks that form between individual criminals which relate to their offending behaviours. These gaps indicate that a different approach is required. The problem with the previous research that does make mention of structure is that assumptions are made about what makes up those structures. A description of a Chinese Triad as "very hierarchical" is vague, at best. What benchmark is used to decide how hierarchical a network is? What is the triad being compared to reach such an assessment? Before we can develop categorizations based on the structure of criminal networks, we need to study the structure itself.

Structural analysis is characterised by a focus on social structure. Structural analysts reject approaches to social analysis that treat individuals as independent units....Their work forms part of a...shift away...from analysing things in terms of the intrinsic characteristics of their individual parts, and toward structural analytic interpretation of phenomena in the light of their linkages with other members of the system. (Wellman and Berkowitz 1998, front page)

The amounts of interactions between members, the roles individuals take on in the group, which individuals do and do not interact and the relative influence of the members are some of the structural aspects that will affect both how the group as a whole functions and how the individuals within the group act. A burglar who is selected to be part of a group working to acquire specific goods for a handler will carry out his or her crimes in a different manner than a drug addict looking for quick money to make a purchase from a dealer. Network structure has an influence on criminal behaviour. The roles that are so important to the construction of group and individual narratives are either maintained or

altered through the interaction between the actors - the group functioning. This functioning typically is designed to meet some goal. A terrorist group aims, in the long term, to bring about some sort of political change. The group will be organized around this. Examining these interactions, then, should potentially reveal information about the roles of the group and the structure that comes out of those roles.

Each of the three approaches have aspects that deal with structure. The group approach best examines the interactions between individuals, exploring such issues as dominance and leadership, but is often hampered by group size. The organisational approach attempts to determine such features as amount of organisation/hierarchy, but limits itself through categorisation rather than explicit examination of the structure. The market approach and the ethnographic studies have come closest to structural analysis, examining patterns of interactions and trying to describe how individuals operate within the social structures of their daily lives and work activities, be they legal or illegal (Letkenmann 1973). Using the broadest definitions of "network," each approach can be viewed as taking a different angle on the analysis of network interaction, in that each deals with the social structure that groups and individuals work within (Frances, Levacic, Mitchell and Thompson 1991). Each of the approaches, in fact, overlaps with the others. The group and organisational approaches share concepts of role division and leadership. Groups and markets have both been described in terms of exchanges between members. Organisations and markets both address issues of the economic factors in criminal networks. Some authors have tried to integrate features of the various approaches when examining criminal networks, essentially carrying out structural analyses, e.g. Hobb's (1995) review of the literature on criminal networks and professional criminals, and Ruggerio and South's (1997) examination of drug markets in the UK. Another area that overlaps with Structural Analysis are intensive ethnographic studies of specific groups, such as crack dealers in a specific location in New York city (Bourgois 1995), the drug-using community in an English town (Plant 1975) or a social group based around a "local" in London (Foster 1990). These studies discuss the social interactions of criminals and the

structures they are located in. These studies have power in terms of depth, as they detail the groups studied in extensive detail. They lack in applicability - the extent to which they can be applied across similar groups is always in question.

Overall, the three approaches detailed above pose more questions than supply answers about the nature of crime as a social process. How much do criminal networks actually organise themselves? Is the amount of organisation dependent on the type of criminal activity being carried out? How do the immediate interactions that take place in groups affect how criminal networks function? To what extent do market forces impact on criminal networks? What is required is an approach that allows for the incorporation of all the aspects of the other models. Structural analysis gives one way of looking at how markets, corporations and other groups operate, regardless of size, amount of organisation or other features. Structural Analysis attempts to understand how networks function by studying their specific structural elements, e.g. are there specific individuals who control the patterns of interactions within the network, thereby giving themselves more power? This approach is described in more detail and applied to the literature on criminal networks in Chapter Two.

Chapter 2. A Structural Analytic Approach to the Literature

As described in Chapter 1, understanding the details of network structure is the main concern of this approach. Fundamental to this idea is that there are relationships between various entities, be they people, corporations, governments or any other distinct unit. The way in which these units interact will have patterns that reoccur with some regularity. These regular patterns are what creates structure in networks. As Wellman (1988) states, these patterns are not random, forming distinctive subgroupings and different levels of individual influence. The CEO of a corporation is the head of the organisation not merely due to their designation as such, but because there is an established pattern of interactions. These patterns are structured in a formal way that place that individual at the top, with influence over everyone else. Wasserman and Faust (1994) summarised the approach in four points:

- Actors and their actions are viewed as interdependent rather than independent, autonomous units
- Relational ties (linkages) between actors are channels for transfer or “flow” of resources (either material or nonmaterial)
- Network models focussing on individuals view the network structural environment as providing opportunities for or constraints on individual action
- Network models conceptualize structure (social, economic, political and so forth) as lasting patterns of relations among actors (pg. 4)

The key point of structural analysis is that assessing the social aspect of human experience is fundamental to understanding that experience, and that social structures are the underlying components of that social aspect. This differs from the other major approach to understanding sociality through the categorisation of individuals into distinct groups.

Indeed, categories that classify individuals can be viewed as aspects of network structure. Collins (1988), for example, explains how different positions in the overall networks of social and economic power make such concepts of “white” and “black” relevant. If we attempt to categorise aspects of networks without first examining and understanding their structures, there is a risk that the assumptions we make will be inaccurate.

The Literature on Criminal Networks

Taking a structural analytic approach entails examining the literature to determine what previous researchers have discovered about the actual structural components of criminal networks. The majority of the work on criminal networks has had some degree of structural analysis within it. Most of this work, however, has described the structure of criminal networks implicitly. While describing the structure has been a major part of the overall account of a network, there is no systematic examination of the structure in detail. At one extreme, some work merely assumes structure. Traditional definitions of the Mafia, for example, make much of the command structure described in chapter 1, but little has been done by those following such a definition to explicitly test it in a scientific manner. More common are descriptive accounts of the nature of the structure, where ethnographic accounts of networks are given, with structural details embedded in the descriptions. There is a subset of the literature that attempts to explicitly examine structure in a systematic way, using some sort of conceptual model to approach the analysis and/or explain the findings. In reviewing the literature, a framework was incorporated where the literature was divided broadly into types of criminal activity - drug trafficking, organised crime etc. Both the implicit and explicit literature were examined together, with more explicit pieces of research indicated as such. This examination will highlight themes about how consistent patterns in network structures are within particular crime types and across types, as well. These themes and, more

importantly, the questions that emerge from them are detailed in the concluding sections of the chapter. The framework starts off with a historical review of the existence of criminal networks, establishing that throughout history crime has had social aspects to it. Themes about the nature of criminal networks begin to emerge even just out of these historical writings.

Early Writings on the Sociality of Crime

Crime has always been a social act. Repeated references to robber bands, teams of pickpockets and criminal underworlds exist in statutes and contemporary writings throughout British history. The actual focuses of these social groups are largely dependent on the culture and technology of the time. More contemporary forms of collective offending activity, e.g. fraud, began to develop out of the growth of the cities and the rise of modern technology and industry, culminating in the Industrial Revolution (McLynn 1989). The revolution created:

- greater numbers of unemployed individuals, replaced by technology
- an emphasis on greater levels of financial organization
- the growth of banking systems and the increase in access to material goods across classes, particularly in the large urban centres.

The last two factors contributed to the development of opportunities for fraud and white-collar crime to take place. Other crimes, such as organized robbery, burglary and the smuggling and distribution of illegal goods, have always been a part of civilization.

Middle Ages:

During the late Middle Ages, organized criminal activity took the form of bandit gangs. In 1378, a statute described roving groups of armed individuals who

...in some places do ravish women and damsels...; and in some places lying in wait with such routs do beat and maim, murder and slay the people, for to have their wives and goods...; and sometimes take the king's liege people in their houses, and bring and hold them as prisoners, and at last put them to fine and ransom.... *Statutes of the Realm*, vol. II, pp. 9-10 (McCall (1979), p. 107)

Some groups did more than roam around committing rape, robbery, kidnapping and murder. As the Middle Ages progressed, professional soldiers and mercenaries increasingly became parts of the wars that raged across Europe. When employment was not readily at the hand, the alternative was crime. McCall (1979) describes one mercenary force of more than nine thousand troops, "The Great Company," operating in Italy in the mid-fourteenth century. Their leader at the time, Moriale, had regular council meetings with his lieutenants and established a set of rules, with hangings for disobedience. In addition, he hired secretaries to manage communications and accountants to manage distribution of loot and company funds. When contracts were sparse, the company would blackmail Italian cities, as well as carrying out the usual looting, raping and taking over of castles. This could be considered an early form of what is now called "organized crime," though their occurrence was very rare. The company had a hierarchy, rigid rules and administration, as well as committing many crimes appropriate for the time, e.g. kidnapping and ransom.

As well as specific incidences of criminal groups, the presence of broader networks was well recognized by those trying to administer the law. Open houses had to be closed by curfew according to the 1285 Statutes for the City of London as

Offenders...going about by night, do commonly resort and have their meetings and hold their evil talk in taverns more than elsewhere, and there do seek for shelter, lying in wait and watching their time to do mischief. *Statutes for the City of London*, 13 Ed. I, *Statutes of the Realm*, vol. 1, p. 102 AD. 1285 (McCall (1979) pg.153)

An additional example comes from a royal treasury theft carried out in 1302 by Richard Pudlicott and associates. He claimed that to enter the treasury, his group had tunnelled through the walls. A more likely alternative was help from the "inside." Part of the stolen treasure was found in possession of several individuals who could have aided Pudlicott in entering the treasury. The theft was undiscovered until items from the treasury began to surface among money-changers and metal-workers, who could dispose of the goods. It was through the presence of a more general network of contacts among offenders and their associates that anyone was aware of the theft (McCall (1979) pg. 154).

Early modern, 15th and 16th:

The early modern era was no less prone to criminal networks of all forms. With the rapid growth of city population of London

...it does seem that the higher concentration of moveable wealth, the floating, anonymous and poverty-stricken population, and the hopeless quality of policing...did provide conditions in which professional and organized criminality might develop. (Curtis and Sharpe 1988, p. 27)

McMullan (1982) describes the process by which early modern London became a centre of crime. It was the economic centre of the region, with a huge market in petty products, such as ribbons, articles of clothing and other decorative items. The developing middle

class and a lower class that had the means to acquire such goods were increasingly consuming them. Simultaneously, London was becoming the social centre for the gentry, bringing in not only more goods and money, but attracting larger numbers of people as staff, hangers on and would be “players” in the aristocratic circles. These individuals also brought and wanted goods of worth, both creating victims and purchasers. A final group of individuals also began to emerge as a power in their own right, the merchants. Their economic success allowed them to match the aristocratic lifestyle - the first nouveau riche. They were targets both for their personal wealth and for the goods from which they made their living. London was an area rich in potential, with victims and buyers of all sorts. As a result, the major focuses for criminal activity were the fences, individuals dedicated to the market in stolen goods. These individuals often played a dual role. Goods could be purchased from thieves then passed on for resale at a profit. Alternatively, they could offer the victims an opportunity to reacquire their property for a “finder’s fee.” This technique was sometimes used with the deliberate theft of particular items of value to the owner.

16th/17th/18th Century:

Sharpe (1984) in his study of crime in early modern England (approx. 1550-1750) identified a variety of forms of criminal networks. One industry in the 18th century that rivals the drug and tobacco trafficking of today was the illegal trade in tea. Smugglers could make huge profits on tea smuggled into England. It could be sold at a price much lower than that which was legally imported and heavily tariffed. At the highly organized end of the spectrum, one figure in the early 18th century stands out - Jonathan Wild. He began his career as a brothel owner and handler. He quickly moved into two new fields - the “recovery” of stolen goods and the practise of thief-taking, the apprehension of wanted criminals for reward. Both activities were fronts for his crimes. He would organize thieves to take the goods that he would then recover. He used thief-taking as an easy way

to eliminate competition and ensure his followers commitment. By the end of his career, he was using warehouses, sloops and teams of criminals as part of his organization.

Horse theft was also a fairly organized activity throughout early modern history, involving networks of informal contacts throughout the country to allow the disposal of the horses far from the site of theft. Coining - counterfeiting and clipping coins - was part of the culture of some communities, particularly in Yorkshire, and attempts to arrest the networks met with general resistance. This form of network is detailed more below Overall, though, the author found that ideas of "organized crime" during the early modern period were overemphasized compared with the huge amount of petty crime and criminals, short-term liaisons and informal networks:

There was little by way of organized or professional crime in our period. There was probably a comparatively high level of organized crime in London [but]...the pathetic small-time whore and the opportunistic pilferer were more typical...We must therefore conclude that there was little professional crime in our period and, equally, few traces of a 'criminal class' or a 'criminal subculture,' at least outside the capital. (Sharpe (1984) pp. 118-119)

17th/18th:

The trends in criminal networks continued into the 17th and 18th centuries. Lemire (1990) reviewed the black market in clothing that instigated a major crime wave in early modern England. The 17th and 18th centuries saw a massive expansion in the production of apparel and accessories, prompted by the continuing expansion of the above-mentioned consumerism at all social levels. Part of this industry was a ready market in second-hand clothing, where products could move across or down the social ladder, depending on styles and condition. A result of this market was a huge increase in clothing theft. This

most often took the form of gangs robbing individuals at home or on the street, or stripping shops of their merchandise. The gangs could then pass on the stolen goods to contacts and handlers. The handlers would then sell the goods on to shops and vendors willing to purchase items without asking questions, a willingness that has not changed. The goods then moved back onto the market as part of the general second-hand trade.

McLynn (1989) describes a trend in the 18th century of the development of organized activities outside London, especially in the expanding urban centres. Aristocrats and rich merchants responded to a perceived crime wave of burglaries by arming groups of servants, which the criminals responded to by forming armed gangs to assault buildings by force. This may be the 18th century version of ramraiding. McLynn also points out the importance of networks in horse theft, allowing the movement of horses throughout the country. The Yorkshire coining trade was an example of how a criminal activity could become accepted by the community. For the most part, the Yorkshire coiners made counterfeits out of gold, rather than base metals, as a response to the lack of legal coins in the area. The populace largely accepted these coins as legal tender and the coiners were actively supported:

The people of the West Ridings perceived their livelihoods to be bound up with the ...trade and resisted all attempts by the authorities to curtail it. (pp. 168)

Eventually, an official response brought an end to the trade, partially through pursuit of the offenders, but primarily through changes to the coinage system. The region slipped back into its former economic slump and crime rates rose significantly, as part of a knock on effect. Another criminal activity not perceived as such by the community was smuggling. In Sussex in particular, pitched battles occurred between smugglers and excise men. In 1747 an assault took place by sixty smugglers on a customs house to reclaim a large quantity of captured tea. Smuggling involved a wide range of individuals taking on different roles at various stages, just like modern drug trafficking. Overall, the smuggling

of the time, in tea especially, and in such goods as tobacco and alcohol was seen as an understandable response to financial chaos created by government mismanagement. The author subscribed to the traditional view of modern criminal networks, that the corporation-like "the Mafia" is the typical form of organized crime. He contrasted this highly organized, hierarchical form with what he described as the smaller, more fluid 18th century forms.

19th/early 20th Century:

Emsley (1988), in a review of 19th century crime in Britain, pointed out that more organized crime made up only a small part of all crimes, but was prevalent. In rural settings, this usually took the forms of poaching and smuggling. In the urban centres, the activities were usually around handling stolen goods and prostitution. Emsley (1996) described gangs of 4-5 armed robbers and burglars in late 18th century London, who operated together for short periods. A whole range of handlers operated at varying degrees within the law throughout the 19th century. Butchers and poulterers dealt with poachers. Fences, pawnbrokers and scrap merchants bought stolen goods off burglars and thieves. All these individuals made up widespread networks involving both illegal and legal trade, the amounts of each depending on the individual involved. Pilfering was also commonplace, especially on the docks of London, where the practise of taking portions of goods in transit was considered part of the job. This practice continues in the late 20th century (Mars 1982). Overall, as in any period, most of the crime was committed transitionally by individuals of the lower classes. A minority of criminals were habitual, committed to a criminal "career." The descriptions of criminal networks of the time, though, painted a different picture, shaped by the predominant values of the middle and upper classes. Crime was the result of:

...an organized, hierarchical social group which lacked any understanding of religious principles, social duty and virtue. (pp. 175)

This organized subculture was, the author states, inferior to lawful society and was not a product of social conditions. These perceptions laid the ground for the traditional views of criminal networks in the 20th century.

Chesney (1970) falls into the trap of describing a criminal "class." The author did point out blurred lines between those who committed crime and those who were, in theory, lawful. He still subscribes to the idea of a distinct criminal subculture. The "navvies," canal and railway construction workers, were typical of the groups who straddled Chesney's two groupings. While lawfully employed, these moving communities engaged in fighting, public disorder, theft, poaching and white-collar crime by their superiors, such as fiddling wages. The author also discussed the role of geographic areas within cities, e.g. London's "rookeries," on crime. These special areas, though, were nothing more than the poorest areas of the city, rather than areas where communities of criminal live together. Crime in such locations was an alternative when work was unavailable. Groups of pickpockets with different roles were a major problem during the period, and were possibly more organized than the pickpockets of earlier centuries. The author's description of handlers corresponds to Emsley's - receivers ranged from those who organized theft to acquire goods through to those who merely bought goods with no questions asked. Echoing the trades in the 17th and 18th centuries, the trade in stolen clothing and accessories to feed a large 2nd hand market was a significant part of this. Prostitution, especially involving brothels, remains as a constant form of organized crime throughout history, though the Victorian era was highlighted by the trade in child prostitution. This was often, the author stated, little more than white slavery, with young lower class girls being forced into the work. One major shift that Chesney pointed out was the development of fraud/swindling at a more sophisticated level as banking and accounting systems became more formalized.

Johnson (1982) identified another link between crime and the railways, though in America. The author examined US criminal intercity relations at the turn of the century as the basis for the later development of syndicates. The development of the railways in the late 19th century offered the opportunity for fast travel between major cities. This quick movement was very important to more professional, sophisticated forms of crime. The opportunist thief may have moved between cities. However, the speed of travel was of less importance than for those who could use the new mode of transport, such as gamblers and conmen, to their advantage. Conmen quickly developed around the ability for rapid movement. These individuals would move around, following specific schedules as they related to such targets as horse-racing events. These targets would be used as the basis for a variety of cons and swindles before the conmen would move on to the next city. The schedules were such that the same individuals would be in the same cities year after year. Over time, regular contacts and associates would develop, forming into teams to carry out their cons. These teams would vary in size and duration. Sometimes members would move together throughout the year. Some would only team up for some specific events. Sometimes the teams were a mixture of regular and occasional members. The teams, then were very much fluid, shifting entities, influenced by location, time of year and the circumstances of the particular con.

McIllwain (1997) used historical documents from the late 19th and early 20th century, mainly official documents and accounts from the media, to carry out an examination of Chinese criminal networks in New York City. The author contrasted current perceptions on the Triad "problem" with what these documents revealed about their activities 100 years ago. Current works, as described by the author, view Triad activity as a relatively new problem, only somewhat predating the new issue of Russian-speaking and eastern European criminal networks. Additionally, there is a general perception that the Triad activities are focussed mainly within Asian communities. The impact outside of those communities, as a result, is much less. They claim that there is a shift towards increased activity in general society, which is why the Triads are more of a threat. McIllwain,

following from Albanese (1996), argues that this work is caught up in the “ethnicity trap” (Albanese’s term), where the focus is placed on the characteristics of the group, rather than the actual criminal activities, and how they are organised. By carrying out a longitudinal series of case studies, the author was able to place the Tongs/Triads in their historical perspective and determine how much these groups corresponded to what he described as “traditional” organised crime:

- nonideological
- organised as a hierarchy
- limited membership
- use of violence and corruption
- extensive planning, specialization and criminal activities

The analysis revealed that the tong war of the period covered was primarily between two tongs, both belonging to national organizations, with the conflict occurring over control of various activities. This is not, as is generally perceived, a chaotic, unorganized war, but a deliberate battle for control. This is a common enough occurrence whenever criminal networks compete for market space, and is often a feature of supposedly more traditional organised crime, such as the Mafia. Along with organised conflict, there was also extensive proof of political corruption and criminal activities outside of the Chinese community. Specialization, use of legal fronts and money laundering were also present. With membership limited by ethnicity, the Tongs certainly conformed to traditional models of organised crime. Criminal networks have operated in a sophisticated, international form, from a variety of ethnic backgrounds, for much of history. The author describes the tongs as continuing to operate when leaders were arrested or killed, acting in an entrepreneurial fashion by engaging in any profitable criminal or legal activity. Criminal networks are not a recent event, the media attention and law enforcement focus are.

Conclusion

Criminal networks, in a wide variety of forms, have existed throughout history. Since the Middle Ages, records of collective criminal activity are easy to locate. Some forms of criminal networks remain constant. Drug smuggling has a long pedigree, with many goods at one point or another being moved as contraband, e.g. tea. Other networks have been largely dependent on the culture and technology of the time. The con artist networks of the turn of the century would not have been possible with more modern transport and communication methods. A brief review of the history of criminal networks before the 20th century reveals three major features.

- Criminal networks, in one form of collective criminal activity or another, have existed in a variety of forms throughout history.
- Economic and social forces of the given period shape the forms that these networks take, e.g. robber bands in the middle ages, large-scale clothing theft in the 16th through 19th centuries, crimes associated with the navvies during the railway building period in England.
- Few criminal networks adhere to the traditional view of organized criminal activity, where rigid rule systems and hierarchies are the norm. More often, the networks range from one extreme of being part of larger community forces, e.g. coining and smuggling, through to loose associations, such as clothing dealers who occasionally buy stolen goods, and into teams of pickpockets and the semi-organized networks of such individuals as Wild. These more resemble Reuter's (1984) "disorganised crime" than the Cosa Nostra. Overall, the networks are flexible, changing structures, with key individuals remaining consistent, but others shifting in and out of involvement.

A brief review of historical writings show that crime is not really possible, in the main, without networks. These networks have taken a variety of forms depending on the type of criminal activity and the culture and technology of the time. An exploration of the literature on 20th century crime will show what forms contemporary networks take and how they are structured.

Drug Trafficking Literature

Drug trafficking has been the criminal activity with the most analysis of network structures. This has largely come about for two reasons. The first is the extensive public, media, political and law enforcement attention given to the “drug epidemic,” the “war on drugs” or any one of a number of terms for drug trafficking, drug abuse and secondary crimes committed by addicts, and corresponding law enforcement efforts. A large amount of research has been carried out to try to develop an understanding of the processes by which drug trafficking and dealing has been carried out. This has been done particularly to identify ways in which these processes could be curtailed. The second reason has been the nature of drug trafficking itself. The supply of cocaine, heroin, metaampethemines and, to a lesser extent, marijuana are largely international industries with production, movement, distribution and dealing being separate stages (Potter 1994). These stages often involve distinct groups operating in collusion with their counterparts to allow the industry to operate. Cocaine can be produced and transported by the South and Central American cartels or, increasingly, South American terrorist groups, with those in production and transport being distinct groups within this larger grouping. The drugs are then passed on to wholesale distributors, which some research in the UK suggest are largely professional white criminals (Hobbs 1997; Ruggerio and South 1997). The drugs, through middlemen, then move on to the street level, made up of both black and white dealers. The production of drugs like Ecstasy have generally been smaller in scale, though still involving networks of individuals to acquire the materials to produce them, to manufacture the drugs and to distribute and sell them (Jenkins 1992). The major difference has been the smaller geographical distances involved - within the UK or between the UK and certain other European countries, such as the Netherlands. Drug trafficking is largely an industry, albeit an illegal one. The structures of the various stages, the interfaces between the individuals involved in each stage and the varying degree of organisation between different stages within any drug and between different

drugs can all be studied. When examining drug trafficking in the UK, the stages usually involved are importation, wholesaling, distribution and street-level retail sales. The majority of illegal drugs in the country are “imports” (NCIS 1995). The literature that discusses these stages of the industry are the most relevant, therefore. Much of the literature on drug networks has come out of the U.S. An examination of this research may help identify themes in network structure, though greater emphasis should be given to UK research.

The American Drug Literature

One analysis of the early American drug trade, Block (1978), examined the cocaine trade in New York City during the 1910's. Of the 263 dealers identified, there was an over representation of Jewish dealers, though there was a general mix of ethnicities, e.g. Greek and Black. This was due to the activities at the time of a Jewish organisation to stamp out Jewish criminality, making it higher profile. It was due to the fact that many Jews were in marginal roles in society, making illegal enterprises the only opportunities for success at the time. Almost all of the trade was in cocaine, though most of the dealers were involved in other criminal enterprises such as smuggling and prostitution. There were different levels of operation, importers, wholesalers and distributors, but with a large amount of overlap, as shown in table 2.1.

Table 2.1 Distribution of dealers across levels		
Level	Number of dealers	Number in combinations
Importers only	2	0
Wholesalers only	10	4
Retailers only	173	42
Importer/Wholesalers	4	2
Importers/Retailers	2	0
Wholesalers/Retailers	27	22
All	16	15

Those involved in wholesaling were usually in combinations, the term Block used for groups of three or more working together, with 41 dealers out of 57 in combinations. The combinations were often Jewish, but there were also kinship groups. A number of dealers were part of more than one group. Overall, the trade was made up of fragmented networks, with individuals joining and splitting as opportunities arose and faded, and the trade was part of general criminal enterprises.

Jenkins (1992) described the methamphetamine ("speed") industry, including manufacturing and distribution, in the Philadelphia area from 1970 to 1990. Speed is a man-made drug, easily manufactured using restricted chemicals. In terms of the organized crime versus crime enterprises debate, he found largely in favour of the latter model existing for the industry. While the Mafia was involved in the importation of the required chemicals and the manufacture/distribution of the drug, the industry itself was structured in a more entrepreneurial form, with no overall tightknit hierarchy controlling the industry. The acquisition of chemicals was carried out either through entirely illegal methods, such as theft, or through more ambiguous methods, e.g. using front companies to purchase the required materials. This end of the industry was significantly more organized and had a heavier Mafia influence. Even at this level of high organization, the structure was not so clear cut. The Mafia group in the region itself was divided into two factions, which were part of a larger internal conflict between two powerful forces in the Mafia based out of Atlanta City. The resulting conflict resulted in a series of high profile murders. The two factions were very similar within themselves, however. Both were made up of a subgroup organized around "powerful individuals or cliques" (pg. 25). These subgroups interacted with various other networks within the industry. Some of these networks were essentially independent of the Mafia, while others had close ties to one or other faction. These networks were primarily involved in the manufacturing and distribution of speed.

The manufacturing/distribution side was more fluid, with some networks operating for extended periods of time and others operating laboratories for short periods before dissolving or moving. The more organized forms of criminal networks were also involved to some extent. The three networks most closely associated with the Mafia were also Italian-American, but only associated with the main figures in the two Mafia factions. Additional networks included a Greek group operating in the area and a network known as "K & A" - a mixture of Jewish and Irish American criminals that had some links to the Mafia. All of these networks were involved in major manufacturing operations and maintained longstanding distribution activities. They also had some involvement in importing restricted chemicals. Many used front companies to conceal their activities and to launder money. They also often had union connections. An additional "player" in the speed industry were the biker gangs, particularly the Pagans. These gangs would operate smaller labs and do some distribution, but mainly acted on behalf of the Mafia and other associates, acting as enforcers and similar work. Other small scale operations would emerge for short periods of times. Overall, then, the market was made up of a loose, flexible network with various subnetworks with a variety of structures. All were essentially criminal enterprises, some more organized than others, with various links between them, many with legal fronts and ties to corrupt officials. The ability to operate with some protection from law enforcement allowed the market to develop in a relatively secure manner. Any illegal operation faces two major threats - law enforcement and their competitors. Law enforcement against the speed industry was low. In addition, the imperfect organization of the Mafia, e.g. the internal conflict between the two factions, would reduce its ability to deal with competitors. This reduction in threat may be part of the reason for the presence of a variety of independent operators within the market.

Bourgois (1995) spent a number of years in El Barrio, in New York city, in an ethnographic study of the life experiences of crack dealers and how the structure of a larger society contributes to their situation, along with their own decisions and actions. He found that it was impossible to separate the two, each were so bound up in the other.

His research indicated that the crack "businesses" were just that - businesses. While lacking the formal structure of a legal business, the entrepreneurs who ran the dealing centres acted very much as bosses. One, Ray:

...proved to be a brilliant labour relations manager...Having grown up in El Barrio as a gang leader...he knew how to discipline his workforce without overstepping...rules of mutual respect...Ray was particularly skilful in his manipulation of kinship networks to ensure...loyalty. (pp. 104)

Employees, some of whom were also users (ones with their addictions relatively under control, though), fulfilled a variety of roles as dealers, lookouts and money collectors. Having a large staff also served as a safety feature:

Primo's best and cheapest insurance against physical assault was to surround himself with a network of people who genuinely respected and liked him. (pp. 30)

Reuter and Haaga (1986) carried out a study on dealers who operated at the higher levels of the dealing stage of drug trafficking - distribution, wholesale and large scale sales etc. A structured interview was developed and administered to forty inmates. There were a number of methodological problems with the sample. Access was only obtained for inmates in low security prisons, which they pointed out excluded those dealers with violent backgrounds. Another sample bias would have been the exclusion of inmates who would be judged high risk - access to extensive resources, high likelihood of escape attempts etc. This would cover individuals at the upper levels of major drug trafficking groups. Additionally, of the 94 inmates originally approached, 54 refused to be interviewed out of mistrust, advice of lawyers or not wanting to recount their past. The authors also pointed out biases in their sample for ethnicity (high proportion of whites) and that there was a higher proportion of individuals on treatment programs for addiction. With this in mind, their research can still reveal details of how the market operates for

this sample. The main purpose of the study was to attempt to determine what factors account for the lack of impact of law enforcement efforts on the marijuana and cocaine markets. They suggest two factors that might contribute:

- the shift from a small number of powerful dealers/distributors to a larger number of entrepreneurs, forcing market prices down
- law enforcement pressures result in the acquisition of skills to resist such pressures, e.g. utilizing new telephone technology

To examine these possibilities, the authors looked at entry into the market and upward mobility, levels of organization, importing/distribution methods and supplier/customer relations. The majority of the sample moved from street-level dealers to higher levels when opportunity presented itself, rather than as an deliberate, planned move. The main skills for success seemed to be intelligence, sociability and an ability to network. For this sample, success was reached through good sources and good customers. Contacts were made dealing, socially and through prison. Opportunities arose as a result of an expanding market and gaps created by law enforcement efforts.

There was little actual organization, with the groups consisting mostly of small, what they termed, "partnerships," where a few individuals operated together and independently. It was felt formal, large-scale organization would attract law enforcement attention. Only during importation was any real organization found by the researchers. Division of task included movement of the drugs to the transport site, actual transport and picking the drugs up, as well as storing the drugs. For cocaine, with its smaller size, less people were required. These ventures would be organised around a few key people, with the peripheral helpers being brought in by those principals to work. For distribution, the authors found the market was primarily of rapid deals, with regular contacts, but not exclusive ones. The supplier/customer relations were informal, but fairly stable and long-term, but, again, not always exclusive. This was likely to be a function of the biased

sample and the kind of drug dealing they engage in - more social, low-key activities, rather than the large-scale operations of major groups, or the distribution of street-level drugs. Overall, the sample described a particular section of the import/distribution level of drug trafficking. This section was made up of individuals who develop long-term, small-scale activities, mainly through opportunity and who they know.

Jacobs (1997) indirectly examined structure when looking at the methods undercover officers use to set up drug deals through informants. Using semi-structured interviews with 24 experienced undercover officers in a US city, Jacobs identified three goals for officers:

- how officers justify their presence
- how officers justify their association with the informants and need for drugs
- how informants are removed from the process to protect them and allow them to be reused, as well as letting the officer directly buy the drugs, which Jacobs says is stronger evidentially in court.

Jacobs proposed that officers used what he called "contingent ties," ties between individuals that shift in strength depending on the situation and are dynamic, to enable them to achieve these goals. The first was typically achieved through presenting the informant as an intermediary, and the officer as a new buyer or one looking for a new source, for a variety of reasons, e.g. the dealer offers better quality drugs in the market. The second was created through establishing a link between officer and informant. The link must be close enough for there to be trust, but not too strong, as that would endanger the informant after the bust. Typical are jail associates (but not close friends), co-workers or from the same geographical area. Being a relation was never used. The removal of the informant was through such techniques as confiding to the dealer that the informant is ripping the officer off or is too expensive, or by establishing some sort of affiliation with the dealer. These successful strategies place the officer within the general network of

illegal activities, which enables trust on the dealer's part. The author states that these bonds develop quickly and are relatively strong:

When each proves to the other that s/he is not out to bust or defraud the other, a shared understanding from co-participation in illicit behaviour develops a bond that may belie the amount of time, reciprocal services and emotional affect each has for the other.... (pp. 49)

By making the informant an associate, rather than someone the officer was closely associated to within the network of individuals involved in crime and the drug market, there is no need for proof of a great deal of knowledge about each other and, as already mentioned, it protects the informant from blame. The techniques were successful because they reflect the normal methods of interactions at the dealing level - individuals must position themselves within networks to establish the trust so necessary within the drug market.

Adler and Adler (1980) interviewed and carried out participant observation with 64 dealers, ranging from street-level dealers to major distributors. They found that the drug markets for their sample were made up of constant business dealing, with contacts occurring as opportunities arose. They described the role of the dealers as

Instead of a rigid hierarchical structure, loose and fluid exchanges prevail in which dealers pragmatically put together buyers and sellers, acting sometimes as pure middlemen and other times as real distributors of the drug...Membership in this unstructured and unbounded group is erratic, with people dropping in and out irregularly... (pg. 449)

Building on this initial work, Adler and Adler (1983) described in detail the career paths of 65 high-level dealers and smugglers in the drug markets of southwestern California.

Information was collected through participant observation and unstructured interviews with the 65, along with their friends, associates and family members. Adler and Alder found three ways in which the sample became upper level dealers:

- Some progressed up the ranks from small-scale dealing and using, though this was only 15% of the sample
- 75% joined immediately at the middle levels of dealing and distribution, through contacts and associations with active dealers
- only 10% of the smugglers were upper-level dealers who decided to become smugglers, the rest were invited to join in smuggling as a result of skills or reputation; half of these were mid-level dealers and the remainder were in the drug scene, but were not dealing

Adler (1985) brought together all of the findings from the ethnographic study of the high-level dealers. The dealers were largely entrepreneurs in the late twenties and thirties, moving into the upper levels of dealing from other occupations, using the income to finance their lavish lifestyles and own drug use. One of the major findings was the shift in the ways that dealing and smuggling were carried out. Structurally, loose, poorly organised groups had been supplanted by teams of individuals used a variety of techniques to move and distribute the drugs. This shift in sophistication was in reaction to law enforcement pressures and an increased desire to maximise profits. The dealers worked in a fluid, shifting network of contacts, various levels of dealers and sub-dealers and a wide pool of users. Much of the dealing between the sample members and dealers of a similar level was done on a rolling system of credit, based largely on trust and a dealer's reputation. Use of violence was minimal, as threats and cutting off association were usually enough within the market to ensure compliance.

Ten years after the initial study, Adler (1992) revisited ten members of the original sample of upper-level dealers to study the degree of their involvement in drug dealing.

Alder found that all were out of drug dealing as an occupation, with varying degrees of success. Some had moved into legitimate occupations with varying degrees of success. Others had drifted into the margins of society. There was a general problem in their reintegration in making the shift from the networks of friends and contacts that had dominated their lives while dealing into new networks outside of the drug scene. The high profit, high living lifestyle was also something hard to give up on, even if they no longer were able to maintain it or had access to it. The overarching reason for ending their careers was the transition from the occupation being a positive experience to a negative one, due to drug overuse, financial failure and similar problems.

Curcione (1997) examined the careers of six middle-class, suburban cocaine dealers, resulting from a larger study of cocaine trafficking and dealing amongst the California leisure cruise and angling industries. While the sample size was small and those studied came from a very exact section of the dealing world, some of the findings have a broader relevance. Curcione found that there was a definite career path to their dealing. Through use of drugs as adolescents led to increasing association with the drug culture, acquiring the methods and beliefs of that system. All of the sample moved into dealing themselves through initially being a "go-between." Due to their location in certain social networks, they were able to act as intermediaries between dealers and users. Two of the dealers, for example, had construction firms and their main customers were the men working in the industry, who used cocaine to facilitate productivity. The shift into dealing themselves was not an easy process, as they had to establish themselves:

...one [aspect] that is critical to a drug-dealing career...involves acceptance of the newcomer by established members of the network. (pg. 245)

Additionally, they had to establish themselves with the users. Curcione found that unlike the gangs that deal drugs described in the work of Padilla (1995), these dealers were independent operators, with the initial capital from their mainstream occupations to

embark on the dealing career alone. In the reasonably secure and discreet networks involved in middle-class drug dealing, the protection from police and competitors that gangs offer was not required. Additionally, customers for the gangs in Padilla's work were located within their social and ethnic networks. The customers for the middle-class dealers, as stated already, arose out of occupational contacts. In common with the gangs, however, was the perception of drug dealing as an entrepreneurial activity, rather than deviant behaviour. How those opportunities were developed depends on the networks within which they take place. The gangs took one path as a result of their financial status, geographical location and contacts, the middle-class dealers, with different options, took a different path. Padilla's gang limitations correspond to the experiences of the dealers in the work of Bourgois (1995), where the crack operations were set up along small businesses. Padilla's work came out of participant observation of a Puerto Rican gang in Chicago. Low key activities, such as avoiding public confrontations, served to reduce law enforcement attention and preventing the development of negative public perceptions. This allowed drug activities to more easily operate. Members of gangs who belonged to other groups acted as intermediaries between the different networks. Exchange of favours and assisting each other was a major feature of interactions between the members.

Potter (1994), as part of a larger study on criminal organisations (described below) examined the drug networks in one small American city. Potter found three major groups involved in drug trafficking and dealing within the city, though a variety of small groups also operated within the city. There were a large number of networks using sites in the vicinity of the city as "waystations," but did not move drugs into it. The first group, the "Knight" organisation, was the most sophisticated. It imported and sold drugs to other local traffickers, as well as moving drugs to other locations. Their own drug dealing was through a carefully structured network, with five wholesalers, twenty dealers and 200 street vendors. An individual at each level only knew a few of the others at their level and one member of the next level up. This compartmentalisation was to protect the highest levels of the network. The other two groups were only involved in purchasing and dealing

drugs, either to users or to smaller level dealers. Some of the drugs were purchased from the Knight organisation, the rest from outside the city. The “James Gang” (see below) sold drugs through streetwalkers and bars, while the “Akbar” brothers (see below) sold drugs through bars, clubs and prostitutes. Deals were more face to face, with the heads of the two groups directly involved in operations at the street level. Potter reached a number of conclusions about the structure of drug networks in Morrisburg:

- there were multiple drug networks, e.g. motorcycle gangs did some dealing independently
- loyalty as maintained through high economic rewards and the threat of violence
- unlike the other criminal networks in the city, drug trafficking was less organised around ethnicity/family/common goals and beliefs, e.g there were 18 dealers in the James gang of mixed ethnicity (black, Italian, east European, Anglo-Saxon and Irish)
- there were no credit systems for drugs, unlike other criminal businesses
- the more dependable the supply, the more successful the network was
- roles were interchangeable, with leaders only having more experience and resources

Law enforcement strategies to deal with drug trafficking have also revealed details about the nature of drug network structures. For example, Kleinman & Smith (1990) identified six strategies used by law enforcement to try to deal with the drug problem:

- 1) Targeting the “Mr.Bigs” in drug trafficking networks
- 2) Sweeping the streets of dealers/users
- 3) Targeting specific geographical areas with drug problems
- 4) Gang suppression
- 5) Controlling user crime
- 6) Protecting youth

Strategies one, two and four all represent attempts by law enforcement to use aspects of drug network structures to aid their actions. Strategy one has the most relevance to structural analysis. The first strategy was to focus on the top ranks of the drug network and gather enough evidence to successfully prosecute those individuals. The removal of the key figures should disrupt the network, in theory. These kinds of investigations were long-term and involved high costs, involving the extensive use of informants, surveillance and undercover operations. There were two problems the authors identify with this strategy:

- ▶ there are no guarantees that individuals removed will not be quickly replaced as restructuring occurs
- ▶ even if the individual network is disrupted, competitors could quite easily fill the gaps in the market

Moore (1990) stated, in another review of methods of drug law enforcement, that to effectively reduce the supply of drugs, agencies must target “connections” - the ability to successfully carry out transactions. This targeting must also be carried out at all levels of the network, not just major figures or street-level vendors. These connections would be fragile due to potential for easy betrayal and the lack of access to traditional forms of protection, such as the police or courts. The increased use of informants and undercover operations, particularly to feed misinformation into networks, should cause increased caution within networks and a slowing down/reduction in transactions. The increased use of wiretaps and surveillance would make communications more complicated and potential dangerous to operations, again creating an atmosphere of caution. All of these methods must be used at both high-level and street-level sections of the network. This was a more in-depth use of structure to facilitate law enforcement, rather than focussing on obvious, easily replaced individuals and large-scale operations. Moore proposed that the best strategy to disrupt networks was through the patterns of interactions between members.

The UK Drug Literature

A second paper by Block (1989) examined European drug trafficking between the World Wars. Before the League of Nations, narcotics were being produced legally by various European companies, with some of the product being diverted for illegal sales. Increased pressure on governments meant that much of the legal production ended, allowing illegal enterprises to develop, much like Prohibition in the US. Jewish and Greek traffickers were frequent. European Jews increasingly found themselves ostracised from society and having to take up illegal enterprises. Greek traffickers came out of a long history of contraband trade along the trade routes through and near Greece. The syndicates that developed, Block found, were usually of mixed nationalities. The networks of contacts and associations suffered when the centre of the trade moved from Paris to Istanbul, due to pressure on the French Government. Betrayals, informing and ripoffs became commonplace. A second shift occurred into the 30's, to the Far East, and, in particular, Shanghai. Opium production in China by various Warlords was a goldmine for criminal entrepreneurs. Again, associations were fluid and multinational:

Smugglers were mobile and opportunistic, traffickers in several types of contraband, rapidly entered into and quit partnerships, and seemed about as likely to forge associations across ethnic and national lines as along them, although kinship was important. (pg. 66)

Lewis (1994) identified six levels of heroin distribution systems in the UK from 1970 to 1990:

- importers and importer combinations
- distributors
- large-scale wholesalers
- small-scale wholesalers and apartment dealers

- retail sales - street dealers, network suppliers and user-dealers
- users

He describes the systems as "...composed of complex, articulated, multi-faceted series of layered networks which individuals enter and exit according to means and circumstances" (pg 46). The system was not a simple top-down model, with separate levels occasionally interacting, e.g. importers selling directly to apartment dealers. The fluid nature of the system was due partially to the lack of organized crime control over the overall process.

Plant (1975) published his PhD research on over 200 drug takers, mainly in marijuana, in Cheltenham in the early 70's. The author used participant observation to carry out snowball sampling to obtain subjects. Of all drug takers approached, only eight refused him, three of whom were drug dealers. The author pointed out that the sample was not representative, but gave insight into the attitudes and relationships within the group studied. As well as observation, interviews were carried out to collect attitudinal data, demographic and drug taking patterns. Overall, Plant found three separate, but overlapping groups - students, middle-class users and unemployed/working class users. All of the individuals drifting into drug use through contact with the lifestyle and networks of users, e.g. by attending college. Joining the network was accompanied by a shift into attitudes that matched those already using drugs, such as describing drugs as a positive thing. Individuals also drifted out of the networks. Plant also collected information on who associated with whom, through observation of day-to-day contacts and from people indicating who they were closely associated with. From this, Plant constructed a sociogram (Moreno 1934), a diagram showing the patterns of connections between individuals in a network. The sociogram showed that the three subgroups were reasonably distinct, though there were considerable links between them. Overall, there were more links between people within the subgroups than across them. Two dealers with regular supplies were located in central locations. Clusters were made up of groups of

friends. Those individuals with the most links, i.e. the most active in the drug network, also tended to be unemployed by choice (including the dealers), used injected drugs and had more delinquent backgrounds. The overlapping groups of friends and associates mirrors the early stages of drug networks described by Dorn et al. (1992), described below.

Chatterson, Gibson, Gilman, Godfrey, Sutton and Wright (1995) described the UK drug markets as part of an attempt to assess performance indicators for local drug strategies. The authors stated that the clear hierarchy of importers, mid-level distributors and street dealers, as proposed by Lewis (1985) and adopted by the Association of Chief Police Officers (ACPO) Broome Report (1986) on drug-related crime investigations, did not reflect the true nature of the markets. The fluid, changing roles and relationships in the market did not allow this. The authors suggested that dealing organisations be classed along dimensions, rather than restrictive types. The three dimensions proposed were physical makeup of the network, the attitudes of the network members, their philosophy, and efforts at concealment. Each had a number of dimensions that would increase or decrease the likelihood of detection.

Table 2.2 Dimensions of drug dealing (based on table, pg. 13)		
Dimension	Sub-Dimension	Increase/Decrease Detection?
Physical aspects	<ul style="list-style-type: none"> - Greater numbers employed - Higher frequency of purchases and sales - Larger quantities bought and sold - Larger number of customers 	Increase Increase Increase Increase
Philosophy	<ul style="list-style-type: none"> - Allegiance to drug scene (high quality/more loyalty) - Use of violence - Desire for more profit - Level of legitimate business (less dependence on drug trade for income, so less dealing) 	Decrease Increase Increase Decrease
Concealment	<ul style="list-style-type: none"> - Anti-surveillance techniques - Division of drugs and money 	Decrease Decrease

Edmunds, Jough and Urquia (1996) used case studies to describe six street-level markets for drugs that create dependency, all in London. Based on research on licit markets, the authors divided drug markets into open and closed types. The former were open to all, usually fixed in time and place. Closed markets have limited access and were not usually dependent on specific locations. Open markets would, they suggested, be visited more by new users and by users of dependent drugs. The latter would do so as there would be no ready alternative to the drugs they were addicted to and would quickly exhaust closed markets they had access to. The type of drug, then, will influence market structure, such as whether there will be a fixed location, open market:

- cannabis, amphetamines, Ecstasy and LSD will not require open markets, but will be available
- open markets will be important for heroin and crack/cocaine
- prescription drugs will require open markets, due to scarcity and dependence

The first market was very closed, and made up of 22 submarkets, as a result of police efforts. Dealing was typically within racial lines, with some crossover between whites and Bangladeshi. The whites were willing to inform on blacks and Asians. The market was mainly in heroin, with the buyers and sellers almost all being local and known to each other. New buyers would be introduced by current ones. Deals were arranged by phone, with any buyers giving out numbers to those outside the network being quickly ostracised. A variety of locations were used, with deals made before the actual meeting. Buyers had access to credit, generally, and sellers operated specific hours.

The second market, originally in local housing, was shifting from closed to open as its popularity increased and it received police attention. It was half heroin, with a large proportion of crack being sold, as well. West Indian crack sellers increased the crack volume, while the market shifted to a nearby shopping area and park. The increase in size and new, more fixed locations led to it opening up. Street sellers were typically also users

and drugs were available 24 hours, due to shift work. Regular sellers were used and deals were typically made by phone. High levels of violence were indicated. The third market was specialised. It began as a closed market in an estate, then opened up, before police caused it to split into specific submarkets, such as street dealing in cannabis, heroin from cafes and crack in the sex trade area. Again, there were regular sellers used and phones. Most buyers were local, with quality being high and violence low. The fourth market was based in local clubs/pubs in the 80's, but police actions moved it onto the streets. It became a centrally located open market as a result, with an additional factor being displacement of sellers from the fifth market. Heroin was sold by Italians and crack by blacks. There were limited barriers - some sellers only dealt with known customers, for example, but these were the exception. Deals were either made by phone or at specific locations. Activities were centred around the tube station. It was generally a white market, with low violence and buyers were very often sex workers. The fifth market centred on a train station, and was open, but in decline. Many buyers were sex workers and customers from all over London, as the area was one through which many people moved through. There were actually two levels to the market. The open level would sell to anyone, with sellers seeking buyers. The closed version mainly supplied local sex workers and was limited to phone deals between individuals known to each other. The open part featured poor quality and high violence. A high police presence had displaced some dealers into the fourth market. The final market was specialist and open. Centred around a needle exchange, it was mainly a market for pharmaceutical drugs. The members, mainly white males, were both buyers and sellers, depending on whether they had access to their prescriptions at the time. The market fluctuated between oversupply, where sellers pursued buyers, and low supplies, where buyers pursued sellers. There was constant movement to avoid police and violence. The authors concluded that

- open markets had less barriers to entry than closed ones and are well known
- open markets provides poorer quality drugs and more fake drugs
- open markets were more geographically fixed

- open markets needed more amenities to survive (e.g. phone boxes, tube stations, chemists)
- in closed markets, specific dealing locations were not set
- open markets often had sex workers as a major part of the buyers

One group of researchers that have made a major contribution to the investigation of drug trafficking, especially in relation to the UK, have been Dorn, South, Ruggiero and associates. Dorn and South (1990) and Dorn, Murji & South (1992) carried out an extensive analysis of the literature on drug activities in the UK and the nature of the British drug markets. Drawing from interviews with a variety of sources (police, offenders in prison (25) and individuals involved in trafficking (55)), they found that in the UK, drug trafficking was the domain of fluid networks, rather than traditional OC groups. From their data, they generated a list of seven types of drug networks, through the authors emphasised the point that the seven were just a starting point, and didn't really reflect the fluidity of the overall drug market. The seven types were

1. trading charities - ideological groups promoting use of drugs such as marijuana
2. mutual societies - friendship groups involved in the exchange of drugs
3. sidelines - where drug exchanges are through licit business and secondary to that business
4. criminal diversifiers - where criminals move into drug trafficking from other activities
5. opportunistic irregulars - individuals occasionally in the drug market as part of general petty criminal activities
6. retail specialists - developed enterprises with role differentiation
7. state-sponsored traders - control agents (LEO) with their collaborators

The authors state that there was a general trend in any particular market, excluding crack, to evolve from earlier levels (1 & 2) to the more profit-orientated and criminal forms.

The first type of network tended to be the earliest form, such as the distribution of LSD/Marijuana in the 60's and Ecstasy in the 80's, with dealers supplying based on the belief of the social benefits of the drugs rather than for profit. These networks were very social. Mutual societies involved friends sharing and selling drugs with an immediate return. The major difference from 1 was that individuals would be both suppliers and dealers. Outside of small groups of close friends, these types of networks, where individuals "feed" off each others' supplies, was found to be a thing of the past. The shift to profit-orientated drug trafficking caused three responses in individuals in types 1 and 2:

- leave the market
- develop a legal front to protect self
- associate with criminals

The third type of network came out of the second response. These were not cases where criminal entrepreneurs use legal facades to carry out such activities as laundering money. They were where individuals have legitimate occupations which give access and opportunity to do some dealing, e.g. publicans. Drug trafficking is only carried out for short periods of time, to minimise risk. The authors point out that it was difficult to clearly separate 3 from the more criminally orientated groups, as it represents a point on a continuum from fully legitimate to fully illegitimate enterprises.

The fourth type of drug trafficking was the shift by a number of professional criminals in the 70's into drugs. This was due to the increased risks of such activities as armed robbery and the significantly higher profits from drugs. These groups can be highly organised, to the extent of even carrying out counter-surveillance on police. There was a general perception in the interviewees that violence was on the increase as the number of criminal groups increased, creating higher levels of competition. One key aspect of the type 4 was the frequency of the notion of the "family" being the core of the network:

...in many cases the strength and security of the enterprises relies on keeping power and control close to the domestic hearth. (pg. 41)

These families weren't necessarily blood-related, but were perceived as family. The fifth group was made up of groups or individuals who carried out petty crimes, drifting in and out of the drug markets as opportunities arose and faded away. The authors state that this type was motivated by money, excitement and status, but this could be true of any of the more criminal groups. Feldman (1985) found that entrepreneurial gangs focussed on status via money and goods. Part of the growth of this type was the increased involvement of black irregulars in drug dealing, with a more direct, on-the-street style, as a response to lack of opportunities for young black males. The final type, excluding law enforcement activities, was the most organised, being essentially commercial enterprises developed around drug trafficking. These had management and employees, with employees having different task roles - security, protection/storage, delivery etc. Managers were rarely users, while employees that were, did not work while under the influence. Methods were sophisticated. Dealing networks, for example, worked out of houses or specific street locations, had delivery systems or only supplied to an elite, carefully controlled clientele.

Ruggerio and South (1997) attempted to come to grips with the nature of illegal markets, especially drug markets by describing the modern city environment as a "bazaar." Using the word bazaar was deliberate, as the authors tried to come up with a description that captured

...a sense of multiplicity, trade and bargaining, movement and adroit manoeuvre... (pg 55),

but also indicating the role of street culture and deviance as part of the market. The focus was a constant exchange of goods, services, money and information. These exchanges

fall along a continuum of legality. The authors did not state it, but where exchanges in the drug market fall on that spectrum is dependent on the type of drug and which stage of the market is involved. As with such authors as Letkenmann (1973), Ruggiero and South saw criminal activities as a form of work - some jobs require skills, there are a minority of professionals and the idea of crime covers a wide range of jobs. Movement was also an important feature of drug markets. Physical movement by drug addicts and dealers in the UK was commonplace, either within an urban setting or, to a lesser extent, between cities. This was confirmed in research by Bennett (1994), who found that 63% of the sample of drug users from Nottingham and 46% from Sunderland had lived in more than one location in the previous year, despite being able to easily acquire drugs locally. There was also movement between criminal occupations at the lower levels of criminal activities. Individuals will take opportunities to work, be it legal or illegal, drifting from minor dealing to theft from automobiles to collecting unemployment or labouring jobs. In general, this movement is horizontal - there is little career "improvement." The upper levels of the drug market in the UK, importation and distribution, were largely controlled by a white professional class, the criminals who moved from armed robbery to drugs in the 70's. Drug trafficking involved higher profits and lower risks. The actual trafficking was carried out by non-British "mules," while the dealing was carried out by lower status blacks and whites. The authors claimed that this reflects the legal marketplace. Ruggiero and South's model of the drug market was very much that of the marketplace. Everything is about deals and exchanges, with relationships and locations constantly shifting and evolving. What constants that exist are in the groups that control the upper levels of the market and, so, have some staying power. The authors do fail to address the involvement of other ethnic groups outside of whites and blacks. Other distinctive ethnic groups in the UK are involved, but not to the same extent or at different stages, e.g. Turkish movement of heroin to the UK.

One author that has used an explicitly structural analytic approach is Williams (1993). The author carried out an extensive review of the international drug markets in heroin and cocaine. The author drew parallels between the drug industry and legal industry:

- both are multi-level, proceeding from a raw material to a processed product, including transport, importation and distribution
- the value of the material goes up at each stage
- the existence of task specialization and separation of stages, though the drug industry is more fluid and based on trust/personal ties than legal industry

The author examined the drug trade using five points developed by Porter (1980) for structural analysis of industries:

- the extent of inter-firm rivalry within the industry
- the number and type of potential new entrants to the industry
- the bargaining power of consumers/buyers
- the bargaining power of the suppliers
- the threat of alternatives to the industry

Rivalry within the drug trade

Williams identified substantial differences in levels of cooperation at the high level, wholesale distribution and retail levels of the industry:

- in both the Cartels (cocaine) and Triads (heroin) that make up the upper levels of the drug industry, a high level of cooperation exists, centred around small, highly cohesive groups bound by ethnic identity and/or familial ties

- there is also a high level of co-operation between the groups involved in wholesale distribution, though not to the same extent
- at the retail level, many small, often different ethnic groups exist in a state of fierce competition for the best spatial locations for retail work, with some degree of cooperation between individual groups, at times.

As most of the groups in the industry are based on familial ties or ethnicity, there are strong levels of cooperation Williams also points out a general trend towards increased cooperation at all levels of the industry, as a response both to pressures from government/law enforcement and to maximize profit making.

Barriers to joining and leaving the market

The entry barriers described by Porter for mainstream industries were found to have relatively weak application to drug trafficking. Access to distribution requires trust between participants, but is otherwise readily available, for example. Williams does describe entry barriers that are more unique to drug trafficking:

- risks relative to profits - arrest and prison, loss of assets
- opposition to entry from established groups, willing to use violence to maintain positions in markets

The strength of these barriers, Williams states, depends on the structure of the market itself, as one that encourages small enterprises will have less barriers than one that encourages control by a few, powerful groups. The author adds that such entry barriers also apply at the retail end of the trafficking chain, particularly for conflict between established and new groups.

Bargaining power of the consumer and the supplier

If consumers have significant power in negotiations, than profits are lower. As many customers are addicts and customers act as wholly independent entities, with no collective efforts, than consumer power is very low. Users can not “shop around” for the best deals for any length of time. As a result, the individuals selling the drugs can do so at substantial mark ups. This is mirrored in the lack of power of the individuals actually producing the materials for drug production. Many of the workers producing the crops required for heroin and cocaine are dependent on them for survival. As a result, they are largely controlled by the buyers. The main reason for their dependence is that the alternative crops, e.g. coffee or rice, offer such small returns that they are not really alternatives. The low costs of purchasing the crops allows the buyers to maximise profits.

Threat from substitutes

Essentially, there are no substitutes for narcotics. Man-made drugs, such as Ecstasy, are designed for different effects. As a result, new products in the market tend to be variations of those already in place, e.g. crack as a new form of cocaine.

Williams also includes a number of other aspects of the drug market that shape it's structure:

- the addictive quality and the need for ever increasing levels of dosage creates increasing levels of demand
- illegality means no regulation, so those in the market can act with any sort of restraint, e.g. the increasingly sophisticated ways of managing the profits of drug trafficking
- the combination of high rewards and the use of violence to punish or to deal with conflicts results in the most effective and ruthless being the most successful

- use of legal business, e.g. airlines, to aid in the trafficking process
- the transnational nature of the activities without the control exerted by the governments of the countries where activities are taking place

All of these factors create the industry of drug trafficking. Williams suggested a number of measures to combat the trade. These included:

- reducing cooperation by deliberately creating competition and conflict - disruption, rather than seizures and arrests
- increase the power of the supplier (one way Williams suggests would be for governments to bid for the crops at higher prices than offered by the drug buyers)

Conclusion

What does the literature on drug trafficking networks say about their structures? It was readily apparent that there were no major corporations dominating the industry from importation on. Certainly, none of the researchers found this to be the case in America or the UK. Large operations did exist, but never to the point of market control. In terms of describing the market as whole, the reoccurring word was "fluid." Repeatedly, the markets were found to be constantly shifting, changing shapes. Deals were created and came to an end, networks collapsed due to law enforcement efforts or monetary failure, supply levels varied considerably, but the market as a whole continues on. The main shaping force seem to be immediate situational factors, such as supply and demand. This amorphous quality is part of what makes it so hard for law enforcement agencies to develop strategies to try to stop such markets.

When looking at individual networks within these markets, the operations that carry out the drug trafficking, a different picture emerges. The markets may change, but the networks must have some degree of stability to operate. The biggest form of stability was in terms of supply. A regular supply meant that the network could operate consistently and develop a positive reputation. Most networks were small in size. The people employed mainly non-specialists. Leaders appeared to be older, more experienced and with more resources, but did not otherwise differ from their employees. This was reflected in the ability of networks to continue to operate even when leaders were arrested. There was, however, a clear split between those leaders and workers, particularly low level ones. This structural aspect acted as a measure of safety, protecting the leaders through a variety of means. Secrecy was maintained by not allowing lower levels an understanding of the network, protection was afforded by having "guards" and the ability of law enforcement agencies to directly link the leaders to the operations was hampered. This was stronger in the more entrepreneurial networks than the more social

ones. The latter may be quite exclusive, based on knowing each other, as in “closed markets,” but they also involved credit and supplying drugs without immediate financial return. There are also features to the individuals in these networks. Leaders have been mentioned above. An additional feature of these individuals is that they are the ones who make the links between networks. They are the arrangers and contacts, making and breaking the alliances. Their power comes from running the operation, without directly being involved. In more closed markets, such as middle -class dealing, the more closed nature allowed more direct involvement. Peripheral members were carriers, street dealers and so on. Drug trafficking, then, is very much the “bazaar” of Ruggiero and South. The markets themselves are fluid, with key individuals creating the networks required to actual carry out the tasks, employing individuals to carry out the actual operations.

What are the specific structural features of drug networks? Table 2.3 outlines the main structural points from the research.

Table 2.3 Summary of Drug Literature	
Author	Structural Features
Block (1978; 1978; 1989)	Wholesale/distribution stage often carried out in groups. Core groups based on ethnicity or kin common. Alliances were fluid and changing. Smugglers usually involved in more than one criminal activity.
Kleinman and Smith (1990)	Leaders of drug networks easily replaced.
Moore (1990)	To disrupt drug networks, focus on connections - key intermediaries within and between criminal networks.
Jenkins (1992)	Subgroups of the Mafia were very distinct from each other. Various alliances and connects existed between criminal networks. Networks often involved at various levels.
Lewis (1994)	Criminal networks involved at various levels. Leaders have power due to resources and connections.

Bourgois (1995)	Street-level dealing of crack run like small business, with bosses and staff. Staff take on variety of roles.
Reuter and Haaga (1986)	Drug networks small scale to minimise risk. Small core groups run networks.
Jacobs (1997)	Informs as intermediaries between real drug networks and assumed ones (police)
Adler and associates (1983 on)	75% of sample joined drug networks at fairly high levels due to contacts. Loose associations now replaced by teams with roles. Position relates to network.
Curcione (1997)	Dealers became such due to connections within and outside network.
Padilla (1995)	Gangs run drug dealing as small businesses, orientated towards profit. Leaders oversee business. Non-economic exchanges main form of interactions within gangs.
Potter (1994)	Higher risk forms of drug networks have more organisation to reduce risk, e.g. layers between leaders and contact with drugs. Lower key networks, less so. All have core groups and agents acting for them.
Plant (1975)	User groups less organised and more fluid/casual than dealing networks.
Chatterson et al. (1995)	Detection increased by larger sizes; more business; larger quantities and customer #s.
Edmunds et al. (1996)	Rarer the drug, more risk as more open market required. Closed markets have lower risks. Closed ones more controlled and organised, and are less geographically fixed.
Dorn and associates (1990 on)	All types are fluid. Professional crim have cores ("family") and agents. Street level more casual and fluid. Retail groups most organised, with staff, roles and most protection.

Ruggerio and South (1997)	Drug networks made up of core (principles) and agents. Cores typically white, agents non-white.
Williams (1993)	Higher levels of drug trafficking are more organised and have tighter cores. Middle levels have cooperation and cores, but not to the same degree. Street level made up of small groups in competition, often ethnic.

A number of themes emerge from the literature on drug networks:

- The first common theme was the differentiation between leaders and other members, Ruggerio and South's (1997) principles and agents. Most of the literature indicated that the networks had such individuals, usually due to contacts and resources, e.g. Dorn and associates (1990 on), Potter (1994), Bourgois (1995), Lewis (1994). Both of these concepts are major parts of structural analysis. Access to both are due in a large part to an individual's position within networks.
- A second theme was the notion of key figures forming cores within the network, based on some measure of association, such as ethnicity, that binds them together, as indicated by Williams (1993), Block (1978; 1989) and Reuter and Haaga (1986), amongst others.
- A third was the presence of different groups within networks, either due to key figures acting as intermediaries between separate parts, or groups having different roles assigned to them, as Adler and associates describes (1990 on).
- The notion of intermediaries was a fourth theme, whether they are leaders themselves, or between leaders and staff, acting as a safeguard. Another form of

intermediary was the contact between different networks, such as Jacobs' (1997) informants and Jenkins' (1992) wide range of networks working together.

The final theme was about the overall structure of drug networks. References to flexibility of the networks operating around key figures and cores are the main form of descriptions. It is these core members that create any sort of permanence in a drug network, maintaining their positions both within their own network and relative to other networks within the market through their contacts and resources.

Non-Drug Networks - Property Crimes, Organised Crime, Professionalism and the Underground Economy

Outside of drug trafficking, organised crime, its associated criminal acts (gambling etc.) and professional criminality have all had some amount of structural analysis carried out on them. Some of the major works in each area present the major themes for networks not involving drugs directly.

Property Crime, Professional Criminals and Criminal Groups

Sutherland's (1937) seminal study of the experiences of one professional thief operating in the 1900-20s described the networks of associates the thief had to draw upon for support, information and for colleagues to work with on jobs. "Mobs" would form to carry out jobs, with widely varying degrees of permanence. Fences played a vital role in facilitating making a profit and served as links between the larger communities of criminals. Corruption was endemic and ever present, but was not any more organised than having a handful of contacts who could arrange "fixes." Apprenticeship featured as part of the movement in a criminal career, with older, more experienced members taking on younger men. There was very much a social structure to the criminal networks, based on the status afforded various occupations within the criminal community. Thieves were quite high status. At one level, Sutherland found that the networks the thief moved through were more organised, honourable and more mutually supportive than how many researchers describe the networks of today. There was a loosely defined code of ethics, where individuals would not inform on each other and would give aid when a member of the mob was arrested. Part of this may have been the tendency to look back to the past with nostalgia, as part of a golden age. Certainly, there was a tendency to do this with British criminality back in the 1960s, when the Krays and other gangs were operating, particularly in London (Hobbs 1995). Another factor, though may have been shifts in the

culture of larger society. As society as a whole moves towards more entrepreneurial, gain-orientated social structures, criminal structures will mimic this. Another major feature of Sutherland's research was the recognition of organised crime as series of syndicates and networks, rather than one monolithic entity. Organised crime, and those who belonged to such groups or had strong associations with them was a powerful force within the world Sutherland's thief lived in, but certainly did not run it.

Einstader (1969) examined the social organisation of armed robbers, comparing the findings to the organisational structure suggested by Sutherland for professional thieves. Interviews with 25 paroled armed robbers was combined with data on 25 incarcerated offenders to build up a picture of how the teams functioned. Unlike Sutherland, Einstader found armed robbers to operate in partnerships, rather than social groups. Armed robbers differed from professional thieves on a number of points:

- there was no sharing with outsiders, individuals giving information were considered part of the team
- expenses were generally minimal, payed out of pocket by individuals. Rather than shared by all the members
- backers were not used to fund robberies, as they generally required little capital
- when a member was arrested, they were not helped by the team, though the arrestee was expected to remain silent
- honesty was expected, but only in an immediate sense, lies were expected about ability, background etc.
- members could join and leave at will

- no evidence of “fixes” being used for court cases

Einstader argued that, by the 60's, Sutherland's model was more historical than anything else. The armed robbery team was a partnership, where members debated decisions and everyone had a roughly equal say. Age and experience were given some weight. Experienced and persuasive individuals could guide the team, but not command it. Roles were decided, for example, by the group. Designation was influenced by personal skills and weaknesses, as well as preferences. The basic unit was a driver, the member who started the robbery and collected the cash and someone to cover the crowd and aid the collector. Any additional members were just one or more of the three basic roles. The lifestyle was opportunistic and short-term, with associates being hustlers, pimps and other criminal opportunists. The robber

needs to move quickly...when the opportunity presents itself...[in] the more adaptable...social organisation represented by the partnership. (pgs. 71-72)

Shover (1973) compared the social organisation of burglars to Sutherland's original work. Shover collected the data from autobiographies, journalistic accounts, questionnaires and interviews with both imprisoned and “free” burglars. Through the data, Shover developed models of both the internal workings of the burglary groups and how they interacted with vital outside links. Internally, Shover found that the networks were constantly changing in size, depending on arrests, size of jobs etc. “Crews” for jobs were formed out of pools of associates located in common meeting places, such as familiar bars and clubs. These locations were common ground, for meetings, sharing information and forming crews. Alternatively, crews could be formed by being brought together by fences or tipsters (individuals supplying information about potential jobs). Burglary groups tended to be made up of cores of two to three members who had built up long-term relationships. As required, additions would be drawn from the pool, as long as they were known to the crew and deemed trustworthy. A member could belong to as many crews as they chose.

The general organisation of established, regular burglars was made up of broad, loosely-structured networks, with small cores scattered through them. The crews themselves were like Einstader's armed robbery teams, with leaders being rare. Again, age and experience were given due weight. Roles were decided as was done for armed robbery. Roles included lookouts, drivers, when needed, members covering police radio transmissions and, typically, one to two members actually entering the premises. Profits and expenses were equally divided.

Three types of contacts figured prominently in the external contacts of burglars. The first was the tipster, sources of information about potential jobs. Tipsters could include other thieves, fences, ex-thieves or individuals with inside knowledge. Ten percent was the share usually given to them. The quality of information and how legal their occupation was created a hierarchy by which tipsters could be assessed. Fences or handlers also had a hierarchy based on how big a business they ran and how much of it was illegal trade. Tips given by fences were usually to acquire certain items, allowing the handler to have some control over inventory. Handlers had more complex relationships with burglars than other external contacts, sometimes giving burglars loans and acting as intermediaries between more legitimate businessmen and burglars, getting the latter to do jobs for the former. The final association was with lawyers and bondsmen. Through repeated contacts, these individuals began to identify which criminals were more trustworthy, potentially allowing them to engage in semi-illegal activities with them, such as accepting stolen goods in lieu of payment, without fear of being informed on. Fixes, as Sutherland described them, were rare events. Shover found that most sources described professional burglary as in decline, with risk levels increasing and cash having less value as a commodity. Professional thieves were being replaced by "hustlers," opportunists focussed on personal gain, rather than on crews.

West (1978) interviewed a group of thieves about their careers. West found that recruitment was not so much into an organisation. The process was more informal, as

youths had easy access to practising thieves through the networks they moved in their lower-class environs. Youthful groups of thieves were loosely formed, with no real organisational structure or consistent leadership. Crimes were more opportunistic. Training was typically "on the job" with instruction given by more experienced peers or older thieves. Networking was found to be an essential part of the job. Contacts gave warnings, information about targets and jobs and cash when needed, while fences and lawyers were actively sought out. Thieves were organised into loose groups of "colleagues," which acted as a pool of associates to draw upon. Individuals would form partnerships for jobs, while large jobs would have role differentiation, though no specialised skills were required. There were some weak limits to who could join such groups. Interactions between individuals carrying out different crimes also frequently took place, e.g. thieves would sell credit cards to fraudsters. As the thieves aged, they would end up in jail, go straight or change occupations, such as becoming a fence themselves.

Porter (1996) did a multi-force study of cross border crime for the Police Research Group. While the paper mainly focussed on crime rates and information sharing between force, there were a few findings with relevance to criminal networks. Of 21 cross border criminals interviewed, 19 saw themselves as career criminals, with crime being their occupation. This is confirmed by their extensive criminal histories and involvement in a wide variety of crimes (drugs, burglary, armed robbery, prostitution). One third of the sample travelled as a deliberate attempt to avoid detection by police, as they were aware of the difficulties police experienced in exchanging information. Porter found that the use of informants was a key part of collecting information on cross border crime, as long as information was shared. This indicates how tapping into the networks of criminals and individuals who interact with criminals was the most productive method of information gathering. For example, two thirds of the sample were regular drug users, so informants connected into local drug networks could possibly have information about crimes outside of those networks, geographically, but involving individuals within the network.

Nee, C. (1996) studied one hundred offenders, almost all males, involved in careers in auto theft. Many of them started out by getting involved in it with more experienced friends. There was no formal apprenticeship, they generally started out performing minor roles, e.g. lookout, before actually getting to commit crimes themselves, after learning the required skills from the more experienced thieves. More importantly, over one third of the sample were involved in organised car crime networks. These networks took a variety of forms:

- stripping cars for the large market in car parts
- selling to receiver (mostly done by older offenders with reputations)
- false sales

Another feature of the sample was that a significant proportion were specialists. 53% specialised in car-related crime as their main form of offending (only 13 had committed other offences). The remaining 47% had committed a wide variety of criminal activities.

Warr (1996) discussed three processes that occur in delinquent groups - instigation, specialization and longevity. Warr states that specialization was a rarity amongst delinquent individuals, but was concerned with whether groups possibly commit similar delinquent acts over time. Longevity was merely the duration of delinquent groups. The author was particularly interested in the issue of instigation, with the majority of the paper exploring that issue. When studying instigation, Warr used Reiss (1986) as a starting point. Reiss, as previously discussed, identified two types of individuals involved in delinquent groups, recruiters and joiners. Warr was interested if an individual was consistently one or the other across groups and whether the two types had different backgrounds. The first major point Warr made was the difference between actual offending groups (OGs) and accomplice networks (ANs). An individual can have an extensive accomplice network from which are drawn the groups that actual crimes are committed with. Warr found that all the offenders in the sample had much larger ANs

than OGs. Those offenders with the largest number of offences also had the largest ANs - larger pools of potential co-offenders to draw from. Depending on the type of crime 20-45% of the offenders had committed their last two offences with the same OG. This indicates some degree of group loyalty, but that offenders do associate with different OGs, in general. Warr also found that OGs tended to stable in terms of what kinds of delinquent acts they committed. This means that while the individuals committed a wide variety of crimes, they did so by moving from group to group, with the group itself staying specialized. Warr then focussed on instigation. The author found that, excluding group fights and trespassing, approximately 90% of the time, delinquent acts were instigated by a single member of the OG. The instigator was usually older than the other members. The instigator was also usually male, with males typically offending in same-sex groups and females, same or mixed, depending on the type of delinquency. The instigators also tended to have more previous offences, though this was rarely statistically significant, and may be due to the differences in age. The instigator was usually a close friend of all the joiners (as described in Chapter 1). Finally, 18% of the sample were classified as pure instigators, 31% pure joiners and 51% mixed, depending on the individual's role and position in that specific OG.

Maguire (1982) interviewed forty incarcerated burglars with long careers in burglary, and other property crimes for thirty-five interviewees. The burglars frequently described their criminal activities in the context of being "work." Burglaries were described as "jobs" and terms such as "professional" and "retired" were used liberally. While the work the offenders carried out was largely casual and unstable employment, they offenders constructed their activities as employment. Maguire divided the sample into three categories, based on broad notions of skill and expertise. Only a few were classified as low level burglars (LL), with little skills or experience. Three more were classified as high level (HL), those seen as true professionals. The majority were medium level (ML), with more ability than the LL, but not exceptional. Maguire found that any individual taking up burglary as work encountered others in the occupation. This occurred through

time in prison, common interests, the need for information and for co-offending. Fifty percent of the sample usually committed burglaries with a partner. Prison time resulted in further, more social meetings in pubs, clubs and similar locations. These various interactions led to three conflicts for burglars:

- self versus the group, e.g. to "grass" on co-offenders
- status versus secrecy
- hedonism/short-term versus long-term stability

The HL dealt with these issues by forming small cliques, with high levels of secrecy. New members were vetted and members kept a low profile by avoiding conspicuous consumption. The HL generally avoided association with the general criminal population for socialising. The cliques made small pools of mutually trusting members that could form co-offending groups. The major feature of the HL was exclusivity. The ML had larger pools, with less exclusive criteria, while the LL basically operated in an open environment. Revenge for grassing (real and imagined informants were a major topic of conversation) also differed between the levels. LL and ML tended to take immediate revenge, or just let it eventually slide. HL carried out longer-term, more planned reprisals. The disposal of stolen goods was also related to level of burglar. LL sold cheaply to pawnshops or other businesses, or in pubs to strangers. ML could access middlemen, thieves acting as intermediaries or legitimate businessmen that would occasionally take stolen goods. The HL sold exclusively to professional fences or would steal to order. Specialist buyers would select burglars carefully, and would either have a legitimate business, as well or were criminals that had "made good."

Walsh (1986) interviewed 122 incarcerated offenders about their activities as burglars or robbers. The high rates of burglary, in its present form, was a result of modern society. Large populations and urban centres allow anonymity, legal proscriptions and enforcement influence behaviours. The large amount of modern housing and commercial

properties provide targets and consumer demands provide the markets. Walsh found that residential burglary was usually carried out by solo burglars, while commercial properties required teams to break in to. A major theme in the statements of the burglars was the difference between exchanges involving respect and those that were purely economic. Respect was an amorphous quality that was related to honour, reputation and differential status between individuals. Of the forty-five burglars, many were single, but fifteen had one to four "supporters," individuals aware of their crimes and not opposed to them and were not wife or kids. A further fifteen had five to ten supporters. Major topics of conversation were targets, either as statements of intent to hit difficult targets as a way of enhancing reputation, or to pass on information for others to use or to obtain assistance. Half of the sample regularly acted on information received from others. Taking this further, Walsh identified people termed "flaw finders." These were individuals who actively attempted to acquire information about weaknesses in targets from those who worked there. "Leakmen" were low status individuals at targets who would inadvertently give up such information. The sixty-nine robbers also studied described their teams as non-hierarchical, with 45% of the planner-type robbers and 67% of the opportunists using relative and close friends on their teams. The preferred size for teams was two, followed by three, acting alone and four or more members.

Shover and Honaker (1992) found that the lifestyles of persistent property offenders was constructed around maintaining a hedonistic life. The lifestyle was one of pleasure, especially alcohol, drugs and acquisition of luxuries, such as designer clothes. The various property crime served as a method of keeping the lifestyle going. A major part of the whole process were the large number of parties that were constantly taking place. These parties served a dual purpose. First, as social events to meet others and to assert status through displaying how successful the offender was. Second, there was an emphasis on individuals coming and going as they pleased, allowing them to assert their autonomy. Involvement in the lifestyle was extremely incompatible with the networks of non-offenders the sample had contact with, such as friends in legitimate jobs, family etc.

The clash of lifestyles often led the offenders to shift more and more into the criminal networks of associates and become increasingly excluded from the non-criminal ones.

Wright, Decker, Redfern and Smith (1992) and Wright and Decker (1994) was a study of 105 active burglars in St. Louis. Wright et al. was an exploration of their use of snowball sampling techniques to obtain the sample. Snowball sampling is a method where new subjects are acquired by current subjects either bringing new subjects into the sample or introducing the researchers to potential new subjects. They found that the optimal method of obtaining subjects was where the individuals that introduced possible subjects were given a cut of the participant fee for the new subject. The main reasons for joining the study were the money, trust of the individual that introduced the researchers and the opportunity to tell their own stories. Seventy-five percent of the sample had not been convicted of burglary. Wright and Decker found that while most of the offenders disliked targeting relatives and friends, twenty-one of the 105 actively sought out casual acquaintances and others known to them, as they could easily find out when they would not be around and have preliminary access to their homes. Using tips took place, but only two used tipsters in the way that Shover described. Four more regularly used information from sources, but not in any consistent manner. Many of the remainder of the sample used tips occasionally, but did not really seek them out. One major theme was the lack of a code of honour, as compared to how offenders in the past were perceived to act.

Cromwell, Olson and Avary (1991, 1993) interviewed burglars, shoplifters, professional/non-professional fences and amateur receivers (those who buy stolen goods for their own use). When criminal co-offending, Cromwell et al. found that decisions became more cautious, with targets that were acceptable to individuals being turned down by groups. This actual shift away from risk was accompanied by a perception that the co-offenders helped the offenders become more brave. The group served to reduce risky behaviour while also strengthening self-image and willingness to engage in crimes. A major section of the study was on handling of stolen goods. Fences/handlers acted as

links between the property offenders and the rest of the market. Fences not dedicated wholly to the purchase of stolen goods and amateur receivers had, they stated, been the focus of very little research and had to be included in any study of stolen good markets. An examination of fifty burglary arrest reports indicated that

- nine burglars sold their goods to pawnshops
- eleven trade the goods for drugs
- ten sold to friends and family
- ten sold to strangers
- nine sold to employees or owners of otherwise legitimate businesses
- one used the goods as collateral with a bail bondsman

The wide variety of purchasers indicated the need to examine a broader range of handlers than just the professional ones. They found that small goods, such as individual TVs were not sold to professional fences (PFs), but to drug dealers, occasional fences and the public. The most professional burglars sold to one or more PFs. Regular work required regular purchasers. New burglars, addicts and juveniles were all seen as untrustworthy and didn't steal high enough quality goods. They had little access to the PF. Seven of the thirty subjects did have regular PFs. Many also stated they would inform on co-offenders before they would their fences, as informing on the latter would result in a reputation of untrustworthiness and an inability to sell goods. They also found that nineteen of the fences were non-professional. These fences acquired goods for personal use or resale, but only occasionally and as a method of bumping up income. Economic survival for otherwise legitimate businesses came out of accessing this part of the underground or informal economy. Cromwell et al. proposed six types of fences, based on frequency of purchases, volume of purchases, the reasons for buying (personal or resale) and level of commitment to purchasing:

1. PFs - fences who make a living from handling stolen goods, with a regular flow of a large volume of goods that are resold or mixed with legitimate goods; often with a legitimate front, but well known as fences and can place orders for goods
2. Part-time fences - less frequent, smaller volume purchases than the PFs, with fencing not being the main business; either passive receivers, where goods are bought when offered or as proactive receivers, placing orders and seeking out goods, usually with a couple of trusted burglars (Cromwell et al. suggest this latter sub type would actually have more information about targets than PFs as they are more integrated with the legitimate markets)
3. Associational fences - individuals with close contact with criminals due to occupation, e.g. lawyers, police, bail bondsmen, that may accept stolen goods in lieu of payment and begin to do so on a regular basis to increase own earnings
4. Neighbourhood hustlers - fencing as part of a wide variety of petty criminal activities; engages in minor fencing, either as an intermediary between burglars and customers for a fee or burglars who occasionally handles stolen goods; often informants, so only access low-end burglars, e.g. addicts
5. Drug dealer fences - take stolen goods for two reasons - increase customer base by accepting goods as well as money and increase profits by selling goods at a substantially profit versus what was payed for them
6. Amateur receivers - selling goods direct to consumers; two subtypes - strangers, the riskiest types, which the lowest status burglars most often accessed and known individuals, who usually bought for their own use

Cromwell et al. proposed that law enforcement strategies must include reducing demand by the less professional fences, through investigation of such purchasers and crime prevention programs. This reduction in non-professional demand would make burglars have to try to use PFs more often, who could then be targeted, and make it more difficult for low status burglars to sell on the goods they take.

Hobbs (1995) carried out a participant observation ethnographic study of a series of professional criminals in the East End of London. Hobbs found that the new style of professional criminal was following a career that mimicked the changes in the more legitimate business world. The market place had become the dominant style of interactions, where, outside of family and friends, ties between individuals were purely instrumental. Hobbs found that the working class entrepreneurial culture so dominant in the East End was, for many serious criminals, a good background for the new style of business. At the heart of this shift away from traditional criminal mores was the rapid domination of drugs as the primary criminal market:

As the globalization of legitimate markets have contributed to the erosion of traditional cultures, so drugs and the subsequent global markets that have evolved since the 1970s have contrived to erode the links between traditional criminal territories and the criminal cultures they spawn. (pg 112)

The key to this new process was what Hobbs describes as a new form of interface between global markets and local criminal activity. The events that occur at the local level are aspects of global markets, shaped by these markets as well as local demand. Criminal exchange in the UK is "just buyers and sellers" (pg 28). One of the common themes that runs through the book was the flexibility of the criminals. Most were engaged in a wide variety of activities. A father and son had been involved in burglary, drugs, handling and fraud at various points in time. Another criminal businessman, indistinguishable from his middle-class neighbours, had, during his career, been a handler, ran a "slaughter"

(storehouse for stolen goods) and, based out of a mobile café, had developed a national network of associates - drivers, companies, burglars and thieves all sold goods or made use of his storage system of warehouses and garages. Associates were only aware of their own part of the operations, creating a loose network:

...the loose coalitions...present...an amorphous image of unstructured criminality.... (pg 63)

After the operation fell apart, the businessman moved into tobacco, then drug smuggling, along with pornography, briefly.

A second theme was the importance of meeting places for carrying out business. A Turkish bath was a key contact point in one example. Another was illegal boxing matches at a pub on Sundays. Others included pubs and clubs. In these locations, individuals initiated deals, found work and used how they presented themselves and their reputation as tools in the constant system of dealing and exchange. The third theme was of violence, sometimes as something that enabled a person to find work. Two criminals discussed their employment in clubs and bars as unofficial bouncers as a direct result of their willingness to use violence. The threat and use of violence was also necessary to conduct business where legal sanction were not an option. Status was no longer conferred by age or experience, but by level of success and willingness to directly punish those who do you wrong. Not all violence was instrumental, with one case involving an ongoing feud between two families that, over twenty years, had occasionally erupted into extreme violence. The role of intermediaries was also important, as manifested by the importance conferred on handlers and "slaughter" operators, as well as those individuals who act as links between different networks.

Hobbs states that examining the interactions between criminals would not allow for an understanding of the nature of the networks themselves. The author argues that a static,

hierarchical structure would be required to be able to do this. The “interactions that are co-ordinated in an infinite number of variations which relate most pertinently to the form of criminal activity in question” (pg. 115) would not allow this. Yet the number of variations would not be unlimited, as the forces that drive the market will make certain forms of structure, which should not be confused with organisation, more effective and successful. A fluid marketplace where flexibility equals survival does not mean structure is non-existent, just that those structures that are flexible will succeed. Without formalised structural components, examining the interactions is the only way to understand what consistencies the patterns might have. There have been numerous attempts to model market structures using structural analysis (White (1988); Thompson, Frances, Levacic and Mitchell (1991)). Additionally, there is a division between the market as network and the networks that operate within markets, an idea expanded on below, with examination of the latter having the most potential.

Hobbs (1997a), building on the previous work, began to address the nature of the changes in criminal culture in the post-war era. The criminal fraternities leading up to the 60s and 70s were based on skill and status, such as safe cracking, until technology made the career redundant. The culture of the professional criminal then shifting into a “network of exchange” (pg. 61) led by armed robbery. The culture of the time very much followed the model put forward by Einstader, discussed above. Again, technology and security made this form of professionalism outmoded, to be replaced by the lower risk market for drugs, where demand became enormous. This new market was dominated by task-orientated business-style exchanges, where business ethics hold sway, without legal controls. This results in a fragmented structure where

Contemporary serious crime groups possess the ability to splinter, dissolve, mutate, self-destruct or simply decompose. (pg. 65)

Hobbs (1997b) described key aspects of criminal networks within the larger context of culture and geography as part of the expanding in-depth ethnographic study. Hobbs highlighted the role of hubs, the centres of networks and the links between networks. These individuals were the entrepreneurs of the criminal markets, forming networks as opportunities arise and establishing ties to others to facilitate their business endeavours. The criminal networks in the UK were for the most part local operations, but almost always have some form of international links, This is most obvious in the drug industry, but also common in the stolen goods markets, e.g. the movement of automobiles and auto parts abroad. Hobbs argues that this globalization does not represent a shift towards transnational organised crime, a media popular concept that has grown to the extent of having its own journal, but a shift towards direct links between local markets and global opportunities. This mimics trends in legitimate economies. Hobbs (1997c) also carried out a comprehensive review of the literature on organised crime, gangs and professional criminals. Hobbs found that there was something of a trend towards increased organisation and orientation towards business amongst gangs. In general, Hobbs found that the criminal marketplace was most conducive to the non-specialised, flexible worker, able to adapt to market needs and form/dissolve arrangements as required. This was accentuated by the emphasis place on personal gain and pleasure through the carrying criminal activities. Professionalism has been replaced by, for those with resources, entrepreneurial action, and for those without, adaptability in what they do.

The dilution and eventual disappearance of the legitimate employment market redefines criminal coalitions, not in terms of gangs, sub-cultures, specialisations, or hierarchical structures, but in the context of the new decentred, unpredictable trading economies...(pg. 831)

This mutable market creates individuals constantly seeking any opportunity to profit and do so quickly, adopting new techniques or exploiting weaknesses in the system as soon as they become apparent.

Organised Crime

Chambliss (1978) studied the structure of organised crime in Seattle in the 1960s and 70s through observation, interviews, archives and any other sources he could access. Chambliss argued that "crime (was) a political phenomenon which takes its character from the economic institutions that exist at a particular point in time." (pg. 8) Seattle was, prior to the time of the research, generally perceived as a "clean" city, one with very little crime in any sort of organised form, but Chambliss identified widespread criminal networks and corruption. Police, politicians, businessmen were all bought off or heavily involved in the networks. The major players in Seattle were, in fact, police leaders, top politicians and lawyers and powerful businessmen. Some were involved in the administration of the networks themselves, others kept a distance by only being involved indirectly, e.g. arranging real estate purchases with profits from gambling enterprises. The network was not a rigid hierarchy, however. Individual power shifted as connections and profits for any one member strengthened or weakened. Meetings were not formal, and did not involve any number of the major members at one time. Informants were adamant that the networks were not controlled by the Mafia. Chambliss found that no one, not even those at the top, had a full understanding of the extent of the networks that were in the city. Competition was present, but open conflict was avoided to minimise attention from outside law enforcement. Independent operators could function, as long as they payed off the right people and not take too much of the market.

Shared interests are the root of the forces of social control that maintain silence and ensure mutual cooperation among the members of the network and those who work for it. (pg. 81)

Criminal behaviour was the result of individuals and groups placed in a social structure that enforces resources and constraints for those people. Chambliss argued that capitalism was at the heart of crime:

- the general populace are orientated towards mass consumption
- yet those in power want to maximise their own profits
- illegal enterprise allows the populace to consume a wider variety of goods, and allows those involved to increase their profit levels

As capitalism is based on the concept of businesses operating in competition in markets, criminal networks operate as businesses. Cardrooms, bars and restaurants, for example, operated as bases for a wide variety of enterprises - gambling, drug distribution, stolen goods, illegal liquor and loan sharking.

Fijnaut (1990) carried out a comparison of the results from research carried out on organised crime in the USA and Western Europe. The primary motivation was the increased political and police emphasis on the phenomena of organised crime, with the resulting development of law enforcement efforts to combat it, such as seizure of assets. A comparison was considered useful as more work on OC has been carried out in the USA, a lot of the research carried out in Western Europe refers to the American literature and there are increasing law enforcement links between the USA and Western Europe. Fijnaut identified three major strands of "organised crime" in the American literature:

- professional criminals - as per Sutherland, not organised in any long-term, stable way
- crime syndicates - networks with hierarchies, key members, using the threat/act of violence and corruption to maintain power and having connections to powerful legitimate individuals (Fijnaut notes that these syndicates were originally seen as one monolithic entity, rather than groups either in cooperation or conflict with each other)
- organised white-collar crime - may or may not be professional criminals, using a combination of legal techniques, loopholes and illegal methods for financial gain

In terms of how organised crime is perceived in the literature, there were three approaches:

- the notion of a single business run by a strict hierarchy based at a national level, e.g. Cressey (1967)
- a neo-Marxist approach (see Pearce 1975) - organised crime as a series of separate groups, operating on the edge of society, with little real impact on the elite, but acting as a controlling force of the lower classes
- the functionalist approach (Chambliss 1978, Gardiner 1970) - again, no singular organization, but is a part of the American economy and culture, filling gaps in the marketplace barred to legal groups. This approach is used to explain why, historically, organised crime in the USA has been the domain of recent immigrant groups, who are marginalised, forcing them to carry out illegal businesses to generate the income required to establish themselves in legal businesses.

Fijnaut indicates that the first model has been largely disproved, while there is no way to substantiate or disprove the second. The third model, with its position that a variety of criminal networks carrying out criminal activities are located at the illegal end of all economic activities was the best supported. The similarity between criminal networks and legitimate businesses have often been highlighted (Cressey 1972; Cohen 1977; Reuter 1983). Fijnaut states that the difference between the illegitimate and legitimate groups are in the secrecy, avoidance of government controls and methods of internal control used by the former. However, secrecy and avoidance of controls are also part of legitimate enterprises, just less so. Internal control, of course, is maintained through entirely different pressures than violence, but those pressures are present and can be quite powerful. The differences were not so great.

Fijnaut then describes the small amount of literature comparing the US to Western Europe. Works by Block and Chambliss (1981) and Albin (1975) both found that

"underworlds" existed - criminal networks, but not in a highly organized format like those in the USA. McIntosh (1975) described the growth of organised crime in the USA as originating in projects carried out by groups of criminals. These projects were the result of the increasing complexity of society and effectiveness of policing. In response, criminals began to plan ahead, develop specializations, invest financial gains. The result were criminal groups developing into networks, then into major organizations. These organizations supplied access to illegal items or activities that people were increasingly trying to access. The classic example is the growth of organised crime from Prohibition. They also began to engage in corruption of agents of the State. The author found that organised crime in the UK was moving towards the US types, but lacked in the element of corruption, a rigid hierarchy and, as she saw it, a single organization. McIntosh believed that when systematic corruption began to take place, then the UK forms of organized crime would have developed into the American types. Mack (1972) also found that no organised crime in the traditional American sense existed in the UK. Networks were present in a variety of forms, but there were few groups engaging in corruption, controlling legitimate businesses or of a long-lived nature. This seems a bit extreme, considering evidence of the pornography/prostitution industry of the 50's, 60's and 70's (Daniel and McGuire 1972; Pearson 1984; Murphy 1993), and the rapid shift of professional criminals from armed robbery to drug trafficking in the 70's (Hobbs 1995). Mack, however, was trying to find networks that fit the most extreme end of the spectrum of organization, so his findings are not surprising. Walsh (1986) described the activities of professional criminals, who would often form small networks to carry out their activities. Overall, Fijnaut finds that organised crime in the UK follows the more functionalist model of such networks in the USA, but lack the central elements of extensive corruption, control of legitimate businesses and influence on unions. There is no difference between the US and the UK for presence of professional criminals and the differences between UK and USA criminal syndicates or networks is shrinking.

Reuter (1983) carried out a major study of organised crime in New York city, drawing on a wide variety of sources. These included official records, materials seized in raids, interviews with police and prosecutors and four informants involved in organised crime in New York. The author's aim was to use the information available to develop an understanding of just how organised bookmaking, the numbers racket and loan sharking were, to what extent the traditional Mafia played a role in them and how each market was structured. Bookmaking, betting on sporting events and racing, involved multiple roles, but without any degree of real specialisation. The roles were bettor, runner, clerk and bookmaker. The runner acted as the intermediary and guarantor for both bettor and bookmaker, in return for a percentage. People often took on any number of the four roles. The networks themselves were broadly of two types. The older networks were organised by Italians with connections to Italian organised crime. The newer networks involved younger, better educated and more independent members. The individual operations were quite small, e.g. 15 clerks or less, and the overall market was highly unstable, e.g. cheating and business failures were commonplace. The operations were largely separate from each other:

Groups of bookmakers and runners have regular dealings with each other, but only occasional and attenuated dealings with members of other networks. (pg. 43)

Bookmaking in NY was a market with high levels of entry, exiting and reentry, made up of small firms in a large market with little collective coordination of pricing.

The numbers racket, illegal lotteries, involved five roles - bettor, collector, pick-up man, controller and "bank." The collector gathered the bettors number picks, either in dedicated betting locations or in legitimate businesses, while the pick-up man took them to the controller. The controller acted as an intermediary between the bank, the financial centre of the operation, and the collectors. The controller was a relatively free agent, able to change banks at will and, as the intermediary, was a key part of the chain. Reuter found

that the market was not concentrated in a few banks, though multiple ownership was possible. This, combined with no real attempts to coordinate the market, suggested a lack of central control, as in bookmaking. The collectors were the most powerful figures in the networks. Additional market pressures came from competition with legal lotteries. While having a Mafia connection would help a loan shark, due to the Mafia reputation for violence, most loan sharks were in business with a regular series of customers, most of whom did not have access to other loan sharks. This gave the loan sharks a degree of control through threat of withdrawal of service, rather than exclusively through violence. Reuter found that levels of violence were much lower than expected. From these findings, Reuter argued that the "organisation of illegal markets is largely determined by market forces" (pg 109). Reuter proposed that the structure of a market grew out of "cost curves." If each new unit produced was cheaper than the last, large organisation would be at an advantage, as rates of production could be much higher. If each new unit was more expensive, than small organisations with limited production would be the norm. Reuter concluded that organised crime activities, in New York were small operations in large, fluid markets. The monopoly of the Mafia in such markets does not exist. The main force are the economic pressures, which cause the most financial gain and the least degree of risk to come out of small organisations. Large numbers of staff increase the likelihood of detection, as well as requiring more people to know about the operations themselves. Minimising size, amount of knowledge and geographical area all reduce risk. Regardless, operations decline and collapse, while new ones quickly emerge as opportunities occur.

Potter's (1994) research on criminal activities in "Morrisburg" went beyond the drug trafficking described in the previous section. Drug trafficking was, in fact, one of the less important crimes carried out within the city. Potter summed up the literature on organised crime in four points:

- organised criminality occurs in an informal, loosely structured, open system...
- small, fragmented and ephemeral enterprises tend to populate illegal markets - not large corporate syndicates...
- the alien conspiracy model...overstates and misinterprets the role of ethnicity in determining the structure of organised crime...
- the alien conspiracy model overplays the role of organised criminals as the corruptors of public officials and professionals... (pgs. 12-15)

An additional feature Potter claimed was largely ignored in the organised crime literature was the role criminal networks play in the local society they operate within. Besides the supply of goods and services, it employs local people, controls individuals who might otherwise engage in predatory crime, gives power to individuals excluded by legal society and the underground economy allows the lowest classes to survive on very limited income. While this does not take into account the negative economic factors criminal activities have on communities, it would be naive to dismiss this proposition. Criminal networks are not groups separate from society, feeding the needs of a minority of the general public. The continued survival of such networks can not be put down merely to secrecy and the corruption of those in power. The integration of such groups into the community is one of their strengths.

Potter carried out an intensive field study of the organised crime activities in "Morrisburg" (pseudonym). The field study, as in the Adler studies and others' work, Potter points out, has the most use for studying particular goods/service, examining specific locations and for

...describing the criminal networks engaged in the delivery of illicit goods and services... (pg. 41)

Potter found a number of criminal groups engaged in a variety of forms of activities. Three, in particular, were dominant. The "Gianellis" were six members of an Italian family and five other people. They also had seven other business associates, of a variety of ethnic backgrounds (Italian, Slavic, Irish, WASP etc.). Opposed to involvement in drug trafficking, they were primarily involved in gambling operations, as well as a variety of legal businesses. Some of these were merely fronts, others, actual businesses. They had a variety of contacts with other groups both within the city and outside. They rented locations, for example, to the "Ackbars," the second major group. These two brothers ran prostitution and drug dealing, previously described, and shared duties with a female associate. They shared police protection with the "James Gang." This third group was headed by a black criminal, "Michael James," and was also involved in prostitution and drug dealing, as well as counterfeiting. Each of the three activities were carried out by James and one associate - drug trafficking with a Greek (see above), prostitution with two white women and counterfeiting with two black and one Hispanic associate. There were various links between these three networks and other, smaller operations, but there was a general tendency to avoid each others activities.

Gambling was generally controlled by the Gianellis, and was organised as required to function. Bookmaking, for example, had legitimate locations for bets to be placed, runners to pick up the bets, clerks to record them and bookmakers to act as banker and set odds and limits. Additionally, there was a highly developed structure to money laundering in the city. There was, however a wide number of independent operators, acting alone or in association with the main operators. Overall,

...it (was) based on a network of associations and relationships. Those who (were) the best organised and (had) the strongest associations (were) also the most successful. (pg. 75)

Similarly, fencing and loan sharking were carried out by a mixture of independents and associates with larger groups. Prostitution involved a wide variety of groups. Streetwalkers who also dealt were associated with the James Gang. Call girls were mainly supplied by a motorcycle gang, while the Ackbars had call girls and prostitutes based in bars. Pornography and specialised services were generally controlled by interests outside of the city.

Potter concluded that organised crime was about social relationships, on the one hand, and business operations, on the other. The social relationships manifested themselves as social networks, which he describes as “amorphous.” Organised crime figures and groups act as brokers between individuals, such as suppliers and customers, and the legal and the illegal. They also act as financiers and other resource suppliers. They have the contacts to enable them to operate, and the contacts to carry out their operations. In terms of network roles, tasks are not so specialised. Potter found, for example, that the difference between leaders and street-level workers in the Knight organisation tended to be ones of age/experience and resources. Ethnicity merely represents strong, regular social networks.

For the most part, organised crime groups tend to be loosely structured, flexible and highly adaptable. (pg. 117)

Potter found that organised crime figures acted as intermediaries between resource sources and opportunities, and between the legitimate and illegitimate, e.g. police and prostitutes. They also acted as resource sources themselves. Organised crime was task-orientated, roles simple and switchable. Leaders are such due to experience, age and resources, not as a result of unique skills. The Knight organisation, for example, had a specialised structure, but anyone could carry out most of the tasks required. The flexibility enables survival, and explains why removal of leaders does not usually cause the collapse of a criminal network. Using Smith (1980) as a starting point, Potter places

illegitimate business alongside legitimate ones, the service or goods supplied being the real difference. The profit comes out of the price hikes enabled by the illegal nature of what is supplied, as well as the lack of regulation, unlike legitimate industries. The major force on structure is the high risk levels involved Risk from employees can be avoided in three ways:

- organised crime heads try to keep a distance from street-level operations, to protect themselves and to minimise how much street-level employees know about the organisation. The higher the risk, the greater the segmentation, as in the case of the Knight organisation
- High rewards to ensure a high level of cohesion within the organisation
- The threat and use of violence or exclusion from accessing the markets

Potter also suggests three structuring dimension from which criminal networks can be described. The first was formalisation/standardisation, where the procedures for activities within the network are consistent, e.g. the process by which bets are collected, processed and monies move hands was consistent regardless of network size. The second was complexity/specialisation, division of labour and skills required. In criminal networks, often it is access to resources that determines position, as well as experience. Centralisation of control was the final dimension. Centralisation was found, but only to the extent that certain ends were expected, e.g. a certain amount of money. The means by which these ends were achieved were usually left to the discretion of those involved.

Following on from Reuter, Potter described how the environment the networks operated in, the larger networks, as it were, affects their structure through

- hostility/riskiness
- uncertainty
- density

The first includes legal punishment and loss of assets, lack of protection for contracts and lack of documentation to reduce risk. Sophisticated organisation increase risk - higher levels of possible detection, more opportunities for broken contracts and more documentation required to function. The higher the risk, e.g. drug distribution and retail versus gambling, the less formal organisation, the better. Uncertainty relates heavily to risk. Higher profits tend to also come out of more uncertain markets, e.g. drugs. Potter suggested that higher division of roles, separation of stages and separation of leaders from tasks will occur in more uncertain markets. Finally, density of networks. Most criminal networks operate in low density markets, there is little competition, so they do not have to adapt to high levels of competitive pressures.

Zhang and Gaylord studied the growth industry in the transport of individuals from China to the rest of the world. Part of this rapid growth is the increasing involvement of organized crime in the movement of illegal immigrants. This is part of an overall trend of the various groups that fall under the umbrella term of organized crime shifting their activities to more international level. Through extensive interviews with smugglers and illegal aliens in America and China, along with some law enforcement officers and journalists, the authors attempted to determine the structure of the smuggling industry. As has been discussed before, the authors identified the two broad approaches to organized crime - OC as corporate entities and OC as small, interconnected (as they term it) "task forces." The authors indicate that, at least for Chinese OC, the reality falls on a continuum between the two. The first aspect of the industry that was examined was the operation of the network. The authors found that the operations involved six fairly distinct stages. The first stage was establishing contacts between the smugglers and individuals wishing to immigrate. The contacts for the smugglers are called "snakeheads," operators at the lowest level of the organization who know nothing about the actual smuggling system and are often find clients through friends or family. Once contacts are established, the snakeheads must screen clients primarily to determine

creditworthiness. This is an important stage because the final payments to the operation are made after the immigrants have reached America, and it is these final payments where the profit is made. The appropriate travel documents are then obtained for accepted clients. This part of the operation is carried out by specialists whose only function in the organization is obtaining and/or manufacturing documents. The fourth stage of the operation is coaching of the clients. This involves training the immigrants in the right things to say if interviewed and how to make best use of American immigration policies, such as claiming political asylum. The second last stage is the actual transport of the immigrants. This typically involves several waiting points, involving local contacts looking after the clients. The sixth stage is the collection of final payment from the clients. This is typically done after they have found work. Usually the threat of violence against them and their family back in China is enough to ensure payment.

Whatever level of organization, the various groups followed the same basic operational procedures. However, differences did exist between more and less organized groups. More organized groups, for example, were better able to obtain high quality documents in stage three. While a continuum did exist in terms of level of organization, the authors were able to draw out two typical smuggling groups. The first were networks already involved in other forms of smuggling, e.g. drugs. These groups were better connected as a result of their previous operations and usually were involved in the movement of larger groups of clients. A second typical group were those where smuggling was secondary to some other activity, e.g. a travel agency. These operations were usually short-term and clients were typically close associates or family. Due to the consistent pattern of operations, the groups were structurally similar whatever their level of commitment to the enterprise. The groups had limited hierarchies. A core group would exist, with each member of the core being in charge of different stages of the operation and the "staff" that worked those stages. One member would oversee the snakeheads, another the acquisition of documents, and so on. This core would receive the majority of the profits. The "staff" for each stage would have limited power and profits. This

structure led to very distinct role differentiation. Local contacts, contacts for passports and snakeheads would have no interaction and individuals would rarely carry out more than one role. A third feature was restricted membership. This was done mainly to protect the group. The core itself would have very similar backgrounds, while potential staff would be judged on how much they could contribute to the group, how similar they were to the core and how strong the ties between the core and the potential staff member were. The final structural feature of the smuggling networks comes out of the need for secrecy. To protect the network from LE and other groups, communications are almost always dyadic, with individuals only contacting one or two other members. This forms what the authors call a "chain reaction," where the success of operation depends on success at each stage and successful personal relationships built on trust.

Criminal Markets

Sutton (1993) carried out a review of literature on stolen goods market, with the aim of indicating research needs. Sutton suggested that there could be improved control of crime through the targeting of the market in stolen goods, rather than total emphasis on those who steal and handlers of stolen property. The paper focussed on 2nd hand goods, as new goods were generally easier to dispose of legally. Second hand goods are usually stolen from individuals, and the loss of personal property, not commercial, has more individual impact on victim. Public willingness to not ask questions and not think too much about the "deal" they're getting helps blur lines between offenders and non-offenders. Cromwell et al. (1991), for example, found significant proportion of stolen goods were sold by thieves directly to the public. Sutton found five ways of disposal:

- To friends and neighbours
- Auctions, car boot sales, classifieds
- Unsuspecting/unquestioning 2nd hand dealers

- Strangers in pubs and similar locations
- Sell to professional fence or other person who can profit from having a market for the goods

Market needs shape to some extent what was stolen. A precise form may be a professional fence may start requesting certain goods. Less precise would be public demand for things that would be currently popular or new enough on the market to increase their value. For a period of time, theft of only the chips from computers was a major crime, due to demand. Supply and demand (market forces) have a high level of influence on stolen goods “enterprises” or networks.

Henry (1978) carried out a major study of the grey and black economies in the UK. Henry describes this form of crime as an activity that everyone engages in. He separates this sort of pilfering from professional theft of goods as the former is carried out by generally honest people. This is arguable, as many individuals pilfer on a regular basis, and so are thieves, just on a smaller scale. The individuals who did steal goods used many of the features of neutralization (de Young 1988) to minimise the damage of their thefts. The actual initial acquisition of goods is usually done by the person on their own, but the trade in goods in the hidden economy creates networks, which Henry found to be primarily family, friends and co-workers:

Typically, hidden economy trading will only take place amongst friends, relatives and workmates. (pg. 33)

With most goods moved in these circles, the major trading venues tended to be pubs and clubs. The goods are not presented as stolen, but there is a tendency not to ask questions. Henry found that, generally, individuals both buy and sell goods. Again, it would seem likely that, by way of opportunity, such as working for a delivery company, some individuals would be primarily sellers, making their positions in trading networks

different. A major theme in the networks Henry examined was the importance of trust for determining who is allowed access to the network. Family members, for example, would be more trustworthy than acquaintances. Henry found that at this level of networking professional fences were very rare and tended to be specialised, e.g. pawnshop owners often deal with legal and questionable goods, but only a few deal with clearly illegal goods. Another feature of this form of network was that often exchanges were very reciprocal. Goods could be acquired for later favours or supplying goods when they were stolen at some future date. Bartering also featured regularly.

Lomnitz (1988) approaches the issue of the hidden economy by describing it as informal systems, for both upper and lower classes, to fulfill economic needs of members, where the formal systems fail to meet or oppose such needs. Lomnitz argues that personal ties (local and familial) are often more important than formal, bureaucratic ones, allowing informal processes to evolve.

...the informal economy depends largely on social networks for its operation, and that the social networks are socially embedded and operate within a set of culturally prescribed rules...(pg. 51)

These ties are based on patronage/loyalty, trust and reciprocity. Lomnitz identified three forms of exchanges that took place in such systems:

- patron-client - a superior does a favour for an inferior, with loyalty given back
- reciprocal - exchanges between equals
- market exchange - business deals

The author then applied this model to the Chilean middle class system of "favores." A highly complex system of corruption and favours has evolved within the middle-class bureaucratic, official and professional community. Patron-client exchanges take place

when an individual moves to a higher status. Lower status individuals ask for favours only on very important matters, and give loyalty and political support in return. Reciprocal exchanges were typically such things as job placements and acquiring licences and documents, limited to activities that will not endanger the person's job. There was almost always no immediate return. Rather, there was an assumption that the giving individual, a relative or a friend will at some later date benefit. Market exchanges take place in three contexts:

- when there was a major status difference, or where there was a class difference
- where the state makes it difficult for a reciprocal exchange to take place
- where the request was outside of those acceptable for reciprocal exchanges

The major difference between the three was that the first two are long-term social relationships, while the latter was short-term.

Passas and Nelken (1993) used a particular case study to illustrate the potential high organization and complexity of European Community (EC) fraud. To do so, they selected a highly involved fraud enterprise, one that was a especially extreme example. Most fraud is carried out at a much less organized level of operation. The case study was also intended to illustrate how both legal and illegal enterprises can be involved in the commission of fraud and to illustrate the different components that make up these kinds of fraud. The case itself was not initially the focus of law enforcement. It came to light in the course of an investigation into some drug activities. It was part of type of fraud committed using the Common Agricultural Policy (CAP) of the EC. CAP was intended to protect the agricultural industries within the EC through a pair of measures:

- levies are administered against imported non-EC agricultural products
- subsidies are given to aid in the export of EC products.

Both of these measures create the potential for extensive fraud. EC products can be illegally imported to avoid levies. EC products can be exported to obtain subsidies, but then reimported illegally, or claims can be made for the export of products when they have never been transported or even produced. Another factor contributes to the occurrence of such incidents. The EC has no judicial authority over fraud. This is the responsibility of the member states which investigate and prosecute fraud at a national level. Mobile or cross-border frauds will be that much harder to detect or investigate, as a result.

The case study involved 57 offenders identified for charges to be brought against them. There were other individuals involved who were not charged. The fraud was centred on the use of false documents and invoices for agricultural products. The materials produced were of poor quality, but were still widely accepted. A number of businesses were involved - some knowingly, some unwittingly, and even some that in reality were bankrupt. These included printing businesses to produce the materials and a variety of import/export companies, some of whom did it to "survive" in a competitive marketplace. The major figure in the case was so successful that he had a rolling "factory of paper" (pg. 226). The main fraud involved inflating purchase prices for the products, thereby securing greater subsidies. Other, smaller frauds were carried out concurrently, including the main figure defrauding the other members of the network. There was also some evidence of involvement on the part of officials. The investigation was hampered by a number of factors:

- member states were more interested in their own concerns and major issues, e.g. drugs
- cross-border/jurisdictional conflicts (which is a problem criminals do not suffer from in the same sort of ways)

- the fuzzy boundaries between legitimate and illegal enterprises - how culpable were the companies that claimed to be unwittingly involved in the fraud (highlighting the dangers of an approach to criminal networks that makes black and white distinctions between legal and illegal enterprises)

The authors point out that this form of crime is not what is typically described as "organized crime." It was a large network which put pressure on witnesses and a number of murders occurred during the investigation. There was, however, no real hierarchy, no family or ethnic ties and the interactions between the individuals involved were more fluid and changeable. The authors conclude that because of the size of the networks, their international nature and long-term activity, investigations should focus on offenders, not individual cases, and so develop a better understanding of criminal networks, not just the kind of crime being carried out.

Conclusion

The environment through which organised crime and professional criminals operate is the underground economy. This economy encompasses a wide variety of markets, ranging from minor pilfering from otherwise law-abiding employees through to prostitution and drug trafficking. Both organised crime groups and individuals seek opportunities and try to develop them. What is considered an opportunity depends largely on how criminal an act the individuals or groups are willing to carry out. Some of the markets within the economy have long-term staying power, based on such factors as how minor the crime is (pilfering) or to what extent the public perceive the crime as relatively harmless (illegal gambling). However, the dynamics within both these markets and the more unstable ones are largely fluid. Action is driven by a combination of opportunity and willingness to take risks. In this way, there is not that much difference between these markets and those that occupy the legitimate economy. Smith (1980) presents a persuasive argument that legal and illegal enterprises are different only in how they are classified, not in how they are structured or operate. A spectrum of enterprise exists, says Smith, that links together the wholly licit and illicit by a variety of grey activities. Pawnshops that handle legal and illegal goods, businesses that evade taxes through deceit and loopholes and similar ventures occupy a space between mainstream and underground economies. The movement of organised crime networks into legitimate business is another interface.

The networks that operate within these markets take a variety of forms. Organised crime, even in the US, is not made up of large-scale organisations. The syndicates or networks that make up organised crime groups are often in conflict or competition with each other. They work with independent operators, and partnerships change frequently. As Potter states, organised crime figures operate as organisers, sources or resources and

intermediaries, rather than heads of corporations. Ethnicity as a factor in organised crime networks is a combination of

- marginalised ethnic groups having to take up illegal activities due to lack of legitimate opportunities
- ethnicity serving as a strong tie between network members, like familial ties, which serve to strengthen the network

Ethnicity tends to be a general feature of the leaders of the networks, rather than all members. Varieties of networks also operate at a smaller scale, with individuals making regular links to others, as happens in day to day life. Networks begin to be structured out of these associations, and may only be temporary. Criminals have associates and co-offenders. Associates are more distant relationships, from which are drawn co-offenders in operations that may be short or long-term. The individuals involved in criminal networks tend to not be specialists, with tasks being more important than skills, such as in bookmaking. Leaders, as in drug trafficking, have the experience and resources to create the networks. Table 2.2 gives summaries for the non-drug literature.

Table 2.4 Summary of Non-Drug Literature	
Author	Structural Features
Sutherland (1937)	Organised crime was syndicates and networks, through which professional criminals moved. Fences were vital connections for information and jobs.
Einstader (1969)	Armed robbery teams as partnerships. Equal voting on all decisions. Little role specialisation.

Shover (1973)	<p>Cores of 2-3 with additional members drawn from loose network of associates.</p> <p>Close links to fences/handlers.</p> <p>Equal voting on all decisions.</p>
West (1978)	<p>Informal recruiting for burglaries was through contacts.</p> <p>Have to network with contacts for information.</p> <p>Fences were actively sought out.</p>
Porter (1996)	<p>Career criminals carried out a wide variety of crimes.</p> <p>Accessing criminal networks through informants best way catch cross border criminals.</p>
Nee (1993)	<p>Starting out in car crime involved taking on minor roles first in car crime.</p> <p>One third of the sample were in organised car crime networks.</p>
Warr (1996)	<p>Co-offenders selected from a "pool" of associates. Groups specialised in crimes, while individuals varied.</p> <p>Activities were instigated by leaders.</p>
Fijnaut (1990)	<p>UK organised crime is flexible criminal networks and professional criminals not organised crime in the traditional sense</p>
Reuter (1983)	<p>Criminal networks were small organisations in gambling and related activities.</p> <p>Successful criminals used connections, rather than acting as a controlling force.</p> <p>Imbalance in networks, with leaders having resources and contacts.</p>
Potter (1994)	<p>Criminal networks are informal, loosely structured.</p> <p>There are key leaders and cores within small groups.</p> <p>The ones with the best organisation and contacts were most successful.</p> <p>"Organised crime" figures acted as brokers and intermediaries, not bosses.</p>
Zhang and Gaylord (1996)	<p>Smuggling operations had a definite core and staff, with distinct role differentiation at different stages.</p>
Sutton (1993)	<p>Demand for stolen goods helps create supply.</p> <p>Professional fences part of this system.</p>

Henry (1978)	Pilfered goods mainly sold to close social network (family, friends etc.).
Lomnitz (1988)	An imbalance in the favour system in Chile, based on relative position in networks
Passas and Nelken (1993)	Offenders constant in European fraud, but the networks are constantly shifting and changing.
Hobbs (1997c)	“Hubs” play a key role in creating and maintaining networks. Networks are flexible to operate in new economies.
Hobbs (1997b)	Common criminal now a non-specialist worker. Resources and contacts more important than skills. Multiple small groups operating as entrepreneurs.
Hobbs (1997a)	Professional criminals shifted from fraternity to partnerships to entrepreneurial exchanges.
Hobbs (1995)	Meeting places key part of “networking.” Market made up of fluid, constantly changing alliances and conflicts.
Maguire (1982)	Burglary as work. High level burglars smallest groups, most secretive. Medium level larger pools of associates. Low level wide open networks.
Walsh (1986)	Teams generally small in size. Two kinds of exchange - those involving respect and economic ones. Half of sample often acted on information supplied from associates.
Shover and Honaker (1992)	Partying lifestyle led to exclusion from non-criminal networks for persistent property offenders.
Wright et al. (1992) and Wright and Decker (1994)	Snowball sampling best when intermediaries get fee. Few offenders regularly used dedicated tipsters or regular tips from associates, though most made occasional use of information.
Cromwell et al. (1991, 1993)	Handling key part of burglary. Six types, ranging from professional handlers to direct purchases by the public.

A similar pattern of themes to those for drug networks emerges. Again, the market networks within which individual networks operate are characterized as fluid economies which the individual networks must adopt entrepreneurial forms to survive in. The themes in the literature include:

- Key figures emerge in networks, either as intermediaries, as Reuter (1983) describes, or as leaders in their own right, as described by Warr (1996). Repeated references to the role of fences is an example of this, with handlers acting as either instigators of crimes, as indicated by Potter (1994) and Sutton (1993) or as sources of information, as well as buyers, as per Sutherland (1937) and West (1978).
- The notion of cores also appears, though not to the same extent as in drug networks. Both Potter (1994) and Zhang and Gaylord (1996) make specific references to their presence, as does Hobbs (1995; 1997b).
- Subgroups also appear to a lesser extent, as in Zhang and Gaylord (1996) and Reuter (1983), as well in the differentiation of roles found in Nee (1993) and Passas and Nelken(1993).
- There was little in the way of mention of intermediaries between leaders and other members, which may be a function of the relatively lower risk levels of many of the forms of networks described here, compared to drug networks.

Overall, the networks described in the non-drug section seem to be less structured than those in the drug section, with the exception of Zhang and Gaylord (1996), another form of smuggling. Key figures and cores are commonplace, but the other structural aspects for the drug networks are not so frequently mentioned in the this set of literature. There are more similarities than differences overall, especially considering some of the studies overlap in discussing both sections of networks, e.g. Potter (1994) and Hobbs (1995; 1997b) both

studied drug and non-drug networks in their work, and found them to be broadly similar. Both forms of networks are generally not large organisations, manifesting themselves as small businesses, with defined principles and agents, operating within fairly chaotic markets. The similarities and differences, along with the over-arching themes are discussed below.

Chapter Summary and Research Questions

Networks can be described in terms of those that are actually markets, with separate entities interacting. Distributors selling to retailers, dealers selling to addicts, handlers selling stolen goods to the public, “johns” using prostitutes are all forms of these exchanges. Within these networks, individual networks operate as single entities working towards common goals, such as the drug distribution network, with its leaders, carriers and sellers. Markets, then, are networks of networks, with smaller, more focussed networks operating within them. There are a number of similarities and some differences between drug networks and other forms of criminal networks. All of the markets described are characterised as being changeable, so as to meet the unstable environment they operate within, e.g. law enforcement pressures, lack of any form of regulation. The themes that relate to criminal networks as they operate within their markets are detailed below. One factor that has an influence on criminal network structure is the need for secrecy.

Secrecy and Criminal Networks

In terms of criminal networks, there are two goals of the group which co-exist but are antagonistic. On the one hand, the group forms to increase the amount of benefit to be gained from the criminal activity. At the same time, the group must avoid identification of its criminal activities by those agents that would stop the network and punish the offenders. The obvious way to fulfill the latter is to not carry out the former, but then the group would never have come into being. The original work on networks operating in secrecy was Simmel (1908). In a discussion of the nature of secret societies, Simmel emphasised the psychological factors that contribute to the development of secret societies, factors that lead to the creation of highly hierarchical structures. These include the love of centralization and control held by those developing the secret society.

Erickson (1981), in a series of case studies of the structure of secret societies, points out that internal and external pressures have the potential to shape such networks in a variety of forms, particularly when those networks are at risk from some outside agency. Erickson identified a wide range of network structures, ranging from the underground at Auschwitz, which was very hierarchical and had a mainly cell-like structure, to the "flat" structure of a network of English marijuana dealers and users. Erickson argued that the networks, when at risk, are developed out of pre-existing networks, with trust functioning as deciding factor in both selecting new candidates and willingness to join. The more distinct the various subgroups are before forming the network, the more they will be afterwards.

Erickson feels that the main factor in the structure of the networks will be control over recruitment. The more centralized and controlled the process of recruitment, the more hierarchical the network will be. Relatively uncontrolled recruitment processes will lead to more diffuse, fluid forms. Control of recruitment comes out of control of resources and information. The Italian crime family used as one of the case studies was fairly hierarchical, with clear divisions between immediate family members, relatives and non-family. The inner core controlled the finances and were the only ones fully aware of the network as a whole. Following Erickson's argument, criminal networks should develop depending on the nature of the criminal activity, e.g. the selling of stolen goods versus long-term criminal enterprises and the goals of the network. In terms of being able to achieve its goals, the group must try to develop ways of committing crimes and communicating that minimizes the likelihood of disruption. criminal networks will develop different strategies to try to succeed at these goals, strategies involving different forms of structure. Adler and Adler (1980) highlighted the conflict between the need for secrecy and the need to be active in the market when studying the methods of secrecy employed by high level drug dealers. They found that, for the sample under study, there was little time devoted to developing strategies to stop the police. Adler and Adler found that it was the other members of the market that were the main concern. Having drugs

or money stolen and being hurt or killed were more of a concern than being arrested and prosecuted for this group of dealer/distributors. Views of the police were divided into three groups:

- those who felt the police were unaware of their activities
- those who believed that their operations were too small-time for the police to be concerned about them, though they believed the police were aware of their activities
- those who felt their operations were large enough for the police to be aware of and interested in them, but had measures in place to prevent their being able to prove anything

The last group was made up of the highest level dealer/distributors. All three groups generally felt the police to be ineffectual and constantly in conflict between agencies and groups. The sample did employ three broad strategies to prevent arrest and prosecution:

- secrecy - this included not living a flashy lifestyle, not dealing near to home; having a legal front and avoiding new contacts
- insulation - not selling to strangers, selling to those recommended by a trusts associate, using codes for drug, changing residence and employing others to carry out various stages of the operations
- manipulation - using lawyers who specialise in finding loopholes and having busts thrown out of court, developing long-term relationships with bondsmen and bribery

Acting against these methods were a number of factors:

- dealers' ego and self-promotion
- the desire for sex

- the desire for a reputation
- greed
- the attraction of a expensive lifestyle
- when using the drugs, a sense of invulnerability

Adler and Adler add to this list the natural urge of people not to keep secrets wholly to themselves. All of these factors give opportunities for law enforcement agents to successfully carry out operations. Their sample, then was in constantly trying to come to terms with the conflict between minimising risk and maximising the material and social benefits of the profits from their occupation.

Themes in Criminal Network Structures

Extensive work has been carried out on aspects of the structures of criminal networks, without explicitly using a structural analysis approach. Terms such as “structure”, “network” and “roles” are used, but the work is mainly descriptive in nature, with no analyses carried out to give more exact meanings in such terms. Some of the research makes up the more general literature, covering a broad range of areas - smuggling, delinquency, fraud, handling stolen goods etc. (e.g. Passas & Nelken 1993, Fijnaut 1990, Walsh 1986, Naylor 1994/95, Wiegand 1994, van Duyne 1996, 1997; Kock, Kemp & Rix 1996). The main area of implicit structural studies has been in drug trafficking, due to the various roles required for the market, its transnational nature and the variety of crimes carried out and criminal groups involved with it (Dorn & South 1990; Dorn, Murji & South, N. 1992; Kleinman & Smith 1990; Jenkins 1992; Lewis 1994; Reuter & Haaga 1986; Ruggiero & South 1995; Williams 1993). Structural themes can be seen through the various research, whatever the form of criminal network under study. Desistance research, for example, has found that one of the major factors in leaving criminal careers can be a shift in the social networks the criminal interacts with, e.g.

Sommers, Baskin and Fagan (1994) found that female street offenders that had desisted credited new contacts and social relationships as a major part of that process. Aspects of the degree of hierarchy in the structure, how organised the networks are and what kind of roles individuals have within the network are identified throughout. Levels within the networks have been described along with differences and similarities. The importance of cohesiveness and the flexible nature of most networks are common themes. There is a general consensus in the research that organised criminal activities are more entrepreneurial in form than the rigid hierarchies of stereotypical "organised crime" (Smith 1980; van Duyne 1996). While highlighting these themes and trying to develop models of criminal networks is beneficial, there is little in the way of actual analysis of data to develop such models. Conclusions are typically reached through case studies or reviews of the literature. What is required are large-scale studies based on what data can be obtained.

Research Questions

The themes produce a number of questions about the nature of criminal networks:

- to what extent are networks structured, e.g.:
 - do the majority of networks fall between the two extremes of highly rigid networks and extremely loose, casual associations, but usually having some form of structure that separates leaders from the other members of the network?
 - are there individuals that hold key positions within the network, acting as intermediaries or controlling the network?
 - are there cores of networks made up of individuals with close associations to each other, through familial ties, ethnicity or frequent contact, and what are the nature of those ties?
 - is the larger structure of the network made up of more peripheral ties, and what are the nature of those ties, e.g. do distinct subgroups operate within the larger networks or are peripheral members for the most part isolated individuals?
- Is there any consistency in network structure between criminal networks within the same market, e.g. do networks at the corresponding stages of drug trafficking have broadly similar overall structures?
- Is there any consistency in network structure between criminal networks across different markets, e.g. are drug networks more compartmentalised, with distinct, separate subgroups, than other forms of criminal networks?

To determine some possible answer to these questions required four stages:

- Identification of an appropriate methodology for carrying out structural analysis. In this case Social Network Analysis was found to be the most effective (see Chapter 3)
- Selection of appropriate data sources that would allow for the collection of a large number of cases containing information directly about interactions between members with criminal networks operating in their markets (Chapter 4)
- Analysis of networks within their markets and identifying consistent patterns in structure (Chapters 5-7)
- Comparisons of networks across markets (Chapter 9)

CHAPTER 3. SOCIAL NETWORK ANALYSIS

Social Network Analysis (SNA) is a major methodological approach in structural analysis. Its methods are designed to explicitly study interactions between entities, individuals, corporations etc. It has been used in the the fields of anthropology, sociology and psychology, and encompasses a variety of methods and definitions. Researchers have used these techniques to examine the basic relationships within groups of individuals (Warner & Lunt 1941), the links between corporations (Scott & Hughes 1980) and in determining social support networks (Seed 1987). Fundamental to the SNA approach is the idea that interactions within any group shape both its individual membership and development. As a result, examining the structure of the network, in terms of the consistent patterns of interactions, will give insight into:

- The significance and roles of its individual members
- How the group behaves and what form it will take

To address these two areas, research in SNA falls into two camps - relational and positional (Rogers 1987; Mizruchi 1994). Research in the former group focuses on the connections between the actors in the network. Ideas such as how central an individual is within the network and the identification of any subgroups are explored in this area, and so it covers both individual significance and aspects of the group. Positional research is concerned with how similar actors are in the patterns of connections that they have. Identifying the roles of individuals within the network, determining types of roles and looking for roles that occur in different networks are all part of this approach. Both approaches have relevance for the study of criminal networks, though the main focus of the research was on the relational branch. Social Network Analysis encompasses a wide variety of methods (e.g. the construction of sociograms, multidimensional scaling techniques, measuring levels of attachment and closeness) and definitions. Exchanges can

be measured in a variety of ways, including self-reported measures of friendship or of communication patterns, participant observation of interactions or such unobtrusive measures as drawing on records of meetings between subjects (Wasserman and Faust 1994).

The History of SNA

SNA roots can be traced back to the early structural sociology of Durkheim (1947) and Simmel (1955). Their research highlighted the impact that social structures have on the individual, manifesting itself in such forms as anomie and the development of secret societies. The real growth of SNA began with the work of J.L. Moreno (1934), who developed sociometrics - standardized techniques to visually represent relationships between subjects, using shapes as "points" to represent different actors and objects, with lines connecting the shapes to represent contact. His early research examined friendship choices within small groups of individuals, identifying such aspects of structure as "stars" - those individuals that were the centre of groups in the sense that they were the individuals most often selected by the other members. Researchers such as Warner (Warner and Lunt 1941) in the 20's and 30's focussed on the substructures of the larger groups, particularly cliques - sub-groups of closely related or interacting individuals, such as was done by Warner in his classic Wiring Room study. Lewin (1951) followed on from this research, shifting the idea of visually representing groups not just as an image, but as a spatial representation of relations, so that points and lines became nodes and paths within a spatial field. In the 1960's, researchers led by the work of Cartwright and Harary (1970) took this progress a step further by linking together social network analysis and graph theory. For example, they structured relationships in terms of undirected connections, positive or negative connections and the resulting forms of triads of individuals. The introduction of techniques from graph theory, a branch of mathematical

research, was the next major step in the development of SNA, with the introduction of more organised and computational approaches to investigating network structure (Barnes (1969); White (1970)).

The classic study of "weak ties" by Granovetter (1973) was one of the seminal points in the application of SNA. Granovetter looked at how important these weak ties - an individuals associates and acquaintances, rather than the strong ties of friends and families - were in attempting to find a job. His early research determined that weak ties were a better source for new information about jobs as those ties moved in different circles of contacts from the job hunter and would be more likely to hear of new opportunities for employment. Later research, including his own, has indicated that the relationship between strength of ties and access to new information, of any sort, is not so simple (Granovetter 1982). Freeman (1979) conceptualised three major measures of centrality, all of which are detailed below. Currently, SNA has expanded into a variety of fields. Organisational and management researchers have, for example, utilised SNA to explore ways of improving company performance (Greenberg and Baron 1995). Another major area of research activity has been the study of experimental and artificial models of exchange systems within dyads, triads and networks (Wasserman and Faust 1994).

Concepts in SNA

Certain concepts are central to SNA, though researchers vary considerably on the exact definitions used and the methods of measuring them. Often two researchers use the same word to describe different concepts and measures. To minimize this, the terms Scott (1991) has selected were used throughout. What follows is a short review of each measure, with measures grouped into centrality, subgroups, other measures and MDS. As with any scientific field, there is a terminology, or specialised language, to SNA. The

basic terms in SNA must be explained before the ways in which the implemented measures work can be detailed. The main basic terms in SNA are

- **point** or **member** - represents the individual, company or whatever unit being examined
- **line** - a connection of some kind between two points, also referred to as a link or a tie
- there can be an **intensity** to the connection, e.g. how strongly A likes B or how often A contacted B
- two points directly connected are **adjacent**
- all points adjacent to a point make up its **neighbourhood**
- the number of adjacent points make up a points **degree** (a measure of centrality - see below)
- **directed** graphs, unlike undirected ones, have lines between individuals that represent some flow or movement in a particular direction e.g. individual A contacts individuals B, and are represented by arrowheads at the ends of lines
- the route that must be followed to go from one point to another, through any intervening points is the **path**
- the **length** of the path is the number of lines that must be followed along the path
- the **geodesic distance** between A and B is the shortest path out of all possible alternatives

- **component** - the most basic form of subgraph in the SNA literature is the **component**. This is a subgraph made up of any points that are connected through paths of any length. A graph can quite easily be made up of only one component, as long as all the points are directly or indirectly connected to each other. Alternatively, a graph can have some number of separate components and individual points with no connections. If, for example, a graph made up of a number of points that were all connected by lines of varying intensity was re-analysed with only lines of intensity x kept in (so as, possibly, to indicate very strong relationships) then the new graph might be "broken up" into a series of smaller components and individual points.

The main concern of the PhD was using the SNA measures to identify aspects of the structure of criminal networks. What each actually measures and any limitations each measure has were more of a concern than the actual mathematical processes involving in producing the results. Explanations of the mathematical steps required to calculate each measure can be found in a number of sources, such as the excellent SNA handbook, Wasserman and Faust (1994). The measures used, on a scale of complexity in SNA, are relatively simple compared to those that do such things as identify roles (White, Boorman and Breiger 1976) or produce systems of classifying markets (White 1991). Sophisticated methods of analysing criminal networks would muddy the water at this early stage of applying SNA to them. By applying simpler measures, part of a foundation can be developed from which increasingly detailed results can be obtained. In addition, these measures have a long, well-established track record for producing meaningful results for the aspects of structure, and so have a great deal of analytic validity and reliability. Measures were divided into four groups, centrality, subgroups, fragmentedness and multidimensional scaling. What each measure actually tells us about the structure of a given network is then discussed.

Relating the Measures to the Research Questions

The conclusion of chapter two raises a number of questions about the structure of criminal networks.

- Who is central and peripheral in the network, i.e. are there key members that are significantly more powerful in the network structure and are there isolated members that exist on the fringe of the network?
- Do key members, if they exist, form a distinct core to the network?
- Do subgroups exist in the network, what form do they take and are they distinct entities within the structure as a whole?
- Do certain individuals act as intermediaries between separate sections of the network?
- What is the overall structure of the network?

Two other questions that are not directly structural but address the relationship between structure and other aspects of networks are

- Do certain individuals act as key communication channels between networks, and, if so, what are their positions within the network?
- Are the different roles or jobs within the network reflected in different groupings in the network?

SNA measures exist that have been used to try to answer all of these questions about non-criminal networks. The first section below describes a variety of measures that have been developed over time to try to identify an individual's relative centrality within the network. These measures, **degree**, **closeness**, **betweenness** and **information**, measure how connected an individual is, how close they to all other members along the paths that connect them, and how much that individual acts as an intermediary between other pairs of points. Two measures, the **clique** and the **2-clan**, are used for identifying subgroups and cores through patterns of links between members. They are detailed in the next section, followed by a measure that aids in determining the presence or absence of a core, called the **k-core**. As well as the centrality measures that indicate how much members act as intermediaries, the **cutpoint/knot** measure indicates which individuals connect otherwise wholly separate parts of the network, and, so, act as intermediaries. An overall assessment of the network structure comes out of the combined results of the previous measures, as well as a procedure for producing a visual representation of the network structure. This procedure, a form of multidimensional scaling, is **Smallest Space Analysis**.

Measures of Centrality

Centrality in SNA defines the relative position of individual members within a network, in terms of power and influence. Within any given network, there will be a continuum of levels of centrality, ranging from those individuals who are leaders or have a major impact on the network through to those individuals with little involvement with or influence on the network. Determining where an individual falls in such a continuum is very important for trying to develop an understanding of how the network is structured. The literature indicates that there are very definite differences in relative power within networks, and that these differences have strong structural antecedents. The SNA measures of centrality should, then, indicate when those difference exist and between

which members of the network. The first measure of centrality used was **degree** (for a mathematical description of this measure and the two following, see Freeman 1979). This is a simple indicator of the number of other points to which one point is immediately adjacent. A network member who has contacts with five other members of the network will have a degree score of five. The network in figure 3.1 has three groups of degree scores. The point in the middle has a degree score of two. Those within the interconnected groups have a degree score of seven, except for the two who are also connected to the central point, who have a degree score of eight. There is a danger, especially with "real world" data, that a degree score could represent the amount known about an individual, rather than how central that individual actually is in the network. This does not necessarily mean that the measure is inaccurate, but it must be used it with caution. Biases in the data are discussed in chapter 4.

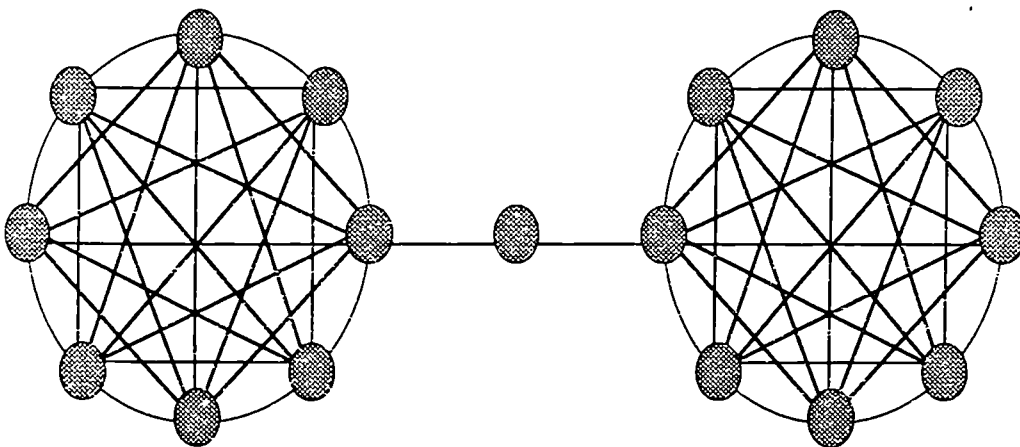


Figure 3.1 Network Model

The second measure use was **betweenness** (Bonacich 1987). This measure represents how much one point falls on the geodesic, or shortest path, of all possible pairs of the other points. By falling on the geodesic, that point has some control over the flow of information, goods etc. between the pair. The more geodesics a point falls on, the higher the betweenness score. Since the measure involves paths, the number of adjacent points has less of an impact on the score. The most extreme example of this is illustrated in figure 3.1. The point between the two tightly interconnected groups only has a degree of two, but acts as the only contact point between two groups. Anything that has to move between the two must pass through that point. As a result, its betweenness score will be high, relative to its degree score. The betweenness score for the central point would be calculated to be 26.67, with scores of 26.25 for those adjacent to it. The remainder would have had scores of 0.00, as none of these points fall on geodesics outside of their direct connections to other points. Betweenness is a particularly useful measure as it will indicate individuals who act as key channels for the flow of transactions.

A third measure of relative centrality is **closeness**. This is also dependent on examination of geodesics, but determines the length of the geodesic paths from each point to all other points. The shorter the total of the geodesic paths, the more close that point is to all the others in the network. Closeness, then, represents a different form of how “connected” a point is to the network. It is not the number of connections the point has, but how easily that point can contact all other points, with the least number of go-betweens. Again using figure 3.1, the length of the path from the point located between the groups to the point marked as A is only two (there is only one point in between). The path between A and B is four (three points in between). The combination of all the paths for a point would lead to the calculation of the closeness score. If closeness scores had been calculated for this network, the central point was the closest one to all of the other points, with a score of 53.33. Again, the adjacent points would have had the next highest scores of 51.61. The remainder would have had scores of 40.00, as they are all equally distant from all other points in the network.

A final measure of centrality is Stephenson and Zelen's (1989) **information**. The information score, then, is a measure of how involved a point is in all possible connections in the network, not just the shortest ones. A development from betweenness, the measure adds two factors to be considered between just positioning on geodesics. The first is that with a choice of geodesics to follow, the one that contains points with higher degrees will be used more, as those points are more connected overall. The second is that, for any number of reasons, the geodesic may not be the preferred path between two points. Point A might be suspicious of B, believing him/her to be an informant. A will go through C and D to contact E, instead. All paths a point is on between pairs of points are included, with the shorter the path, the more importance it is given. For the simple layout of figure 3.1, the information scores should mirror those for the betweenness scores. This is the case. The middle point would have had a information score of .87, the adjacent points would have a score of .83 and the remainder have scores of .75. The applications of the information scores are the same as for betweenness - as a measure of how much an individual is central in terms of acting as an intermediary in the network.

Centrality measures can be classified into two groups - global and local centrality (Mizruchi 1994). Global centrality indicates how central the actor is to the network as a whole, while local centrality is a measure of how central the actor is in the immediate area of the network. One indicator of local centrality is the degree of any particular point. This indicates, relative to all other points in the graph, how connected that particular point is. While degree was described above as only those immediate connections to the point, the definition can be expanded to include indirect connections. A measure of 2-degree, then, would be the number of points connected to that particular point by paths of two or less. This can be expanded to paths of three and so on. The problem with going beyond two is that the measure quickly begins to lose any sort of meaning - all the points soon become connected to each other over paths of three or four, making them indistinguishable. This has implications for measures that identify subgroups, detailed below. As with most measures in SNA, comparisons of degree can only be made between

points in the same graph, or in graphs of similar sizes. Freeman (1979) proposed standardizing the measure of degree by making it a relative measure. This is accomplished by dividing the actual degree score by the total number of points. This calculation reduces the impact of differences in network size on direct comparison of results for different networks. Standardization can also be carried out on betweenness scores. The remaining three measures above cover the global centrality of a point. Points that have low local and global centrality can be considered "peripheral" within the network structure (Scott 1991). Points with high centrality scores are either highly connected to the network or act as major intermediaries in the exchanges that make up the network structure.

Types of subgroups

Any form of network analysis would be, in reality, the examination of some sort of subgroup (it can also be called a subgraph in SNA). Any network analysis carried out is a subgroup of some larger population, e.g. a network of managers is part of the larger network of a corporation. Carried to its most extreme, the largest possible network is one made up of every individual on the planet. Milgram (1967), for example, showed that any two people require a path involving six people to be connected. When a researcher decides to look at a subgroup of the network being studied, this is carrying on a process begun by selecting the network to begin with. A subgroup can be defined as a "collection of points selected from the whole graph of a network, together with the lines connecting those points." (Scott 1991; pg 103) This selection can be carried out in either of two ways, or a combination of the two. The selection of points can have some substantive psychological meaning, e.g. looking at the connections between offenders after drawing them out of a larger network of offenders, victims and investigators. Alternatively, the basis for choosing the subgroup can be based on some statistical measure, e.g. dividing the network into a core and periphery on the basis of two groups of distinctively different

levels of centrality. The two can be combined when the statistical measure is used to examine some meaningful construct. For example, the core identified above may also represent the key members of some criminal group, and so have more connections to each other, making them more cohesive and perceiving themselves as a particular "group" within the network as a whole.

The first subgroup measure used was the **clique**. This would be a subset of the graph where all points are connected directly to each other, and those connections are reciprocated. In figure 3.1, all of the points on either side of the network make up a perfect clique, e.g. 1,2, 3, 4, 5, 6, 7 and 8 are all directly connected to each other. In the real world, this ideal is rarely attained, for two reasons. Exclusion of individuals due to not being directly connected to all of the others may not accurately represent a distinctive subgroup. A point may be directly connected to one other point, which itself is part of a clique of four points. The five points could be seen to form a distinct group relative to the rest of the network. A clique, then, may be too narrow a definition to accurately represent subgroups. A second consideration was quality of information. Gaps in details in intelligence files may lead to links being missed. Using such an exact measure as the clique may result in individuals being left out which are, in reality, part of the subgroup. Some sort of compromise was required that could potentially reduce such "noise" in the data. An alternative was the **n-clique**, where all points do not require direct connections, but can be separated by a path distance of n, i.e. a "perfect" clique would be a 1-clique, while a 2-clique would include all points connected through an intermediary. In figure 3.1, there would be two 2-cliques. Each would be composed of the one of the cliques, plus the point that occupies the position between the two. All of the points in the clique are connected to this one through an intermediary (either 8 or 10). There are two problems with using the n-clique as a measure. The first is identifying what psychologically meaning of n when it exceeds two. One intermediary can be identified as a mutual friend or contact, but what does two intermediaries mean? It is likely that the maximal meaningful level of n is dependent on the features of the network being

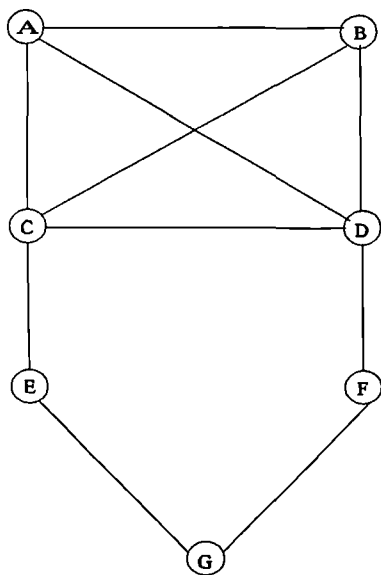


Figure 3.2 Example of the Problem with the 2-Clique Measure

examined. In situations where the central figures each use their own go-betweens, then a 3-clique could be useful, for example. The second issue with n-cliques is that it is possible for two points in a clique to be joined by a point that is itself not part of the clique. As shown in figure 3.2, the points A through F form a 2-clique, but only because E and F are joined through G, a point that is not a member of the subgroup. Molken (1974) suggested the **n-clan** as an alternative to the n-clique as a way to avoid the second problem. The n-clan uses the value of n not only as the length of the path between points, but also as the diameter of the subgroup (the maximum distance between the two farthest apart points used to connect members of the subgroup). As G is a distance of three from A and B, that point could not be used to connect members of the subgroup.

Other Measures

Hage and Harary (1983) used **Cutpoints** and **Knots** to determine the role of key points in the structure of components within a graph. Cutpoints are those points whose removal would result in the component disintegrating into a number of smaller units, and so they join together sub-components of the whole. Knots are each of these sub-components along with their cutpoints. Cutpoints can play a pivotal role in the flow of resources or information through the components, and possibly the network as a whole, as they function, in a sense, as "gatekeepers" between the various sub-components. Returning to figure 3.1, the connecting point in the diagram would be identified as a cutpoint. Its removal would separate the two cliques from each other. Additionally, the two points that connect to that point are also cutpoints. Removal of one or the other would result in the rest of the clique being separated from the middle point and the other clique. The cutpoint measure, at an individual point level serves as a measure of network importance, in the intermediary position that person holds. At a general level, a high number of cutpoints relative to the size of the network would suggest a fragmented structure, with the network broken down into a large number of sub-components without direct contact with each other.

Another structural aspect of the network was identifying the boundaries within the component -whether there was core and peripheral regions. Seidman (1983) utilized **k-cores**, which used increasingly weak levels of degree, to determine the various boundaries. The potential core subgroup must consist of a series of points connected to each other where all points have an equal level of degree of k . For the group to actually form a "core," the number of points must be $k+1$. The identification of a k -core indicates a subgroup with a high level of cohesion. However, there might be other groups of highly connected points that don't qualify as k -cores, where one point, for example, may act as a bridger between two extremely cohesive areas, but itself fails to have a high enough

degree, and so falling short of the $k+1$ number of points. This would be the case in figure 3.1. Seidman used the k -core to analyse what he termed the "core collapse sequence." The k -remainder are the total points in the network not in the k -core (recorded as the number that will be excluded from the core if k is increased by 1). As k increases, the remainder can alter, and it is the pattern of change in the remainder score as k goes up that is of interest. If there is a smooth, regular increase in the remainder, then this is indicative of a fairly uniform density. If it is uneven, with sudden jumps and levelling off, this indicates a highly dense core and a number of peripheral areas. Doreian and Woodward (1994) expand on Seidman's work on k -cores, stating that defining the boundaries of a network is one of the key first stages of an analysis. Improper identification of the boundary can lead to exclusion of relevant parts of the network, and "both centrality and density measures can change dramatically with changes in the location of the boundary." (pg. 268) The boundary, in terms of k -cores, is made up of the points in the k -core that connect to non-core points, while the boundary for the non-core are those points that connect to the k -core.

SNA and Multi-Dimensional Scaling (MDS)

SNA has also tried to develop tools that allow the researcher to get an overall view of the network structure. This process began with Moreno's sociograms, was generally supplemented by the application of graph theory in SNA. This now manifests itself in the use of software-generated graphical representations of network, such as correspondence analysis (Roberts 1996). An understanding of the overall structure of the group can aid in interpreting the results obtained from the other methods. An approach is to use one of several packages in the social sciences that carry out multidimensional scaling (MDS) (Doreian 1988). One of the most established form of MDS in the SNA field is smallest space analysis (SSA) (Shye and Elizur 1994). The SSA represents the overall structure

of the network, using a triangular matrix of associations between all of the network members. Each individual is plotted in a 2-, 3- or high dimensional space, relative to all other members. Position is dependent on how strongly the members are associated with each other.

Examination of an SSA plot can reveal several features of a network.

- Strength of association is the most basic feature. Those points far apart have less relative association within the network. Groupings of individuals near each other can suggest subgroups, which can be supported through the various measures for identifying subgraphs.
- A second feature is some indication of potential core and peripheral members. Individual points in the centre of the spread of points have a more central position in the network. Points out on the edges have a more peripheral position. Again, these results can be confirmed through measures of centrality and influence.
- The SSA allows the researcher to look at the overall layout of the network, e.g. highly decentralised and spread out versus tightly linked together.
- A final, as yet unexplored feature of the SSA is the indication of potential gaps in the intelligence information. Areas within the spread of the network may be void of points, a sort of "vacuum." This area may result from a lack of strong associations between different parts of the network, resulting in their moving away from each other on the graph. An alternative explanation is that associations may be present, but have not been picked up, for whatever reason, by the intelligence gathering. This is more of a methodological application than an analytic one.

Heinz and Manikas (1992), for example, studied patterns of associations between various actors within the criminal justice system in Illinois (including the judiciary, the police, special interests groups and other parties). They found, through the use of SSA, that there was no core of "power brokers" who made up a hierarchy that controlled the flow of communication between the groups. The structure was made up of a circle with closely associated groups spatially closer together. Groups with little influence, and so less communication, were on the fringes.

Social Network Analysis in the Criminal Network Literature

There are a few pieces of research that explicitly use SNA to study aspects of criminal networks. These are detailed below. Other research mentions SNA, but do not actually use it, e.g. Montagne (1990) identified social network analysis as an approach to the study of drug networks and markets, but did not explore the issue to any length. Sparrow (1991) produced an important paper on the potential application of SNA techniques to criminal intelligence analysis, discussing the area at a theoretical level (see Chapter Eight). Another argument for the use of social network analysis, at a practical level, was given by Prunckun (1996). The author draws parallels between the methods used by intelligence analysts and social scientists, focussing particularly on similarities in data collection and analysis. For analysis, Prunckun describes how linking charts, visual representations of connections between individuals, are computer-produced sociograms. In addition, time lines, association matrices and the analysis of transcripts are all areas where analysts methods have been drawn from the social sciences. The potential practical applications of social network analysis for criminal intelligence analysis are discussed in Chapter Eight.

Jackson and Herbrink (1996) have carried out some preliminary work, in addition to bringing up a number of issues relating to applying SNA to intelligence. To examine a

case of a Dutch drug network, they drew on two sources of information. The first were summaries of interviews between the suspects and investigating officers. The second source was interviews carried out with a senior officer in the case. It was intended that each identified interaction would be classed as one of three types:

- authoritarian - where one member would order another
- advice - where one member would give information to another
- social - where one member would initiate a purely social interaction

The authors found it extremely difficult to draw out network information and were unable to analyse the structure of the drug network . The main reason for this was not so much in that SNA was not applicable to the network, but from both the chosen sources of information and the attempt to divide interactions into separate types. Interviews with offenders may contain some information about interactions, particularly in terms of who committed crimes together, but would not be as good sources as surveillance and phone records, for example. Attempting to obtain information about a network from a single officer two years after the case is, again, likely to produce little information. Intelligence is rarely of sufficient detail, outside of actual recordings of interactions through phone taps and similar methods, to permit subtle divisions into types. At this stage of research, the interactions themselves are all that can readily be analysed.

Baerveldt and Snijders (1994) examined petty crime amongst school children while trying to develop a new measure of identifying subgroups that operates without the assumption that each subgroup is completely separate from the rest - the segmentation index. Their reasons were that in networks, it was not often possible to clearly divide up the subgroups and that differences between groups should be by degree rather than total separation. Segmentation was defined as "a network is more segmented if the social distances between persons who do not have a direct tie with each other, are larger." (pg 219) In other words, segmentation is a measure of to what extent the network is fragmented into

highly distinctive subgroups. They proposed four hypotheses on the nature of segmentation and its relationship to the spread of information and cultural norms:

- ▶ individuals connected to each other are more likely to have similar cultural norms
- ▶ as segmentation increases, the stronger the impact of connections on cultural norms
- ▶ as segmentation increases, the impact of what they term "external events" (things that affect the network that come from outside it) will be lessened over the whole, but individual sub-groups will shift to more extreme positions
- ▶ the more new connections established by external events, the more likely segmentation will be reduced

To test these hypotheses, the authors drew on data collected about the networks and petty delinquent and criminal behaviour of 870 Dutch students. The deviancy was defined as the cultural norms and behaviours to be examined in relationship to segmentation. Of the four hypotheses, only the first was clearly confirmed - that students were committing more acts of deviancy when their friends did likewise. The other three hypotheses were not confirmed, however, putting the impact of segmentation on the maintenance and spread of information into question. Further research will determine how effective a measure of both how much a network can be subdivided and how information moves through networks.

McCarthy and Hagan (1995) studied the relationship between degree of embeddedness in criminal networks and criminal attitudes/activities. They proposed that the control theory and cost-benefit analysis explanations of crime were lacking in that they assume that crime is an act committed by the individual separate from their social environment.

Drawing on the work of Sutherland and Granovetter, the authors present a different perspective - one where the social relations of the individual are a fundamental part of their criminal activities. The individual can seek out criminal activities, acquire skills relating to crime and be encouraged in carrying out crime within the appropriate network, just as other people search for jobs and acquire work-related skills through their own networks of contacts, e.g. Granovetter's "weak ties." Their study focussed on a sample of 390 Canadian adolescents who had left or were thrown out of home. Looking specifically at the "street" crimes of selling drugs, theft and prostitution, the researchers developed a questionnaire that covered the criminal and general histories of the adolescents, the extent to which their friends at home and on the streets were involved in criminal activities and what individuals aided in their acquisition of "skills" relating to crime, e.g. offers of assistance in acquiring/selling drugs. They found that the greater the integration into a network of criminal associates, the easier it was to develop the skills to carry out crimes and the greater the amount of criminal activity. This embeddedness was facilitated by such factors as level of deviant attitude, having friends at home involved in similar activities and age/gender. Overall, the results supported their argument that the criminal activities of the sample were as much a result of the interaction between the adolescents and others as they were an individual's actions. This is within the confines, as they admit, of examining crimes of a very instrumental nature, where the aim is to make some sort of monetary profit from their activities. The authors hold that the same may not hold true of more "impulsive" crimes such as vandalism.

Baron and Tindall (1993) examined a similar research topic, looking at the role juvenile gang structural and individual position in gangs play in the delinquent attitudes held by gang members. They identify two approaches to juvenile gangs - the sub-culture perspective, where the bonds to the gang lead to deviancy, and control theory, where deviancy is a result of lack of bonds in general. Reviewing the literature, the authors follow a perspective based on a combination of the two. They propose, amongst other things, that the members of the gang with the weakest bonds to conventional society

would have the most delinquent attitudes, would be more integrated into the gang and would be more central in the network structure. The subjects were the thirty-five members of a juvenile gang, with data collected through participant observation and interviews about delinquent attitudes, closest associates within the gang and details such as length of time with the gang. The results confirmed their primary hypotheses - that the individuals more central in the group (as measured by degree and betweenness) were more integrated into the gang and had strong deviant attitudes, though those with the weakest bonds to society, regardless of involvement in the gang had the greatest delinquent attitudes. Baron and Tindall suggest that, overall, this supports control perspective, and that gangs play a role not in creating delinquency, but in fostering it and in create situations where delinquency can be carried out, e.g. situations where an individual would not be able to be deviant alone. One problem with extending this criminal groups as a whole is that, as with much of control theory, this is applied to juvenile groups. Uncohesive, loosely structured groups are typical of any adolescent group, deviant or otherwise. Criminal groups made up of adults may be very different. Longitudinal studies of gangs that continue on from adolescence into adulthood might reflect such changes.

Baker and Faulkner (1993) carried out network analyses on cases of the white-collar crime of price-fixing in the American electrical equipment industry. Their aim was to determine what played the more important role in the development of the structures of the conspiracies - concealment of their activities or the need to maximize effectiveness. In addition, they also wanted to determine what role the structure of the different forms of price-fixing played in terms of outcomes in verdicts and sentencing. Two main approaches to white-collar crime were identified - the industrial organizational economics and organizational crime perspectives. The former focuses on how the structures of the industries themselves contribute to this form of crime, while not examining the structure of the groups of offenders themselves. Such crimes occur in situations where there are a small number of people responsible for selling products and products that are very

similar to each other from company to company. Such situations make activities like price fixing much easier by reducing the numbers of people required to carry out the crime and making organization easier. If products are similar, organization is made even easier. The organizational crime approach looks at how both the personal motivations of the offenders, e.g. making promotions, and how the activities benefit the companies, e.g. illegal toxic waste disposal to minimize costs can separately or mutually occur under the right conditions. These include poor financial conditions, market pressures and, for example, in the time period covered in the study a sub-culture of total devotion to "the company" in America in the 50's. As Baker and Faulkner state:

The conspiracy was a "way of life" in which price-fixing crimes served organizational and personal ends. (pg. 842)

The authors point out that what both these approaches lack is an in-depth analysis and understanding of the internal structure and mechanisms of the conspiracies themselves - how they were organized, what roles did the individuals play in shaping and maintaining the conspiracy and what actually goes on while the crime is being carried out. It is this issue that the authors address.

Drawing on the literature on group/organizational behaviour and on secret societies and white-collar crime, two factors affecting structure were identified - organizational objective and information-processing requirement. Organizational objective refers to the main aim of the conspiracy, either to maintain secrecy or to coordinate activities. While both would exist in a conspiracy, which ever one was dominant would influence the structure of the group. Concealment, as they term secrecy, would lead towards a highly decentralized structure with minimal interaction, thereby minimizing the risk of group activity being recognized and of individual members being linked to the network. Coordination would lead towards the best form of efficient interaction, one where the members communicate the most effective way possible to minimize problems. The form

of information processing affects structure through the kind of task being carried out. Simple, clear tasks (low requirements) are best accomplished in highly centralized structures, while complex ones (high requirements) fare better in decentralized structures. This creates a conflict in that, as long as the information-processing requirement is high, both the concealment and coordination elements push for decentralized structures. However, when information-processing demands are low, concealment needs still push for decentralization while coordination needs push for a centralized structure. The authors then examined three price-fixing conspiracies to determine how each dealt with the potential conflict. In addition, the authors hypothesized that decentralized structures would make identification and prosecution more difficult, so that conspiracies with this structure would have lower numbers of convictions and less severe punishments. Finally, individual position in the structure would influence the outcome of trials - those more central in the network would more easily be identified and would suffer greater punishments.

Drawing their data from transcripts of a congressional committee on price-fixing, identifying 78 individuals, each ranked as either upper, middle or lower management, from 13 companies, making up the three separate conspiracies. Measures for individual centrality were degree, betweenness and closeness. Measures for centrality were density and graph centrality. (Freeman 1979) Of the three conspiracies, the turbine one was identified as having high information-processing requirements, while the switchgear and transformer conspiracies were identified as having low requirements. While it was expected that the former would definitely be decentralized, it was determined that the opposite was true - it was the most centralized and dense of the three. For the remaining two, both were found to be decentralized, indicating secrecy was more important than coordination of activities. For individual outcomes, degree significantly increased the likelihood of a guilty verdict, though affecting the punishments given. In general, the level of centralization did not affect outcomes, except upper management in decentralized networks suffered greater punishments. Baker and Faulkner concluded that, unlike the

situations examined in the literature on small-group structures and information processing, the need for secrecy in high requirement conspiracies results in centralization. This is a result of the need for extensive coordination to deal with the high level of information processing required, a process which is made even more complex by the individuals in the group not being able to freely interact. It is the secrecy itself that led to the conflicting result.

Waring (1993) used models of network structures to generate a classification scheme for forms of co-offending white-collar crime. Drawing on pre-sentence reports collected by previous researchers, Waring identified 516 single offender crimes and 494 multiple offender crimes in the database. From the 494 cases, the author developed a classification scheme based on the connections between the members, network size and the differentiation of roles between members. The primary division is a split into two groups based on whether each network roughly approximates two "ideal" network patterns - the complete network and the star. The complete network was where all individuals were in contact with each other, basically, a clique. The star consisted of one member holding a central position through which different parts of the network must go through to contact each other. Groups that resembled either ideal were assigned to the appropriate category. Both categories can be further divided into differentiated and undifferentiated types. This relates to the roles of the members of the networks, but is slightly different for each category. In complete networks, differentiation represents members in the networks having different roles, e.g. one individual deals with altering the accounts, another arranges the transfer of monies etc. Undifferentiated complete networks do not have clear role divisions. In star networks, differentiation only applies to the non-central members. For these networks, the differentiated peripheral member category indicates that the central member acts as a form of intermediary between two separate groups of peripheral members, e.g. a lawyer that arranges marriages for immigration purposes acts as a go between for those who wish to immigrate and those who are willing to marry them. In the undifferentiated category, there are no divisions between peripheral members.

The two categories of complete networks can be further divided into large and small networks. Small networks only involve two offenders, with large being three or more offenders. The author does not give any reason for defining large and small at this level, though most research in the field would appear to consider a network of three or four members as quite small. SNA research classifies three individuals as a triad, not a network, with a whole area devoted to research on such a structure (White, Boorman and Brieger 1976). Differentiated star networks can be further divided into two sub-categories, based on the role of the central member. Pure core members are those that act as brokers or intermediaries between the two or more sub-groups of peripheral members. Former customer networks are those where the core member was or currently is fulfilling the same role as one of the peripheral sub-groups, in addition to their central role. Waring then gave descriptive accounts of the forms of white-collar crime that were felt to be indicative of each of the various classifications:

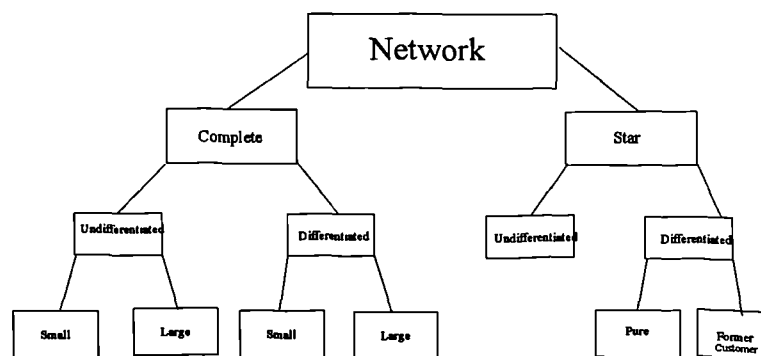


Figure 3.3 Waring's Classification System

- large, undifferentiated complete - price-fixing conspiracies, where all members contacted each other, all had similar roles (arranging prices and using them in their business) and there were a sizeable number involved
- small, undifferentiated complete - tax fraud, where the process is similar, but with smaller numbers
- small, differentiated complete - kickbacks, where there is the person(s) who offer the kickbacks and those that receive them
- large, differentiated complete - fake companies, where individuals take on different company positions while running the scam
- undifferentiated star - false payment, where the broker acts as an intermediary merely for the false movement of monies
- differentiated, pure star - fake marriage, where the broker acts between those seeking marriage to immigrate, for example, and those willing to marry for money, with the broker's role being specialised and technical
- differentiated, former customer star - loan fraud, where the individual between the company and the fraudsters was typically one of the fraudsters, as well

While very informative, and a first step towards classification of criminal groups/networks, the danger of oversimplification is one that must be addressed. The author does discuss this point, but still uses the ideal network types. Would, for example, a network made up of two almost complete sub-graphs connected by one bridging point be classified as a large complete network or a star? Some sort of more complex system is required to deal with those networks that don't come close to fulfilling the ideals chosen.

Johnston (1998) applied SSA to investigate the structure of seven hard-core football hooligan groups. The SSAs were produced from records of associations between various members of the seven groups or networks. A rough hierarchical structure was identified, with the core members being located most centrally within the network, while the newest

and most casual members were on the fringes of the network. The core of each network were significantly more likely to have violence crimes as their first convictions and there was a trend towards the core having more violent convictions overall. In addition, the members of the networks identified as "known leaders," based on intelligence, were significantly more likely to be in the core region of the SSA. While a preliminary piece of research, the tangible results from the use of only one SNA measure highlight its potential application. Humphries (1996) carried out a series of analyses on drug networks, using SSA on the first two case studies. The data for these case studies was based on phone billings, with association matrices being produced for each network. Both two- and three-dimensional SSAs were generated. While not as specific as such measures as betweenness, the SSA plots did highlight a number of aspects of the networks, with all the resulting investigative implications. Examination of the diagrams revealed central and peripheral members, subgroups within the networks, and key connections, as discussed above. When the results were discussed with officers involved with each case, and when SSA had been explained, the officers thought the two- and three-dimensional models would have been of use in organizing their intelligence, and more accurately reflected the intelligence than the link diagrams. This was particularly true of the three-dimensional models, though they were harder to interpret.

Conclusion

The first few studies described have less direct application to this study, as they do not directly address aspects of the actual structure of the network. The approach was more the impact of overall structure on behaviour, rather than the actual makeup of the network itself. The price-fixing, white-collar crime and two studies that used SSA are very relevant. The themes indicated in Chapter 2 emerge here, as well. Increased needs for secrecy created more decentralised structures in the price-fixing networks. The networks in the white-collar crime study were small, with only the minimum individuals required to carry out the crime, to reduce risk, yet still often had definable central individuals. Core individuals or groups were found in all of the studies. The price-fixing study found key individuals whose positions related directly to investigative outcomes. Waring found key individuals at the centre of the stars. No highly structured hierarchies were found. Subgroups were found in all of the studies, as well. The stars were distinct subgroups joined through a central figure, making that individual very much a cutpoint. Both Johnson and Humphries found that certain individuals were more central within the SSA plots. These findings indicate that, at this preliminary stage, SNA methods are tapping into the same themes that the more ethnographic and descriptive accounts have identified.

scientific study. Discovery, in this case, means that only identified networks are potential targets for intelligence gathering. Reporting covers the fact that only selected networks are chosen for intelligence operations, based on such factors as relative importance of the known networks and political priorities, e.g. drug networks are now considered high priority. Once networks have been selected, the intelligence that is actually recorded has the potential to be the result of biases for what is collected, e.g. the assumption that certain individuals are the leaders of the network can lead to more information being collected on them, resulting in a higher level of “involvement” for those people.

The worst case scenario would be that the features that resulted in the attention of law enforcement agencies are also features that make the subset significantly different from most other criminal networks and that the intelligence collected reflects police perceptions of criminal networks rather than their actual structures. The ones which do not have intelligence collected on them are passed over because they are structured in such a way as to make identification difficult, at best. While risking the possibility of drifting into self-fulfilling prophecy, the best answer is the extent to which the networks in this study, using a different source of data and a different form of analysis from the literature, have similar structures to those described in other research. Much of the research into criminal networks has not used police data as the primary source of information, if at all. Ethnographic accounts, in particular, are the result of direct experience of such networks. The literature review in Chapter Two has shown that there are consistent, broad themes that occur across various pieces of research, in both American and UK studies. Analysis of the cases in this research will indicate to what extent they follow those themes.

Secondary Sources

Research within the social sciences has traditionally been based upon data collection via experimental procedures, surveys and questionnaires. There has, in fact been a “complacent and self-defeating dependence upon single classes of measurement”

(Webb, Campbell, Schwartz and Sechrest 1966) in many areas of psychology. The reason for this reliance is predominately due to a long standing desire for data which clearly and concisely 'certifies' theories, plus a need to utilise formerly accepted and familiar methodological techniques. Such data collection techniques are, however, open to criticism from a number of angles. Firstly, interviews, questionnaires and experiments often create as well as measure attitudes - for example, participants are aware they are being tested and will, as such, systematically alter or modify their reactions with respect to those they believe are expected or acceptable. Results are consequently often defined by the 'demand characteristics of the experimental situation' (Orme & Evans 1965). Secondly, variance in results may occur as a function of the experimental design - for example question order and thirdly investigator effects such as mood, characteristics or sex of the interviewer may affect results.

Regardless of these problems, however, alternative sources of data are often neglected and underestimated. Eugene Webb and his colleagues (Webb et al. 1966) advocated a range of data sources for which they coined the term "unobtrusive measures." These measures included data from real world situations as well as from documentary and archival sources (Stewart 1984). Webb et al. aimed to "broaden the social scientist's narrow range of utilized methodologies." Their ideas have been gradually developed such that a slowly but steadily increasing number of researchers are currently expressing an interest in the abundance of data encapsulated within books, newspapers, magazines and possibly films, television and photographs. Within the domain of Investigative Psychology, pertinent sources include police and Home Office reports, crime statistics and true crime magazines. The main advantage of data from such sources is that it is not directly affected by the requirements of the researcher or the particular project it is to be incorporated within. It is, therefore, not so prone to the 'reactive measurement' errors as data collected within the traditional experimental framework. A lesser degree of masking or modification resulting from awareness of being tested should be apparent within data produced for purposes other than scholarly ones eg running records. The variety and scope of data pools such as the above and

the low cost of acquiring considerable quantities of information are addition points in favour of these resources given the tight economic climate in which research is required to operate.

There are, however, a number of problems inherent in the utilization of records, archives and media reports which cannot be overlooked. The first arise from the initial stage at which the data was recorded. The researcher has no knowledge of errors or inaccuracies chronicled by the original author and may not be aware of the precise circumstances under which the data was collected or the biases which may have influenced this crucial stage. Data may not have been reactive to the purposes of the social scientist but may have non-the-less been influenced prior to him accessing the data. Certainly, this was true of the data collected. Limitations on time and resources prevent intelligence gatherers to carry out in-depth studies required to guarantee complete accuracy. In general, cases were selected where the most amount of intelligence had been collected.

As well as actual distortion of data, there is also the problem of selective filtering of details. Certain details such as those of popular interest will undoubtedly survive the course of time but others will be effectively deposited as information is relayed. The researcher may consequently only have access to partially depleted data sets. Further more, details which do survive may be subject to exaggeration and sensationalisation. Disproportionate weight may be placed upon the dramatic or engaging facts to the exclusion of the more mundane but never-the-less extremely important issues. Again, the data for the research can suffer from this problem, where overemphasis could be placed on an individual or individuals perceived as the "leaders" of a network. The case selection process filtered out some of this effect. Thirdly, particular problems arise at the stage of utilisation by the researcher. Due to the fact that the data has not been collected for the purpose of the particular study and has not been structured with the researcher's needs in mind, it is often necessary to make inferences and encode a large quantity of missing values. The process of analysing the data and sorting through the 'noise' will lead to yet further filtering and problems inherent in the

giving of meaning to data. Due to the lack of comparable sources, the problem also arises of evaluation and external corroboration of detail. Criteria described below were implemented to try to deal with these last two issues as much as possible.

One criterion that was used to maximise the quality of data accepted for the research project was that for any given case the intelligence information collected by the police was on more than one individual. Often, intelligence actions are centred on one individual and that person's immediate associates. These cases are called "egocentric networks" in SNA (Wellman 1993). While valid in their own right and the focus of much research, they involve very different procedures than multiple member networks. The limitation of egocentric networks is that they represent only one individual's immediate neighbourhood, and not the network as a whole. Individuals connected to the main figure may also be connected to each other, but such possibilities are not likely to come out of the data collected. Cases were selected, therefore, when they were carried out on an identified group of individuals, or where the investigation began with a single individual and was subsequently expanded to include intelligence gathering on a larger group of people.

A second criterion was that intelligence was gathered in more than one way. Cases limited to just phone billings, surveillance or another single source have the most potential to give misrepresentations of the network structure. By using cases with more than one source of intelligence, the amount of information was increased. This procedure is similar to triangulation methods used in other studies, where multiple source of data are used to maximise the accuracy of the information (Hickey 1991). The exception to this were some cases where single sources were used during actual criminal activities. Four cases involved extensive phone records, including phone communications used during the course of crimes being committed, such as during burglaries or for coordinating drug-dealing activities. Each case of this type was clearly identified. The phone records used for the network analysis were those exchanges during the commission of the crimes, giving a indication of how the network operated during actual functioning. A single case involved surveillance of a

specific location where drug distribution and dealing were being carried out. As all of the drug activities of the members was focussed on this one location, the meetings that took place were an indication of who had contact with whom. Both cases are described in more detail in their respective chapters.

Social Network Analysis has been used on a wide variety of secondary sources, often as information about the relationships between actors can only be obtained through such means. indirect communication. Burt and Lin (1977) described a number of useful archival data sources, such as legal records, public documents and journalistic accounts, each with limitations. Any sort of historical analysis of networks, for example, inevitably requires drawing on such sources. Schweizer (1991), for example, analysed the power struggle in an Chinese Agrarian village between 1950-1980, using information gathered by previous researchers, from informants. Breiger and Pattison (1986) studied financial records to build up a picture of the network structures in 15th century Italy. Alexander and Danowski (1990) examined letters written by Cicero (106-43 BC) to colleagues. Through these documents they modelled the relationships between and within two Roman groups, the knights and senators. While keeping in mind the limitations of the data source, each found significant levels of useful information. A more contemporary source of such information would be the Internet, particularly in the use of the WWW and in email. One discussion of the possibilities of using the latter can be found in Rogers (1987).

Qualitative Research

Qualitative research is the study of non-numerical data. Interviews, transcripts and other approaches not involving exact measures require different procedures for analysis than measures for such things as reaction time. There is no one accepted approach to qualitative research, with methods that vary in such ways as to what degree the information produced is converted into numbers and analysed using

procedures similar to quantitative research. Robson (1993) gave a series of basic rules for dealing with qualitative data:

- Analysis of some form should start as soon as data is collected. Don't allow data to accumulate without preliminary analysis
- Make sure you keep tabs on what you have collected (literally - get it indexed)
- Generate themes, categories, codes etc. as you go along. Start by including rather than excluding; you can combine and modify as you go on
- Dealing with the data should not be a routine or mechanical task; think, reflect! Use analytical notes (memos) to help to get from the data to a conceptual level
- Use some form of filing system to sort your data. Be prepared to re-sort. Play with the data
- There is no one 'right' way of analysing this kind of data - which places even more emphasis on your being systematic, organized and persevering
- You are seeking to take apart your data in various ways... Your main tool is comparison (pg. 377)

For making comparisons between cases, making direct comparison between the similarities and differences in the actual quantitative SNA measures was problematic, as such things as network size can affect those measures. The minimum network size was set at seven members, though larger networks were given preference. Most networks in the study range in size from about 15-30 members, with the largest having approximately 45 members. Networks involving small numbers of people were likely to have fairly unsophisticated structures, by the sheer lack of possible combinations. There is a great deal of potential in the study of these mini-networks, particularly through such methods as sociograms constructed by the members themselves (McClusky and Wardle (in press)) and through more general group

psychology methods. SNA measures detailed in the previous chapter have more usefulness when the network has enough members to allow for a variety of possible combinations of interactions and exchanges. To make an organised approach, it was necessary to relate the conclusions for each case back to the themes that emerged from the literature. The extent to which two cases could be described as similar depended on to what extent each matched or differed from the structures the literature suggested would exist. This sort of judgement was ultimately a subjective one. By keeping the overall themes fairly simple at this stage of the research in this field, any potential biases were reduced. For example, simple descriptions of there being a definite core to a network that had some control over the other members would be easy to identify from the SNA measures. If two networks had cores, than that was a point of similarity. A similar approach was adopted for making comparisons between crime types. The similarities and differences between crime types in expected network structures were used as a basis for those comparisons.

Issues in the Use of SNA

Sparrow (1991) provides a series of cautions about applying SNA to criminal networks:

- Criminal networks are often much larger than those traditionally focussed on by social network analysts.

However, not all criminal networks are so large, and size can also be dependent on at what level of criminal activity the researcher examines. In addition, network size can have little impact on the actual measures, and the power of computers today make computations of large data sets easy.

- Criminal networks will often be incomplete, with missing points and connections.

Any network, with the possible exception of those in the most tightly controlled experimental context, will be incomplete. It is merely a question of to what extent. Any form of "real world" research (Robson 1993) will suffer from this problem, though often researchers choose not to confront this issue. While recognising that the data is incomplete, the researcher can still analyse the network in terms of what is known.

- Criminal networks involve the potential for extensive overlap, where members belong to multiple networks and/or networks have multiple connections to each other.

Again, this depends on the type of network being looked at. The key is carefully defining the networks being studied. Expanding the boundaries of the size of the network being examined as it becomes apparent that two separate networks are associated with each other, would be one example.

- Criminal networks are dynamic, in that they are constantly changing over time

Again, this is true of all networks. Analysis of networks is also not a static process. As more information comes in, reanalysis is required. In addition, major changes to a network require new intelligence collecting efforts and new analyses. A network that has had several key people removed will either disintegrate or try to reform in a different structure. If the latter takes place, a new network exists to be investigated. All these concerns warrant consideration. They do not, however, prevent the effective use of SNA by the researcher who is aware that, like any other method, it is not a perfect solution. Extensive research in the SNA field has examined similar forms of data drawn from imperfect sources (Alexander and Danowski 1990), and few networks match all of Sparrow's points. This research has found SNA to be an

effective method of analysing and understanding incomplete and problematic networks despite such potential concerns. Criminal networks are no different than these.

Data Sources and Classification

A number of forces were the primary suppliers of data for the research. Cases were obtained from a wide range of demographic areas. A large urban area supplied a major proportion of the cases, with a smaller urban centre and a rural force supplying the remainder. Cases were grouped qualitatively into three broad criminal "focuses." The first focus was drug networks. The second involved cases of property crimes - burglary, ramraiding and handling stolen goods. The final chapter addresses a special form of criminal network, cases of organised sexual abuse of children.

Coding Procedures

For all of the cases drawn from the forces, the same basic procedures were adhered to. Once authorisation had been obtained from appropriate management and the data protection officers, the researcher began the actual coding process. The first stage was a quick review of the case to ensure that it matched the criteria detailed above. The second stage involved reading through all of the case materials to ensure that there was sufficient appropriate information about the connections between individuals to allow coding. This was usually the case, as examining patterns of connections is part of the intelligence analyst's work (for a detailed discussion of intelligence analysis and SNA, see chapter ten). The third stage involving going through the case files in detail, collecting all information about connections between individuals. Only substantiated links were used. These included, but were not limited to, being seen together by an officer, one member's phone number contacting another's, financial exchanges and both being prosecuted for specific crimes. Information such as unsubstantiated connections supplied by informants was not used on its own, as the potential for

inaccuracies with informant data were considered too high. When the data was stored on a computer with one of the intelligence analysis packages used by the police, this procedure was facilitated considerably. Data about links could be drawn out quickly and produced in a hard copy that could be coded quite easily.

The final stage of the coding procedure was anonymisation of the data. All identifying information was removed from the coding sheets, with numbers given for each network member. These anonymised sheets were then cleared by the individual at the force overseeing the data collection to ensure that the confidentiality requirements of the force were met. Secondary information was also collected, when available, on the types of criminal activities each network was involved in, which individuals were labelled "leaders" and what roles members may have taken on. In some cases, secondary information about the outcomes of investigations or the nature of the relationships within the network was also collected. This was only done when the researcher had access to this information and was allowed to collect it. This kind of secondary information would be required for research of this sort to move forward, as it allows structural aspects to be related to investigative outcomes and to other aspects of the network, e.g. familial and ethnic components.

Analysis Procedures

The networks were divided into subsets based on the criminal focus of the network, then each network was subjected to analysis. The data from the coding sheets was entered directly into the main network analysis package, UCINET (Borgatti, Everett and Freeman 1992). This was used to generate all of the measures (degree, betweenness, closeness, information, cliques, 2-clans, knots/cutpoints and k-cores) apart from the SSAs. The visual representations of the network structures were produced through a separate SSA package (Lingoes 1973). The majority of the networks were converted into binary format, where if two members have any number of connections then they were given a score of one tie in the matrix. No connections resulted in a score of zero. This was done to minimise the amount of noise in the data, where discrepancies may occur due to more information being collected on ties between two individuals relative to other pairs. By not differentiating pairings by the strength of their ties, these inaccuracies are reduced. Obviously, links may exist that were not identified in the intelligence gathering, resulting in connections between individuals not being represented in the data matrix. This was a function of the nature of the data, as described in the first sections of the chapter, and was unavoidable. While some inaccuracies were inevitable, the criteria used to select cases and to decide on using a link would cut down on their frequency. It is the nature of the beast in using this data to study a large number of cases, rather than a few ethnographic-style studies. An example would be the cases where phone billings were used. Two individuals may have been in phone contact thirty times, but the number of communications specifically related to criminal activities was not known. By reducing the score down to having a link or not, this prevented additional weight being given to the interactions between the two when it was unwarranted.

Running the analyses was relatively straightforward, with results produced quickly. Once all of the measures were run for each network, appropriate tables and diagrams detailing the results could be generated. These included ranking tables for the centrality measures, tables listing the cliques and 2-clans, tables listing the k-cores and

cutpoints and the number of knots for each and diagrams for the SSA results. From these descriptions, detailed discussions of the structure of the network could then be written up. Centrality measures indicated potential key members in the networks and whether cores of such individuals were present. The cliques and 2-clans results identified cores and whether distinct subgroups existed within the network. The K-Core measure aided in determining whether or not a core existed, while the cutpoints showed which members acted as gatekeepers within the network structure. The combined results from all of these measures, used in conjunction with the structural model given by the SSA allowed a detailed discussion of the overall network structure. Once all of the networks within a criminal focus subset were analysed, a larger discussion of commonalities and differences could then be developed, with reference back to the themes in the literature. Finally, comparisons across subsets were made to make inferences about the nature of criminal networks, in general. The analyses, therefore, carried out for the PhD straddle the boundaries of quantitative and qualitative research. The initial data collection and individual analyses involved exact, quantitative methods. The comparisons between cases and across subsets are more descriptive and qualitative, following on in the more ethnographic orientation of much of the previous research.

Chapter 5. Drug Networks

The literature raised a number of questions about the nature of network structures within criminal markets. These could be summarised as

- is there structure to criminal networks and can SNA measures identify those structures?
- if structures do exist, how exactly are the networks structured?
- is there any consistency in network structures within markets?
- what are the similarities and differences in network structures between markets?

The literature on drug trafficking networks suggests that often these networks are structured such a way as to be able to distinguish between the main members of the networks and the rest, in at least a very basic way. This amount of organisation seems to be largely dependent on the stage of trafficking, e.g. distribution and wholesaling generally are more so than street-level dealing, and on amount of risk, such as the type of drug, e.g. heroin versus marijuana. Potter's (1994) "Knight" organisation represents one more organised end of the spectrum, with multiple layers between the heads of the network and those involved in dealing on the street. At the opposite end were the "Akbar" brothers, involved in the day-to-day distribution of drugs to the dealers themselves. As a function of risk, the former organisation was larger, had more links to networks outside of the city and was involved in moving drugs to other cities, as well. The second network was low-key, less likely to draw the attention of law enforcement outside of the city with its reasonably corrupt police force and much smaller. Bourgois (1995), Lewis (1994), Dorn et al.(1990; 1997) and Adler (1992) all found networks to be small groups, with some status differentiation. The questions

remain of just how organised are drug networks and how are they structured to allow such organisation to take place? Does the nature of drug trafficking naturally lend itself to the develop of hierarchies, albeit crude ones, in networks or is it largely dependent on the situation any given market is in? Are the leaders sufficiently distinct from the rest of the network as to form core groups within the structure? Are drug networks organised to have distinctive subgroups, or is there little distinction between members outside of cores, if they exist?

To try to address these questions, data, drawn from intelligence files, was collected on twelve drug trafficking networks. All were involved in importation, distribution, dealing or combinations of the three. Networks directly involved in production of drugs abroad and the movement of drugs into the UK were outside the scope of the study, as these networks are the focus of such organisations as NCIS and the recently developed National Crime Squad (Campbell 1998), rather than the forces supplying data for the study. The networks were also very much internal in nature, rather than the actual marketplaces where drug dealing was taken place. Intelligence on such markets was much less frequent, as the focus of most intelligence gathering is on specific groups. To create continuity amongst the networks from intelligence files, no networks involved in marijuana were included in the study. While this obviously reduces the broader applicability of the findings, it allows direct comparisons to be made between the networks to identify consistencies and differences. The drug networks in the study involved narcotics and/or "artificial" drugs (Ecstasy and amphetamines). The amount of information about each network made accessible varied from case to case. Four of the studies involved background information, as well as association details. The data for the remaining eight was largely association details. To make the chapter readable, only the first four networks were discussed at length, covering the details of the findings for all of the measures. The remaining eight were summarised for comparison purposes, with fuller details contained in Appendix 1.

Case Study 1

This case of drug importation and distribution involved two families extensively involved in criminal activities. As well as carrying out drug importation into the city they operated in, they were heavily involved in providing nightclub security. This involvement allowed the families to have some amount of control over the movement of drugs into clubs. The network involved 28 individuals. Data for the case was in the form of phone billings for the combined home and mobile numbers producing a dichotomous association matrix. In this case, a score of 1 indicated a confirmed phone contact between two individuals. There is an obvious potential for gaps in the intelligence about the network, and so not all actual links will be in matrix. However, intelligence indicated that phone communications were a major part of the process by which the members of the network interacted, so the data will still give a mainly accurate description of the structure of the network.

Centrality

The centrality table below (table 5.1) gives the centrality scores for all members of the network. The higher the given the score, the more central that individual was, for that measure. The degree results showed that the majority of network members had only two connections (twenty of the twenty-eight), with only one member having a degree score of one. Member 27 had a degree of three, members 10 and 22 both had a score of four and 25 had a score of five. The remaining three members had substantially higher degree scores. 1 had a score more than twice the next lowest - eleven. 28 had a score of nineteen, while 9 had a score of twenty-three. These last three members were highly connected, relative to the rest. 10, 22, 25 and 27 had middle range degree scores compared to the remainder. This division was very distinct, indicating the relative importance of a few members of the network. Unsurprisingly then, the closeness scores mimicked those for degree, in terms of the seven highest scores. Those individuals who were highly connected, 9, 28, 1, 25, 10

and 22, in descending order, were also closest to all other members of the network. There were sizeable jumps in closeness scores between these high scorers, with about ten points difference between each until 25, where differences tended to level off. This lends further support for the notion of a core of members, with the rest “pushed out” towards the periphery into separate groupings that must communicate through the central members.

Table 5.1 Centrality Results for Case Study 1				
	Centrality Measures			
Member	Degree	Closeness	Betweenness	Information
1	11.00	62.79	35.50	1.78
2	2.00	49.09	0.09	1.05
3	2.00	49.09	0.09	1.05
4	2.00	49.09	0.09	1.05
5	2.00	49.09	0.09	1.05
6	2.00	49.09	0.09	1.05
7	2.00	49.09	0.09	1.05
8	2.00	49.09	0.09	1.05
9	23.00	87.10	178.33	2.03
10	4.00	52.94	0.59	1.41
11	2.00	50.94	0	1.07
12	2.00	50.94	0	1.07
13	2.00	50.94	0	1.07
14	2.00	50.94	0	1.07
15	2.00	50.94	0	1.07
16	2.00	50.94	0	1.07
17	2.00	50.94	0	1.07
18	2.00	50.94	0	1.07
19	2.00	50.94	0	1.07
20	2.00	50.94	0	1.07
21	2.00	50.94	0	1.07
22	4.00	52.94	3.33	1.35
23	1.00	36.00	0	0.61
24	2.00	45.00	0	0.99
25	5.00	55.10	30.59	1.42
26	2.00	45.76	0	1.01
27	3.00	51.92	0.09	1.29
28	19.00	77.14	109.82	1.97

The betweenness scores went even further towards this concept. Member 9 had an extremely high score, with 28 coming a close second. 1 and 25 came next with high scores compared to all but 9 and 28. An interesting feature was that 25 has only half the degree score of 1, but has an equal betweenness score, suggesting some sort of pivotal intermediary role for 25. Members 10 and 25 had scores slightly higher than the remainder of the network. These scores indicated that few network members acted as geodesic intermediaries. Even those with fairly high degree and closeness scores - 10 and 25 - did not have high betweenness scores. The network, according to these results, was largely dependent on 9 and 28, and, to a lesser extent, 1 and 25, for communications along the shortest routes available. For information centrality, the same order of ranking occurred - 9, 28, 1, 25, 10, 22 and 27. The information score for 9 was 2.03. There was a drop from 1.97 to 1.78 between 28 and 1, and a drop from 1.78 to 1.42 between 1 and 25. Another drop occurs between 10 and 22. After 27, with a score of 1.29, the scores drop to 1.07 and lower. 9 and 28 formed a first grouping, following by 1, then 25 and 10, and a final pairing of 22 and 27. These drops indicated that there were distinct groupings within the higher scorers on information, and that the majority of network members did not act as intermediaries in a substantial way. The centrality results give a clear indication that there was a subset of the network that were central to the functioning of the network. There were also subsets to this highly central group. 9 and 28 stand out from the rest, followed by 1, while 25, 27, 10 and 22 appeared to have less of an impact. The majority of the network, while not dependent on only one person, i.e. they had degree scores of two rather than one, were, by comparison, highly peripheral.

Subgroups

Nineteen cliques were identified in the network, with twenty-two of the twenty-eight members in at least one. All of the cliques are given in table 5.2. Each line in the table represents one clique. Of the nineteen, six were made up solely of highly central members. One clique was composed of 9, 10, 22, and 28. Two more cliques

consisted of 9, 25 and 28 and 9, 27 and 28. The other three each had three members, and were made up of the pair of 1 and 28, along with either 10, 25 or 27. There was some overlap of direct connection between the highly central members, but 9 and 22 do not directly link to 1. This opens up the possibility that if there was an actual core group, it may not have been highly cohesive and distinct. Central members may be outside of it. The SSA will aid in determining this. There were eleven cliques with a size of three composed of the pair 9/28 and one other member. These other members all had a degree of two, and were wholly dependent on 9 and 28 to connect to the rest of the network. This explains why 9 and 28 top all of the centrality rankings. The remaining two cliques were made up of two central members and one other. The first was made up of 22 and 28 with 24. The second had 25, 28 and 26 as members. 28 was in all of the cliques, and so was connected directly to most of the network. 9 came next, in fourteen of the nineteen. The remaining clique members were in three or fewer. 9 and 28, then, were the primary core members of the network, in terms of subgroup membership. The number of cliques made up of solely highly central members did suggest a core group of some form.

Only three 2-clans were found, as shown in table 5.3, with the same format as for the cliques. The first 2-clan included all members except 23, 24 and 26. The second included 24 and 26, but then excluded members 2-8. The first two were very large and, combined, included all members except 23. This member was the only one to have a degree score of one, and so occupied a relatively isolated position. The third 2-clan included 23, as well as 26, but the other members (1, 9, 25 and 28) were all highly central members. Examination of the association matrix (see Appendix 2) revealed that 23 was directly connected only to 25, isolating this member from the rest of the network. The majority of the members, then, were connected by a path length of two, indicating either the network was highly diffuse, which the differences in centrality does not support, or that the central members were the intermediaries, but were spread out enough to allow almost the entire network to be within relatively close distance of each other.

Table 5.2 Cliques for Case Study 1
19 cliques found.
1: 9 10 22 28
2: 9 11 28
3: 9 12 28
4: 9 13 28
5: 9 14 28
6: 9 15 28
7: 9 16 28
8: 9 17 28
9: 9 18 28
10: 9 19 28
11: 9 20 28
12: 9 21 28
13: 9 25 28
14: 9 27 28
15: 1 10 28
16: 1 25 28
17: 1 27 28
18: 22 24 28
19: 25 26 28

Table 5.3 N-Clans for Case Study 1
3 2-clans found.
1: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 25 27 28
2: 1 9 10 11 12 13 14 15 16 17 18 19 20 21 22 24 25 26 27 28
3: 1 9 23 25 26 28

K-core

The results from the k-core added to the impression of some form of core existing in the network. Table 5.4 shows the results, with each line representing the members included at each degree level. Large differences between any two levels in numbers of members included may indicate a core to the network. The step from degree three to degree four in table 5.4 was sizeable, with a jump from just 1, 9, 10, 22, 25, 27 and 28 to all of the network less 23, who was included in the step from two to one. This large increase lends support to the highly central members also forming, to some extent, a core. This core partitioned the more peripheral members off from each other.

Table 5.4 K-Core for Case Study 1	
	Member
	1 2 2 2 2 1 1 1 1 1 1 1 1 1 2 2 2 2 2 1 9 0 2 5 7 8 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 9 0 1 4 6 3
Degree	
4
3	XXXXXXXXXXXXX
2	XX .
1	XX

Knots/Cutpoints

Only one cutpoint was found. As already mentioned, member 23, the only one with a degree of one, was dependent on 25 to connect to the network. The lack of cutpoints supported the idea of a fairly diffused network, if one still dependent on key members for communications.

SSA

Associated members on an SSA plot are located closer to each other, so that highly central individuals will be potentially located in the centre of the layout. The SSA diagram had a very interesting structure (figure 5.1). 1, the third most central member, was located to the extreme left of the diagram. There was a number of peripheral members between 1 and members 9, 10, 27 and 28. 22 was slightly off to the right. 25 was located fairly far towards the bottom centre of the plot. The lower centrality members that weren't between 1 and the rest were scattered around the top, right and bottom of the diagram. The addition of links, representing the dichotomous associations between individual members, gave even more information about the actual structure of the network (figure 5.2). The centre was actually around 9 and 28, with a skewed effect created by the lack of direct connection between 1 and 9. Interactions between the two were dependent on the central members 10, 25, 27 and 28, as well as a number of peripheral members (2-8). All of these go betweens filled the space between these two highly central members, pushing 1 off to the far left. Examination of the actual links also show that 10, 22, 25 and 27 were not actually that important in the indirect interactions between peripheral members. Most of their links were with other highly central members. The cliques for 9/28 and the go-between setup for 1 and 9 involved most of the peripheral members. The peripheral members acted as the intermediaries for the more central members. The core, if any, was made up of 9 and 28, with 1 somewhat independent of the other two. The other "core" members were connected to the other core members, but had little other influence on the network. There was also a second interpretation of the SSA structure, based around the isolated nature of member 23, at the bottom centre of the SSA plot. If 23 were to be the actual head of the network, then 25 becomes the second in command of a fairly hierarchical structure. 1, 9 and 28 act as intermediaries between 25 and the rest of the network, less 26. Background information was used to determine which assessment was more accurate.

Figure 5.1 Drug Network 1

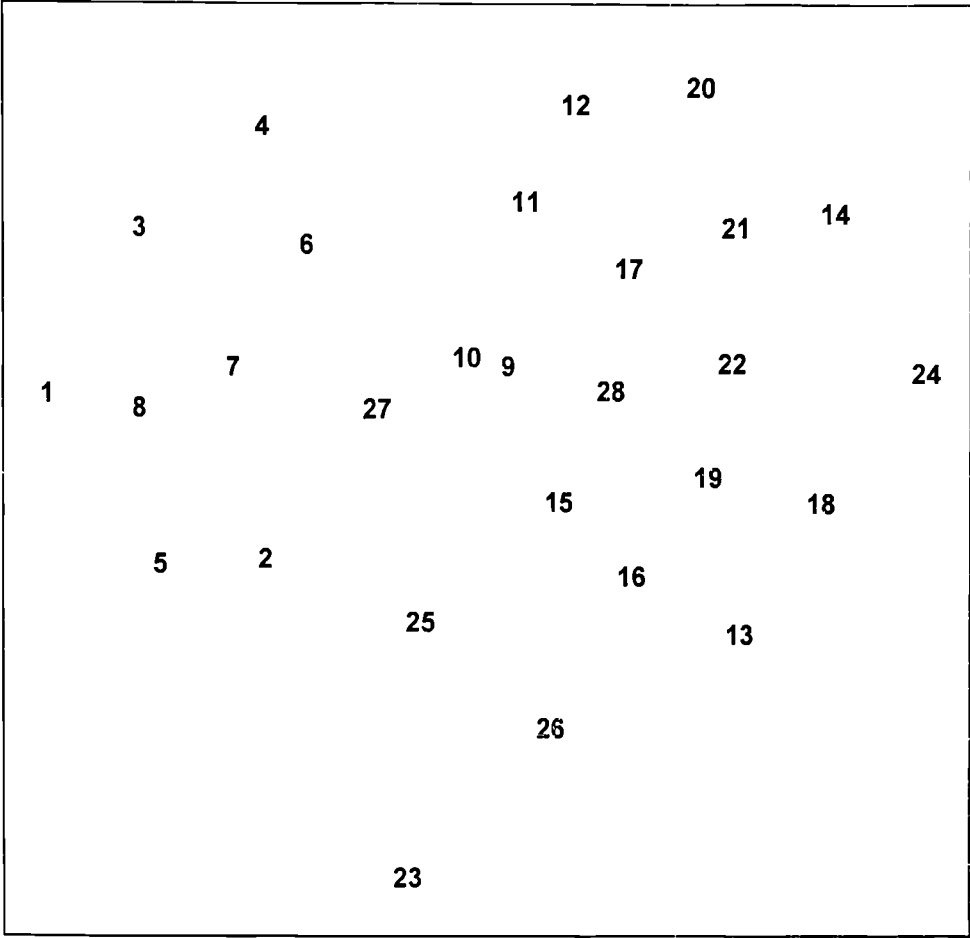
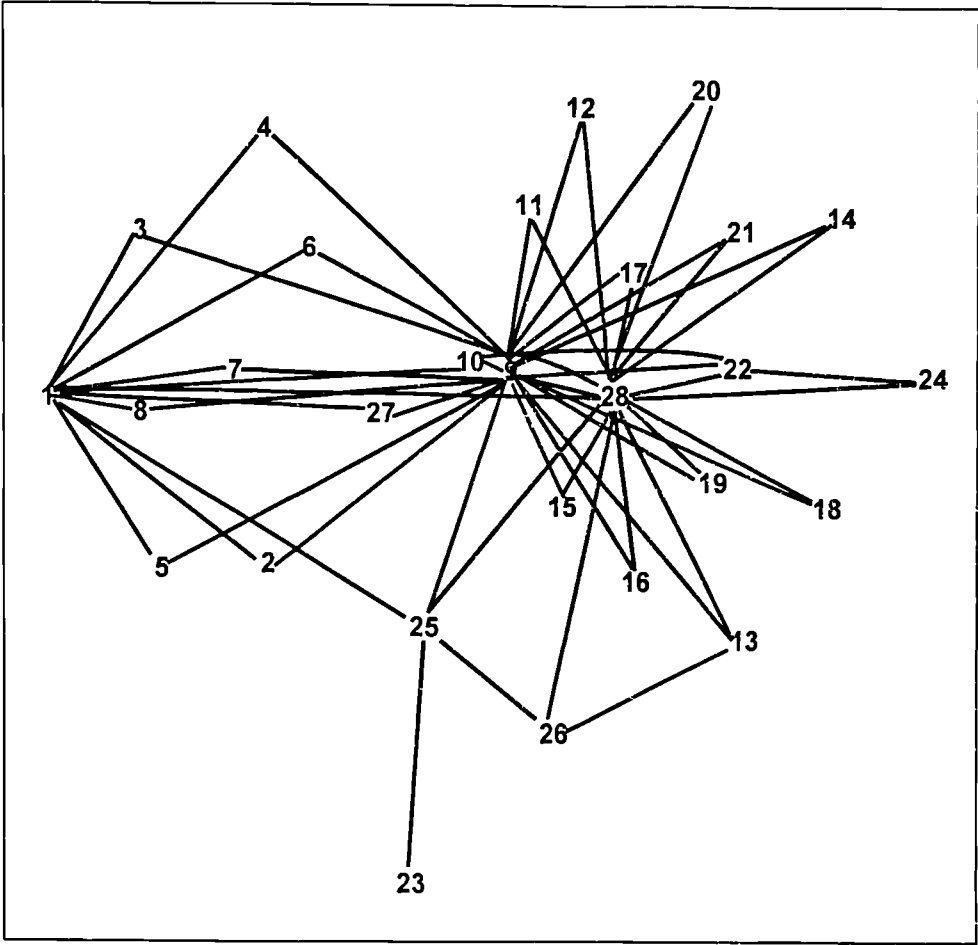


Figure 5.2 Drug Network 1



Summary

Review of the intelligence indicated that 9 and 28 were actually senior members of the two crime families, with 1 being the younger brother of 28. 1 was in charge of drugs, while 28 ran the club security side of the operation. 10 was a close associate of 28 and was married to a relative of 9. 10 was found to be 9's right-hand man, while 1 fulfilled that role for 28. Additionally, members 2-8 were all known drug dealers and members 11-21 were doormen. Members 22-27 were known criminals, with links to outside criminal networks. 23, 24, and 26 all lived outside of the city and so represented contacts outside of the regular network itself. This information makes the first interpretation of the SSA the more accurate one. The different jobs within the network also allow partitioning of the members. The dealers are located between 1 and the 9/28 pair. The doormen are located above and below the 9/28 pair. 22-27 are located in various points, with the outside members (23, 24 and 26) located the greatest distance out from the core pair. 25 and 22 have high levels of centrality as a result of their connections to these outside members, as well as to the central 1, 9 and 28. These positions relate directly to the intelligence. As senior members of the families, the central positions of 9 and 28 are confirmed. While 28 was connected to 1 and 9, 28 had no direct contact to the drug dealers, 2-8, which 1 and 9 appeared to oversee. Instead, 28 oversees, in concert with 9, the more legitimate branch of operations of door security by having links to members 11 to 21. The fact that 1 was the younger brother of 28 and was also identified as 28's right-hand man makes 28 appear to be the main head of the network, using 1 and 9 to distance himself from the higher risk drug activities. 1 and 9, in turn, use 2-8 as their intermediaries with street-level dealers, providing an additional layer of protection. Directly linked to some or all of the main three are other members, who are not directly involved in the drug or door activities - 10, 22, 25 and 27. These associates are links through to outside networks, especially when connected to 23, 24 and 26. These latter three are actually outside the network, serving as links to networks outside the city. It is of interest that of the three, two have links directly to 28, again making him the main

network member. Further intelligence might reveal these individuals to be the contacts for arranging importation of the drugs.

Where the intelligence information is weak is in the nature of the interactions within and between the dealer and doormen groupings. The paired links between each dealer and 1 and 9, and between the doormen and 9 and 28 are valid, indicating which of the core members is involved in the two areas, but there is a gap in the nature of the structure within these groupings. Individual doormen and dealers may have more influence within each group, creating a structure within the structure. Overall, however, the results give very clear indications of the nature of the structure between the various central members and between those central members and the rest of the network. These results show that the network is consistent with other drug trafficking groups. The literature shows time and again that when drug trafficking is in a high risk context, e.g. Potter's "Knight" organisation and Ruggerio and South's networks, the main individuals create layers to distance themselves from contact with the drugs themselves. This is the case here, with 28, then 1 and 9, then 2-8 creating three layers of separation. Where the main individuals involve themselves is in maintaining ties and business arrangements with outside networks, as shown through the links between the outside contacts and, in particular, 28. In terms of the questions raised by the literature, there was an identifiable structure to this network, based around a number of highly central members. These members were the leaders and their right-hand men. The remainder of the network occupied more peripheral positions in the structure, creating a simple hierarchy. There were also distinctive subgroups, formed by the connections of members to pairs of the central group. These subgroups were not groups in an SNA measure sense, as there were no links between the members, but they were distinct within the SSA structure from each other, with the intelligence information indicating the difference between dealers and doormen. Another feature of the structure was the location of connections to other networks on the very edges of the SSA plot, connecting only to more central members. Further cases will indicate how consistent this structure is.

Case Study 2

The second case study was a network of phone communications between individuals involved in heroin importation and distribution in a major urban centre. The focus of the investigation was two brothers and their four associates, all of whom were involved in the supplying of heroin to street level dealers. Phone communications were the primary method of arranging transactions and network activities. The network was made up of seventeen members in total. The data was coded so that if communications had occurred between any two members, an association score of "1" was entered, creating a dichotomous matrix.

Centrality

One individual (11) had a higher degree score than the rest of the network - nine connections (table 5.5). The next closest members were 1 and 7, both with six connections. 12 and 17 had four connections apiece and 3 and 10 each had three. The remaining ten members had two, except for 14, who only had one connection. The degree scores indicated a continuum of number of connections, with one member standing out, a few more with high scores and the remainder with only a couple of links. While 11 stands out, the overall pattern was that the network was generally interconnected. Nine of the seventeen were connected to at least approximately 25% of the network. All but one of the rest had at least two links. This suggested either distinct subgroups or a network of general interactions. The subgroup and SSA measures should indicate which. The closeness scores replicated those for degree. Member 11 was again the highest score (66.67). This makes sense in that 11 was directly connected to nine of the other sixteen members. Following from this, the next highest closeness scores mimicked those for degree - members 1, 7, 12, 17 and 3 were second through sixth. Unsurprisingly, those most connected were also closest to the rest of the network. The remainder were located in such a way as to have the high centrality members along the paths between them.

Member	Centrality Measures			
	Degree	Closeness	Betweenness	Information
1	6.00	55.17	13.67	1.18
2	2.00	37.21	1.77	0.81
3	3.00	44.44	6.17	0.98
4	2.00	42.11	0	0.85
5	2.00	42.11	0	0.85
6	2.00	42.11	0	0.85
7	6.00	53.33	42.28	1.15
8	2.00	36.36	0	0.73
9	2.00	36.36	0	0.73
10	3.00	37.21	0.5	0.80
11	9.00	66.67	56.4	1.32
12	4.00	51.61	35.02	1.07
13	2.00	36.36	15	0.59
14	1.00	27.12	0	0.39
15	2.00	43.24	1.02	0.86
16	2.00	43.24	1.02	0.86
17	4.00	48.48	15.17	1.09

Examination of the betweenness scores reveal a slightly different pattern. 11 remained the top scorer (56.4), as it connected so many members directly to each other along the geodesic. There was a reordering of the next highest scores. Member 7 came next with a score of 42.28 and then 12 with a score of 35.02. These three members formed a core of individuals who act as intermediaries along the geodesics, and, so, had the most control over the flow of information along optimal paths of phone communications. The next grouping was 17, 13 and 1, with approximately half the scores of the top three. These had some influence on information, but not to the same extent. 2, 3, 10, 15 and 16 all had minor impact on the flow of information, while the remainder (scoring zero) had no influence. Interestingly, 1 and 17 had low

betweenness scores relative to their degree and closeness scores, while 13 had a much higher betweenness compared to previous results. 1 and 17 must have occupied positions of connectedness that do not fall on the geodesics. 13 must have occupied the reverse. The information scores shifted back to the pattern established by the degree and closeness scores. The inclusion of more than just the shortest paths for communicating meant that 11 remained first (1.32), followed by large drop to 1 (1.18), 7 (1.15), 17 (1.09) and 12 (1.07). The remaining members all scored lower than 1.00 on information. The movement of 1 and 17 back up from mid-levels of influence to high levels of influence indicate that, while not the most directly connected in the network, their relative overall position made them key controls of the information flow. 13 remained a lower scoring member. How much this is true will be further indicated by the SSA. The patterns of centrality scores showed a sharp division between a subset of the seventeen and the remaining members, with some variation within the ordering of the high scoring members. Further measures will indicate whether these members make up a distinct subgroup(s) or are high centrality individual nodes.

Subgroups

Seven perfect cliques were pulled out of the network, all with three members (table 5.6). Of these, four were made up of two members with high centrality scores (11 and 1) along with one member with lower scores. Of these four, three of the members only had a degree score of two (4, 5 and 6), making them dependent on 1 and 11. Member 3 had an additional link. A fifth clique was composed of three high centrality scorers - 1, 7 and 11. The remaining two cliques were made up of member 7 and 10, along with either 8 or 9. Members 1 and 11, then, appeared in five cliques, while 7 appeared in three and 10 in two. This presence for 1, 7 and 11 was reflected in the centrality scores for these members. Their high levels of direct connections to other members made the perfect cliques possible. One point of interest was the lack of a clique composed of more than three of the highly central members, suggesting

that there was no specific grouping of such members to former a distinct core. The lack of links from 12 and 17 to the other highly central members for forming cliques supported the previous results that no distinct core existed, or that individuals outside the core had a major influence on the network.

Table 5.6 Cliques for Case Study 2	
7 cliques found.	
1:	1 4 11
2:	1 5 11
3:	1 6 11
4:	1 7 11
5:	1 3 11
6:	7 8 10
7:	7 9 10

Six 2-clans were identified by UCINETX. As can be seen in table 5.7, the largest of the 2-clans was made up of ten of the seventeen members. This 2-clan was basically made up of the first five cliques described above, as well as 12. 17 was not part of it. Two more had a size of seven. All but one involved 11, with 12 in five of them, 1 in four of them and 17 in three. All of the 2-clans involved some of the highly central members (1,7,11,12,17). One of the size seven 2-clans had all of these members plus 15 and 16. The 2-clans indicated that there are connections between the central members, but not always direct ones. Only one 2-clan had all but one of the highly central members in it, the others had a few members and a number of more peripheral ones. The wide variety of combinations of members across the 2-clans also supported the idea that there was no distinctive core, but the reoccurring members did indicate that certain members had much more influence in the overall structure of the network. The SSA with added links should indicate which of the highly central ones make up core, if any.

Table 5.7 N-Clans for Case Study 2	
6 2-clans found.	
1:	1 3 4 5 6 7 11 12 15 16
2:	1 7 11 12 15 16 17
3:	1 7 8 9 10 11 17
4:	1 2 3 11 12
5:	2 11 12 13 17
6:	12 13 14

K-core

The difference between degree two and degree one for the k-core was not large, with only 13 and 14 being excluded at level two, as shown in table 5.8. The likelihood of a distinct core group was diminished by this result. More likely was that there were wholly or partially independent individuals with high levels of influence within the network structure.

Table 5.8 K-Core for Case Study 2	
	Members
	1 1 1 1 1 1 1 1
	1 2 3 4 5 6 7 8 9 0 1 2 5 6 7 3 4
Degree	
3	. . . . .
2	XXXXXXXXXXXXXXXXXXXXXXXXXXXX . .
1	XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Cutpoints/Knots

Three cutpoints were found (table 5.9). Member 7 made a link between members 8,9,10 and the rest of the network. As well, a chain was formed with 14 connecting to 13, who connected to the member joined to the rest of the network, 12. The two key cutpoints, then, were highly central members - 7 and 12. The 7,8,9 and 10 grouping appeared to form a distinctive subgroup within the network, while the lack of other cutpoints can be put down to the lack of members with a degree of one, with individuals connected outside of the 1/11 pair or to both.

Cutpoint	Knots
7	8
	9
	10
13	14
12	13

SSA

The SSA diagram (figure 5.3) revealed a number of features of the network structure. Members 11 and 1 were located in the upper middle region of the diagram, with the peripheral members 4, 5 and 6 located above this pair. Member 7 was off to the left, with the three members that form a knot with it (8,9,10) at the far left of the diagram. 12 was located to the right, below 2 and 3. The members that formed a chain of 12, 13 and 14 were to the far right. 17 was beneath 1 and 11, with 15 and 16 located nearby. The initial appearance was one of four separate “pods” located in various parts of the diagram. Each of the highly central members had a distinct location in space relative to the other members, rather than grouped together. Each also had peripheral members located near to them. The addition of the links (figure 5.4)

altered this layout somewhat. 11 and 1 now held a more central position, by the extensive links to the rest of the network, and made up something more like a core area. Member 17 had no direct links to 11 - they were linked through 7, 12, 15 or 16. 1 and 17 were only indirectly linked through 7. Member 12 was indirectly linked to 1 through 11, and was the connection between 13 and 14, and the rest of the network. 17 had a high centrality as a form of "alternate" communication channel from the core. 3 had a high centrality due to the link to 2, and so to 12 and then 17.

Figure 5.3 Drug network 2

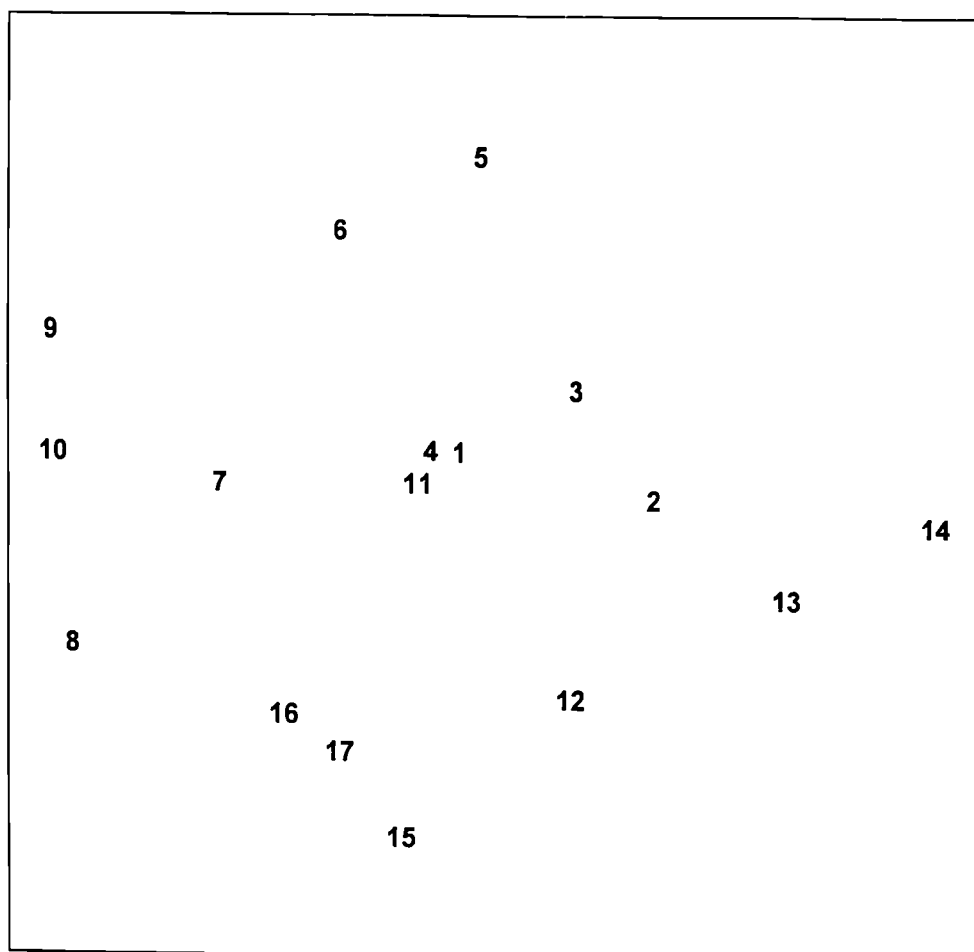
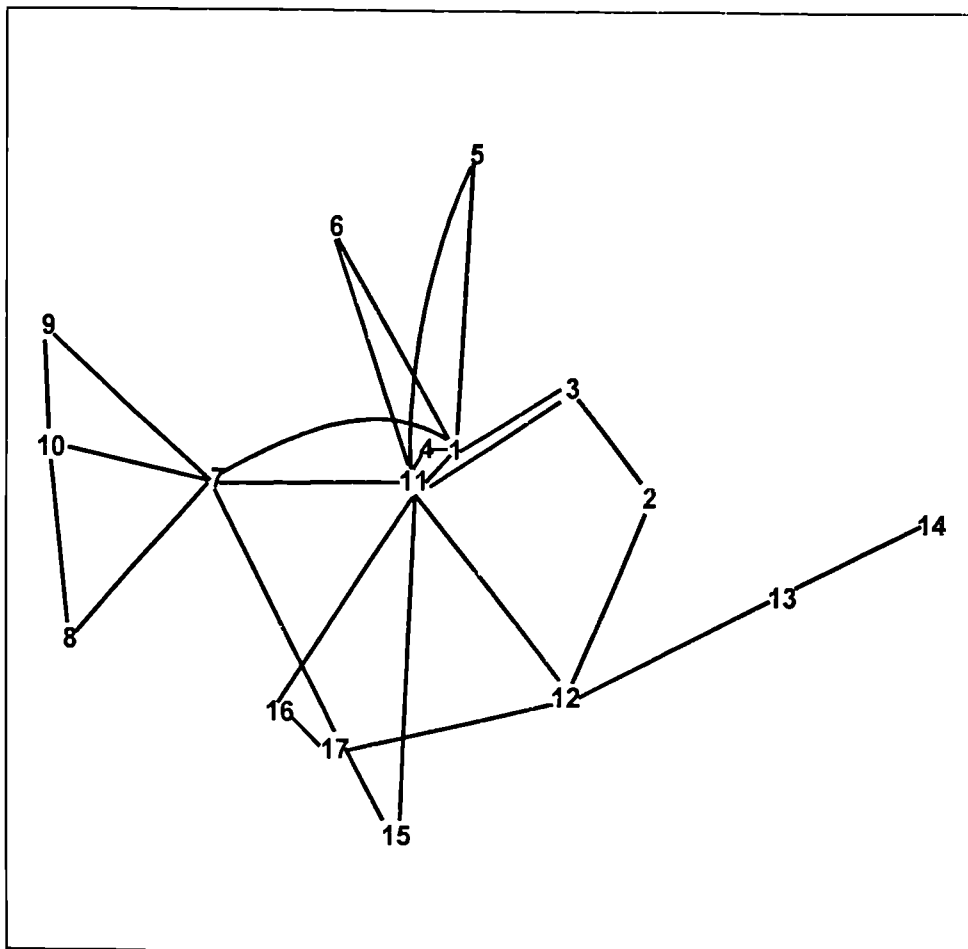


Figure 5.4 Drug network 2



Summary

While the measures of centrality clearly indicated a group of network members with higher centrality than the rest, the results from the subgraphs and SSA indicated that they did not form a cohesive core. The pattern of the SSA indicated that 11 was the core of the network in terms of phone communications, with a second layer of more influential individuals connected directly or indirectly to 11. While 11 was the most central, it was not directly connected to all of the other high centrality members, which was also true for 1. 7, along with 8, 9 and 10 formed about 25% of the network and were quite distinctive. 17 and 12 were important in the network, with 12 having only a link to 11. In general, the second layer communicated with each other and each connected to at least a couple of the more peripheral members. Overall, the network was fairly centralized, but not nearly to the same extent as the previous case study. The closest to a core in the network was a single individual, and even that member does not have direct contact to almost half of the network, including one of the other more central members. The network was more diffused, with less control over communications, though there were very distinctive subsets of peripheral members which did not interact.

The data from the intelligence files resulted in the two brothers being network members 7 and 11, while the four associates were 1, 2, 10 and 12. Arrests were made of 1 and 11 as the most central members, while 7 was arrested as the brother of 11. 12 was the final member arrested, as he was a link to member 14, a connection to another criminal network. During interviewing, the four initially were quite cohesive and were aware of each others arrest. After a period of time, however, 1, 7 and 11, especially 1, gave evidence against 12. 12, in turn gave information about 1 only. Within the confines of only having phone billings for the six initial members, there is a pattern to the structure, with 7 and 11 in key positions in the network. 1 and 12 were also in key positions, with 2 and 10 less so. Of the six, the most important four were also the four that were arrested, indicating that the police intelligence, as a whole, indicated that these four were the priority. 17 stands out as an member of

relative importance, as a link between 7 and 12, and so an alternative connection between the 7-10 grouping and the 12,13 and 14 chain. This individual could have potentially moved into either or both of the 7 and 12 positions, resulting in only 4,5 and 6 becoming isolated from the rest of the network. The second drug case study is at a lower level in the drug trafficking market, involved more with street level dealing than the previous case. The direct links between the central members and the dealers and the more diffuse nature of the central members is more in accordance with the literature on this level of dealing, such as Bourgois and Padilla. A feature of note is that, as in the first case study, the link to outside networks is more isolated than many of the others, at the end of a chain, or having very few connections. With regards to the primary questions, there was a structure, with identifiable key members to the network. Unlike the first case study, there was much less of a core around which the rest of the network was structured. There were also distinctive subgroups in the network, as indicated in the SSA and the subgroup measures.

Case Study 3

The third drug network case, with a total of sixteen members, was involved in primarily street-level dealing and the corresponding purchase of heroin and ecstasy from suppliers and distribution to individual dealers. Data taken from intelligence files was determined by identification of any sort of substantial link between two network members. In this case, links came out of phone billings, surveillance of the members and a small quantity of financial transactions between certain members. To minimise data “noise” creating imbalances in the structure by over- or understating the strength of relationships between pairs of members, the data was dichotomized, with a “1” indicating a link.

Centrality

Degree scores (see table 5.10) for the network could be grouped into three categories. The highest scoring members were numbers 1 and 11, with scores of fifteen each. These two members were directly connected to all of the other network members, making them by far the most connected individuals. The second grouping were members 2-4, 6, 7, 9, 10, 12-14 and 16. With degree scores all the same (twelve), these individuals were equally connected to the network. The final three members, 5, 8 and 15, had, relative to the rest, low degree scores (score of four) indicating that they had very few connections to the network as a whole. The similarity of scores within these two latter groupings suggest that some form of subgroups were occurring. 5, 8 and 15 may be some form of cluster distinct from the rest. Closeness scores match up to the degree scores, with 1 and 11 higher than the rest. 1 and 11 both had scores of one hundred, which was not surprising, as they were connected to all of the network. A second cluster occurs at the mid-level between the two high scorers and the three with the lowest scores - all the members with scores of 83.33. Again, 5, 8 and 15 had the lowest scores at 57.69. This also indicated that these three members were separate from the rest, having farther to travel to access all of the other members.

Table 5.10 Centrality Results for Case Study 3				
	Centrality Measures			
Member	Degree	Closeness	Betweenness	Information
1	15	100.00	16.5	6.91
2	12	83.33	0	6.06
3	12	83.33	0	5.90
4	12	83.33	0	5.90
5	4	57.69	0	3.29
6	12	83.33	0	5.90
7	12	83.33	0	5.90
8	4	57.69	0	3.29
9	12	83.33	0	5.73
10	12	83.33	0	5.73
11	15	100.00	16.5	6.61
12	12	83.33	0	5.73
13	12	83.33	0	6.06
14	12	83.33	0	6.06
15	4	57.69	0	3.29
16	12	83.33	0	5.73

The betweenness results were surprising. Only 1 and 11 actual had scores for this measure at 16.5 for each. 1 and 11 occupied positions within the network that made them the key members along the geodesics for all of the other members Their equal scores indicated that whatever positions they occupied were exactly the same in the overall structure of the network. The lack of scores for the rest of the network must have been due to the structure being such that none of the rest must hold more intermediary positions than the any of the others. As with the first two centrality scores, there was a three-way grouping for the information results. 1 and 11 were still top ranked, at 6.91 and 6.61, respectively. 5, 8 and 15 were much lower than the rest of the network, with scores of 3.29. The remaining members all had approximately the same scores, ranging from 6.06 to 5.73. The centrality scores presented a different pattern from the previous case studies. While previously there has been a ranking to the

member's scores, this was the first time where the differences were so pronounced. In terms of the structure, 1 and 11 occupied the most important positions, while 5, 8 and 15 were very peripheral. The second feature was the similarity of scores within the three groupings. With the members of each grouping having such similar scores, the likelihood was that they had similar patterns of connections. The clique and 2-clan scores will help determine if those similar patterns manifest themselves in distinctive subgroups.

Subgroups

The clique results were very straightforward (table 5.11). Only two cliques existed. Both involved the high centrality members 1 and 11. The first included all those members in the middle grouping of centrality. The second included all the low scorers (1, 5, 8, 11, and 15, in total). Unsurprisingly, as all members were represented in the two cliques, the 2-clan was made up of the entire network (table 5.11). How the network was structured becomes readily apparent from these results. There were two subgroups, separated by 1 and 11. Within these subgroups, all members were connected to each other and to 1 and 11.

Table 5.11 Subgroups for Case Study 3
2 cliques found.
1: 1 2 3 4 6 7 9 10 11 12 13 14 16
2: 1 5 8 11 15
1 2-clans found.
1: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

K-core

With such a tightly interconnected network, the lack of a k-core was expected. The jump from degree five to four (see table 5.12) was small, with only 5, 8 and 15, the least connected members, excluded at level five.

	Members
	1 1 1 1 1 1 1
	1 2 3 4 6 7 9 0 1 2 3 4 6 5 8 5
Degree	
13	. . . . .
5	XXXXXXXXXXXXXXXXXXXXXXXXXXXX . . .
4	XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Cutpoints/Knots

Again, with high levels of connections and with two intermediary members between the two separate cliques, no cutpoints were found. The removal of any one individual would not have had any effect on the network structure. The removal of both 1 and 11, however, would have resulted in the two groups being cut off.

SSA

The SSA results confirmed the findings from the subgroups. The plot (figure 5.5 below) clearly showed that 1 and 11 were located between the two subgroups, accounting for their betweenness scores, while the members of each of the two subgroups were clustered around each other. Structurally, there was no real difference between the members in the main subgroup, each having the same links to each other and 1 and 11.

In reality, this subgroup could be considered as a single entity. 5, 8 and 15 were located along the right side of the SSA. Inclusion of links (figure 5.6) confirmed this division.

Figure 5.5 Drug Network 3

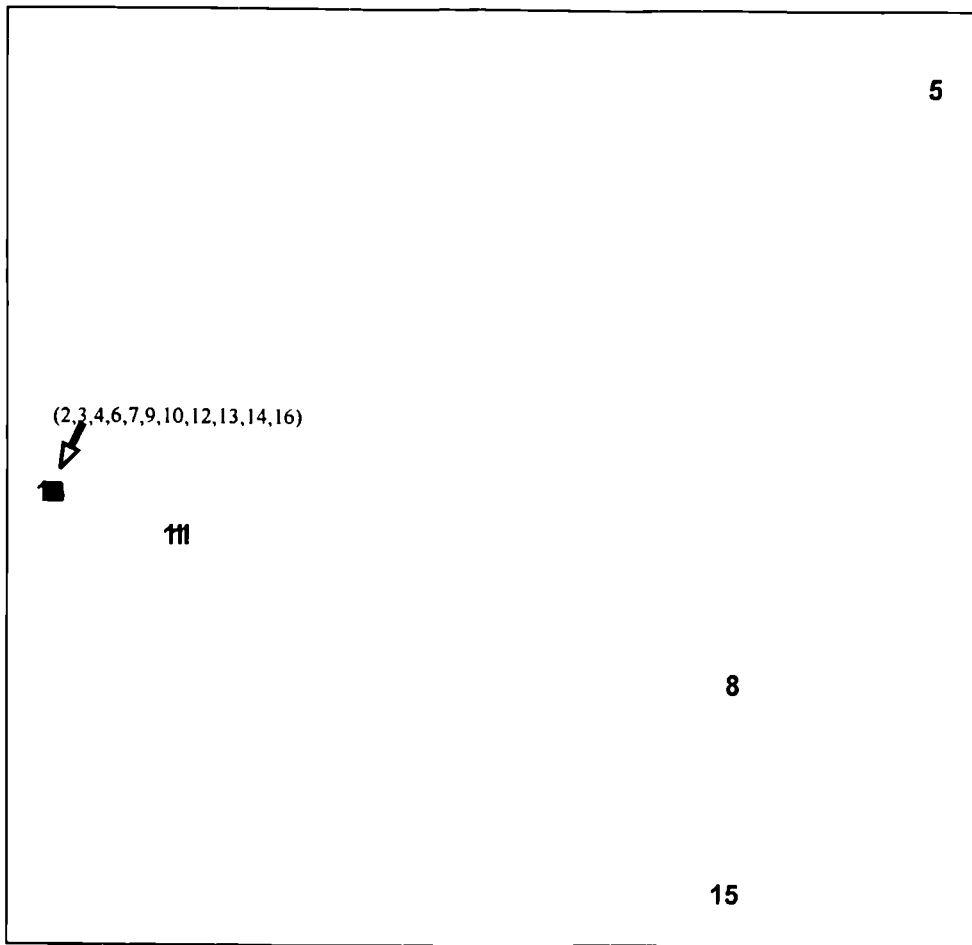
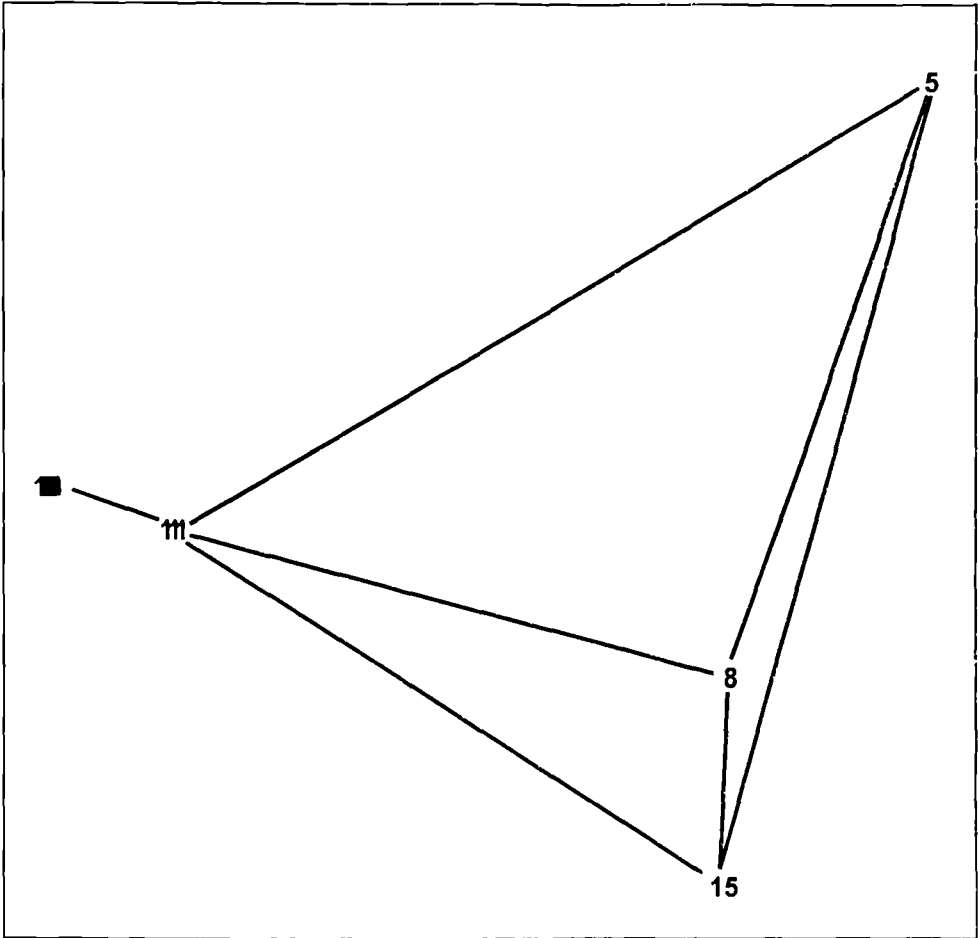


Figure 5.6 Drug Network 3



Summary

The results all indicated a very simple network structure. The subgroups were distinctive entities, with only 1 and 11 having associations with all of the members. Within the subgroups, there was no way to structurally reveal any difference between the members. In terms of actual intelligence on the network, the result made sense. Members 5, 8 and 15 were the actual heads of the network, overseeing the activities of 1 and 11. These two were the actual contacts with the dealers, the remainder of the network. The dealers themselves were socially active with each other as well as working for the network, which accounted for the high levels of interconnectedness. The results from this case strongly fit into the model of structural separation between leaders and operation as suggested in the literature. This case differs from the first one in the nature of that separation. In the first case, the head of the network achieved separation through an intermediary, but was still heavily involved in the overall network structure. In this case, the leaders clearly placed themselves outside of the network, dependent on their representatives for linking to the dealers. This would be the strategy of minimal risk in one sense, removing the leaders from any physical criminal activity more so than in the first case, where the main figure was involved in the security aspect of the network. The tradeoff would have been in the limitations placed on control over the network. Dependence on intermediaries to such an extent for information would leave the leaders at risk from those very same members either potentially attempting to replace them or as effective sources for law enforcement. Again, a broadly similar network structure to the first two cases was present, in the sense that there was a hierarchy in terms of network position. The major difference was that the intermediaries occupied the most central positions in SNA terms, with the resulting split between leaders and other members forming two subgroups.

Case Study 4

This case study was slightly different in terms of intelligence collection than any of the others collected in the study. Two factors made it so. The first was the relatively smaller size of the network. There were only eight members included in it. The second was that the data was drawn from surveillance on a fixed location where a series of meetings relating to the exchange of drugs took place. The network of eight individuals were involved in street-level drug dealing, and included dealers, dealer users and users. Due to the nature of the type of data, the associations were recoded in a format somewhat different from the method used in the other cases. It was impossible to dichotomize the associations merely on the basis of having attended at least one of the series of meetings together, as all of the eight members had been together at least once. The resulting matrix would have been nothing more than a perfect clique, giving no insight into the structure of the network. Instead, the association matrix was converted from its most raw form to one where a score of "1" indicated a high level of attending meetings together and a "0", a low level. High and low levels were based on the mean number of meetings attended by all of the pairs of individuals in the network, which was 3.75 meetings. A score of "1" was given for each pair that attended more meetings than this mean score. As the data was direct observations of which individuals attended which meetings, over or under representation of any individual was unlikely. This minimisation of inaccuracy allowed for the use of the more detailed form of associations. Interpretation of the result for this case study took a slightly different form than the others, but was required and within the criteria outlined in chapter four.

Centrality

The degree scores for the eight members showed an ordering. Member 6 had high levels of association with all of the other members, indicating this member had been present at most of the meetings (see table 5.13). 2 came second, with a degree of six, while 3 had a degree of five. Both of these individuals were strongly associated with a majority

of the other members, also indicating frequent appearance at the meetings. Members 4 and 8 both had degree scores of four, or strong co-attendance with about half of the network. Members 1, 7 and 5 had degree scores of three, two and one, respectively. While attending meetings frequently with some portion of the network, these individuals were generally not involved with most meetings. Closeness results were also structured along number of meetings attended. The same ordering of members occurred in the results, with 6 being substantially closer to the rest of the network (score of 100) than the next closest, 2 (87.5). Another small jump between 2 and 3 was found, before a gradual reduction in closeness scores from 3 through to 5. With direct links to all of the other members, the perfect score of 100 for 6 was expected. The rest of the results follow from the fewer and fewer number of direct links in this small network. Each score of 0 for any given association makes those members have to use longer paths to reach each other.

	Centrality Measures			
Member	Degree	Closeness	Betweenness	Information
1	3	63.64	0	1.67
2	6	87.5	2.67	2.20
3	5	77.78	0.67	2.04
4	4	70	0	1.87
5	1	53.85	0	0.86
6	7	100.00	00.67	2.39
7	2	58.33	0	1.35
8	4	70.00	0	1.87

For betweenness, only three member received scores. 6 had the highest (8.67), acting as the major intermediary in the network, due to strong associations with all other members. Frequency of contact with the other seven would allow this individual to have access to information that could be passed on to the rest of the network. 2 had a much lower betweenness score, at 2.67, while 3 barely received one at 0.67. The structure of the network must have been such that these two members have strong associations with

certain members that others do not. Information scores also mimic the pattern established by the degree scores, with 6, 2 and 3 all scoring above 2.00, and 5 the only one scoring below 1.00. The consistency across centrality scores was a function of the small network size. As size decreases, the impact of direct connections are heightened, as the possibility of distinct subgroups and other more complex structural features is reduced. An individual with a high number of direct connections will be the intermediary between those who do not, for example. The findings indicated that there was an order to how much members were heavily involved in the actual drug-dealing meetings. 6 has the most influence in terms of attendance, while 1, 7 and 5 have the least.

Subgroups

Three cliques and one 2-clan were found for the network, as shown in table 5.14. The first feature of the cliques was that 5 did not belong to any of them. With a degree of one, which must be a strong association with 6, this was to be expected. All three of the cliques were formed around the pairing of 2 and 6. The major difference between 2 and 6, then, was the contact between 5 and 6. Otherwise, the two members hold similar levels of association within the network. The much higher betweenness score for 6 was a result of that member being the only intermediary for 5. With only eight members in total, a single isolated member can make the intermediary that much more important. The third most central member, 3, was in two of the cliques, having no link to 7. The 2-clan was made up of the entire network, as all members were separated by a distance of no more than two. The network was structured around 2 and 6, though most of the other members have strong associations with other members, as indicated by only one member being outside of the cliques.

Table 5.14 Subgroups for Case Study 4	
3 cliques found.	
1:	2 3 4 6 8
2:	1 2 3 6
3:	2 6 7
1 2-clans found.	
1:	1 2 3 4 5 6 7 8

K core

As shown in table 5.15, the pattern across the levels of degree was quite smooth, indicating that the network was a fairly cohesive whole, rather than made up of a core and peripheral members. This goes along with the centrality and subgroup findings. The network was too small and too well interconnected.

Table 5.15 K-Core for Case Study 4	
	Member
Degree	1 2 3 4 6 8 7 5
5	. . . . .
4	. XXXXXXXXXXX . .
3	XXXXXXXXXXXXX . .
2	XXXXXXXXXXXXXXXXX .
1	XXXXXXXXXXXXXXXXXX

Cutpoints/Knots

As indicated by the degree and subgroup results, there was only one cutpoint. As previously mentioned, 5 has strong associations with 6 only. While 5 may have attended meetings with other members, 6 was the only one which attended at least four meetings with 5.

SSA

The SSA is given in figure 5.7 below. 6 and 2 held the most central positions in the overall structure, with 6 slightly more influential, as stated before, due to the position of 5. 4 and 8 had matching centrality scores as they had the exact same pattern of connections (to each other, 3, 3 and 6). 2,3 and 6 formed a division between 1 and 7 and 4/8 and 5. The SSA with links confirmed this pattern (figure 5.8).

Figure 5.7 Drug Network 4

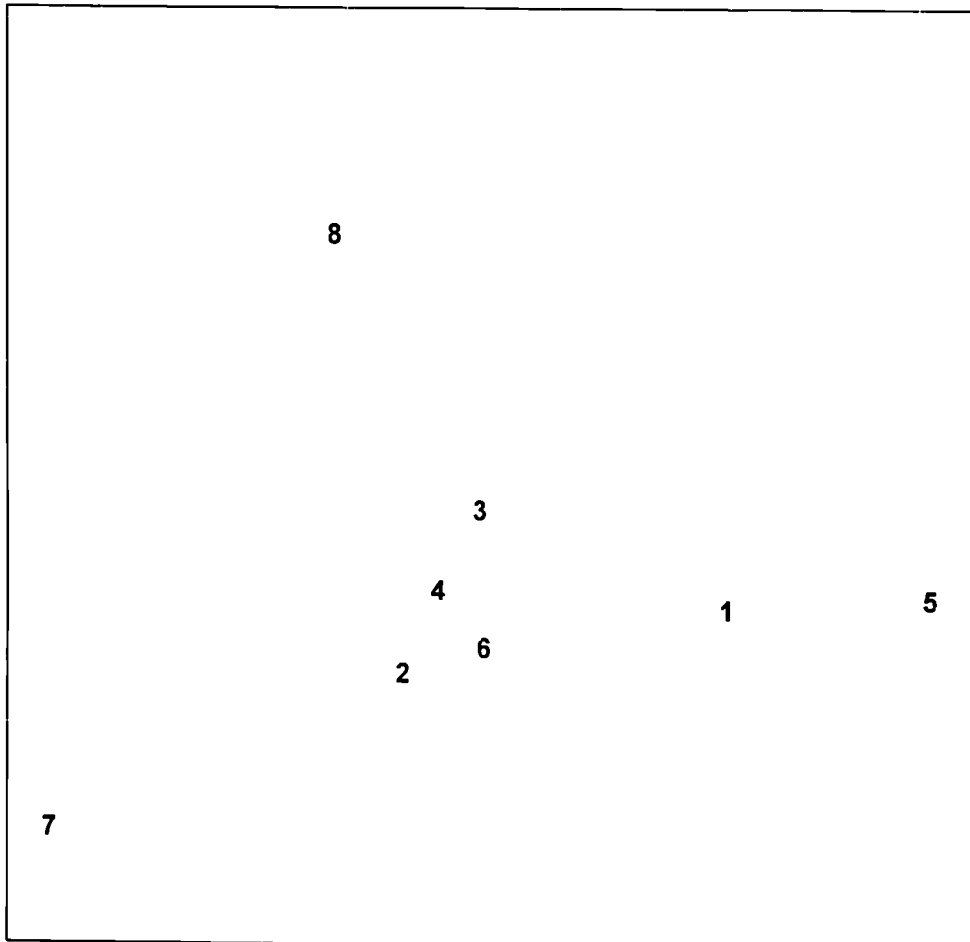
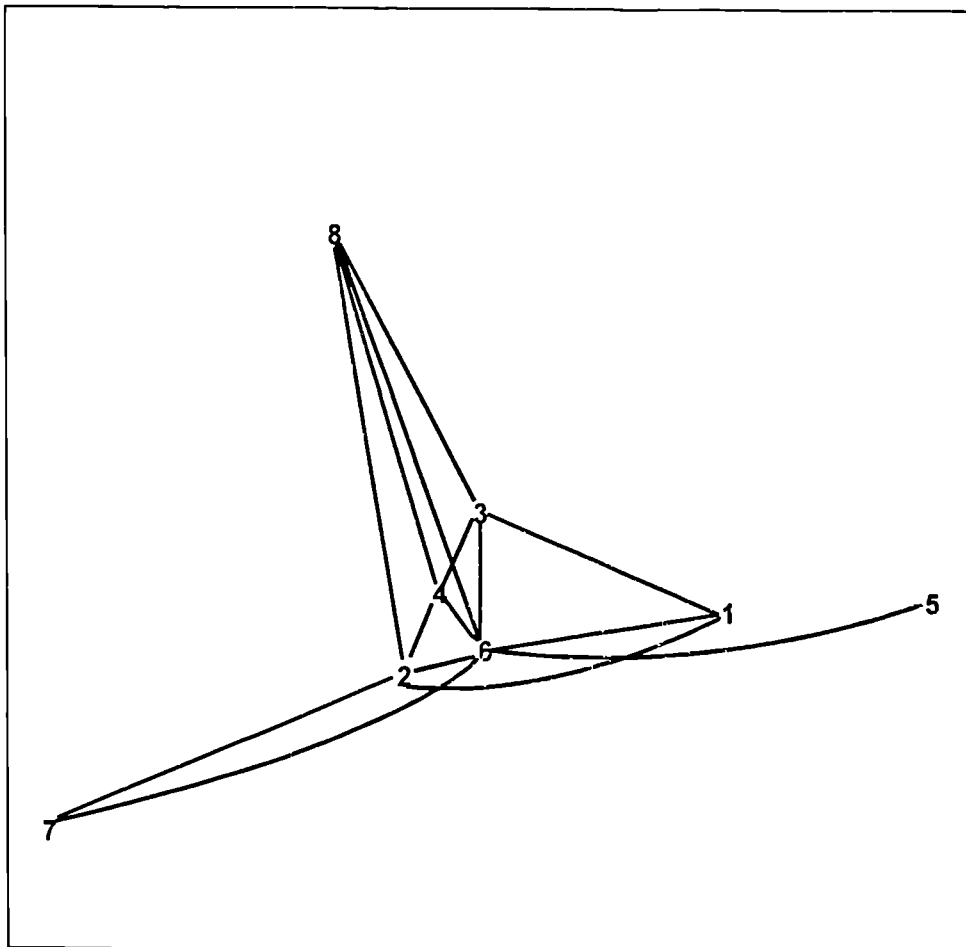


Figure 5.8 Drug Network 4



Summary

The results were fairly straightforward, with 2 and 6 having the most involvement in the drug deals, and 5 and 7 the least, both of whom were only strongly associated with the main two. The rest of the network had strong associations with at least one other member outside of 2 and 6. What was of interest was how the structural analysis results related back to the additional intelligence information on the members. 8 was the leader of the network, and was the one that obtained the drugs for selling. 1, 2 and 6 were dealers only. 3 and 4 were both dealers and users, while 5 and 7 were users that frequented the site to make purchases. The latter two were the least frequent attendees of the location. This would confirm the idea that there was some attempt to keep the exchange of drugs between the supplier and the dealers and between the dealers and users separate. This would be a measure of security, though, in this case, it was not always adhered to. The users only attended meetings with any frequency with 2 and 6, the two most central members. These dealers appeared to be the major figures at these meetings, attended the most and being the most strongly connected to the other meetings. 8, the actual leader, only really frequently attended meetings with 2, 3, 4 and 6, avoiding the meetings with the two users and with dealer 1. This member was a relatively infrequent member of the network, despite not being a user in any form. Intelligence did not offer any explanation for this, but may have been a part-timer, one of Dorn et al.'s "opportunistic irregulars," drifting in and out of dealing as situations arose. The network was technically a perfect clique, in that everyone attended at least one meeting together, so a direct link was present between all members. When examining the network in terms of who attended meetings frequently, and with whom, a slightly different pattern emerges. Some attempt at separation between the leader and the users was apparent, in the low mutual attendance between 8 and 5 and 7, and the generally lower attendance for 8 compared to the dealers 2,6 and dealer/users 3 and 4. This strategy was only carried out so far, as there was contact between the different levels. The network was organised, in that the dealer 6 appeared to be the main representative of 8, but the overlapping contact between all members indicated that this organisation was minimal at best. Bourgois's crack dealers had a similar structure, with

the head of a group being present in the same location, albeit having no physical involvement with the drug dealing. This case may have involved a similar level of hands-on management.

Overall Findings

A number of features relating to the structure of drug networks comes out of the first four case studies and the results for the other eight (see Appendix 1). Table 5.16 summarises the features for all twelve cases. The question about consistencies in network structures within a market can be addressed. The first major feature was the presence of difference levels of influence in the network. Key figures occur in all of the networks. There are differences between individuals that are related directly to the structure of the networks. The second feature, related to this, was the presence of a core group which control the overall network. Most of the drug trafficking networks in this study had these core groups (eight of the twelve). This was true across whatever level of activity the networks were involved in. A less common feature was the presence of mid-level members - those having higher centrality scores and positions in the overall structure than most of the network, but less so than the key figures. Again, there seemed to be no relationship between type of activity and the occurrence of such members. Distinctive subgroups was the fourth feature of these networks, occurring in half of the cases analysed. One feature that did appear to have a relationship to type of activity was the occurrence of very isolated individuals, where one or more members are connected to the network through one individual or to a much lesser extent than the rest. These often appear when the network had involvement in the importation of drugs. In the two cases with additional intelligence available, isolated individuals were connections to other criminal networks. There may be a relationship between importation and such individuals. The final feature was the nature of the subgroups, when they were present. In some cases, subgroups were just groupings of individuals connected to one or more key members, without a lot of internal connections. In others, the subgroups were mostly internally connected.

Table 5.16 Summary information for drug network case studies												
	Case Study											
	1	2	3	4	5	6	7	8	9	10	11	12
Characteristics of Network												
Number of members	28	17	16	8	15	12	16	10	18	22	20	30
Type of drug (Heroin, Artificial, Cocaine)	h,a	h	h,a	h	h	h	h,a	h,a	h	c,h	h,a	h
Level of activity (Importation, Distribution, Street-level dealing or All)	all	i,d	s	s	d,s	i,d	all	d	i,d	s	d	all
Structural Features Present? (Yes/No)												
Key central figures	y	y	y	y	y	y	y	y	y	y	y	y
Core group	y	n	y	n	n	y	y	n	y	y	y	y
Mid-level members	y	y	n	n	n	n	y	n	n	y	y	n
Distinct subgroups	y	y	y	n	n	y	y	n	y	y	y	y
Isolated individuals	y	n	n	n	y	y	y	n	y	n	n	y
Subgroups as clusters, not chains	n	y	y	n/a	n/a	n	y	n/a	y	n	n	y

How do these findings relate to previous research? These networks operate outside of the special markets where individuals can function in relative safety, such as

middle-class cocaine suppliers of Adler (1992) and Curcione (1997) or the mutual societies of Dorn et al.(1992). None of these networks operated in closed markets, as defined by Edmunds et al. (1996), where the clientele are carefully selected and known to the suppliers. All of the cases fit into the more criminal types described by Dorn et al.(1992), as professional criminals or retail specialists, networks organised around optimising profit in the chosen drug market. Often, they were involved in more than one stage of the market, a described by Lewis (1994). To what extent, then, do these networks have similar structures to the ones in the literature? The first major feature common to the networks in the literature was the imbalance in the exchanges between members. There would be a clear distinction in terms of power between members of the network. Most of the authors, e.g. Jenkins (1992), Adler (1992), Lewis (1994), Bourgois (1995), Potter (1994), Williams (1993) etc., all describe the definite presence of leaders in the networks. These leaders have the resources and connections to facilitate the network's operations, but require others to actually carry out the movement of drugs, both to meet demand and to offer a level of safety. The results from the centrality measures and the SSAs showed that in all of the cases in this study, there were individual members that held significantly higher levels of control in the network than the rest. The first two case studies have the leaders in the core of the network, with links into the operations. The latter two have the leaders acting through intermediaries, reducing their direct influence on the network as a whole. These intermediaries have more power as a result. The other eight cases all have similar patterns, with certain key members of the network standing out. Without additional information, though, these members could be actually leaders or intermediaries between leaders and the rest of the network. Either way, there was a differential in influence between these individuals and the majority of the members of their network.

Intermediaries between leaders and other network members or between networks were another feature of the literature. The latter form were specifically mentioned by Moore (1990), Jacobs (1997) and Adler (1992), as well as Hobbs (1997b) description of "hubs," key individuals that act as connectors between different networks. In both

of the first two cases, intelligence specifically highlighted certain individuals as connections between networks. In both cases, these individuals occupied highly peripheral positions, connected to the more central members of the network. While this does not make a trend, it very much concurs with Granovetter's (1973) research on "weak ties," members that act as infrequently utilised connections between separate networks. These individuals allow the spread of new information between networks more so than those within the network, who share information regularly anyway. Whether the position of these individuals within criminal networks would be consistent with the results from the first two case studies warrants further work, especially as five of the other networks had such isolated individuals.

A third feature from the literature was that key individuals form core groups on the basis of some form of close ties - ethnic, familial or personal association. The Ackbars in Potter's (1994) work were family. Williams (1993) and Block (1978; 1989) both found that ethnicity played a role in the formation of cores whatever the level of the activity. Hobbs (1995) found that professional criminals in the drug markets formed close associations based on trust and personal contact. Again, this was a common feature of most of the networks in the study. Nine of the twelve had such cores. In the first and third case studies, along with six of the other eight networks, these cores were in distinct positions within the overall structure. In the first study, it occupied the central area of the SSA. In the third, it was located to the side. The second case study had something of a core, but other individuals had central roles, as well. The final case study had no core, due largely to small network size. The two networks without cores stood out, but without further details, the reason for the difference was not identifiable. Family and friendship played a role in the cores of the first two case studies, while long-term professional association was at the basis of the third.

The last aspect of the structure that relates closely to the literature was the presence or absence of distinct subgroups outside of the core itself, if one was present. Distinctive subgroups took the form of groupings of members separated from the rest

through either cores or by certain members acting as cutpoints. These subgroups could either be just a number of individuals connected to one core member and with few, if any connections within them (called “chains” in the table above) or could be subgroups formed by cliques or other connections (referred to as “clusters” in the table). These subgroups conform to the theme of division of labour so prevalent in previous research. While division of members by specialist skills were not a common feature, division by roles were. The transition towards organised groups involved in the importation of drugs in Adler’s (1992) research included designated roles for different members of the networks. Williams (1993) found that same division of roles, as did Padilla (1995). Such divisions would involve overseeing by leaders or their representatives, with the resulting structural forms of distinct subgroups frequently associating with those overseers, as was found for the case studies with such groupings. In case study three, two distinct subgroups, one the leaders, the other the dealers, were present. Both were clusters. In the first case, chains of dealers between 1 and 9, and doormen between 9 and 28 were present.

Conclusion

The drug networks in this study correspond closely to those described in the literature. The networks were small-scale entrepreneurial groups attempting to operate in fluid marketplaces. The required flexibility manifest itself in restricting the number of members in the network and not having overly complex organisational structures. Differentiation between members was possible in terms of position within the network, but these clear divisions were not structured into rigid hierarchies. The networks often featured core members, closely associated with each other and controlling the structure of the network. The more peripheral members of the networks sometimes formed distinct subgroups around these cores, possibly indicating some form of division of labour within the network. There is, then, a consistency to the structure of most drug networks, as indicated by both the literature and the findings of this chapter. Research on even a larger scale would be the next step, with

the collection of more background information about the drug networks. The characteristics of the network that dictate these consistent patterns of structure could then be identified. Are cores usually central to the structure or act through intermediaries? Do isolated members represent links to other networks? Do distinct subgroups have distinct duties within the network? Some of the literature, e.g. Block and the various work by Adler et al., indicates that combinations were relatively short-lived enterprises, contributing to the fluid nature of the drug marketplace. The temporal aspect of criminal networks would be an area of focus for further research, examining how networks operate over long periods of time and what effective law enforcement pressures have on their structures.

Chapter 6. Property Crime Networks

The same questions created by the drug network literature arise for other forms of criminal networks. Are there network structures that the SNA measures can identify? What forms of structure do non-drug networks adopt within their markets? Is there any consistency between these networks? To answer these questions, it was necessary to focus on a specific form of non-drug network. Networks centred on property crimes were selected. Property crimes actually encompass a wide range of criminal activities - burglary, theft, ram raiding, handling stolen goods and shoplifting are just the main forms it can take. Criminal networks in this area can be involved in the supply end of the market - burglary or ram raiding teams, or can occur at the demand end, where handlers become involved in moving the goods to purchasers. Networks can also cover both supply and demand, as in, for example, cases where specific goods are acquired by criminals to meet "orders" (Klockars 1974; Sutton 1993). The previous literature has suggested that these networks have key figures, especially handlers when discussing burglary networks, as mentioned by Sutton (1993), Maguire (1982) and others. Cores of central members are also mentioned, as well as subgroups to a much lesser extent. Within burglary teams, however, leadership and imbalances in network centrality were not usually found. Intermediaries within and between networks were also frequently referred to, be it as leaders or as facilitators, such as the role of organised crime figures described by Hobbs (1995; 1997a), Potter (1994) and Reuter (1983) and in the typology of handlers proposed by Cromwell et al. (1991, 1992).

Cases selected for the study were chosen on the basis of being networks involved in burglary, ram raiding, handling or combinations thereof. While this only addresses one area of the broad range of criminal networks involved in stealing goods, smuggling, auto crimes, gambling etc., this gave the data collection a focus and allowed for more direct comparisons between networks. Eleven cases in total were collected from access to intelligence files. Of the eleven, background information was obtained for five of them. Four of these cases studies, involving burglary, ram raiding and handling stolen goods, were selected for in-depth analysis. Details about the

remaining cases are found in Appendix 1. As with the drug networks in the previous chapter, these networks were very much internal ones, rather than attempts to develop an understanding of general markets in stolen goods. This was partially a function of the nature of the police investigations, which were typically aimed at collecting intelligence on organised burglary teams or the networks that form around handlers, for the purpose of arrest and prosecution. It was also a function, as with the exclusion of marijuana networks in the drug network chapter, of a desire to investigate a particular area of criminal networks, so as to create consistency across the sample. It would be difficult to make direct comparisons within the sample if the networks were engaged in highly dissimilar activities. While this diminishes somewhat the broad applicability of the findings, it makes them all the more relevant for the chosen area. The aim, then, of the chapter was to analyse these networks to develop an understanding of their structures, how similar they were to each other and how their structures matched those described in the literature.

Case Study 1

The first network consisted of twenty-one members, involved in a series of highly sophisticated burglaries. This network had been operating for an extensive period of time and had proved resistant to law enforcement efforts to obtain evidence for arrest and prosecution. The first stage involved analysis of the phone transaction charts. These charts were records of the phone calls made by numbers associated with eight main numbers used by the network during nights where the crimes were occurring. Mobile phones were used extensively to coordinate the activities, as members had defined roles for any given offence and were often not physically in contact with each other. Home phones were also used as relay stations. A home number could be contacted and that number would then contact others on mobile phones, allowing the original caller to deal with whatever situation caused the call. The eight numbers were the ones identified as associated with what intelligence indicated as the eight main members of the network. The network used a number of security measures to protect themselves, including canceling an operation at the slightest hint of police or security activity and active monitoring of police channels. Additional measures included careful selection and extended observation of targets. The network was sufficiently developed to engage in counter-surveillance measures against the police, gathering information on vehicles and individuals to aid in assessing potential police activity in the vicinity of their homes and targets.

A limitation of the data was that only calls made from the eight numbers were recorded. Any calls made to those eight, except for ones from another of the eight, were not on the charts. This limitation prevented any analysis being carried out in terms of structure of the network for the other fourteen members. Insights about structure could be obtained for within the eight members and between those eight and the remainder of the network. For example, a core was likely to be found of some or all of the eight, merely because there was no indication of how much activity was going on between the other members. One of these may have had an exceptionally high number of contacts, but outside of the eight. Only the presence and frequency of

any sort of phone call could be examined. The records were used to determine associations between the 22 phone numbers, with a "1" indicating a link between two numbers at any point over the series of offences. Reducing the data to a simple yes/no link was hoped to alleviate some of the problems with having only eight of the phone numbers being listed. Doing so would eliminate the total influence of any given member being based on number of total calls, as well as whom they contacted.

Centrality

The various measures of centrality, as shown in table 6.1, were generally consistent across the four measures used - degree, closeness, betweenness and information. The first column in table 6.1 is the member numbers, up to twenty-one. The following four columns are the members' scores across the four measures. In the column for degree, member 5 was the most central figure in the network, in terms of phone communications between offenders, with a degree score of nine. Offender 4 came second with a degree of eight, with offenders 3 and 2/8 following. Certain members, then, had more phone communications with members of the network. It was likely that some of these were the eight targeted numbers. What was important was whether any of the targeted members were low in centrality, and any of the non-targeted ones high. For closeness, 4 was the highest ranked member, being the member with the shortest overall paths to travel to contact all of the other members. 5 was tied with 3 for second, with 2 and 8 coming 3rd and 4th respectively. Unlike degree, the differences between the members in closeness were much less pronounced. This indicated that while some members were using the phones much more than the others, their actual position in the structure of the network was not much more in the centre.

Table 6.1 Centrality Results for Case Study 1				
	Centrality Measures			
Member	Degree	Closeness	Betweenness	Information
1	2	41.67	0.00	0.76
2	6	55.56	81.58	1.00
3	7	60.61	86.33	1.07
4	8	62.50	147.42	1.09
5	9	60.61	173.33	1.07
6	4	44.44	18.58	0.87
7	2	33.90	0.33	0.69
8	6	48.78	39.75	0.96
9	1	39.22	0.00	0.55
10	1	38.46	0.00	0.54
11	1	39.22	0.00	0.55
12	1	38.46	0.00	0.54
13	1	38.46	0.00	0.54
14	2	43.48	0.00	0.77
15	1	38.46	0.00	0.54
16	1	38.46	0.00	0.54
17	1	33.33	0.00	0.51
18	1	36.36	0.00	0.53
19	1	36.36	0.00	0.53
20	1	38.46	0.00	0.54
21	3	42.55	5.67	0.84

Betweenness scores retained the same top four, with 4 and 5 switching places. There was a sizeable difference between these two, followed by another large drop down to 3 and 2, third and fourth, respectively. There was another large drop down to 8, and another to 6. 21 and 7 only just received scores, while the remainder of the network had a score of zero. 5 and 4 were very much in positions in the structure to be along the preferred geodesics for any pair of members in the network. 3 and 2 were also in relatively high intermediary positions, followed, to a lesser extent, by 8. Information

results had 4 switch places with 5 again, which ties with 3 for the next highest score. 8 and 6 again completed the top five. 1, 10 and 14 rejoin the top ten, with member 6. Member 22 and the rest had substantially lower information scores than the top ten. Overall, the top five offenders remained fairly consistent, with offender 4 being marginally closer to the rest of the network than offender 5, and offender 5 having a slightly higher betweenness score, and both high information scores. Offenders 3, 2 and 8 remained in the same rank positions, while the remaining positions were filled by a variety of other network members. The two offenders 4 and 5, along with offenders 3 and 2, make up what can be seen as a group of highly central members. Offender 8 was also central to the network, particularly for the intermediary measures of betweenness and information, but lower than the four main scores and higher than the remainder of the network. 6 ranked next, overall, to 8. The analyses revealed a core to the network, members 2 through 5, in terms of both how connected individuals were and how much they controlled the flow of communications. Two other members had fairly important positions in the network, with the rest being more peripheral. The analyses indicated that the five most central offenders dominate communications in terms of actual amounts and in acting as intermediaries for communication between others. The question remained, how much do these five match up to the eight phone numbers? Three of the targeted numbers, at least, did not rate as highly central.

Subgroups

Eight perfect cliques were found (table 6.2). The first clique consisted of the four most central members (members 2 through 5). The next two cliques were made up of two highly central members and a peripheral member. A fourth clique was made up of 3,4 and member 8. Two of the cliques (4/6/8 and 3/8/21) were made up of member 8 with one of the highly central members and a peripheral member. The last were made up of 8 again, with 6 and one other peripheral member (7 or 21). While all of the central members appear in the cliques, 8 appears in five of them. 6 appears in three, matching the number of times 3 appears, and surpassing 1 and 2. Only 4

appears more frequently. There must be something about the network structure that makes these members have high centrality scores, despite not being part of as many cliques as 6 and 8. The peripheral members often have a degree of one, most likely to one of these four members, accounting for their high centrality.

Table 6.2 Cliques for Case Study 1
8 cliques found:
1: 2/3/4/5
2: 3/5/14
3: 1/2/4
4: 6/7/8
5: 4/6/8
6: 6/8/21
7: 3/4/8
8: 3/8/21

The list of 2-clans suggests that the peripheral members (those with a degree score of one) were linked mainly to the four most central members. For the six 2-clans (see table 6.3 below), the central four appeared together in all but the last one, where only 5 was missing. 8 appears in four of them. The pattern indicated that each two clan was essentially the core group, with peripheral members connected to one of the central members making up the rest of the members. Part of the reason, then, for the four most central members having such high scores was the dependence of so many peripheral members on those four to access the rest of the network. Again, this would be partially a function of the limited range of phone numbers recorded.

Table 6.3 N-Clans for Case Study 1
6 2-clans found:
1: 2/3/4/5/10/12/13/14/15//16
2: 2/3/4/5/8/14/20/21
3: 1/2/3/4/5/6/8/9/11
4: 2/3/4/5/6/8/21
5: 1/2/3/4/5/18/19
6: 2/3/4/7/8/17/21

Cutpoints/Knots

The final analyses of cutpoints, as shown in table 6.4, did not reveal findings radically different from the results above. The first column indicates the cutpoint (which offender whose removal would separate sections of the network). The second column lists the members of each knot. As already indicated by the 2-clans, the core members were intermediaries between some peripheral members and the rest of the network. The removal of offender 5 would result in offenders 10, 12, 13, 15 and 16 becoming isolated from the rest of the network, should they not have the ability to contact or are not acquainted with the other core members. 4, in turn, connected 9 and 11 to the network. 18 and 19 were connected to 2, and 20 was dependent on 3. Ten of the twenty-two members, then, were directly connected to one of the highly central members. 17 was connected only to eight. These eleven members also made up most of the additional members in the 2-clans above, confirming that these subgroups were made up of the central group and the peripherals directly connected to one central member. The first 2-clan, for example, was made up of the central four, and those connected to 5, plus 14.

Table 6.4 Cutpoints/Knots for Case Study 1	
Cutpoint	Knots
5	10
	12
	13
	15
	16
8	17
4	9
	11
3	20
2	18
	19

K-Core

The k-core results (table 6.5) indicated that there may have been three layers to the network. The first layer was made up of 2, 3, 4 and 5. The next level down then included 1, 6, 7, 8, 14 and 21 - all those members with degree scores higher than one. The next level included the entire network. Normally, this would indicate a core, then a secondary level of members. With the data limited to eight numbers, the results indicate that some, but potentially not all of the targeted numbers were in a core. Examination of the additional intelligence information will indicate whether they were located in the second layer or were peripheral.

Table 6.5 K-Core for Case Study 1	
	Member
	1 2 1 1 1 1 1 1 1 2 1
Degree	1 2 3 4 5 6 7 8 4 1 9 0 1 2 3 5 6 8 9 0 7
4
3	. XXXXXXXX
2	XXXXXXXXXXXXXXXXXXXX
1	XX .

SSA

The SSA (figure 6.1), based on phone calls made between network members, illustrated the overall structure of the network. The SSA plot did not include lines to show actual connections between individuals, so they were added in figure 6.2 to aid in interpretation. Unsurprisingly, the four core members, 2, 3, 4 and 5, were centrally located in the network and were close to each other. 8 was located in the centre of a cluster of members at the bottom right of the SSA plot. The variety of members nearby support the relatively high centrality for that member. Those peripheral members who were connected to two core members (e.g. offender 1 was in contact with offenders 2 and 4, member 14 to 3 and 5), were located off to a side, but between the two core members. Peripheral members with only one core connection were generally farther out and clustered near that core member, e.g 18 and 19 were linked only to member 2. Offenders 7 and 17 were the only network members without at least one connection to a core member. Examination of the connecting lines placed on the SSA of the network revealed that for all of the 2-clans involving the core and peripheral members, those peripheral members were directly connected to only one core member. For example, all of the peripheral members in the first 2-clan were connected to offender 5 of the core. The overall structure was one of a central group, surrounded by a number of peripheral members, while a fairly distinctive subgroup, around 6 and 8, overlapped with the core.

Figure 6.1 Property Network 1

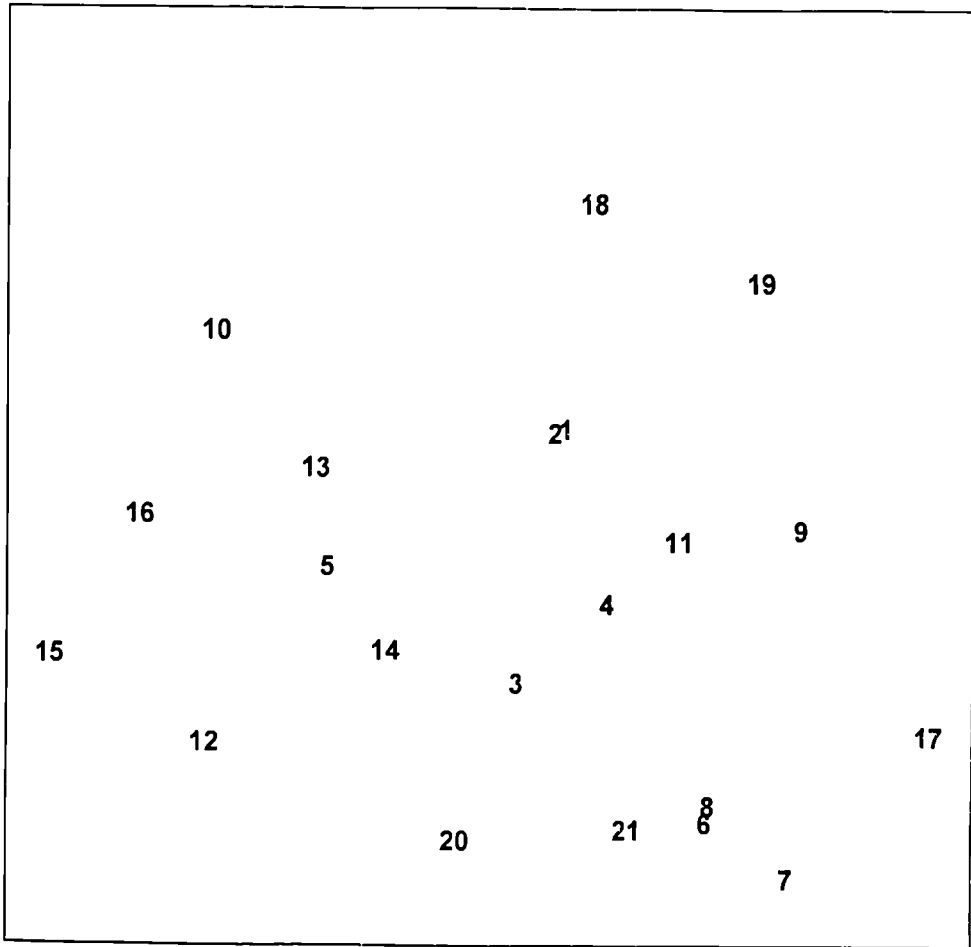
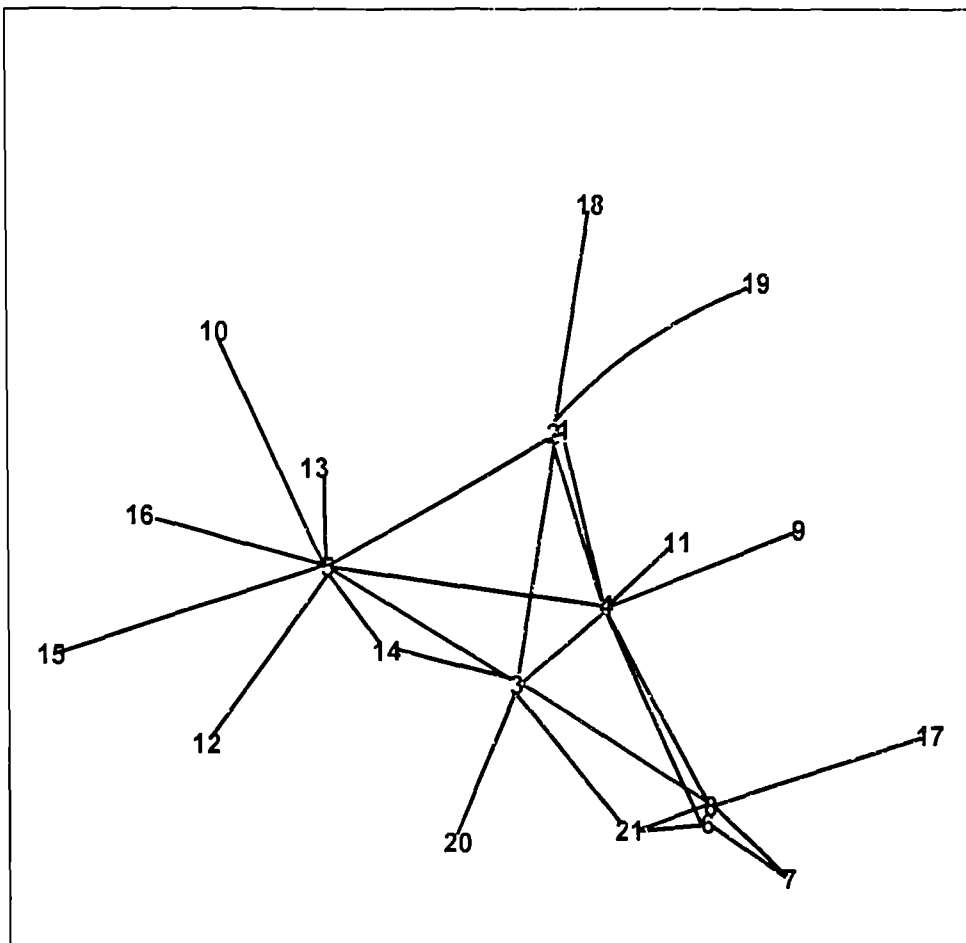


Figure 6.2 Property Network 1



Summary

The initial impression of the network structure would have been one of a core of four members, with an additional layer at a medium level of centrality, surrounded by a number of peripheral members, most of whom were only connected to a single member of high or medium centrality. The results must be interpreted in terms of the structure being based on only eight of the members phone calls. The eight numbers were 2, 3, 4, 5, 6, 8, 11 and 14. Of these eight, four occupy the most central core group - 2 through 5. Members 6, 8 and 14 all have fairly high centrality scores. Only 11 would have been classified as a peripheral member. What can be said was that there were differential levels of centrality between these eight members. The top four were relatively equal in terms of centrality scores, with the exception of betweenness. These four were significantly more involved in the network than the other four. Communications for the mid-level part of the eight, 6, 8 and 14, were roughly on par with 1, 7 and 21. These latter members were contacted by the eight enough to warrant a higher centrality than the majority of the ones without phone records. Additionally, examination of the cliques indicated which members of the eight contacted each other. 2 only contacted the rest of the core. 3 contacted the core, along with 8 and 14. 4 was in communication with 6 and 8, and the core, and was the only link into the network for 11. Besides the core, 5 contacted 14. 6 had links to 4 and 8 only, while 8 had on top of 4 and 6. 11 had no links to the other eight, outside of 4, and 14 was only in contact with 3 and 5. The core four, then, were not only in contact more with the peripheral numbers, but had more contact with members of the main eight.

Member	Degree
1	9
2	46
3	61
4	83
5	107
6	7
7	3
8	18
9	1
10	8
11	2
12	1
13	2
14	6
15	1
16	1
17	2
18	1
19	2
20	2
21	3

A second analysis of degree scores, with total numbers of phone calls, was run. This allowed a more in-depth examination of the differences in phone calls between the eight (the members in bold in table 6.6). Total calls made were very different across the eight. Members 4 and 5 made huge numbers of calls, with 2 and 3 coming next. 6, 8, 11 and 14, had relatively few, by comparison. Of the many calls made, very few were to outside the eight. The total calls received for the other thirteen was thirty-nine. Total calls were 366. This confirms that the core four identified by the SNA measures were, both for communications to members outside of the eight and those

within the eight, were the main communicators. The structure for the network, within the limits of the data, was a core of four members, primarily 4 and 5. The remaining four included three fairly central members and a single member with low centrality - 11. Examination of the matrix indicated that 11 was connected only to member 4 from the core. The intelligence files indicated that member 2 was the mobile phone for one of the leaders, whose home numbers were 1 and 11. 3 was the mobile of another member. 4 and 5 were the home phone numbers for two more of the main members. 8 was a home phone number of one of the major member, while 14 was a mobile for another one. 6 was a close associate of the core. For the numbers contacted, the other mobile phones were 10, 13, 15, 16, 17 and 19. The rest were home phone numbers.

There were four levels, then, in terms of contacting members of the network. 4 and 5 did the most contacting, followed by 2 and 3. 6, 8 and 14 occupied less active communications. Numbers 1 and 10 were contacted frequently, making the third level of communications, while the remainder, including 11, were infrequently involved in contacts. 4 had links to three of the non-core recorded numbers, while 5 had more communications with non-recorded numbers, as shown in the cutpoint results. 2 was the least connected member of the core, having only two knots and being connected to only the core members. The files indicated that 2 was the mobile phone used by the leader of the network. Through the mobile, the leader contacted other key members - 3, 4, 5 and 8, as well as one of his own homes, 1. 11 was the other home of 2, and only received calls from 4, another core member. 4, 5, 6 and 8 were all homes of girlfriends of members. Their positions as centrally located members, confirm the intelligence reports that the homes were used as intermediaries in communications, receiving and passing on information during the criminal activities, either directly to a member who would be at that location, or by contacting other numbers. 5, in particular, was such an intermediary, especially for mobile phones. Peripheral members 10, 13, 14, 15 and 16 were all mobile phones and all connected to 5. This was facilitated by the use of mobile phones 2 and 3. The overall structure was of frequent communications within the core group, either the offenders themselves or individuals at their homes. Peripheral members were contacted much less frequently,

though information about who they contacted and how often was not available. 2, the main leader of the network, was separated from the majority of the minor contacts, with the exception of 18 and 19, suggesting some hierarchy of communications.

It would appear that the major difference between this network and the burglary teams described in the literature was its large size. The teams described by Cromwell et al, Maguire and other were usually 2-4 members, and rarely larger. However, there was only six members that were the main members of the team. The network of twenty-one members was a combination of those six, home phones numbers they were located at or used as communication way stations, and a number of members that were a pool of associates brought in as required. For any given offence, the total numbers involved rarely exceeded eight. The first case study was a network made up of a pool of professional burglars, with different combinations brought in for a given crime. This goes along with Shover's work on burglary teams, as well as Maguire high level burglars. There was also an ordering within those six, with 2 being the actual head of the other five members. This case study, then, has similar social processes to those found for other burglary teams, but on a larger, more structured scale. Success, despite increases in risk associated with larger size, came from rigid work practices and careful member selection, both features of professional burglary teams.

Case Study 2

The second case study was of a group of ram raiders involved in a series of crimes against commercial properties. Teams carried out theft of high powered automobiles and then using them for ram raids. These were organised by leaders, selecting from pools of members. Individual offenses were committed by different combinations of offenders. Some individuals also carrying out burglaries and armed robberies, as well. Targets for the ram raids were of a wide variety, particularly electrical goods, designer clothes and similar items. The dichotomous matrix was developed from intelligence about who had regular contact with whom, through business dealings, arranging teams or friendship. The size of the network was quite large, 45 members in total.

Centrality

Table 6.7 shows the results for the centrality measures. As can be seen, five members of the network, 19, 35, 29, 24, 21 had consistently high levels in all four measures. The remaining offenders had measures that range from fairly close to the core six through to relatively low levels. For degree, 19 and 35 had the highest value of sixteen, about one third of the network. Following them were 29, with a degree of eleven, and 24, with a degree of eight. Members 4, 21, 33, 37 and 7-9/42-45 had degree scores from seven through four. The rest of the members had degree scores of three or less, with fourteen of the members having a degree of one. The network had two individuals two times more connected than all of the rest of the network, bar one, with the remainder descending in scores down to a cluster of individuals with a score of one. Closeness scores for the first four stay basically the same, along with a high score for 21 and 33, but 4 was no longer present. Some individuals with lower degrees were, then, actually closer to the rest of the network than some with higher degrees. 6 through 8, for example, have higher closeness scores than 4, but much lower degrees. The structure of the network, then, must have low connected individuals in more central positions than more connected ones.

Member	Degree	Closeness	Betweenness	Information
1	3	24.04	0.5	0.58
2	2	23.91	0	0.52
3	1	23.78	0	0.43
4	7	30.98	115.58	0.73
5	3	30.13	9.75	0.62
6	3	40	46	0.75
7	4	40.36	46.58	0.78
8	4	40.36	93	0.76
9	1	28.02	0	0.37
10	3	38.59	125.00	0.57
11	2	28.38	43	0.38
12	1	22.22	0	0.28
13	1	27.32	0	0.36
14	2	37.28	43	0.54
15	1	36.66	0	0.53
16	1	36.66	0	0.53
17	1	36.66	0	0.53
18	1	36.66	0	0.53
19	16	57.14	622.83	1.08
20	2	36.97	0	0.72
21	6	45.83	11.5	0.96
22	1	36.66	0	0.53
23	1	32.11	0	0.50
24	8	46.8	102.5	0.96
25	1	32.11	0	0.50
26	2	33.58	0	0.7
27	1	32.83	0	0.51
28	1	32.83	0	0.51
29	11	48.35	190.83	0.99
30	1	32.83	0	0.51
31	2	33.08	0	0.65

32	3	36.36	5.67	0.76
33	7	46.31	31	0.97
34	3	35.2	0.58	0.78
35	16	51.76	379	1.03
36	3	35.2	0.58	0.78
37	5	35.77	23.58	0.82
38	2	34.92	0	0.67
39	2	26.99	0.5	0.61
40	3	35.2	19.75	0.7
41	2	34.92	0	0.65
42	4	35.2	0	0.75
43	4	35.2	0	0.75
44	4	35.2	0	0.75
45	4	35.2	0	0.75

Betweenness scores followed a similar pattern, with the top members remaining fairly consistent in position, but with more variation further down the ranking. 19, 35 and 29 remained at the top three positions. 10 came fourth, the first appearance for this member in the top ten. 4 came next, followed by 24 and 8. These members all had high betweenness scores, making them key intermediaries along the geodesics, particularly 19 and 35. A second level occurred with 6, 7, 11, 14 and 31 having roughly the same scores, while 5, 21, 32, 37 and 40 had low scores. The remainder had scores of zero, or close to it. Information results reverted back to the pattern closer to the degree results. The top three remained the same, followed by equal scores for 21, 24 and 33. 37 came seventh highest, appearing for the first time, followed by the pair 7/34, and, finally, 8. The centrality results appeared to indicate certain key individuals, 19, 35, 29, possibly formed a core group. Other members, e.g. 4 and 21, have some high centrality scores, but lower other ones. These members may have occupied positions of importance, but may have been outside the core. They could be relatively independent or act as intermediaries between the core and some parts of the overall network.

Subgroups

Eighteen cliques were found, in total, as shown in table 6.8. The first clique was made up of six of the most central offenders, indicating the existence of a fairly distinct, core-like subgroup in the network. Members 19, 21, 24, 29, 33 and 35 were all directly connected to each other. Each had high or relatively high centrality scores. The next three cliques all involved member 19. The low number of cliques for the most central member of the network was unexpected. The drug networks, for example usually had a high number of cliques around the most central figures. The SSA would potentially explain this result. The next five cliques all had member 4 in them and combinations of 1, 2, 5, 6, 7 and 8, suggesting some sort of subgroup made up of overlapping cliques. Three more cliques were formed around 29, another highly central member of the network. Five more cliques were around 35, including 34, 36, 37, 38, 40 and 41. There was less overlap than in the case of 4, so this may not have been a separate part of the network. Another clique existed around 35, along with 42 through 45. This, again, indicated a distinct subgroup within the network. While the number of cliques around 35 accords with the member's high centrality, the lack of cliques including 19 and 29 was curious. Something about the network structure made these members centrally important without inclusion in cliques.

Table 6.8 Cliques for Case Study 2
18 cliques found.
1: 19 21 24 29 33 35
2: 19 20 21
3: 7 8 19
4: 6 7 19
5: 1 2 4
6: 4 5 8
7: 1 4 5
8: 4 6 7
9: 4 7 8
10: 24 26 29
11: 29 31 32
12: 29 32 35
13: 33 34 35
14: 34 35 37
15: 35 36 37
16: 35 37 38
17: 35 40 41
18: 35 42 43 44 45

The results from the 2-clan analysis clarified some of the questions raised by the clique measure (see table 6.9). The first 2-clan was an extension of the clique based on a group of highly central members, indicating that these members may have made a core to the network. The next three 2-clans were each made up of most, if not all, of central group, along with three ranges of members divided by their ID numbers. The first 2-clan consisted of the core and mainly the two groupings of cliques around member 35. The second consisted of the core and the cliques around 19. The third 2-clan was made up of the core and a number of members in the middle range of IDs,

those with IDs in the twenties. The next three were made up of 19 and combinations of associates. The first was 19 and the overlapping cliques around member 4. The second and third 2-clans were members, again, that were not in the cliques. The second last 2-clan was the cliques centred around 35 again, but with the inclusion of member 39 and the exclusion of the rest of the central grouping. 39 must be one removed from 35. The final subgroup was made up of a combination of the overlapping cliques around 4 and the member 3, which, again, must have been a member that was isolated from the rest. The subgroup results definitely supported the notion of a core, from which the rest of the network was connected to, due to the clique of highly central members and the series of 2-clans made up of combinations of other members and that clique. There would also appear to be distinctive subgroups, with clusters of overlapping cliques forming into 2-clans.

Table 6.9 N-Clans for Case Study 2	
9 2-clans found.	
1:	19 21 24 29 32 33 34 35 36 37 38 40 41 42 43 44 45
2:	19 21 24 26 27 28 29 30 31 32 33 35
3:	6 7 8 10 14 15 16 17 18 19 20 21 22 24 29 33 35
4:	19 21 23 24 25 26 29 33 35
5:	4 5 6 7 8 19
6:	9 10 11 12 19
7:	13 14 19
8:	1 2 3 4 5 6 7 8
9:	34 35 36 37 38 39 40 41

K-Core

The K-Core also indicated a potential core, made up of the members found in the first 2-clan, 19, 21, 24, 29, 33 and 35 at degree six. A second jump included 42 through 45, then a third jump to 4 through 8. Both of these latter groupings were made up of overlapping cliques which formed 2-clans in their own rights. At degree level two, most of the network was included, with the one degree members included at the lowest level. The findings indicated not only a core, but distinctive subgroups separate from that core.

	Members
	1 2 2 2 3 3 4 4 4 4 2 2 3 3 3 3 3 3 3 4 4 (remainder)
Deg	1 2 4 6 7 8 9 1 4 9 3 5 2 3 4 5 5 0 6 1 2 4 6 7 8 9 0 1 (remainder)
6
5 XXXXXXXXXXXX
4 XXXXXXXXXXXXXXXXXXXX
3	. . XXXXXXXXXXXXXXXXXXXX
2	XX
1	(all)

Cutpoints/Knots

The cutpoint results showed to what extent the members with a degree of one were connected to 19, as shown in table 6.11. Five members were directly connected to 19 only, while four more (9, 11 and 12 to 10 to 19; 13 to 14 to 19) formed chains that 19 joined to the rest of the network. In addition, the subgroups formed around 4, including members 1 to 8, would have also been separated from the rest of the network if 19 was removed. In total, removal of 19 would have isolated twenty of the forty-five members from the rest. 19 was the most central member as he acted as an

intermediary between basically two halves of the network. 24 and 29 both had members with links only to them. 35, like 19, had a cluster, 42-45, that connected to the network through him.

Cutpoint	Knots
4	3
10	9
	11
	12
14	13
19	1-8
	10
	14
	15
	16
	17
	18
	22
24	23
	25
29	27
	28
	30
35	42-45

SSA

The output from the SSA confirmed the findings from the previous measures, and also added more detail for understanding the overall structure. The figures in the centre of the SSA (figure 6.3) were the six core members identified by both sets of measures - 19, 21, 24, 39, 33 and 35. Also distinct were the three separate groupings, all located adjacent to one of the core members and close to each other. 42 through 45 were located together in the upper left region of the plot. 1 through 8 were on the right side. Finally, the more peripheral points were located throughout the rest of the graph. All of these were located relatively near at least one of the core members, those that they connected to. Examination of the matrix of associations indicates that all of the individual offenders have direct connections to one core member. Addition of the links between members clarified these groupings, as shown in figure 6.4. The left half of the SSA was made up of a large grouping around member 19, accounting for the number one rating in centrality measures. The high number of members in knots around 19 confirmed this. One part of this grouping, 1 through 8, were a distinct group in their own right, with high numbers of internal links. A second large grouping occurred around 29 and 35, and to a lesser extent 24 and 35. Of these, one definite subgroup was connected exclusively to 35 - 42 to 45. These formed a perfect clique. A second group, 36 through 41, were a 2-clan and some other members linked to 35.

Figure 6.3 Property Network 2

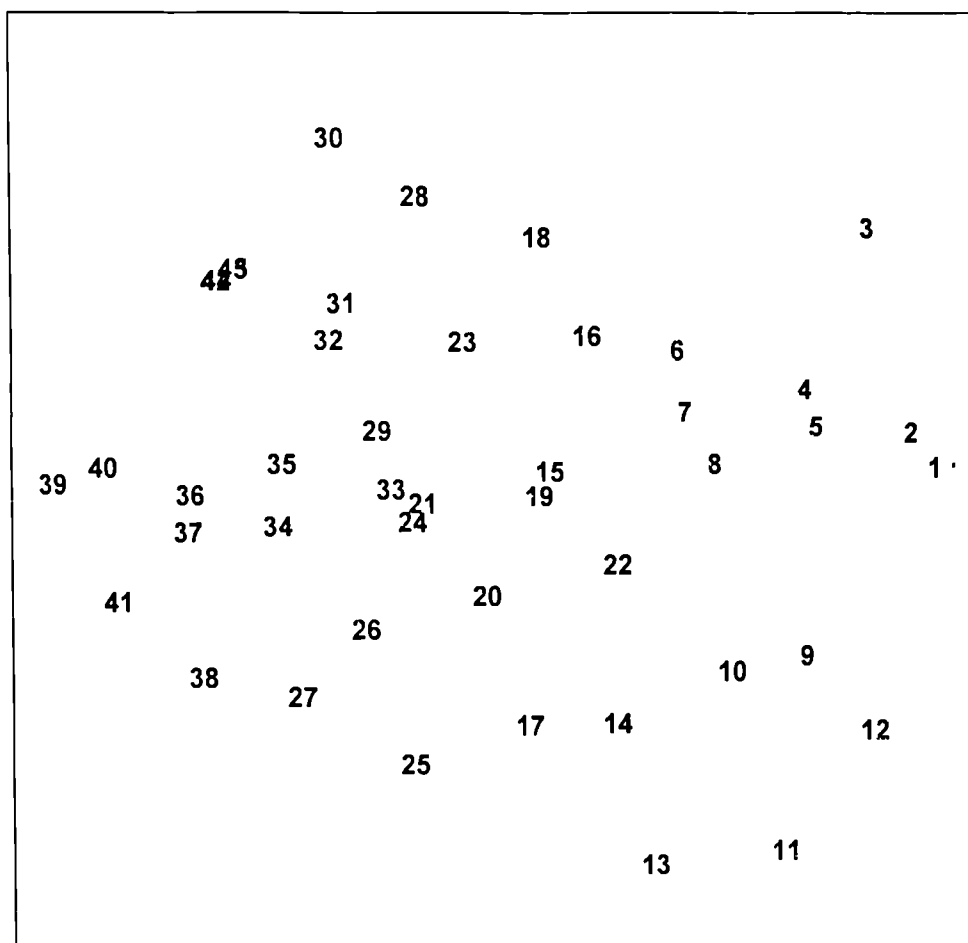
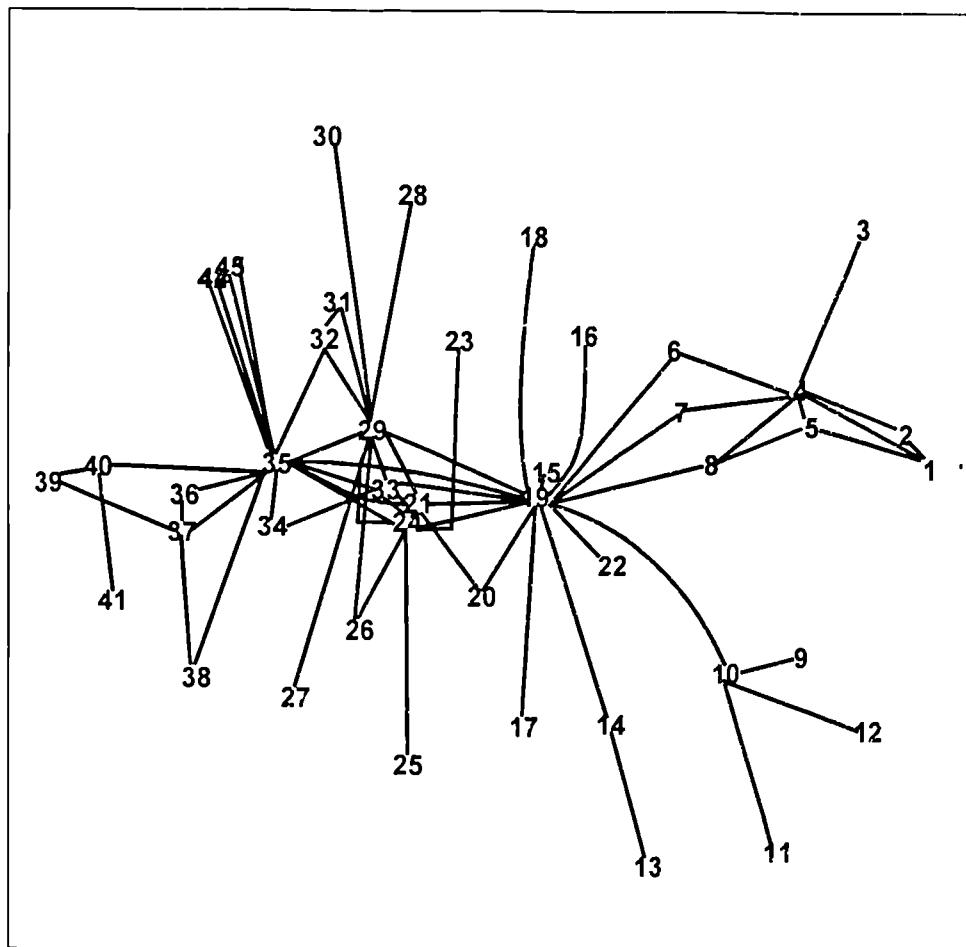


Figure 6.4 Property Network 2



Summary

The overall structure of the network appeared to be very much like the “cell ” pattern common to a number of terrorist groups. There was a pool of members to draw upon for a given ram raid, with parts of that pool being very separate. The cells were the clusters around 19 and 35, and to a lesser extent 24 and 29. Only a few members of each cell had contact with the core group and/or they connected to a single central member. This core group determines what information the other cells and individual offenders had access to, particularly from each other. Within the clusters around 19 and 35, contacts routinely occurred with each other. In the case of 42-45, this was a perfect clique, while 1-8 and 34-41 were pretty much all indirectly connected to each other. Reviewing the case files indicated that this was a somewhat similar assessment of the network as described. The leaders identified by the intelligence file were primarily 19 and 21, followed by 8, 24 and 29. 19 and 21 were the ones who chose targets and checked them out for security and police responses. They also arranged buyers for the goods and picked the teams to carry out the ram raids. In conjunction with 20, a business owner, they acted as the handlers for the stolen goods. 19's leadership was confirmed by his position in the network structure. 21 was more interesting. While usually in the top five or six in centrality scores, due to his location amidst the central core, the only link outside of the core members was to 20. This link related to the handling of goods. 21, then, used intermediaries to carry out contacts with the members selected for teams. This fits in with the literature indicating that network leaders often use individuals as buffers, keeping the leaders out of actual criminal activity to reduce risk.

A second feature of the intelligence reports was that the network was drawn from two suburban areas. The lower numbered members came from a different geographical area from the higher numbered ones. This mimicked the results from the SSA and the subgroups, with these two groupings being distinct from each other structurally. 19, then, was the link to one suburban group, while 24, 29 and 35 were links to the other ones. Some previous research has suggested that individuals taken on special roles

during these crimes (Wilson and Donald (in press)). Some were drivers, others moved the goods and a third group acted as security. Background characteristics corresponded with these roles, with the violent backgrounds mainly held by the security groups. Interestingly, the intelligence files highlighted the 1-8 group as the ones most willing to use violence, and so worked in those roles. 4, 5, 6, 7 and 8 had all been linked to incidents involving physical assault on police, for example. Information on other groups, such as the 42-45 clique, was not available, but the findings give some support to the notion of different roles within ram raiding teams. At the end of the investigation, members 4-9, 19, 20, 24, 27 and 29 were arrested. This removed the more violent members and some of the more central ones. The importance of 21 in the overall structure was highlighted by intelligence that he and 10 were carrying out further ram raids, albeit less frequently. No real information was available on 35, despite the prominent structural position this member occupied. The network, overall, had a definite structure to it, and was more organised than a number of the drug networks in Chapter Five. This structure, however, was just a more complex version of the ones suggested by the literature. As with the first case study, the complexity was more a feature of size. Again, there was a pool from which the 'core drew required members. This network was more advanced than the literature would have suggested was likely.

Case Study 3

This network was a burglary/theft ring, involving twenty-two members. The network engaged in a wide variety of house and automobile break ins, supplying the stolen goods directly to a specific handler. The data for this file was collected through surveillance of the suspected group members, of which only eight of the twenty-two were originally identified. The surveillance indicating a much larger network was in operation, culminating in the identification of all the members used in the analysis. The data was converted into dichotomous format, as the data sources, surveillance, informants and previous intelligence information, could potentially have skewed by such factors as the respective importance of individuals by their level of activity during the time period covered. Conversion to dichotomous data, indicating contact between members, reduced the potential for such effects.

Centrality

As shown in table 6.12, the centrality results indicated a very distinct pattern. Member 2 had significantly higher scores on all four measures than the rest of the network. For degree, 2 had a score of eighteen, indicating direct connections between this member and almost all of the rest of the network. The next highest score, fourteen connections less, was member 6 with a degree of four. Members 1, 7 and 10 all had a degree of three. Members 11 and 14 have a degree of two and the remainder had a score of one. Most of the network, then, only interacted with one other member. Due to the high degree score for 2, most were directly connected only to this member. A small group of members had connections to more than one other member, while 2 was connected to most of the network. The network structure, from just this first measure, appeared to be near to being a "star," where everyone was linked to a single member. For closeness, a similar pattern emerges. 2 had a substantially higher closeness score than the rest, as most individuals were directly linked to this member, distance was minimised. 6, 7, 1/10 and 14 were somewhat closer to the rest of the network than

the individuals with a degree score of one. 8, 9 and 11 had the lowest closeness scores, indicating these may be more peripheral members connected to ones connected to 19. This was despite 11 having a degree of two.

Member	Centrality Measures			
	Degree	Closeness	Betweenness	Information
1	3.00	51.22	9.50	0.71
2	18.00	87.50	198.50	1.09
3	1.00	47.73	0.00	0.55
4	1.00	47.73	0.00	0.55
5	1.00	47.73	0.00	0.55
6	4.00	53.85	39.00	0.75
7	3.00	52.50	1.50	0.78
8	1.00	35.59	0.00	0.44
9	1.00	35.59	0.00	0.44
10	3.00	51.22	9.50	0.71
11	2.00	35.00	0.00	0.58
12	1.00	47.73	0.00	0.55
13	1.00	47.73	0.00	0.55
14	2.00	48.84	0.00	0.70
15	1.00	47.73	0.00	0.55
16	1.00	47.73	0.00	0.55
17	1.00	47.73	0.00	0.55
18	1.00	47.73	0.00	0.55
19	1.00	47.73	0.00	0.55
20	1.00	47.73	0.00	0.55
21	1.00	47.73	0.00	0.55
22	1.00	47.73	0.00	0.55

Consistent with the first two scores, 2 has a very high betweenness score. Being positioned as the only link for the majority of the network would have made this so. 2 was followed by 6, with 1/10 and 7 also scoring - all those with degree scores higher than two. The remainder, including 11 and 14, have no betweenness score. This further confirms the role of 2 as the primary intermediary in the network, with a few other members being in positions of some influence. Outside of the star pattern around 19, there must have been some additional structure to the network, to allow other members to have betweenness scores, if they have a degree larger than two. 11 and 14 were more connected than the members that made up the star, but were not positioned, as such, to act as intermediaries along the geodesics. Finally, information scores basically mirrored the same groupings for betweenness. Member 2 had the highest score, by far. Again, there was a cluster of 7,6, 1/10, along with 14 this time, forming the next highest set of scores. Overall, the nature of centrality in the network was quite clear. The primary member was 2 - this individual was the key to the structure of the network. The nature of the influence the group of 1, 6, 7, 10, 11 and, to a lesser extent, 14 was not so clear. They were part of the structure outside of the star section of the network, so the subgroup measures would help indicate what sort of structure that was.

Subgroups

The subgroup measures did illuminate the pattern of interactions between the members with higher centrality scores. Four cliques were identified, all involving these members. Figure 6.13 showed the four cliques, three of which involve member 2 (2,6,7; 2,7,14; 1,2,10). The remaining clique was made up of 1, 10 and 11. These cliques indicate that those individuals interacting with more than one other member interact with each other, and with 2. There appeared to be two separate groupings, one involving 1, 10 and 11, and a second involving 6, 7 and 14. Additionally, the members with a degree of one that did not connect to 2 - 8 and 9 - must connect into

one of these subgroups. The cutpoint measures would indicate which members they were connected to.

Table 6.13 Cliques for Case Study 3
4 cliques found.
1: 2 6 7
2: 2 7 14
3: 1 2 10
4: 1 10 11

The 2-clan results proved the separate groupings even more (see table 6.14 below). Of the three 2-clans found, the first was made up of all members directly connected to member 2. This includes almost all of the one degree members, the star group, as well as the more central members directly connected to 2. The only members excluded were member 11, part of the 1, 10 and 11 group, and members 8 and 9, mentioned above. The remaining two 2-clans were extensions of the cliques, including the members left out of the first 2-clan. The first was made up of 2,6 and 7, along with two single degree members (8,9) not connected to 2. The other clan was the third and fourth cliques combined, including member 11. Two subgroups within the network definitely exist. One includes members 1, 10 and 11. The second includes 6, 7, 8 and 9, along with 14 to some extent.

Table 6.14 N-Clans for Case Study 3
3 2-clans found.
1: 1 2 3 4 5 6 7 10 12 13 14 15 16 17 18 19 20 21 22
2: 2 6 7 8 9
3: 1 2 10 11

K-Core

The k-core results indicate a clear core, with members 1,2, 6, 7, 10, 11 and 14 together at degree level two, and then a sudden jump to all members at degree one (table 6.15). This result, though, was somewhat deceptive. The core members outside of 2 were merely those connected to 2 with a degree greater than one. While they occupy positions of some structural importance, their relative importance to 2 makes defining them as a core suspect. The real centre of the network was 2 alone, rather than a core of multiple members.

Table 6.15 K-Core for Case Study 3	
	Member
	1 1 1 1 1 1 1 1 1 1 2 2 2
Degree	1 2 6 7 0 1 4 3 4 5 8 9 2 3 5 6 7 8 9 0 1 2
3
2	XXXXXXXXXXXXX
1	XX

Cutpoints/Knots

The cutpoints/knots results (table 6.16) showed that 8 and 9 were connected to member 6. Otherwise, the results show the direct links between most of the members and 2. The majority of the blocks were the thirteen members directly connected to 2. The remaining two blocks for 2 were the subgroups of 2,6,7, 14, along with 8 and 9 connected to 6, and 1, 10 and 11. Removal of 2 from the network would have effectively destroyed it. Most members would have been isolated, while the two subgroups would remain connected only internally.

Table 6.16 Cutpoints/Knots for Case Study 3	
Cutpoint	Knot
2	3
	4
	5
	6 7 14
	12
	13
	15
	16
	17
	18
	19
	20
	21
	22
	1 10 11
6	8
	9

SSA

The SSA confirmed the structure indicated by the previous measures. The SSA (figure 6.5) placed 2 in the most central location. The two subgroups were located as distinct groupings to the far left and the bottom of the SSA plot. The remaining members were scattered around 2 across the top and right. The expected star pattern was created by these members and the members of the subgroups directly connected to 2. Inclusion of the links (figure 6.6) between the members clearly shows how much 2 controls the network, acting as the gatekeeper or central figure for interactions between the

subgroups and the peripheral members, though not within the subgroups. A few possible hypotheses comes out of the analysis of the structure

- one of the peripheral members was the head, with 2 acting as their intermediary
- one of the subgroups were the leaders of the network, with 2, again, the intermediary
- 2 was the head of the network, with the two subgroups having specific reasons for being interconnected

Figure 6.5 Property Network 3

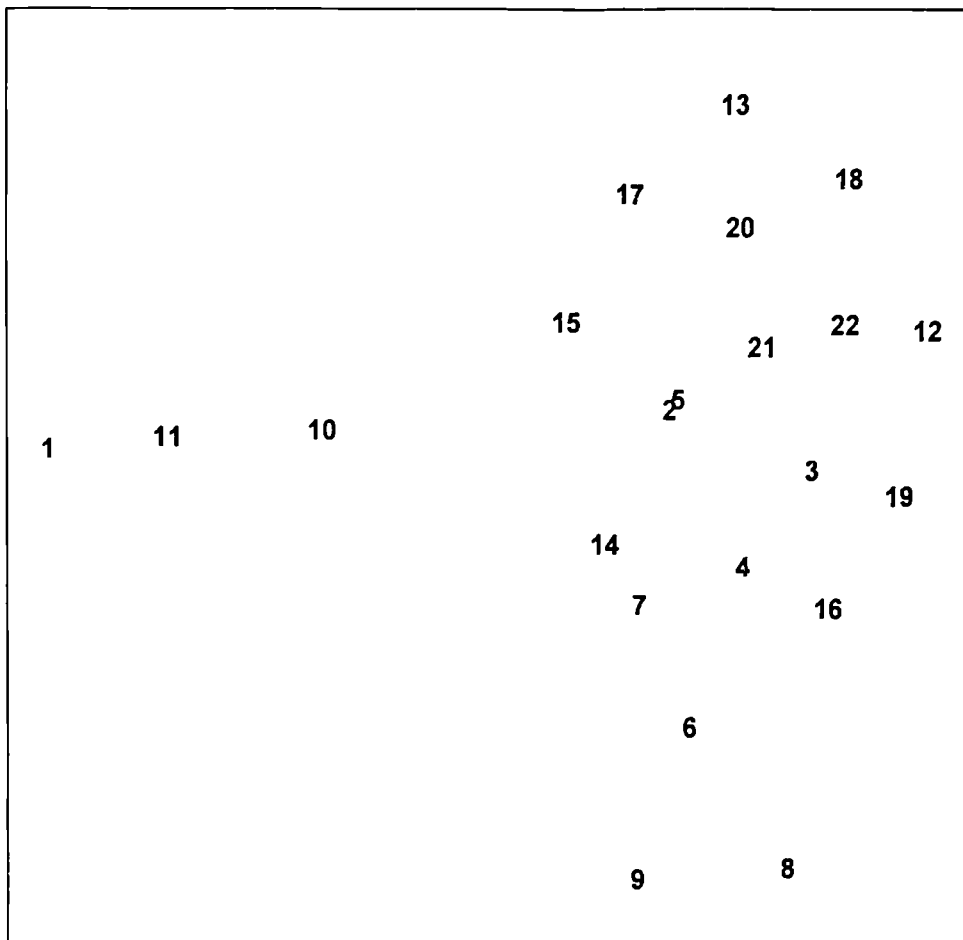
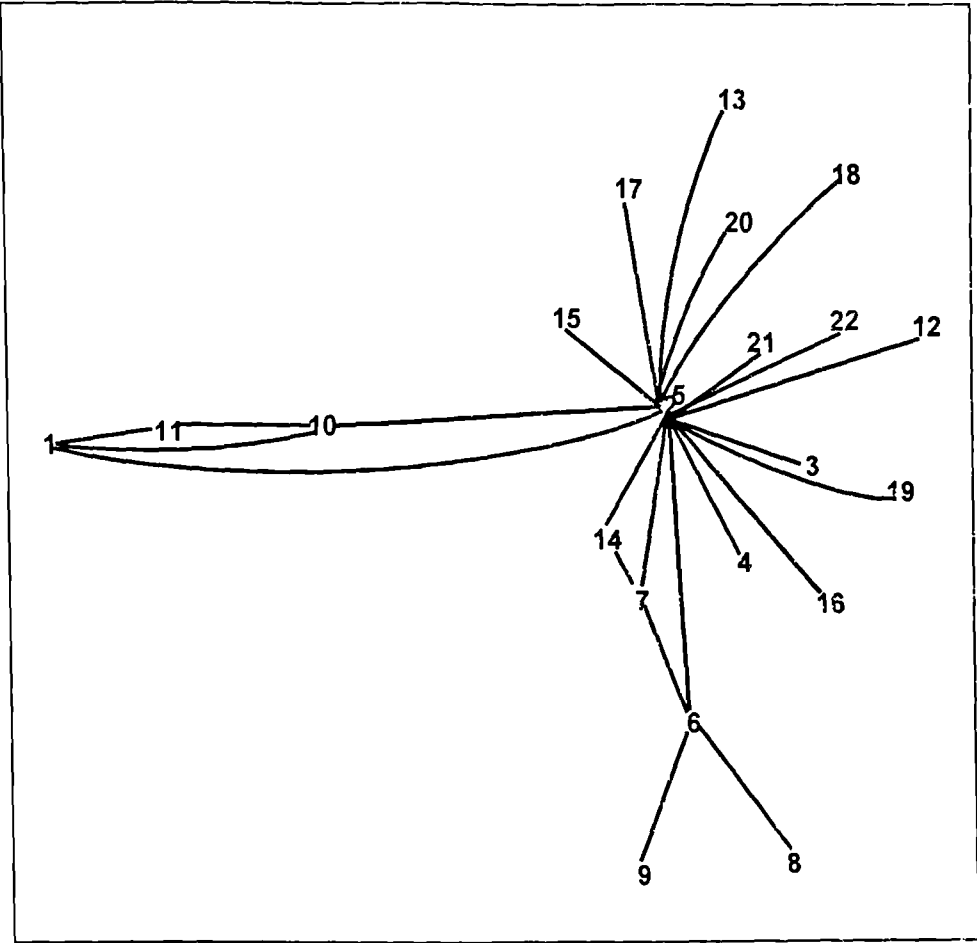


Figure 6.6 Property Network 3



Summary

The subgroup and SSA results revealed that the more central members, excluding 2, were such as a result of their connections to each other. They could be split into two distinct subgroups:

- 1, 10 and 11
- 6, 7, 14, with 8 and 9

These two subgroups, and all of the remaining members depend on interactions with member 2 to have any sort of indirect contact with the rest of the network.

The case file reveals that the latter option described in the SSA section was the correct one. 2 was the handler for the stolen goods, moving the items on to other associates and paying the burglars off. The subgroup made up of 1, 10 and 11 had been working for the handler for a long time and had come to know each other. The files gave no indication of the reason for the second subgroup, but they also engaged in burglary for the handler. The network was very structured, at the most basic of levels, with a division between the handler and the rest of the network. Most of the interactions were business - the supply/purchase of stolen goods. Some of the observed interactions within the subgroup 1, 10 and 11 and between the handler and the subgroup were not so clearly business-related. This was not to say that they were not engaged in some form of criminal exchange, but that there was no clear exchange of goods for money. This network, then, was a more complex version of the star model described in Waring's research, as well as confirming the pivotal role of handlers, as indicated first by Sutherland, followed by West, Potter and Sutton and Cromwell et al., amongst others. The two subgroups were teams of offenders, possibly taking targets that required more than one offender, and possibly also stealing to order for the handler. These may have represented a higher level of burglary, while the majority of single offenders may have been less regular operators for the handler with lower

quality and quantity of goods. The handler, then, may well have fit into either the professional or pro active semi-professional fence types described by Cromwell et al.

Case Study 4

The fourth case study consisted of a network of size sixteen. This network, headed up by a group of professional criminals, had engaged in a series of burglaries of private properties and businesses specifically to obtain personal computers and the chips contained within them. For a period of time, before market forces drove chip prices down considerably, this had rapidly become a specialist area of theft. Intelligence supplied by an informant on the network's activities led to a major intelligence-gathering operation, using phone billings, surveillance and informants to collect details about the network. The data was converted into a dichotomous matrix by coding any number of links between two individuals as a "1." The resulting matrix produced the following about the structure of the network.

Centrality

As shown in table 6.17, member 4 had the highest degree score (fifteen), closely followed by 10 and 2 (fourteen and thirteen respectively). 4 had a direct connection to every single member of the network, while 10 and 2 almost did. 7 came next with eleven links, before a large grouping of members all with a degree score of ten: 1, 3, 5, 6, 8, 9 and 16. The remaining member had degree scores of six (13 and 14), five (15), four (11) and two (12). While some members had very high degree scores, all but the lowest five were connected to about two thirds of the other members. This indicated that the network was, for the most part, highly interconnected. Closeness scores followed the same pattern of results. 4 scored a perfect hundred due to being connected to all of the network. 10 and 2 came next, also due to their high degree scores. The same cluster of matching scores also took place, with members 11-15 having the lowest overall results, indicating that they were the farthest removed from the rest of the network. Again, while some members were more or less close than the middle cluster, the general trend was towards a network with key individuals, but no controlling core.

next, before a large jump down to 16, 5 and the tied scores for 1, 3, 6, 8 and 9. As with all of the other measures, member 12 was lowest, indicating a very isolated position for this member. The information scores indicated that the network was structured so that those with the highest degrees were also the main intermediaries. The centrality results gave four members as the most central, primarily 4, with 2, 10 and 7. These member consistently came at the top of the rankings, despite the high levels of connections between the majority of the network, as indicated by the degree scores. The majority of the network fell into a cluster of approximately the same scores, followed by handful that were less central - 11-15. The only exception to this was the few that achieved scores in betweenness.

Subgroups and Cutpoints/Knots

Only five cliques were found. This result was not surprising, considering the interconnectedness of the network. The first clique was made up of eleven of the network members, all of those with a degree of ten or higher (see table 6.18 below). The second clique was composed of the four central members, along with member 13. The third clique left out member 7, and included 14 and 15. 4 and 10 combined with 11 and 14 to form the fourth clique, while 4, 11 and 12 made up the final one. Member 4, the most central, appeared in all of the cliques, indicating a substantial role as a connector between these cliques. This was particularly true as there was little overlap between the first clique and the other four. The only shared members were high centrality ones. 10 appeared in four of the cliques, while 2 was in three and 7 was in two of them. Only one 2-clan was found, which was expected as all of the network members were included in the cliques, and all of the cliques shared at least one member. As there were no members with a degree of one and no subgroups connected only to one member, no cutpoints were found. The entire network was connected to each other, either directly or through a single intermediary. The network had a split between two sections, with one completely interconnected within itself and the second consisting of a series of overlapping subgroups. The two sections were

joined through the central members. The two sections would be disconnected if 2, 4, 7 and 10 were removed.

Table 6.18 Subgroups for Case Study 1
5 cliques found.
1: 1 2 3 4 5 6 7 8 9 10 16
2: 2 4 7 10 13
3: 2 4 10 13 14 15
4: 4 10 11 14
5: 4 11 12
1 2-clans found.
1: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

K-Core

The k-core results did not indicate a core (see table 6.19). This was a result of so many members being connected to each other directly. It also highlighted the importance of overall structural position can be, relative to merely how connected an individual was. 2, 4, 7 and 10 were not central due to having substantially more connections than most of the network, but because of their positioning between the two sections. 4 had an exceptionally high betweenness score, but the differences between 4 and the other members was less pronounced across the other centrality measures, for example.

Table 6.19 K-Core for Case Study 4	
	Members
	1 1 1 1 1 1 1
Degree	1 2 3 4 5 6 7 8 9 0 6 3 4 5 1 2
11	. . . . .
6	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
4	XXXXXXXXXXXXXXXXXXXXXXXXXXXX . .
3	XXXXXXXXXXXXXXXXXXXXXXXXXXXX .
2	XXXXXXXXXXXXXXXXXXXXXXXXXXXX

SSA

The SSA plot (figure 6.7 below) had the non-central members of the perfect clique located along the top and top right. The central members, 2 ,4, 7 and 10, were positioned beneath this grouping. For the other grouping, 13 was located closest to the central group, as the only member of the section with a connection to 7. The remaining members were scattered along the bottom, with 14 in a middle position, as the only member in the section with connections to 11, 13 and 15. The results clearly showed that the sectioning model for the network was appropriate, with clear lines between the two groupings. Addition of links indicated the extent of the connections between members, and how much they concentrated around the central members, as shown in figure 6.8. The upper section was heavily lined, while the lower section was much more sparse. The SSA confirmed different levels of position in the network, based on position and that the network was divided into separate groups.

Figure 6.7 Property Network 4

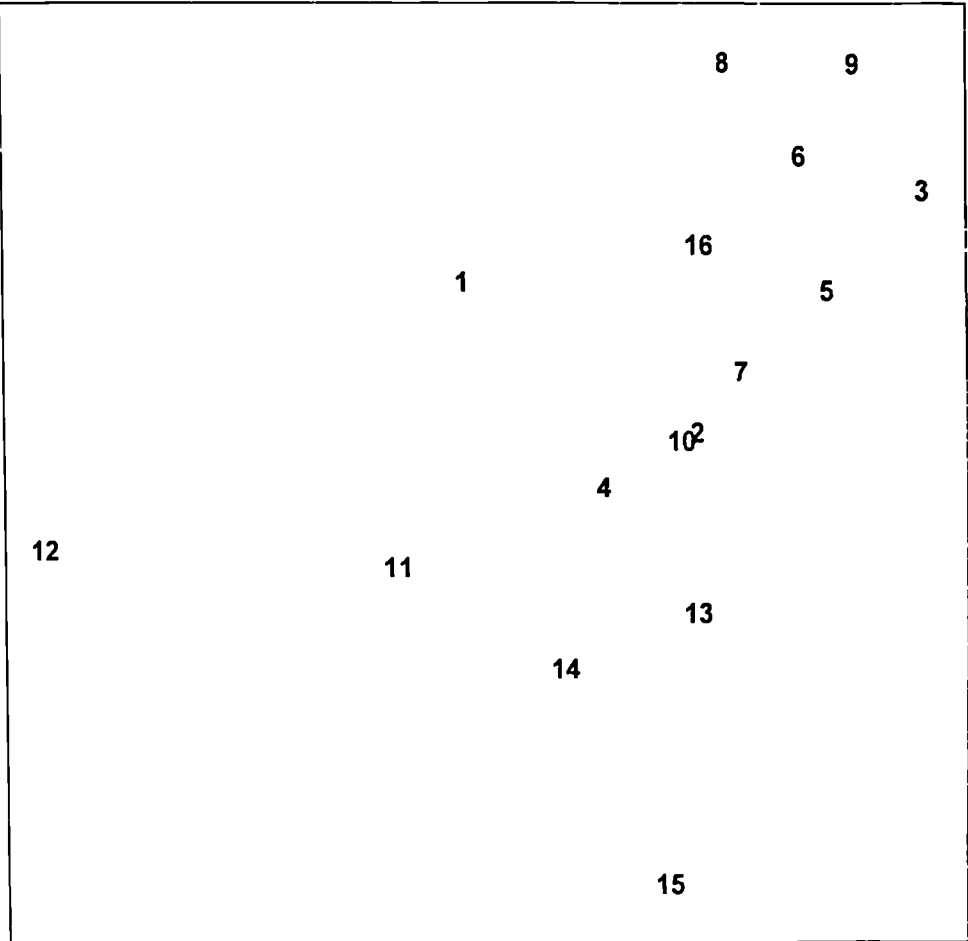
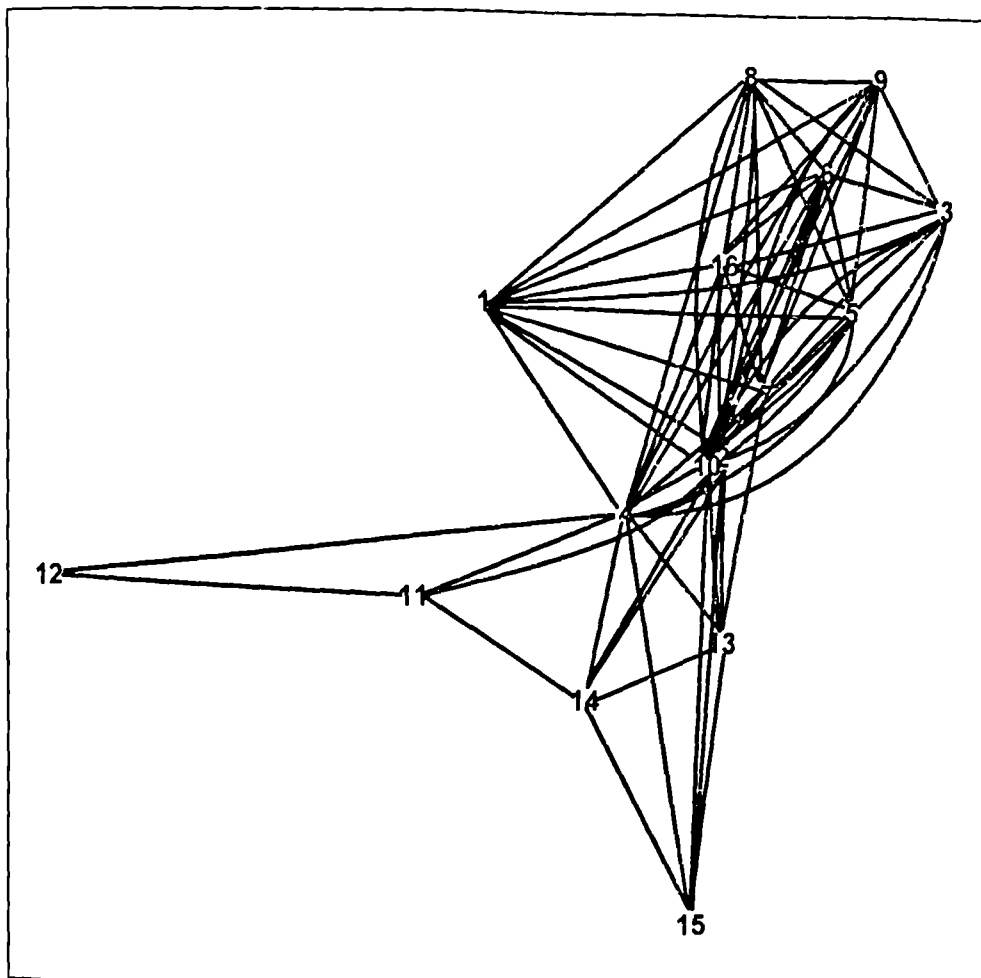


Figure 6.8 Property Network 4



Summary

The overall structure of the network was fairly simple. The major part of the network was made up of a perfect clique, composed of eleven of the sixteen members. This clique was a large group of offenders, all in contact with each other. Four of the members of the clique also connected into the two other subgroups within the network, providing the connections between the different sections. These members, 4, 10, 2 and 7, in descending order of contact, made the three subgroups overlap. There was, therefore, a ranking to what extent each of the four acted as intermediaries, with 4 at the top. One of the other two subgroups was primarily two members, 11 and 12, interconnected primarily with 4. The final subgroup, 13, 14 and 15, were all connected to at least one of the central four. The structure that exists within this network was a function of the separation between seven of the members of the perfect clique and the five members that did not belong to that clique.

Additional information from the intelligence files revealed that 4 and 10 were identified as the leaders of the network, with the remainder being various members they would get to actually carry out the crimes. The majority of the other members were younger offenders (late teens, early twenties), while the main two were substantially older (both in their forties). The two had substantial criminal histories and were considered dedicated professional criminals, and often worked together. The files did not give any information as to why there was a division between the major clique and the rest, outside of the fact that the clique members had more frequent association with the two than the other five non-clique members. The fundamental question about the nature of the network that created that division remained unanswered, outside of a suggestion that the clique may be the regular "employees" of the two leaders, while the rest were more casual labour. The nature of the network was very much reminiscent of the burglary teams in the literature. If the clique was considered the true pool of offenders, then differentiation between members in terms of structure becomes difficult. The research, such as Sutherland, Shover and Maguire, indicated that teams were non-hierarchical, as was found here. The leaders of the

group could be more easily identified as the ones who were primarily in contact with the members of the network that were not part of the pool. They were the ones that brought them into the network, though not the team. The clique formed the pool from which the burglar teams could be formed.

Overall Findings

As with the drug networks, the four cases described above and the conclusions reached about the other seven (as given in table 6.20 below and described in greater detail in Appendix 1) indicate that, in general, property networks had key members within their structures. Only two, which were basically just large cliques, did not have individuals that stood out on the centrality scores. Much less frequent were the presence of core groups, with only two of the seven in the table and three of the above cases having such cores. In the case study without a core, one individual actually occupied such a central position as to be a core onto themselves. In the first and fourth cases, the cores were actually made up of individuals whose connections to members of the networks that weren't really members of the main group of offenders made them more central. Without these connections, the differences between members would have been reduced, creating a much flatter structure. Overall, cores were not a strong feature of the property networks, with the ram raiding case study being the exception in the first four. Key individuals either were one or two members, or were sufficiently separated from each as to not form a core. Mid-level members, a feature rarely mentioned by the literature, were virtually non-existent. They were present in only two of the eleven cases. Subgroups were another feature that only occurred in about half of the networks in the chapter (six of the eleven). When they were present, as in the ram raid case, they were very distinctive. Where subgroups were present, they did tend to be interconnected internally, indicating that they formed "mini-networks" in their own right. Four of the six cases with subgroups had clustered subgroups, rather than simple chains of connections. Isolated individuals were infrequent, with most members having at least a couple of connections, or so many members were connected to one person that they were indistinguishable. Only four of the eleven had isolated members within the structure.

Table 6.20 Summary information for property crime case studies

	Case Study										
	1	2	3	4	5	6	7	8	9	10	11
Characteristics of Network											
Number of members	21	45	22	16	23	7	8	13	8	15	19
Type of activity (Burglary, Ramraiding, Handling)	b	r,h	b,h	b	b,h	b	b	r	b	b	b,h
Structural Features Present? (Yes/No)											
Key central figures	y	y	y	y	y	y	n	n	y	y	y
Core group	y	y	n	y	n	n	n/a	n/a	y	y	n
Mid-level members	n	y	n	n	y	n	n	n	n	n	y
Distinct subgroups	n	y	y	y	y	y	n	n	n	y	n
Isolated individuals	n	y	n	n	y	n	n	n	n	y	y
Subgroups as clusters, not chains	n/a	y	y	y	n	y	n/a	n/a	n/a	n	n/a

The findings correspond in large part with some of the themes in the literature. The work on burglary repeatedly mentions the existence of a difference between associates and burglary teams. Associates provide the pool from which additional members can be drawn (Maguire 1982, Shover 1973, Warr 1996). The main members of the burglary teams, on the other hand, tend to be closely associated, small in numbers and egalitarian in structure (e.g. Sutherland 1937, Hobbs 1997b, Walsh 1986). Where the sample differed from the literature was in the size of these teams. Most of the previous studies suggest sizes of two to three. In a few cases, this was true, e.g the fourth case study, but others had substantially larger cores or general membership, such as the first two cases. This increased size in both the size of the teams, where identifiable, and the overall networks, made for more complex structures than would have been expected from the previous literature. This difference was partially attributable to a bias in the sample. Intelligence gathering, as with all aspects of modern policing, is influenced by resources. Large networks, with a potentially higher visibility and greater rewards from investigation, would have been over represented. Two or three burglars, operating in a low-key manner, would be much less likely to attract police attention.

Another partial difference was, when additional intelligence was available, the presence of definite leaders. The larger literature would suggest that criminal entrepreneurs would initiate opportunities within their markets, creating the network required to do so (Reuter 1983, Potter 1994, Hobbs 1997a). The literature more specifically on burglary, as already mentioned, describes more egalitarian structures. Again, the size of the networks in the sample may account for some of this difference. A second factor in the difference, and one that is a major theme in the literature, is the role of the handler. The handler operates as a focal point for thieving activities, creating demand whatever the level of involvement with stolen goods (Sutton 1993). In the second and third cases, the individuals at the centre of the network were either involved in handling (the leaders of the ram raiding network and an associate) or (in the third case study) was a dedicated professional or semi-professional fence (Cromwell et al. 1991). The associate in the ram raiding case was a semi-professional

fence, with a legitimate business as well as involvement in handling. In both cases, the networks were organised around the handlers. The literature on handling confirms this, with Cromwell et al. 1991, Maguire 1982, Hobbs 1997c and Potter 1994, amongst others, describing the pivotal role the handler has in the development of criminal activities.

Where cores existed, additional intelligence information did not indicate familial or ethnic ties between the members. The fourth case study was centred around two long time associates, but there was no other indication of close ties contributing to the formation of the cores. Some work has found that relations and close friends can be co-offenders (Walsh 1986) but this was not a theme in much of the literature. Obviously, it is impossible to make a judgement on non-structural details for the other seven cases without additional information. The small number of cases with isolated individuals gave two possibilities about the role of inter-network intermediaries. Either, unlike the drug networks, intermediaries are more integrated into the network, and so less recognizable or connection manifest themselves in different ways in different markets. None of the cases in the sample included any sources of information as part of the networks, so that kind of intermediary was excluded. Where handlers were present, they occupied central positions rather than fringe ones. Intermediaries in the form of organised crime figures (Sutherland 1937, Potter 1994) were also not featured in the networks.

Conclusion

There were structures to the property networks, with most networks having an imbalance in structural positions between members. Key figures were a regular feature of the sample. Cores were less common, resulting in networks that were generally balanced and more decentralised. The lack of mid-level members also confirmed the more decentralised and less hierarchical nature of these networks. These findings largely confirm the themes suggested by the literature. The importance of handlers was also indicated in the functioning of networks. The sample, however, was greater

in size and more divided than the literature would have indicated for networks centred around property crimes, such as the frequency of distinctive subgroups. This was partially due to sample bias, but may also indicate that with the inclusion of pools of offenders, quite large networks can be constructed. As with the drug networks, the findings indicate certain trends for property crime networks. They also raise more questions - to what extent can networks be structured around handlers? How much pro-active ordering of stolen goods takes place? Are ram raiding networks generally as structured as the case in this study, or was this an aberration? Are the key members/cores merely teams and the peripheral members pools to be drawn on, or do actual leaders occur more frequently than some studies have suggested?

While there was a differential in structural position between members, this was mainly dictated by location, rather than actual separation within the network. There was direct contact between the highly central members and most of the rest of the networks within the sample. As a criminal market, theft and handling are relatively low risk, with fairly low levels of arrest and short sentences. With such factors, trusting other individuals becomes a moderately more acceptable behaviour than in drug trafficking or other crimes considered more serious than moving stolen goods. While mistrust and caution are required states of mind for surviving in markets where competition can include violence and without legal recourse or protection, the amounts required can be influenced by the type of market the individual is operating within. In all of the four cases detailed above, the leaders were either in direct contact with most of the network and/or were involved in the commission of crimes themselves. The more direct structure of the network was a reflection of the extent of the individual's involvement and the relative low risk of the market.

Chapter 7. Organised Sexual Abuse Networks as a Special Form of Criminal Network

The sexual abuse of children occupies a place at the extreme end of a how immoral various criminal behaviours are considered. Few people consider such actions to be anything less than extremely morally wrong, outside of the offenders. Abuse organised by groups of offenders is one form that is seen as particularly bad as it implies deliberate, planned intent. The term “organised sexual abuse network” can encompass a broad area of activity, ranging from the interactions between abusers in prison, through to the shared abuse of children. Regular letter or e-mail exchanges, including the distribution side of child pornography fall in between. It covers any sort of interactions taking place between individuals who sexually abuse children, where those interactions, either directly or indirectly, relate to that abuse. Actual sharing of children would be direct abuse. Discussions rationalising their abusive activities would be indirect. In terms of organised abuse being criminal networks, however, there has been little research. Some attempts have been made to develop typologies of forms of organised abuse, with some discussion of their organisational components, but there has been little in the way of explicit examinations of their structure. The amount and forms of communication between paedophiles is a largely unexplored area. Most research that has been carried out has either attempted to describe individual cases of collective abuse or to assess prevalence levels of such activities. There has been a particular gap in the literature in examining the indirect forms of networking, outside of child pornography. Organized acts of sexual abuse where offenders gather to abuse children at the same time, may, relative to overall rates, reflect a small proportion of the total sex crimes against children, though there are some reports of increasing trends in such areas of child prostitution, both in the UK and abroad (“Net points paedophiles east,” *The Guardian*). Indirect actions between are likely to be much more prevalent, and can lay the ground for movement into the direct forms of abuse, as discussed below.

Research on Paedophile Networks

Research into the social forms of paedophilia have focussed, in the main, on the most extreme end of the continuum. Paedophile rings, satanism, child pornography, and, to a lesser extent, child prostitution, have been the primary topics of discussion. The less direct forms have been discussed more as facilitators and secondary aspects of these forms. In the late sixties, with improvements in media technology it became much easier for individuals or small groups to produce magazines and film. Particularly in countries such as Denmark, and to a lesser extent the US, this led to the production of semi-commercial child pornography (Tate 1990). Over the 70's, these operations increasingly came to the attention of the police in Europe and North America, resulting in a number of large-scale operations. Attention was then shifted to more general cases of organized abuse, mainly led by the FBI and its colleagues (Lanning 1992). Over the course of the 1980's and early 90's, increasing public attention was devoted to the idea that satanic groups were operating throughout America and the rest of the world. At its highest point, there were suggestions of a vast underground network of satanists abusing huge numbers of children (Tate 1994). The overreaction to ritual abuse, however, led to a number of high profile, controversial sex abuse cases. In the end, the evidence, particularly physical, suggests that anything that can be called satanic abuse is very much less frequent than first supposed (Lanning 1992; LaFontaine 1994).

As part of their *Crime Classification Manual*, Ressler, Douglas, Burgess and Burgess (1992) developed a guide for identifying types of a wide variety of sexual and violent crimes, the FBI included a section of types of organised sexual abuse. This was built on the work of Burgess in the 80's (1984) and Lanning in the 90's (Lanning 1989; 1992). The first type was involved in the production and/or collection of child pornography, under which there were three sub-types:

- closet

The closet collector was described as individual who uses child porn, but rarely abuses children himself. While described as having “no acknowledged communication with other collectors” (pp. 230), this collector obtains the porn through commercial channels. This class raises two issues - how accurate is the description that they do not interact with other offenders and these individuals must be part of networks of paedophiles through the mutual use of “commercial channels.”

- isolated

An offender who abuses one child at a time, and produces their own porn. Again, the percentage of such cases which may interact with other abusers was not clear. In addition, there was a line in the description that states such abusers may “seek out children not known to him by travelling to another country.” Those isolated offenders that make such trips are likely to be taking part in child sex tourism or child prostitution in those countries.

- cottage

These were networks producing porn for distribution within themselves and without commercial intent. The exchange of materials was a social activity to strengthen the ties between network members. In addition, these networks were described as sometimes committing abuse together.

The second type, termed historical sex rings, centred on actual abuse of children. Again, there were three sub types:

- solo

One offender and a group of children. There was mention of the potential of occasional involvement of by a secondary partner.

- transitional

Groups of offenders with a number of victims. There is a exchange of victims. Less organized than the syndicated form. Often involves pubescent victims and the movement of children into prostitution.

- syndicated

Again, multiple offenders and victims, but with a higher degree of organizational structure, including actively acquiring victims, production of porn, prostitution and numerous offenders involved as customers. Features include trading of porn and children, communication networks involving letters, beepers and (though not mentioned in the *Manual*) the Internet, definite suppliers, self-regulation and a degree of profit.

The final type were multidimensional sex rings, which involved ritual or satanic aspects to the abuse. These included groups of victims and offenders, fear as a method of control and bizarre/ritualistic behaviour as features of these types of networks. Reports of their activities typically emerged out of four situations:

- adult survivors reporting abuse in the past
- abuse in a day-care setting was described as fitting this category
- family/neighbourhood abuse, such as in a rural setting
- brought up in custody disputes

There are obvious overlaps between all of them, with individuals and groups being able to be classified as more than one type, potentially. This is true, both within each type and between them. With modern information/media technology, cottage collectors don't need to be highly organized in "corporate" sense to produce, edit and sell child pornography, allowing such groups to develop into more entrepreneurial forms so common in other criminal markets. Does this mean that syndicated groups are nonexistent, or is there no longer a difference between the two types in terms of child pornography? An additional problem was the is the lack of various research to back up the classification. The typologies throughout the *Manual* are based on a combination of law enforcement experience and small-scale studies. This doesn't invalidate the typology, but more work would have to be done to assess its overall accuracy. There are various references to networks and links throughout the types. The closet collector taps into commercial sources, the cottage industry involves multiple offenders sharing their product and victims. The syndicated ring, and, to a lesser extent, the transitional ring, both involve structured organisation, though not clearly defined, and various kinds of abuse. Where the typology falls down, for structural analysis, is the lack of details about structure itself. How is the syndicated ring more organised than the transitional one? Is there more task specialisation or a clearer hierarchy within it? How are children exchanged and how do members communicate? The few case studies for each fail to give clear structural information.

Elliott, Browne and Kilcoyne (1995), in a general discussion of paedophiles' descriptions of their views and behaviours, gave a couple of interesting points. Ninety-one offenders were interviewed, though there was some sample bias in that they would have been offenders willing to discuss their actions. The first major point was that one in five offenders claimed they knew where to obtain child prostitutes and illegal child pornography. Even if some offenders were grossly exaggerating, it indicated that some offenders may well have access to abuse networks. The second finding was that one in twelve kept in contact with other child sex offenders. This finding is of particular

importance. These communications represent a form of abuse network that has major implications for offending behaviour.

LaFontaine (1994) carried out an extensive review of a wide range of cases in the UK. Primarily carried out to establish the extent to which ritual abuse occurs, but with a secondary focus on more general organized abuse. Cases were defined as a “cluster of adults and children connected in an incident or series of incidents of the sexual abuse of children” (pp. 3). A sample of 211 cases was used, citing an estimated 242 cases/year, on average, with 21 cases of allegations of ritual abuse/year. LaFontaine divided the sample into five classes:

- Ritual Abuse - ritualistic, possibly satanic elements (62)
- Family-based Abuse - incestuous and abuse acted out with the consent of parents (28)
- Paedophile Networks - groups of individuals united by a common sexual preference for children and collectively carrying out abuse (43)
- Institutional Abuse - abuse in such settings as care homes (45 - 16 residential, 29 non-residential)
- Other - not falling under the above classifications (28)

The lack of a literature that discusses structure makes developing research questions problematic. For this reason, the two case studies discussed in this chapter were approached in an very exploratory fashion. The analyses were carried out not to compare to the literature, but to see what themes in structure might emerge from the cases themselves.

Defining a "Network"

The paedophile network is a form of criminal network which is created around a common behaviour - the sexual abuse of children. This includes communicating about abuse and/or accessing materials that relate to abuse. The members interact through a series of transactions shaped by the structure and dynamics within that group. These transactions relate to the goals of the offenders directly (e.g. actually offending) or indirectly (e.g. arranging meetings). In terms of paedophile networks, there are two goals of the network which co-exist but are antagonistic:

- On the one hand, the network forms out of common interest, to offer encourage and support, and, potentially, to increase the amount of sexual abuse
- At the same time, the group must avoid identification of its abusive activities by those agents that would stop the abuse and punish the offenders

To achieve its goals, the network must try to develop ways of interacting that minimizes the likelihood of identification. Paedophile networks will develop different strategies to try to succeed at these goals, strategies involving different forms of roles and structures.

Network Types

Paedophile networks can be broadly classified into two groupings, those without direct sexual abuse and those that do carry out organized abuse. This division comes out of the literature, distinguishing between interactions about abuse, such as the FBI closet collectors, and interactions involving abuse, such as LaFontaine's Paedophile networks. The two types are

1) Paedophile Information Networks - covers the wide range of information exchanges between paedophiles, from meeting each other through to the exchange of child pornography. Determining what levels of interaction are criminal can be problematic. There is a major legal difference between the general discussion of child sexual abuse, encouragement from one offender to another to abuse a specific child and making arrangements to actively abuse specific children together. The first is not illegal (in the UK), the third is definitely conspiracy to commit a crime. The second falls in the grey area in between.

- many paedophiles meet in prison, serving time together in the confines of an environment that, outside of each other, is generally hostile, which can lead to regular communications or spending time together after prison
- communication through letters and, increasingly, email and other Internet methods.
- distribution of child pornography (real or computer-generated)
- the most structured format, as reflected in such groups as NAMBLA and the Rene Guyoun Society (Lanning 1992), organized around promoting and discussing the idea of paedophilia, rather than to carry out actual abuse.

2) Paedophile Abuse Networks - the various forms of organized sexual abuse are the most extreme form of social activity, and can emerge out of the information networks, where contacts are established and developed. Initial meetings in prison potentially lead into regular communications on the Internet, child pornography could be exchanged, culminating in arrangements for one member to supply another with a victim to abuse. Networks can shift in aims over time, and some will shift towards organized abuse. The

different forms, unlike in the information networks, do not represent increasing involvement. They are variations of the extreme.

- special tourism packages designed to supply underage prostitutes in foreign countries
- involvement in child prostitution
- what are traditionally referred to as “paedophile rings,” where children are shared between members.
- the production of child pornography

The common thread that runs throughout this continuum is that whatever form the activity takes, the result is a network of associations that will have some form of structure to it. The networks involved in actual abuse will have information aspects to it, when communications take place, for example. Networks that involve the distribution of child pornography can shift into production. A paedophile ring can also produce child pornography.

The Structure of Organised Sexual Abuse

The paucity of literature on organised abuse, particularly any that discusses structure, makes developing hypotheses about the nature of such networks difficult. The aim of this section of the research was very much to carry out some exploratory work. This was done with the intent to determine whether:

- the data available was of a type where SNA measures could be applied
- use of SNA measures allowed for the identification of aspects of the structure of such networks

Case Studies

Two cases studies were obtained for an preliminary analysis of paedophile networks. Both cases were supplied from police investigations, involving analysis of case files for relevant information about associations between members. The first case study was a paedophile information network, with ten members engaged in exchanges of letters. The second case study involved actual abuse, where individuals offended together. The first case study was an information network. The second was an example of actual co-offending. Each, then, represented a different level of abuse, from communications through to actual collective abusing.

Case Study 1

The first case study began as an investigation into abuse by children by a single offender. Collection of evidence at the home of the offender revealed a large quantity of correspondence between the individual and other abusers. Six other individuals were identified from the collection. Raids on their homes gave further links between members and identification of a further three offenders, creating a total of ten members within the network. No other links to other offenders were located in the correspondences that were collected. The data was coded so that any two members that had engaged in correspondence with each other were linked, with a score of "1" in the association matrix. A more in-depth analysis would have been possible if the information available to the researcher had indicated the number of contacts between each pair in the network, but only limited details were accessible.

Centrality

Only three of the ten members had degree scores greater than one (table 7.1 below). Member 5 had an extremely high score of seven, while members 8 and 5 had scores of four and two, respectively. Seven of the members were only linked to one individual, which, due to the high degree score of 5 must be primarily that member. Others may be connected to 8 and, possibly, 7. 5 was very much the centrally connected network member. With the pattern of connection indicated by the degree scores, the closeness results were expected. 5 had a much higher closeness score than the rest of the network, as that member was connected directly to most of the network. 8 comes second, due to the degree score. 7 comes somewhat higher than the remainder of the network. 9 and 10 have the lowest scores, indicated that they were the farthest out members of the network. These two members must be the two not directly connected to 5. They were probably connected to 7, which would account for the high degree score for that member.

Member	Degree	Closeness	Betweenness	Information
1	1.00	47.37	0	0.57
2	1.00	47.37	0	0.57
3	1.00	47.37	0	0.57
4	1.00	47.37	0	0.57
5	7.00	81.82	30	1.03
6	1.00	47.37	0	0.57
7	2.00	56.25	0	0.77
8	4.00	64.29	15	0.86
9	1.00	40.91	0	0.51
10	1.00	40.91	0	0.51

The results from the closeness measure were confirmed by the betweenness scores. Only members 5 and 8 have scores for this measure, with 5 having twice the score of 8. These members were along the geodesics for the network, while none of the other members were. The reason for this result must be that, as suggested by previous measures, most of the network was connected to one or the other and to no one else. The information scores followed the same pattern as all of the other centrality measures. 5 came first, by a large margin, followed by 8 and 7. The remainder had much lower scores, with 9 and 10 coming last. The centrality results were straightforward, with 5 being the main member of the network, and the only link for a major portion of the network. 8 linked two members not connected to 5 (9 and 10) into the network, giving that member the second-most important position. The results indicate that the network was made up of two stars, as described by Waring in chapter three, connected to each other.

Subgroups

Only one clique was found, as seven members had a degree of one. The three member clique was made up of the three most central members, 5, 7 and 8. This confirms that member 7 was connected only to 5 and 8, and that all of the members with a degree of one were connected to one or the other of the two. Two 2-clans were also found. Both include the two high degree members 5 and 8, along with member 7. The first two clan was also made up of members 1-4 and 6. These were the additional five members that made up the degree of seven for member 5. The second 2-clan included 9 and 10, the two identified as connected to member 8. These findings are shown in table 7.2. The results also indicated a structure made up of two connected stars, one larger than the other.

Table 7.2 Subgroups for Case Study 1	
1 clique found.	
1:	5 7 8
2 2-Clans found.	
1:	1 2 3 4 5 6 7 8
2:	5 7 8 9 10

K-Core

The k-core indicated that 5, 7 and 8 were potentially a core within the network (table 7.3). In the sense that almost all of the members outside of these three were connected only to 5 or 8, this was true. 7 was a member by having links to both, and so was not wholly dependent on one or the other.

Table 7.3 K-Core for Case Study 1	
	Member
	1 2 3 4 5 7 8 6 9 10
Degree	-----
3	.....
2	.... XXXXX ...
1	XXXXXXXXXXXXXXXXXXXXXXX

Cutpoints/Knots

The cutpoint/knots measure merely adds the final proof of the positions of the peripheral members relative to members 5 and 8. Five of the peripheral members, 1-4 and 6, would

be isolated from the network if 5 were removed. 9 and 10 were similarly linked to 8. This was the final proof of the two-star structure.

Cutpoint	Knots
5	1
	2
	3
	4
	6
8	9
	10

SSA

Member 5 was centrally located in the SSA plot, with members 1 through 4 and 6 located around him. 7 and 8 were to the right of 5, with 10 and 9 farther to the edge of the right side of the plot (figure 7.1). Addition of links confirmed the findings from the other measures, as shown in figure 7.2. 5 was the central figure in the network, with five of the other members connected only to him and seven of the nine with links. Only members 9 and 10 did not connect to 5, only to 8.

Figure 7.1 Organised Abuse Network 1

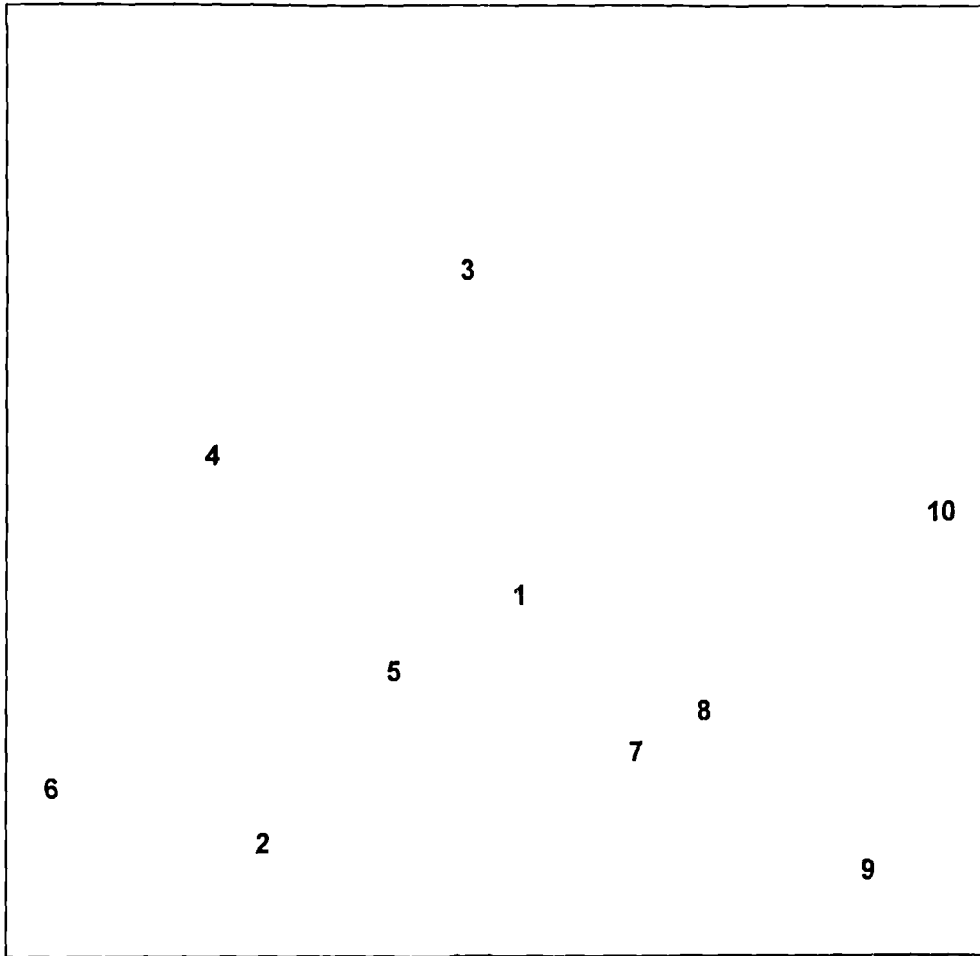
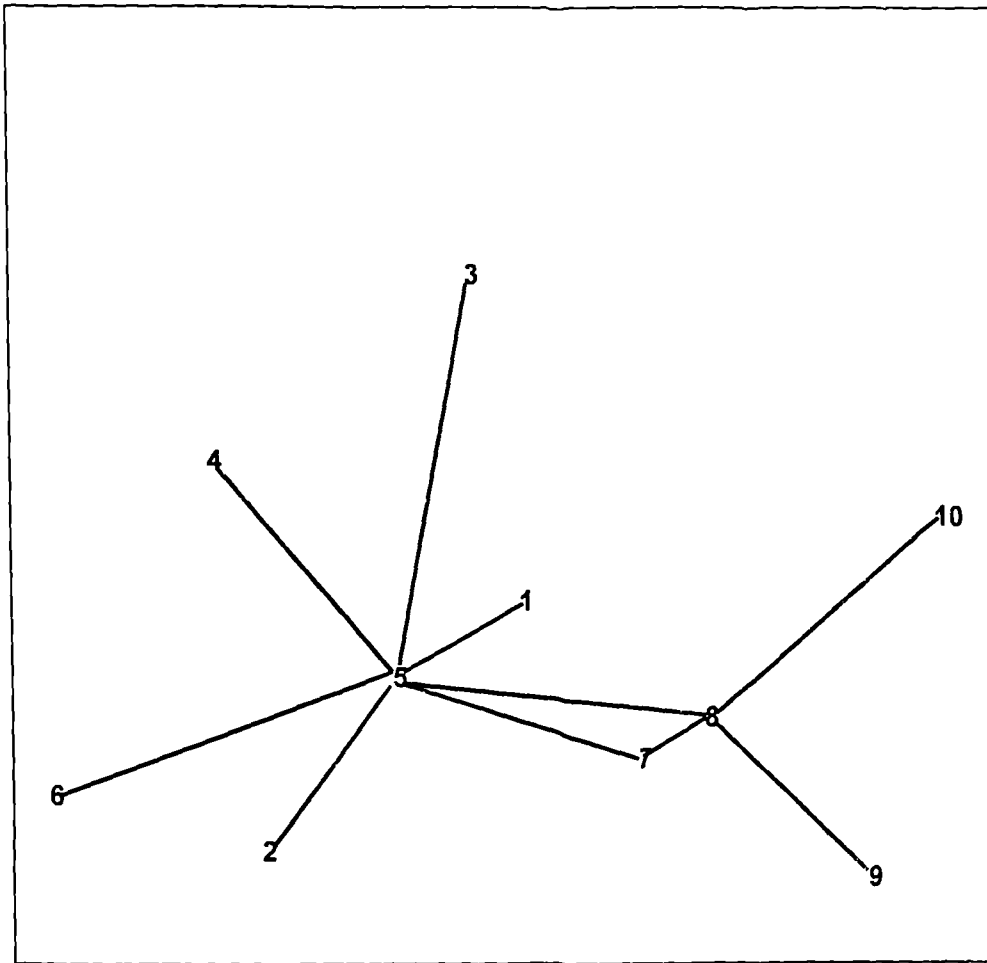


Figure 7.2 Organised Abuse Network 1



Summary

The network for letter communications was relatively straightforward. Two members acted as cores for seven of the eight other members. Five of these connected to 5, the other two, to 8. These members were in letter contact with only one member. The two core members were also in contact with each other and a third member. If the exchanges had not been interrupted by the arrest, other members may have been "added in", expanding the network. Current members may have begun to contact each other, creating new links. At the time of arrest, the network was a chain of links, made up of two star shapes. The initial arrest was made on member 5, who was the primary instigator of the network of letter exchanges. The members engaged in exchanges relating to preferences in types of children, sexual activities engaged in and various neutralizations of the harm of their activities (deYoung 1988).

Case Study 2

The second case study involved eight members identified as being involved in a series of sexual assaults against children. Evidence from the victims indicated extensive abuse taking place where more than one member of the network had been present and taken part. Once evidence had been fully collected, it was determined that member 1 was actually uninvolved in the network of the other seven. The abuse carried out by member 1 was a coincidence. The case was coded that a score of "1" was given for any pair of members when there was a record of the two having co-offended against any of the victims. Special attention was given in the interviews to establishing whether such events had taken place, as indicated by the eventual exclusion of member 1, so the likelihood that a link was missed was low.

Centrality

The centrality results are shown in table 7.5. One member, 8, had a much higher degree, with a score of 6, than the other six members. 4 and 5 had a degree of two, while the rest had a degree of one. 8 was connected to all of the other members of the network, indicating that this member had co-offended with each of the rest. As the four members with a degree of one must be connected to 8, the two members with a degree of two, 4 and 5, must be connected to 8 and to each other. The clique measures would confirm this. Closeness measures, unsurprisingly, gave similar results. 8 had a substantially higher score than the rest, with 4 and 5 being slightly higher than the remainder of the network. As 8 was the co-offender for most of the network, then this member would be located closest to all of the members. A betweenness score was found only for 8, being located in the centre of the star. Likewise, the information score for 8 was much higher than the rest, with 4 and 5 slightly higher than the other four. As with the first case, the network

structure was quite simple, partially due to small network size. 8 was located in the centre of another star, but with two of the members also connected to each other.

Table 7.5 Centrality Results for Case Study 2				
Member	Degree	Closeness	Betweenness	Information
1	0.00	N/A	N/A	N/A
2	1.00	36.84	0.00	0.63
3	1.00	36.84	0.00	0.63
4	2.00	38.89	0.00	0.80
5	2.00	38.89	0.00	0.80
6	1.00	36.84	0.00	0.63
7	1.00	36.84	0.00	0.63
8	6.00	50.00	0.00	1.15

Subgroups

The one clique found (table 7.6) was the main member, 8, along with the two members with a degree of two, 4 and 5. The 2-clan measure included all members.

Table 7.6 Subgroups for Case Study 2
1 clique found.
1: 4 5 8
1 2-Clan found.
1: 2 3 4 5 6 7 8

K-Core

A similar result for the k-core was found as for the first case study. The members with a degree over one, the clique, formed a potential core (table 7.7).

	Member
Degree	1 2 3 4 5 8 6 7
3
2	. . . XXXXX . .
1	. XXXXXXXXXXXXXXX

Cutpoints/Knots

As final confirmation of the structure before running the SSA, the cutpoint measure (table 7.8) identified the central location of 8 through being the cutpoint for 2, 3, 6, and 7.

Cutpoint	Knot
8	3
	4 5
	6
	7
	2

SSA

The SSA plot (figure 7.3) had 8 in the central location, with the rest of the network spread around this member. Addition of links (figure 7.4) revealed that. As expected from the cutpoint measure, all of the members, bar two, were directly linked only to 8. 4 and 5 were also co-offenders. 1 was linked to no one, as this offender was not actually part of the co-offending network.

Figure 7.3 Organised Abuse Network 2

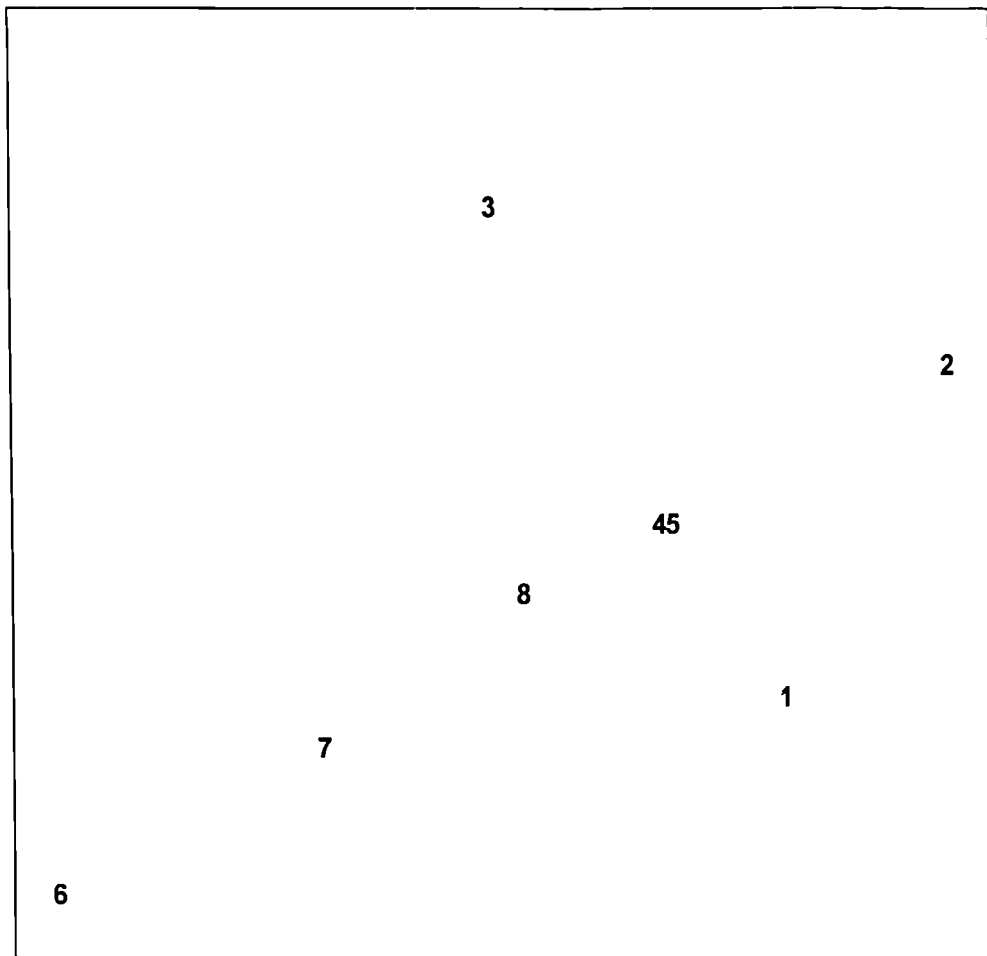
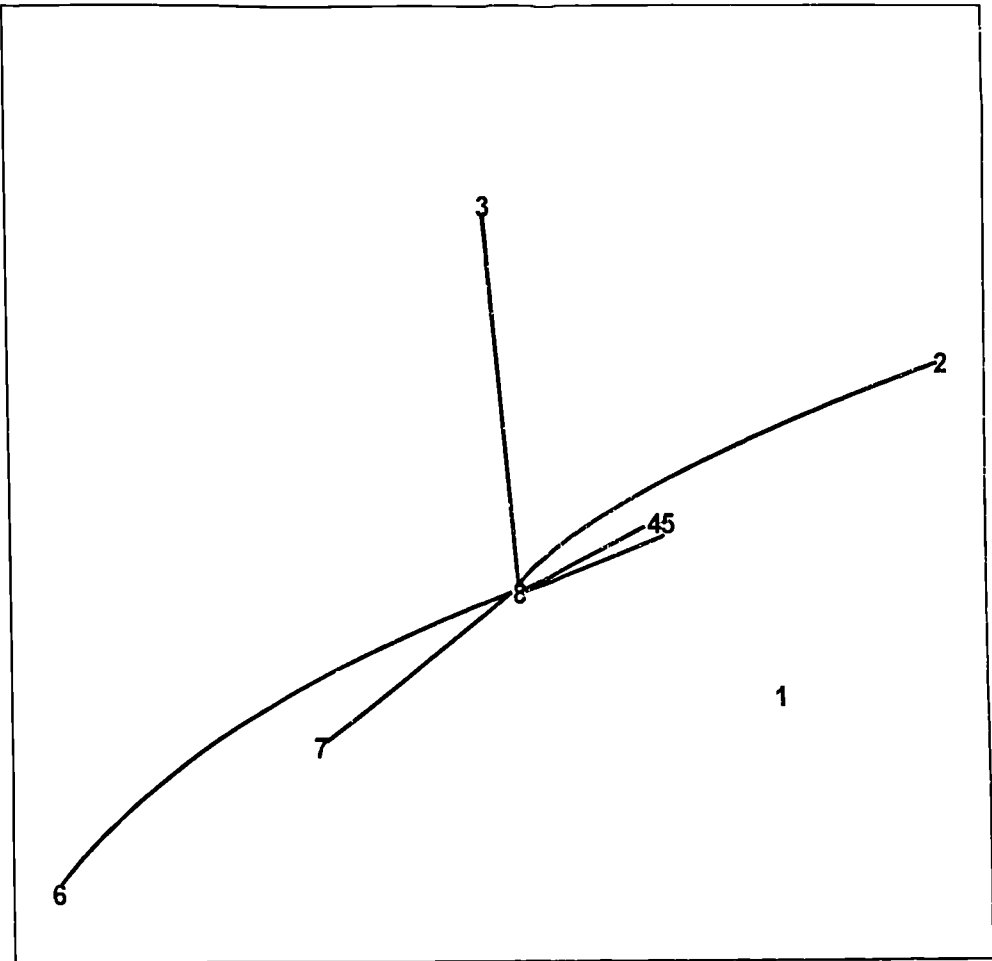


Figure 7.4 Organised Abuse Network 2



Summary

The network was, like the first case, a very simple structure. This was for two reasons. The first was the small size of the network limited the potential forms of structure it could take. Larger groups are required to be able to distinguish subgroups and cores. They are unlikely to develop in a network size of seven. The second reason for the simple structure was in the nature of the network. The case file gave a number of details about the members. 8 was very much the organiser of the network, getting members involved and selecting and recruiting new ones. The network was very much run to benefit 8 in that member's offending activities. 4 and 5 were romantically linked and were living together at the time of the offences. All three had engaged in offending behaviour together, rather than separate offending with 8/4 and 8/5, while 4 and 5 had offended together without 8. Both 3 and 7 had engaged in correspondence with 8, exchanging letters and photos. When interviewed, no one offered evidence against 8, nor did 4 and 5 offer evidence against each other. 7 did suggest 3 might be responsible, while 8 suggested the same for 4. While the members did not offend together, at least 7 and 8 were aware of the involvement of 3 and 4. This may have been through contact or through 8 revealing others in the network. Either way, these members did not feel any need to try to protect 3 and 4, but did not offer up the main instigator, 8. The structure arose out of the relationship between 8 and the other members. When co-offending took place, outside of 4 and 5 co-offending only with each other, 8 was always included. As the network was basically run for the pleasure of 8, it would be structured around him.

Preliminary Findings on Organised Abuse Networks

The aim of the chapter was to explore the application of structural analysis to organised abuse networks. In that sense, the results were promising. Analysis of the associations between members in the networks, using the various SNA measures, allowed for a greater understanding of their structures for both the information and abuse networks. Both had relatively simple structures - star patterns based around a key individual. There were other connections among members, but most were to those key offenders. What will not be clear until much further, more detailed research is carried out is the extent to which these simple structures represent standard abuse networks. The exchange of child pornography on the Internet has the potential to involve very large numbers of members, with the only limitation being current members' distrust of potential new members, to minimise risk. It may be the case that the simple chains represented in the structures of these two networks may be mimicked at a large scale for other abuse networks. A chain affords protection for members by allowing any given member to know only those member to their "left and right" on the chain. Larger cases would be required to explore this hypothesis. An additional area of application of structural analysis to abuse networks involves use in police investigations. While the practical applications of the SNA measures for intelligence analysis are discussed in Chapter Eight, a few points directly relevant to abuse networks are given below.

Network Structures and Investigative Implications

Examination of organise abuse network structures, through looking at such things as the communication patterns of letters, could influence investigations in three ways:

- Structural analysis - identification and prioritization of members in terms of relative importance in the network, determining the presence of subgroups and determining key communication links in the network
- Interview strategies - adopting different approaches to interviewing members who play a key role in the network compared to members on the periphery, e.g. for the former, playing on the importance of their role in the network, while emphasizing the latter's sense of relative lack of commitment to the network to obtain information
- Obtaining evidence - members who act as key "gatekeepers" in the flow of interactions may be centres for physical evidence, e.g. large quantities of child pornography. Those more involved in the network are more likely to be actually involved in abuse that has taken place.

Chapter 8. Intelligence Analysis and the Structural Analysis of Criminal Networks

The measures examined as means to understand how criminal networks are structured also have the potential to be applied to criminal intelligence analysis, where understanding such structures have implications for investigations. Information management has always had an important role to play in policing, ranging from the effective handling of informants (ACPO 1994) through to complex data storage/management systems such as HOLMES. The use of intelligence in whatever form, e.g. informants and records of financial transactions, has increasingly become a key part of police investigations, particularly when dealing with criminal networks of any form (Anderson and Peterson 1990; Maguire and John 1995; Schneider 1997). At a proactive level, information is used to prevent crimes from taking place or to ensure a police presence when the crimes are carried out. Identification and targeting the core minority of criminals that commit the majority of crimes is another aspect of intelligence-driven policing. Pittman (1996), for example, found that the most crimes committed by gangs were actually carried out by a “core” of 15-20% of the members. Focussing on these individuals will increase the likelihood of their removal, albeit temporarily, from the system. When studying networks of any size, the investigators will try to draw out certain aspects of the structure to aid both investigation and prosecution (Humphries 1996), with the ultimate aim of identifying methods to disrupt or destroy the network:

- Who is central and peripheral in the network? Targeting these individuals for intelligence gathering and removal would disrupt the network.
- What are the different roles or jobs within the network? Removal of individuals with unique roles would disrupt the network.

- What subgroups exist in the network? Elimination of subgroups or those that connect subgroups to the network would cause disruption.
- What are the important communications and methods of communicating?
- Which individuals should be removed to disrupt the network?
- What individuals might be more likely to give information to the police? Use of informants is a key part of strategies to gather intelligence about criminal operations.
- What is the overall structure of the network?

To achieve its goals, the intelligence process involves a series of stages, with the exact number depending on the author describing the process (e.g. Prunckun 1996; Schneider 1997). One version involves five stages - collection, evaluation, collation, analysis and dissemination (Humphreys 1997). The structural analysis of criminal networks takes place in the fourth stage of the process. This is where the SNA measures may have application.

Current Criminal Intelligence Analysis - to what extent does it achieve those objectives?

A major part of current intelligence analysis on criminal networks involves the conversion of large amounts of information into an understandable and interpretable format. One of the main ways this is achieved is through the production of graphical representations of networks. The standard form of analyst-drawn visual representation, the link chart, is based on the ANACAPA system (Sparrow 1991). Using this system, various categories, e.g. individual members of the networks,

vehicles, addresses, are given specific symbols. Sparrow identified three guidelines that affect the layouts produced:

- The analyst will try to place individuals relative to each other - the stronger the association, the closer together they will be.
- For clarity, the analyst will move individuals around to avoid connecting lines crossing each other.
- The analyst will aim to place the individuals with the most connections (highest "degree" - see below) in the centre of the graph. The lower the individual's number of connections, the farther out that individual will be.

The end result is a two-dimensional representation of the network, showing the links between individuals, for example, living at the same address, the strength of association between members and a rough guideline to a member's importance, determined by how central they are on the plot.

Sparrow describes several potential problems with the approach of having the analyst do the graphical representation "by hand." The first of these is the limitations of two-dimensional representations. Often, the complexities of a network will prevent the analyst from accurately representing the relationships in only two dimensions. Sparrow admits, on the other hand, that two dimensional images are much easier to understand and interpret. Not having lines cross also makes for easier interpretation, but may make the diagram not accurately represent the network. In a two-dimensional layout, minimising crossed lines may be difficult without some significant alteration of the diagram. This limitation can prevent an accurate model being created of the connections between individuals relative to all the other connections, as individuals will be moved from one location to another. Finally, Sparrow points out the use of degree as a measure of centrality is arguable in both crime analysis. Degree can represent how much information is known about an individual rather than the amount

of contacts he or she has in reality. If an individual is seen as central to a network early in the intelligence-gathering phase, then he or she will be the focus of more intensive observation. Since a greater amount of information is being gathered, more connections are likely to be found, making that individual seem relatively more important. This cycle continues, whether the first assumption is accurate or not.

More recently, computer-aided analysis has come to the forefront. Software packages have made the production of such images faster and more effective. The software automatically generates links and the graph (or chart) can be presented in a variety of formats. These different layouts include circular diagrams, illustrating connections without placing one individual in the middle relative to the rest, or graphs with crossed lines. However, the assistance the computer gives can go beyond just creating diagrams. The limitation of the current level of analysis is that the information gathered is only being converted from one form, such as phone bills, into another, a generated graphic that is easier to understand. What is required are methods that can aid that decision-making process of the crime analyst, e.g. scientifically proven procedures that show what subgroups may exist in a network. The analyst can then take these results and compare them with what she or he knows about the network, leading to the identification of new ways of developing the investigation. Such decision-support methods change the process of analysis from just making intelligence out of information into using the information as data that can be scientifically analysed (Heritage 1996). What is required is the identification of methods and research in the social sciences that have the most application to this particular aspect of intelligence analysis (Prunckun 1996). The work carried out in the previous chapters shows that the measures drawn from SNA have a great deal of potential for direct application in intelligence analysis, as outlined below.

SNA Techniques and Intelligence Objectives

One area of SNA is already extensively used in crime analysis. The ANACAPA diagrams described above are variants of the sociogram, a method developed by Moreno (1934) in the earliest days of SNA. The formats are the same, with guidelines for the selection of icons to represent people, locations and types of relationships, and how to design the layouts of the charts. Moreno and associates used sociograms to develop a better understanding of the impact of interactions on social relationships. Over time, researchers in the field began to look for more scientific methods of exploring relationships. The problem with sociograms was that they were too individualistic, although they remain an effective method to examine subjective views of networks by members of those networks (McCluskey and Wardle 1997). A researcher examining a network from the outside requires more rigorous methods, when possible. A wide range of the SNA measures that have come out of the development of such methods have implications for the analysis of intelligence. They are best grouped by referring to each of the intelligence objectives listed above.

1. Who is central and peripheral in the network?

Centrality in SNA defines the relative position of individual members within a network, in terms of power and influence. Within any given network, there will be a continuum of levels of centrality, ranging from those individuals who are leaders or have a major impact on the network through to those individuals with little involvement with or influence on the network. Determining where an individual falls in such a continuum is very important for investigators who are trying to develop an understanding of how the network operates. Chains of command, leaders and subordinates must be identified to allow for prioritisation of targeting. The advantage of the SNA approach is that it can identify individuals who are not obviously central to the network (i.e. not leaders) but who hold central positions in other ways, such as controlling communications.

The one measure currently used in crime analysis is **degree** - the number of other points to which one point is adjacent. As mentioned previously, there is a danger that degree represents amount known about an individual, rather than how central that individual is. This does not necessarily mean that the measure is inaccurate, but analysts must use it with caution. In the first ram raiding case, the member with the highest degree was the only link between a particular grouping and the rest of the network. **Betweenness** is a particularly useful measure for intelligence analysis as it will not just indicate individuals who have many connections, but also those who act as key channels for the flow of transactions. The major figures in the computer theft network were so influential not because they were more connected, but because they were the intermediaries between the separate parts of the network. **Closeness** is also dependent on examination of geodesics. Closeness, then, represents a different form of how "connected" a point is to the network. It is not the number of connections the point has, but how easily that point can contact all other points, with the least number of go betweens. **Information** is a measure of how involved a point is in all possible connections in the network, not just the shortest ones. The applications of the information scores are the same as for betweenness. Using a variety of centrality measures will allow the analyst to identify two groups of individuals.

- Those individuals who are well connected, such as in the example above
- Those individuals who play a key role in the flow of contacts within the network, but who may not appear to be well connected relative to the rest

Both groups of individuals, which will frequently overlap, could warrant targeting for further intelligence gathering or removal from the network.

2. What subgroups exist in the network?

Identification of subgroups has several uses in crime analysis:

- When examining networks, subgroups may represent specific groups that operate as teams or groups with specific roles. For example, the drug network with dealers and doormen very much unconnected with each other. Through identification of subgroups as they develop, the police can take steps to disrupt or destroy them.
- Identification of subgroups can give insight into the structure of the group - whether it is organised into separate "cells" connected by key people or into a hierarchy of groups with, for example, a core of leaders at the top. An additional feature is the identification of teams within the network. These teams may be devoted to particular activities, e.g. a team of individuals within a drug network who are primarily involved in financial matters. Targeting these individuals, using financial investigations, would be effective not just for investigating them, but for other network members who are connected to the subgroup.
- Subgroups may represent the core members of a group or different cells of offenders. Identification of such individuals would have a major impact on the emphasis of target selection within such networks. Core subgroups were found in the ram raiding and general burglary cases, as well as the first and third drug networks.

For criminal groups, analysts can also use **components** to identify wholly separate networks and individuals who are isolated from those networks. Those wholly separate networks may then be subjected to separate analyses. Additionally, lack of connections might suggest that there is insufficient information about the links between different sections of the graph. The analyst could request further investigation

of these "empty zones." An additional approach that comes out of the component idea is the production of link diagrams or other visual representations using cut-off levels, e.g. only using links where individuals have been in phone contact with each other at least six times. A new link chart based on this criterion would highlight concentrations of communications by removing individuals not frequently involved in the network.

3. What are the important communications and methods of communicating?

Another approach to intelligence analysis is focussing on specific interactions between two individuals rather than on individual members. Key communication channels are those interactions that move highly relevant information from one part of the network to another or pass along new information that comes from outside the network itself. For communications within the network, several measures are relevant. Individuals with high betweenness or information scores would be involved in key communications. In addition, **cutpoints** and **knots** could be used to determine the role of key points in the structure of components within the network. Cutpoints can play a pivotal role in the flow of resources or information through the components, and possibly through the network as a whole. Cutpoints function, in a sense, as "gatekeepers" between the various sub-components. The obvious application of cutpoints for crime analysis is in the identification of individuals whose removal from the network will result in its break-up or disruption. The case study where the highly central members were the intermediaries between the leaders and dealers illustrates this. They may not be the heads of the network, but structurally they occupy key positions.

With regards to new information coming from outside the network, or between highly distinct parts of the network, Sparrow discusses the importance of the existence of **weak ties**. A concept developed by Granovetter (1973), weak ties are infrequently used key communication channels through which groups of individuals interact in order to access new information. These differ from the **strong ties** that exist between

individuals who are in frequent contact with each other, and so have access to the same information. This idea lead Sparrow to two propositions:

- More important communications/interactions are likely to occur through weak ties.
- Targeting the weak ties for disruption will have a significant impact on the ability of the network as a whole to interact quickly and effectively.

There is no specific measure for identifying weak links per se. It is rather a concept for the analyst to be aware of. In two of the drug networks, isolated, poorly connected individuals turned out to be connections to outside criminal networks. This would be an area definitely worth further investigation, in terms of practical implications and highlights the need to use structural analysis in conjunction with other intelligence.

4. What individuals might be more likely to give information to the police?

Determining which individuals may be more likely to give information can be an important part of gathering sufficient evidence in order to prosecute offenders. SNA can facilitate this process in two ways. The first method is based on individual centrality. Peripheral network members may perceive themselves as less a part of the "group" than members more deeply involved. Peripheral individuals, then, may be more likely to give information to the police. Targeting these individuals is something of a trade-off, however. Being less involved in the network also means they are likely to have less relevant information about the activities of the network. Targeting of high level members would yield the best information, but they may be too loyal to the network to reveal useful information. Members who are in the middle-range may be the best compromise between willingness to give information and quality of information. In the drug network case where such information was available, the central members in the core turned against a central member outside of it, while that member gave evidence against one of the core members. The second method is a

similar process, but involves a series of reanalyses of a network at different stages of its existence. As loyalties shift and individuals gain and lose influence, their positions in the structure of the network will also shift. Over the series of analyses, some individuals may be continually shifting into increasingly less central positions. These individuals may see themselves as rejected by the network and may begin to feel increasingly frustrated with their position. As a result, they may be more open to giving the police information when the opportunity arises. The advantage of the second approach is that the individuals being targeted were originally in positions of influence and would be more likely to have highly significant information.

5. What is the overall structure of the group?

An understanding of the overall structure of the group can aid in interpreting the results obtained from the other methods. As mentioned before, a problem exists in presenting accurate visual representations of networks. Software packages have gone a long way towards alleviating this problem, by giving a variety of options for layouts, e.g. standard ANACAPA linking, circular patterns, link charts with lines that can cross. An alternative approach is to use one of several packages in the social sciences that carry out multidimensional scaling (MDS). Examination of an SSA plot can reveal several features of a network:

- Strength of association is the most basic feature. Those points far apart have less relative association within the network. Groupings of individuals near each other can suggest subgroups, which can be supported through the various measures for identifying subgroups.
- A second feature is some indication of potential core and peripheral members. Individual points in the centre of the spread of points have a more central position in the network. Points out on the edges have a more peripheral position. Again, these results can be confirmed through measures of centrality and influence.

- The SSA allows the researcher to look at the overall layout of the network, e.g. highly decentralised and spread out versus tightly linked together.
- A final, as yet unexplored feature of the SSA is the indication of potential gaps in the intelligence information. Areas within the spread of the network may be void of points, a sort of “vacuum.” This area may result from a lack of strong associations between different parts of the network, resulting in their moving away from each other on the graph. An alternative explanation is that associations may be present, but have not been picked up, for whatever reason, by the intelligence. The analyst may suggest further investigation into these areas of vacuum.

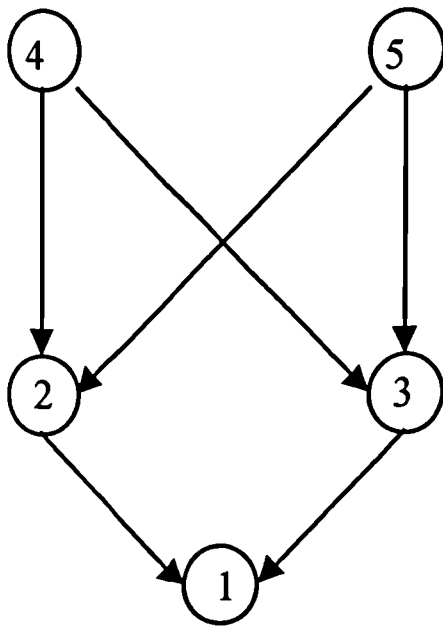


Figure 8.1 Equivalence example from Wasserman and Faust (1994)

6. What are the different roles or jobs within the network?

The term "role" in SNA refers to the patterns of connections as opposed to a job definition. Two individuals have the same role within a network if they have connections with the same people. This is illustrated in figure 8.1, taken from Wasserman and Faust (1994). Points two and three have the same roles, in that they are both connected to points one, four and five. Likewise, points four and five are equivalent as they have the same pattern of connections - to two and three. Sparrow (1991) termed equivalence measures as including substitutability, stochastic equivalence and role equivalence. For substitutability, if an individual has a counterpart(s) who can maintain the same pattern of connections, then that individual is less important than someone without substitutes. Stochastic equivalence, which does not require exactly the same patterns, would fulfil the same purpose. It has the advantage of being adaptable to incomplete information about connections between points (though Sparrow does not state this). The main use of role identification is the targeting of individuals with relatively unique roles, rather than those who share the same role with others. The removal of one of the latter members would have little impact on the network, as others could replace him/her. Role equivalence is slightly different, in that it is a comparison of individual roles in separate networks. Role equivalence can be used to develop typologies of roles in similar criminal networks. This would allow investigators to develop the most effective strategies for dealing with general roles, rather than having to examine each individual separately.

7. Which individuals should be removed to disrupt the network?

Disruption can be as important for policing of networks as actual arrests. Preventing a network from operating effectively will reduce its ability to carry out further criminal activities, while the investigation continues. Several of the measures already detailed can aid this aim. Most of the key measures mentioned so far have highlighted different ways to disrupt networks. Removal of central individuals, as identified through such measures as degree, will have an adverse effect on leadership or

organisation. Removal of central subgroups would also have such an effect. The elimination of individuals with the most influence on the flow of communications will prevent the network from interacting successfully. Measures such as betweenness and information would aid in identification of such individuals, as would determining weak ties within the network. If these network members who tie subgroups together, such as the cutpoints that link together knots, can be identified, such as the cutpoints that link together knots, then their removal will prevent these subgroups from interacting. Finally, the identification and elimination of individuals with unique roles within the network would also disrupt the network, as other individuals would not have the necessary connections to easily replace their contribution to the network.

Conclusion

Many potential areas exist for the application of SNA to the structural analysis of intelligence on criminal networks. The first major area is the examination of criminal activities by groups ranging from teams through organised crime to general networks. This has been the main focus of the chapter. Other applications have been only touched upon. Potential areas for further application are discussed in Chapter 9.

Chapter 9. Conclusions

The findings from all three chapters indicate that there are structures to criminal networks. These structures do not manifest themselves in such a highly developed ways as organisations, but they are more complex than simple groups. When networks form within markets as a collection of individuals with common intent, social forces immediately begin the process of shaping those networks into structures that can function with the restrictions and opportunities of the markets they operate within. While crime markets are superficially similar, in that they exist in conflict with the letter of the law and must function surreptitiously, there are major differences. The extent to which the activity is considered deviant within the culture it operates within will affect the market. The more deviant the focus of the market, the more the need for secrecy and protection from agents of the State. The exchange of child pornography is considered more deviant than the selling of marijuana. The levels of profit and competition, the ease of entry and other factors described by Williams (1993) all contribute to the market, as do levels of supply and demand. All of these factors create market pressures, pressures that encourage certain network structures to develop in favour of others. This can be seen in the differences between the drug, property and, though with a limited sample, organised sexual abuse.

Comparing the Networks

The major similarity between the two groups of networks was the existence of different levels of influence and control between members. In almost all of the networks, there were clearly key members within the network structure. These individuals, across all the measure of centrality and in the SSA diagrams, ranked at the top end of scores. While not necessarily leaders, as in the case where the highly central members were intermediaries in two of the drug networks, these members had power in terms of their network positions. Other members were less central, often with a number being quite peripheral, e.g. connected into the network only though

one of the more central members. This is structure manifesting itself in its most basic form. Differences in network exchange are what allow networks to develop beyond simple cliques. In the cases where background details were available, these key figures were always either leaders of the network or their intermediaries, In either case, the structural power was a reflection of actual power. Control of information and resources is vital to maintaining power in a criminal network, and establishing network structures to do so, within the limits of the market, is necessary to achieve this.

The relationship between the key members differs between the drug and property networks. The basic core is a cluster of individuals within the network, all of high centrality, with strong levels of association with each other, relative to the rest of the network. While the drug networks often (eight of twelve cases) form distinctive cores, the same can not be said for the property networks (five of eleven cases). Two reasons for this difference are the nature of the markets and the nature of the networks themselves. Drug markets differ from property markets in their need for organisation within the networks. Drug trafficking and dealing is considered, by and large, a more serious form of crime than burglary, particularly by law enforcement agencies and government. Involvement in drugs is desirable, as profits can be substantial, but risks are also higher. The distancing of core members from the rest of the network alleviates some of that risk by separating the leaders from the actual drugs. This separation manifests itself structurally by the division of a core and remainder of the network. In the property networks, levels of required organisation are lower, with more direct involvement between key and peripheral members. The ram raiding case, with its relatively high complexity, on the other hand, did have a distinct core that were the leaders of the network. Cores also form out of common association and social and familial ties. These ties can also form subgroups, such as in the ram raiding case study or the subgroup of burglars that were also friends in property case three. It can not be not be stated that drug networks will have cores and property networks will not. Market pressures, however, make the formation of cores in drug networks more likely.

The second reason for the difference in presence of core is in the nature of the networks. While the drug networks cover a wide range of activities, the property networks were largely centred on burglary and handling. The interaction between burglars and handlers has been found by most authors to be direct (Cromwell et al. 1991, West 1978). This was true whether it was professional burglars stealing to order for high level handlers (Klockars 1974) or drug addicts selling to the public or pawnshops. Some mention has been made of intermediaries bringing burglars and handlers together, but not acting as conduits for the stolen goods themselves (Maguire 1982). This direct interaction may well reduce the likelihood of the formation of cores that were more or less separate from the rest of the network. The other aspect of the nature of the networks was that drug networks were centred around a common task. Outside of one of the case studies, users were not included in the membership. This meant that the networks all represented the supply side of the drug market. The exchange of goods for money between handlers and burglars were part of the larger market, as an interaction of supply and demand. The burglary networks, then, were organised around a common activity, rather than the common task of the drug networks. The common activity involves two separate tasks, theft and handling, that interact. Neither typically require the degrees of organisation demanded by large-scale drug trafficking.

Presence of subgroups within the network seemed to be more a function of network size than focus of the network. This indicates that networks begin to form subgroups when network size becomes too large for individuals to have ease of access to the rest of the network. This limitation encourages focussing on those individuals in a given member's network "neighbourhood" over the others. This results in the formation of the subgroups. These groups may be indicated in the network structure through the specific measures, as was the case in most of the networks with subgroups, with the ram raid case being an excellent example. The first drug network highlights that subgroups can be present with connection to each other, however, with the doormen and dealers being two distinct groupings within the overall network structure, but not being subgroups in the SNA sense.

Mid-level members did not feature as prominently in the property networks. Additional layers of division in structural influence represent more complex network structures. As has already been established by the existence of cores in the drug networks, these tended towards more complex structures than the property ones. Another point of difference was the amount of isolated single members in the two types of networks. These isolated members were more common in the drug networks than in the property ones. Where intelligence was known, the isolates in the drug networks were contacts to other networks. As mentioned in Chapter Five, these isolates represent Granovetter's (1973) "weak ties," sources of new information and contacts. There were two reasons for the lack of such figures in the property networks:

- the lack of information sources in the networks
- the integration of handlers into the larger network structure

Again, these relate to differences in the type of networks being studied, with the drug networks not including suppliers and buyers, while the property networks with handlers included supply and demand features. In comparison to the other two network types, the abuse networks were very simplistic. The networks were both structured around one or two individuals, with star patterns in both. None of the other features of the first two network types were found.

What all three network groupings have in common, and was the one feature that ran throughout the literature, as well, was the imbalance of power. Structural positions were not equal across members for almost all of the networks in this study. Certain individuals, alone or in cores, had more dominant positions in the network than the majority of the rest of the members. These could have been leaders, right-hand men, intermediaries or employers. All had structural positions of influence.

The Structure of Networks

In general, the literature on criminal networks has taken three approaches to discussing their structures. A portion of the literature describes criminal networks in terms of their properties as groups or social entities, covering the work on juvenile gangs, armed robbery teams and ethnographic accounts of criminals in their day to day lives (e.g. Farrington 1990; Foster 1990; Henry 1978). A second theme is the criminal network as organisation, such the classical definitions of organised crime (e.g. Cressey 1969) and some work on drug trafficking (e.g. Williams 1993). Finally, criminal networks have been described in terms of their similarities to markets (e.g. Kock, Kemp and Rix 1996; Ruggiero and South 1997).

Each of these themes does have its strengths, in that each gives an accurate account of some subsection of criminal networks or qualities that many criminal networks possess. Many researchers have, while holding to one position, made mention of features that tap into other themes. Ruggiero and South (1997), for example, make mention of a hierarchy in drug markets based on ethnicity, with white importers/distributors and black dealers, and controls to ensure the status quo is maintained. The literature shows that each of the structural themes above have some role to play in criminal networks, with the specific dominant themes dependent on network size, individual roles and power, division of labour, the nature of the relationships between members and the kinds and amount of criminal activities. All of these features impact on and are impacted on by network structure. This structure comes out of the interactions between network members. The findings and the literature both indicate broad types of exchanges which can be distinguished from each other and are based on the relative positions of those engaged in the exchange and the kind of interaction.

The Nature of Interactions

Two major themes come out of the literature on criminal networks. The first focusses on the nature of the network interactions. In social exchange theory (Brucke 1997), there are two forms of exchange in interactions. The first are negotiated exchange, where one thing is exchanged for another immediately. This covers bargaining, financial deals and any sort of business transaction where there is specific exchange of goods, actions, materials or money. The drug deal, where drugs are immediately exchanged for money is a good example of this, as is the purchase of stolen goods. The other form of exchange is reciprocal, where there is no direct and immediate benefit to one of the parties involved in the exchange (Molm, Peterson and Takahashi 1997). This would cover favours, doing actions without any expectation of return or any form of long-term deal. One example would be where one member supplies drugs to another as part of a general framework where those who have drugs give to those who don't, with the favour being returned at some later date. Another example would be patronage appointments. These forms of exchange involve much higher levels of trust, as there is an acceptance that the other party will, at some point, be willing to respond in kind.

In reality, this split is more of a continuum, as there are gradations of degree of negotiation and reciprocity. Some acts are completely altruistic, others will gain the individual some benefit in the future. One, then, is more reciprocal than the other. Criminal networks exhibit interactions along this continuum. Interactions within families, closely knit groups or distinct ethnic groups have been found to be more social and involve higher levels of trust relative to those outside the grouping. The Triads exhibit an extreme form of this, with very exclusive membership and a high level of mutual support (McIllwain 1997). It is only more recently that membership in some triads have been expanded to include individuals who are not native-born Chinese. Some systems of informal banking allow for extensive informal economic and criminal activities to be carried out amongst members of certain ethnic populations, such as Afghanis, when the system is based primarily on trust, and

mirror the local informal economies that drive the underground economy in the West. When families make up the key members of criminal networks, they are very supportive of each other (Potter 1994).

The distinction, then, is between those who primarily are involved in the more reciprocal forms of network interactions, and those that take part in negotiated exchanges. Those in the former represent a more “internal” system of exchanges. The latter are more “external.” The second theme expands on this differentiation in terms of the **balance** of the interactions that take place. These can be broadly grouped into two categories, which, again, merely represent two ends of a continuum. An unequal balance is where one of the two people engaged in the interaction is in a dominant position relative to the other. The leader of a gang has more advantageous position in exchanges than a regular member. “Respect,” as described by Walsh (1986), is also a form of unequal exchange. Equal exchanges are those between individuals with relatively equal power. An example would be a simple purchase of stolen goods.

From these themes comes four possible combinations, as shown in the table below. Where the balance of the exchange is equal, the forms of exchange are the normal reciprocal exchange for internal forms and negotiated exchange for external. The exchange of a stolen video in a pub is a criminal act. If money is involved it is a basic negotiated exchange. If it is a gift, then it is a reciprocal exchange. The nature of the exchanges alter when there is imbalance in relationship between the two people involved. For internal forms of exchange, this imbalance will take such forms as leaders and gang members in prisons (e.g. Fong and Buentello 1991) or patrons and clients (e.g. Lomnitz 1988). In the more business-like external interactions, the form will be of principals and agents (Strong and Waterson 1987). This is where individuals carry out activities on behalf of other (e.g. Jenkins 1992). It is hypothesized, based on this four-way split that

- criminal networks that are unequal/internal will be structured with a core/periphery split, representing the inequality between members, but that

peripheral members will have extensive access to each other, as part of the ongoing reciprocal exchange, e.g. gangs, teams of professional armed robbers

- unequal/external will also have a core and periphery, with the core highly cohesive, and the peripheral members being in separate subgroups or as individuals (internal ties likely within the core) The largest versions of this will be the most organised forms of organised crime, where the “made men,” actual triad members etc. will be the core of principles, internally tied to each other, and the remainder of the network will be more like agents (Ruggerio and South 1997)
- equal/internal (also includes cores in u/e) networks will be criminal groups, where there is no distinct differentiation, e.g. early drug networks in the UK, or cores within larger networks
- equal/external are networks with less cohesion, and large numbers of connections, encompassing the more market-like forms, e.g. stolen goods, some handling arrangements, periphery of the u/e, general market of crime

Table 9.1 Exchange in Networks			
		Form of Exchange	
		Internal	External
Balance of Exchange	Equal	Reciprocal Exchange “The Club”	Negotiated Exchange “The Marketplace”
	Unequal	Leader/Member “The Family”	Principle/Agent “The Business”

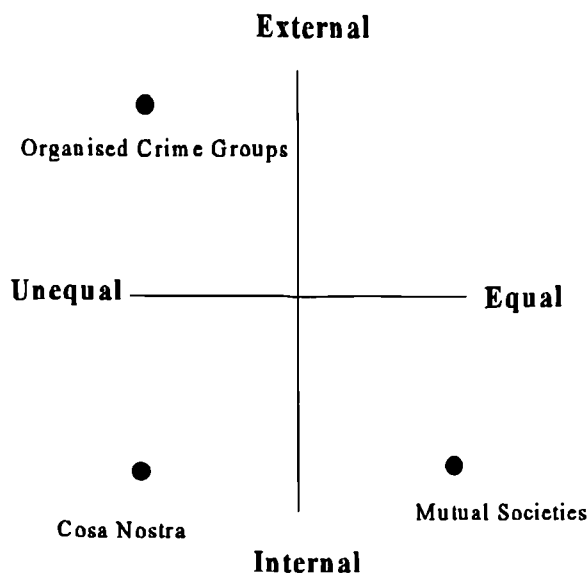


Figure 9.1 Criminal Network Dimensions

It should be reiterated that these do not represent distinct types. Both form and balance are continua, with criminal networks, falling along the axis of each at varying points. In figure 9.1, then, the traditional model of the Cosa Nostra, would fall in the far lower left, with a high level of unequal balance (a highly structured organisation) and a primarily internal form of interaction (superiors do favours for underlings in return for loyalty; inferiors “work” for their bosses). A more accurate representation of the operations of organised crime groups would place the Mafia in the upper left, where the relationships between the core members and the peripheral “employees” would be more business orientated. The “mutual societies” (Dorn, Murji and South 1992) is an example of an internal form of network (where individuals give each other drugs with no immediate financial or other gain) and no differences in balance exist (primarily a group of friends). A burglar selling goods to a handler on an ad hoc basis would be an unequal external exchange, but if the goods were stolen to order, the

exchange would have shifted towards a more internal form, with the beginning of a development of a network within a market. These two continua, while describing the social interactions between individuals within networks are shaped as much by market forces on the network as on the actions of and relationships between the members. Minimising risk in drug markets encourages not only physical separation from peripheral members, but also more business-orientated, less social interactions, creating a different form of exchange.

Further Research and Practical Applications

The proposed model is a starting point to highlight the impact of the nature of exchanges on the structure of criminal networks. The results from the study have shown that imbalances exist in criminal networks, resulting in and arising from the structure of those networks. To develop an understanding of exactly how those imbalances manifest themselves requires examining networks both at the overall network level, e.g. core groups, and in sections of networks, e.g. the development of distinctive subgroups. This must be done in the context of particular markets, where network similarities will emerge. The first major area for further research is the examination of criminal networks on a much larger scale. Analysis of dozens of drug networks at a particular stage in the trafficking process and for a specific drug would allow for determining if consistent structures exist for that given area of that particular market. Ram raid teams would be another area to study, only touched on here. Further work to expand analyses of organised sexual abuse networks would also be required. The same holds true for markets that have not been examined in this research. Another area is the study of prison populations. Using security information, networks of offenders could be analysed. The relatively confined network within the prison may prove to be a particularly fruitful way of exploring criminal interactions. This could be done at the level of prison gangs (Fong and Buentello 1991), certain markets within the prison, such as contraband goods and drugs (Stevens 1997) or at the broad level of the network of inmates in the prison as a whole.

A particular application is the identification of how potential problem subgroups might develop within prison networks. As a prison network is analysed and reanalysed over time, a group of individuals may shift towards forming a subgroup as they increasingly interact with each other. This process could be very helpful in understanding how networks form and change over time. At a practical level, once a group has been identified as engaging in a criminal or disruptive activity, steps can be taken to break it up by moving prisoners to new locations or taking measures to prevent the members from meeting. A final area for analysis is the examination of

links between criminal networks outside and within prisons. This could involve continued involvement in the “management” of criminal networks by incarcerated offenders, as well as criminal activity within the prison with links to the outside. The supply of drugs to prisoners is an example of the latter. The networks involved in moving drugs into prison, distributing them and paying the suppliers outside may then be investigated in order to identify any differences between these and other drug networks, as well as determining methods for disrupting their activities. Other measures in the SNA field need to be tested to determine their usefulness for understanding network structures. Granovetter’s (1973) weak ties must be examined in more detail/ SNA roles, as described in Chapter Eight also need to be applied to criminal networks to determine their use both academically and for intelligence analysis.

The relationship between informants and network position is another avenue of study. It may also highlight ways that can be used to identify potential sources. The emphasis is on assessment of the individual’s position - measures of centrality may highlight individuals who may be targeted as potential sources. Those individuals on the periphery of the network, like those with low levels of cohesion to a group, may feel excluded or have little loyalty to the network. Individuals in the middle-range, or those who hold key positions, in terms of controlling the flows through networks, but are not part of the core are a second level. They also may feel excluded, though from the benefits of membership in the top levels of the network. This exclusion, relative to their actual positions in the network could engender a willingness to act as a source. Those in the core of a network would be the most useful sources, but may be the least likely due to high levels of commitment. This points out a key aspect of the process of identification of sources through group or network membership. There is a trade-off between amount of involvement in a group/network and amount of information known. While low-level members may make more willing sources, they are also likely to have the least amount of useful information. Those with the most information would be the hardest to acquire. Research on the relationship between informing behaviour and network structures and positions would indicate the strength of these

arguments. For intelligence gathering, it shows how knowledge of position relative to power might be a major part of source targeting. Those individuals with high responsibilities and influence, but who have little power are could be the best sources.

An additional approach is through assessment of individual change of position over time. Repeated analyses of a network at various stages in its existence should be carried out. Individuals who move from positions of power to more peripheral locations in the network may be optimal sources for information as:

- they would be more likely to have high quality information than those members that have always been peripheral
- they may feel rejected or betrayed by the network as a result of their loss of position, and so may be more willing to give information.

To test this, it would be necessary to identify network positions for informants both at the time of informing and during the time previous to informing. If identifiable trends in network position could be determined for informants, then this would allow for an understanding of how structure affects commitment and cohesion.

Ultimately, research into a variety of forms of networks may allow for the generation of systems of classification based on structural components. Networks will differ in amount of hierarchical structure, what limitations are placed on general interactions, how varied or focussed their activities are, how subdivided they are and in their size. These factors will be influenced by the goals of the network, what kinds of time scales and geographical areas they are operating within and such elements as ethnic or familial ties. Consistent patterns of types of networks should emerge - networks with similar goals and operating conditions should form broadly similar network structures. Once consistent types have been identified, a system of classification can be created. For intelligence analysis, this system could be developed into a series of templates, to which new networks could be matched. Once this matching has been carried out,

flexible action plans suggesting optimal courses of action can then be implemented. These action plans would be developed based on two sets of information:

- guidelines based on what was determined to be the best plans of action used against the networks that making up that particular template
- details from the particular case on hand

The guidelines would give the analyst and the investigating officers direction as to what were effective or counter-productive actions against similar networks in the past. These guidelines are not intended to be accepted as the only option. No case will exactly match a template, so the analyst must be aware of specific details that may make some of the guidelines ineffective or make some more important than others.

Conclusion

Research into the application of SNA to crime networks is still very much in its early days. Work still needs to be done to determine the value of the various sources of data, e.g. phone records versus surveillance logs and informants. The issue of the quality of the data being received must also be dealt with. A number of other questions must also be addressed. For example, to what extent does the information the analyst receives reflect the emphases of the investigation and to what extent does missing data skew the results generated? SNA still holds great potential understanding criminal networks. Even this limited study has highlighted some underlying structural components of criminal networks. Structure in some form is almost inevitable for criminal networks, as in all social interactions. Without some form of consistency, the chaos that would result in human interactions would prevent any sort of social functioning, let alone markets, criminal or otherwise. A certain amount of stability is required for any network to operate effectively. Successful drug distributors are those with a regular supply. Professional burglars make long-term ties to professional fences. Organise crime members success is largely based on good contacts and access

to resources. Establishing trustworthiness, as well as a reputation for dealing harshly with betrayal, features as a major part of establishing a reputation. The ability for flexibility may be a key part of surviving in a criminal market place, but so is the ability to utilise structure. Matsumoto (1988) describes the fundamental role of structure in language:

According to Teruo Goko, in the Japanese language there are two kinds of 'things:' *Mono* and *Koto*. (Italics by author) The former refers to properties, or matter and energy, while the latter refers to the organizing relationships, or information that connect various *Mono*... (pg. 52)

Structure occupies every aspect of human experience. Criminal networks are no different. Networks, like individuals in their environment, are shaped by and shape the markets they operate within, and like individual behaviour, consistent patterns of structure will emerge.

Bibliography

- Association of Chief Police Officers (ACPO) (1986) *Final Report of the Working Party on Drugs Related Crime*. (Unpublished)
- ACPO Crime Committee (1994) *Guidelines on the Use and Management of Informants*. London: Association of Chief Police Officers.
- Adler, P.A. (1992) "The 'Post' Phase of Deviant Careers: Reintegrating drug traffickers." *Deviant Behaviour*, 13: pp. 103-126.
- Adler, P.A. and Adler, P. (1980) "The Irony of Secrecy in the Drug World." *Urban Life*, 8 (4): pp. 447-465.
- Adler, P.A. and Adler, P. (1983) "Shifts and Oscillations in Deviant Careers: The case of upper-level drug dealers and smugglers." *Social Problems*, 31 (2): pp. 195-207.
- Albanese, J.S. (1996) *Organized Crime in America*. 3rd edition. Cincinnati: Anderson.
- Albini, J.L. (1975) "Mafia as Method: A comparison between Great Britain and the USA regarding the existence and structure of types of organised crime." *International Journal of Criminology and Penology*, 3: pp. 295-305.
- Alexander, M.C. and Danowski, J.A. (1990) "Analysis of an Ancient Network: Personal communication and the study of social structure in a past society." *Social Networks* 12: pp. 313-35.
- Arlacchi, P. (1986) *Mafia Business: The Mafia ethic and the spirit of capitalism*. Oxford: Oxford University Press.
- Baerveldt, C. and Snijders, T. (1994) "Influence On and From the Segmentation of Networks: Hypotheses and tests." *Social Networks*, 16: pp. 213-232.
- Baker, W.E. and Faulkner, R.R. (1993) "The Social Organisation of Conspiracy: Illegal networks in the heavy electrical equipment industry." *American Sociological Review* 58 (Dec): pp. 837-60.
- Banman, N.A. (1994) "The Social Networks of Sex Offenders." *Dissertation Abstracts International, A: The Humanities and Social Sciences*, 55 (6).
- Barnes, J. (1969) "Graph Theory and Social Networks: A technical comment on connectedness and connectivity." *Sociology*, 3: pp. 215-32.
- Baron, J. (1988) *Thinking and Deciding*. Cambridge: CUP.
- Baron and Tindall (1993) "Network Structure and Delinquent Attitudes Within a Juvenile Gang." *Social Networks*, 15: pp. 255-73.
- Bennett, T. (1996) *Drugs and Crime: The results of research on drug testing and interviewing arrestees. Home Office Research Study 183*. London: Home Office.
- Block, A.A. (1978) "History and the Study of Organised Crime." *Urban Life*.
- Block, A.A. (1978) "Progressive-Era Cocaine Trade." *Criminology*.
- Block, A.A. (1989) "European Drug Trafficking: Between the World Wars." *Journal of Social History*.
- Block, A. A. and Chambliss, W.J. (1981) *Organizing Crime*. New York: Elsevier.

- Blumstein, A. et al. (eds) (1986) *Criminal Careers and Career Criminals*. Washington, D.C.: National Academy Press.
- Bonacich, P. (1989) "Power and Centrality: A family of measures." *American Journal of Sociology*, 92: pp. 1170-82.
- Borgatti, S.P., Everett, M.G. and Freeman, L.C. (1992) *UCINET IV Version 1.62*. Columbia: Analytic Technologies.
- Bourgois, P. (1995) *In Search of Respect: Selling Crack in El Barrio*. CUP: Cambridge.
- Breiger, R. and Pattison, P. (1986) "Cumulated Social Roles: The duality of persons and roles." *Social Networks*, 8: pp. 215-56.
- Brown, R. (1988) *Group Processes: Dynamics within and between groups*. Oxford: Basil Blackwell.
- Burgess, A.W. (ed.) (1984) *Child Pornography and Sex Rings*. Lexington, Mass.: Lexington Books.
- Burt, R.S. and Lin, N. (1977). *Sociological Methodology, 1977*. San Francisco: Jossey-Bass.
- Campbell, D. "New crime squad to track British villains in Europe," *Guardian*, 13/3/98.
- Canter, D.V. and Kirby, S. (1995) "Prior Convictions of Child Molesters." *Science and Justice* 35 (1): pp. 73-78.
- Canter, D.V. and Alison, L.J. (Eds) (in press) *The Social Psychology of Crime*. Aldershot: Dartmouth.
- Cartwright, D. and Harary, F. (1970) "Ambivalence and indifference in generalisations of structural balance." *Behavioural Science*, 15: pp. 497-513.
- Cartwright, S. and Cooper, C.L. (1992) *Mergers and Acquisitions: The human factor*. Oxford: Butterworth-Heinemann Ltd.
- Chambliss, W.J. (1978) *On the Take: From petty crooks to presidents*. Bloomington, ID: Indian University Press.
- Chatterson, M., Gibson, G., Gilman, M., Godfrey, C., Sutton, M. and Wright, A. (1995) *Performance Indicators for Local Anti-Drug Strategies: A preliminary analysis*. *Crime Detection and Prevention Series*, 62. Home Office Police Research Group. London: HMSO.
- Chesney, K. (1970) *The Victorian Underworld*. London: Temple Smith.
- Cicourel, A.V. (1976) *The Social Organization of Juvenile Justice*. London: Heineman.
- Clarke, R. and McGuinness, T. (eds) *The Economics of the Firm*. Oxford: Basil Blackwell.
- Cohen, A.K. (1977) "The Concept of Criminal Organisation." *British Journal of Criminology*, 17 (2) 97-111.
- Coleman, C and Moynihan, J. (1996) *Understanding Crime Data: Haunted by the dark figure*. Buckingham: Open University Press.
- Collins, R. (1988) *Theoretical Sociology*. New York: Harcourt Brace Jovanovich.
- Cressey (1969) *Theft of the Nation*. New York: Harper & Row.
- Cromwell, P., Olson, J. and Avary, D. (1991) *Breaking and Entering: An ethnographic analysis of burglary*. London: Sage.

- Cromwell, P., Olson, J. and Avary, D. (1993) "Who Buys Stolen Property? A new look at criminal receiving." *Journal of Crime and Delinquency*, 56 (10): pp. 75-95.
- Curtis, T. & Sharpe, J.A. (1988) "Crime in Tudor and Stuart England." *History Today*, 38 (Feb): pp. 22-29.
- Curcione, N. (1997) "Suburban Snowmen: Facilitating factors in the careers of middle-class coke dealers." *Deviant Behaviour*, 18 (3): pp. 233-253.
- Daniel, S. and McGuire, P. (Eds) (1972) *The Paint House*. Hammondsworth: Penguin.
- Davis, R.H. (1981) "Social Network Analysis - an Aid in Conspiracy Investigations." *FBI Law Enforcement Bulletin* 50 (12): pp. 11-19.
- deYoung, M. (1988) "The Indignant Page: Techniques of neutralisation in the publications of paedophile organisations." *Child Abuse and Neglect*, 12: pp. 583-91.
- Doreian, P. (1988) "Using multiple network analytic tools for a single social network." *Social Networks*, 10: pp. 287-312.
- Doreian, P. and Woodward, K. (1994) "Defining and Locating Cores and Boundaries of Social Networks." *Social Networks*, 16: pp. 267-93.
- Dorn, N., Murji, K. and South, N. (1992) *Traffickers: Drug markets and law enforcement*. London: Routledge.
- Dorn, N. and South, N. (1990) "Drug Markets and Law Enforcement." *British Journal of Criminology* 30 (2) pp. 171-188
- Durkheim (1947) *The Division of Labour in Society*.
- Duyne, van, P. (1996) "The Phantom and threat of Organised Crime." *Crime, Law and Social Change* 24: pp. 341-77.
- Duyne, van, P. (1998) "Mobsters are People Too." In D.V. Canter and L.J. Alison (Eds) *The Social Psychology of Crime*.
- Edmunds, M., Hough, M. and Urquia, N. (1996) *Tackling Local Drug Markets. Crime Detection and Prevention Series, 80*. Police Research Group. London: HMSO.
- Ekland-Olson, S. (1982) "Deviance, Social Control and Social Networks." *Research in Law Deviance and Social Control*, 4: pp. 271-99.
- Einstader, W.J. (1969) *The Social Organization of Armed Robbery*. Social Problems 17(1): pp. 64-83.
- Elliott, M., Browne, K. & Kilcoyne, J. (1995) *Child Sexual Abuse Prevention: What offenders tell us*. Kidscape: London
- Emsley, C. (1988) "Crime in 19th Century Britain." *History Today*, April, vol. 38.
- Emsley, C. (1996) *Crime and Society in England 1750-1900*. London: Longman.
- Erickson, B.H. (1981) "Secret Societies and Social Structure." *Social Forces*, 60 (1): pp.188-210.
- Farrington, D. (1990). "Implications of Criminal Career Research for the Prevention of Offending." *Journal of Adolescence*, 13: pp. 93-113.
- Feld, S. (1997) "The Focussed Organisation of Social Ties." *Social Forces*, 86 (5): pp. 1015-35.
- Fijnaut, C. (1990) "Organised Crime: A comparison between the United States of America and western Europe." *British Journal of Criminology* 30 (3) pp. 321-40.

- Fong, R.S. and Buentello, S. (1991) "The Detection of Prison Gang Development: An empirical assessment." *Federal Probation* 55 (1): pp. 66-69.
- Foster, J. (1990) *Villains: Crime and community in the inner city*. London: Routledge.
- Freeman, L.C. (1979) "Centrality in Social Networks: Conceptual clarifications." *Social Networks* 1: pp. 215-39.
- Fritzon, K. (1998) *Differentiating Arsonists: An action systems model of malicious fire setting*. Unpublished PhD, University of Liverpool.
- Gardiner, J.A. (1970) *Politics of Corruption: Organized crime in an American city*. New York: Russell Sage Foundation.
- Gaughan, J. and Ferman, L. (1987) "Towards an Understanding of the Informal Economy." *Annals of the American Academy of Political and Social Science*, 493.
- Granovetter, M.S. (1973) "The Strength of Weak Ties." *American Journal of Sociology* 8: pp. 1360-80.
- Greenberg, J and Baron, R.A. (1995) *Behaviour in Organizations*. Upper Saddle River, NJ: Prentice Hall.
- The Guardian* (1997) "Net points paedophiles east." October 21st.
- Hage, P. and Harary, F. (1983) *Structural Models in Anthropology*. Cambridge: Cambridge University Press.
- Hagedorn, J.M. (1994) "Homeboys, Dope Fiends, Legits and New Jacks." *Criminology*, 32 (2): pp. 206-219.
- Hagell, A. and Newburn, T. (1994) *Persistent Young Offenders*. London: Policy Studies Institute.
- Harris, M. (1990). *Unholy Orders*. Markham, Ont: Viking.
- Heinz, J.P. and Manikas, P.M. (1992) "Networks among Elites in a Local Criminal Justice System." *Law and Society Review* 26 (4): pp 831-61.
- Henry, S. (1978) *The Hidden Economy*. London: Martyn Robertson.
- Heritage, R. (1996) Personal Communication.
- Hess, H. (1973) *Mafia and Mafiosi: The structure of power*. Farnborough: Heath.
- Hirschi (1969) *Causes of Delinquency*. Berkeley: University of California.
- Hobbs, D. (1995) *Bad Business: Professional crime in modern Britain*. Oxford: OUP.
- Hobbs, D (1997a) "Professional Crime: Change, continuity and the enduring myth of the underworld." *Sociology*, 31 (1) 57-72.
- Hobbs, D. (1997b) *Serious Crime Networks*. <http://www.salford.ac.uk/isr/page13.htm>
- Hobbs, D. (1997c) "Criminal Collaboration: Youth gangs, subcultures, professional criminals and organised crime." in Maguire, Morgan and Reiner (eds) *Oxford Handbook of Criminology*. Oxford: Clarendon Press.
- Hogg, M.A. and Abrahams, D. (1988). *Social Identifications*. London: Routledge.
- Hoghugh, M. (1983) *The Delinquent: Directions for social control*. London: Burnett Books.
- Home Affairs Committee (1995) *Organised Crime*. Third report. London: HMSO.
- Hosking, D. and Morley, I.E. (1991) *A Social Psychology of Organising: People, processes and contexts*. Cambridge: Harvester Wheatsheaf.

- Huczynski, A. and Buchanan, D. (1991) *Organizational Behaviour: An introductory text*. Cambridge: Prentice Hall.
- Humphries, R.J. (1996) "An Examination of Social Network Analysis as a Decision Support Model for Investigating Organised Crime." Unpublished MSc Dissertation, University of Liverpool.
- Humphries, R.J. (1997) Personal Communication, drawn from Course Notes, Northumbria Police Intelligence Operative Course 1994.
- Hunt, J. (1988) "Managing the Successful Acquisition: A people question." *London Business School Journal*, Summer: pp. 2-15.
- Jackson, J.L. and Herbrink, J.C.M. (1996) *Profiling Organised Crime: The current state of the art*. Report NSCR WD 96-01 - June. Leiden, Netherlands: Netherlands Institute for the Study of Criminality and Law Enforcement.
- Jacobs, B.A. (1997) "Contingent Ties: Undercover drug officers' use of informants." *British Journal of Sociology* 48 (10): pp. 35-53.
- Janis, I.L. (1972) *Victims of Groupthink*. Boston: Houghton Mifflin.
- Jenkins, P. (1988). "Myth and Murder: The serial killer panic of 1983-85." *Criminal Justice Research Bulletin*, 3 (11): 1-7.
- Jenkins, P. (1992) "Speed Capital of the World: Organising the Methamphetamine Industry in Philadelphia 1970-1990." *Criminal Justice Policy Review* 6 (1) pp. 18-39.
- Johnson, D.R. (1982) "The Origins and Structure of Intercity Criminal Activity 1840-1920: An interpretation." *Social Problems*, vol. 15 (4) pp. 593-605.
- Johnson, L. (in press) "The Social Structure of Football Hooliganism." in Canter and Alison (eds) *The Social Psychology of Crime*. Aldershot: Dartmouth..
- Klein, M.W., Maxson, C.L. and Miller, J. (eds) (1995) *The Modern Gang Reader*. Los Angeles: Roxbury Publishing.
- Kleinman, M.A.R. & Smith, K.D.(1990) "State and Legal Drug Enforcement: In search of a strategy." In Tonry & Wilson (eds) *Drugs and Crime. Crime and Justice: A review of the research, vol. 13*. University of Chicago Press: Chicago.
- Klockars, C. (1974). *The Professional Fence*. New York: Macmillan.
- Kock, E, Kemp, T. and Rix, B. (1996) *Disrupting the Distribution of Stolen Electrical Goods. Crime Detection and Prevention Series paper 69*. London: Home Office Police Research Group.
- Krippendorff, K. (1980) *Content Analysis*. Beverly Hills: Sage.
- LaFontaine, J. (1994) *Extent and Nature of Organized and Ritual Abuse*. HMSO: London.
- Lanning, K. (1992) *Child Sex Rings: A behavioural analysis*. Arlington, Virginia: National Center for Missing and Exploited Children.
- Lanning, K. (1987) *Child Molesters - A Behavioural Analysis for Law Enforcement*. Arlington, Virginia: National Center for Missing and Exploited Children.
- Lemire, B. (1990) "The Theft of Clothes and Popular Consumerism in Early Modern England." *Social Problems* 24 (2) pp.255-76.
- Letkemann, P. (1973) *Crime as Work*. Englewood Cliffs, NJ: Prentice-Hall.

- Levacic, R. (1991) "Markets: Introduction." In Thompson, Frances, Levacic, and Mitchell (eds) *Markets, Hierarchies and Networks: The coordination of social life*.
- Lewin, K. (1951) *Field Theory in the Social Sciences*. New York: Harper.
- Lewis, N. (1967) *The Honoured Society*. Harmondsworth: Penguin.
- Lewis, R. (1994) "Flexible Hierarchies and Dynamic Disorder." In Strang & Gossop (eds) *Heroin Addiction and Drug Policy: The British system*.
- Lewis, R., Hartnoll, R., Bryer, S., Daviaud, E. and Mitcheson, M. (1985) "Scoring Smack: The illicit heroin market in London 1980-83." *British Journal of Addictions*, 80: pp. 281-290.
- Lingoes, J.C. (1973) SSA1, Guttman-Lingoes Nonmetric Program Series. Ann Arbor, Michigan: Mathesis Press.
- Lippitt, R. and White, R. (1943) "The 'social climate' of children's groups," in Barker, R.G., Kounin, J. and Wright, H. (eds) *Child Behaviour and Development*. New York: McGraw Hill.
- Lomnitz, L.A. (1988) "Informal Exchange Networks in Formal Systems: A theoretical model." *American Anthropologist*, 90 (1): pp. 42-55.
- Mack, J.A. (1972) "The Able Criminal." *British Journal of Criminology*, 12 (10) pp. 44-54.
- Mack, J.A. (1975) *The Crime Industry*. Westmead, Hants: Saxon House.
- Maguire, M. (1982) *Burglary in the Dwelling*. London: Heineman.
- Maguire, M. and John, T. (1995) *Intelligence, Surveillance and Informants: Integrated approaches*. Police Research Group Crime Detection and Prevention Series, no. 64. London: HO.
- Maguire, M., Morgan, R. and Reiner, R. (eds) (1997) *Oxford Handbook of Criminology*. Oxford: Clarendon Press.
- Mars, G. (1982) *Cheats at Work*. Aldershot: Dartmouth.
- Marshall, A. (1936) *Principles of Economics*. London: Macmillan.
- Marsden, P.V. (1982) "Power and Politics in Organisations: The social psychology of conflict, coalitions and bargaining." *Social Forces* 60 (3): pp. 932-935.
- Matsumoto, M. (1988) *The Unspoken Way. Haragei: Silence in Japanese business and society*. New York: Kodansha International.
- McAdams, D.P. (1988) *Power, Intimacy and the Life Story*. New York: Guilford Press.
- McCall, A. (1979) *The Medieval Underworld*. Hamilton: London.
- McCarthy and Hagan (1995) "Getting into Street Crime: The structure and process of criminal embeddedness." *Social Science Research*, 24 (1): pp. 63-95.
- McCluskey, K. and Wardle, S. (1998) "Networks of Robbery." In Canter and Alison (eds) *The Social Psychology of Crime*. Aldershot: Dartmouth.
- McIllwain, J.S. (1997) "From Tong War to Organized Crime: Revising the historical perception of violence in Chinatown." *Justice Quarterly* 14 (1) pp.25-52.
- McIntosh, M. (1975) *The Organisation of Crime*. London: Macmillan.
- McLynn, F. (1989) *Crime and Punishment in 18th Century England*. Oxford: OUP.
- McMullan, J.L. (1982) "Criminal Organisations In 16th and 17th Cent. London." *Social Problems*, 29(3), pp 311-23.

- Milgram, S. (1967) "The Small World Problem." *Psychology Today*, 22: pp. 61-67.
- Minister of Justice (1994) *Report of the Ritual Abuse Work Group*. The Hague, Netherlands: Government Publishing.
- Mizruchi, M.S. (1994) "Social Network Analysis: Recent achievements and current controversies." *Acta Sociologica* 37: pp. 329-43.
- Molken, R.J. (1979) "Cliques, Clubs and Clans." *Quality and Quantity* 13: pp. 161-173.
- Montagne, M. (1990) "The Social Epidemiology of International Drug Trafficking: Comparison of source of supply and distribution networks." *The International Journal of the Addictions* 25 (5): pp. 557-77.
- Moreno, J.L. (1934) *Who Shall Survive?* Washington, D.C.: Nervous and Mental Disease Publishing Company.
- Murphy, R. (1993) *Smash and Grab: Gangsters in the Londond underworld 1920-60*. London: Faber and Faber.
- Naylor, R.T. (1994/95) "Loose Cannons: Covert commerce and underground finance in the modern arms black market." *Crime, Law and Social Change* 22: pp. 1-57.
- Nee, C. (1993) *Careers in Car Crime*. Home Office Research Bulletin.
- NCIS Organised Crime Unit (1994) *An Outline Assessment of the Threat and Impact by Organised/Enterprise Crime Upon United Kingdom Interest*. London: NCIS.
- NCIS Drug and Organised Crime Unit (1995) *United Kingdom Drug Trends, 1995*. London: NCIS.
- Padilla, F. (1992) *The Gang as an American Enterprise*. Rutgers, NJ: Rutgers University Press.
- Padilla, F. (1995) "The Working Gang." in Klien, M.W., Maxson, C.L. and Miller, J. (eds) *The Modern Gang Reader*. Los Angeles: Roxbury Publishing.
- Passas, N. and Nelken, D. (1993) "The Thin Line between legitimate and criminal enterprises: Subsidy fraud in the European Community." *Crime, Law and Social Change*, 19 (3) pp. 223-43.
- Pearce, F. (1975) *Crimes of the Powerful*. London: Pluto.
- Peason, J. (1984) *The Profession of Violence: The rise and fall of the Kray twins*. London: Granada.
- Pittman, A. (1996) "Gangs." Presentation to Community-Based Police Response: Third Research and Development Conference, Staffordshire University, April 12th.
- Plant, M.A. (1975) *Drug Takers in an English Town*. London: Tavistock Publications.
- Pondy, L. (ed) *Organisational Symbolism*. Greenwich, Conn.: JAI Press.
- Porter, M. (1996) *Tackling Cross Border Crime. Crime Detection and Prevention Series*, 79. London: Home Office.
- Potter, G.W. (1994) *Criminal Organizations: Vice, racketeering and politics in an American city*. Prospect Heights, Ill: Waveland Press.
- Powell, W. (1990) "Neither Hierarchies nor Markets." In B. Shaw & L.L. Cummings (Eds) *Research in Organisational Behaviour* 12.
- Project Focus (1994) "Outlaw Motorcycle Gangs." *RCMP Gazette*.

- Reiss, A.J. (1986) "Co-offending Influences on Criminal Careers." In A. Blumstein et al. (eds) *Criminal Careers and Career Criminals*. Washington, D.C.: National Academy Press.
- Reiss, A.J. and Farrington, D.P. (1991) "Advancing Knowledge about Co-offending: Results from a prospective longitudinal survey of London males." *Journal of Criminal Law and Criminology* 82: pp. 360-95.
- Ressler, R.K., Douglas, J.E., Burgess, A.W. & Burgess, A.G. (1992). *Crime Classification Manual*. London: Simon & Schuster.
- Reuter (1983) *Disorganized Crime: The economics of the visible hand*. Cambridge, Mass.: MIT Press.
- Reuter, P. and Haaga, J. (1986) *The Organisation of High-Level Drug Markets: An Exploratory Study*. Santa Monica: RAND.
- Roberts J. (1996) "Alternative Approaches to Correspondence Analysis of Sociomatrices." *Journal of Mathematical Sociology*, 21 (4): pp. 359-68.
- Robson, C. (1993) *Real World Research: A resource for social scientists and practitioner-researchers*. Oxford: Blackwell Publishers.
- Rogers, E.M. (1987) "Progress, Problems and Prospects for Network Research: Investigating relationships in the age of electronic communication technologies." *Social Networks* 9: pp. 285-310.
- Ruggiero, V. and South, N. (1995) *Eurodrugs: Drug use, markets and trafficking in Europe*. London: UCL Press.
- Ruggiero, V. and South, N. (1997) "The Late-Modern City as a Bazaar: Drug markets, illegal enterprise and the 'barricades.'" *British Journal of Sociology* 48 (1): pp. 54-70.
- Scheurell and Rinder (1973)
- Scott, J.P. (1991) *Social Network Analysis: A handbook*. London: Sage.
- Scott, J. and Hughes, M. (1980) "Capital and Communication in Scottish Business." *Sociology* 14 (1): pp. 29-47.
- Schweizer, T. (1991) "The Power Struggle in a Chinese Community, 1950-1980: A social network analysis of the duality of actors and events." *Journal of Quantitative Anthropology*, 3: pp. 19-44.
- Seed, P. (1987) *Applied Social Network Analysis: A set of tools for social services research and practice*. Tunbridge Wells, UK: Costello.
- Seidman (1983) "Network Structure and Minimum Degree." *Social Networks*, 5: pp. 269-87.
- Sharpe, J.L. (1984) *Crime in Early Modern England 1550-1750*. London: Longman.
- Sherif (1967) *Group Conflict and Cooperation: Their social psychology*. London: Routledge and Keegan Paul.
- Shaw, M. E. (1981) *Group Dynamics: The psychology of small group behaviour*. New York: McGraw Hill.
- Shaw, B. and Cummings, L.L. (eds) (1990) *Research in Organisational Behaviour*, 12. Greenwich: JIA Press.

- Shover, N. (1973) "The Social Organisation of Burglary." *Social Problems*, 20 (4): pp. 499-514.
- Shover, N. and Honaker, D. (1992) "The Socially-Bounded Decision Making of Persistent Property Offenders." *Howard Journal of Criminal Justice*, 31 (4): pp. 276-93.
- Shye, S. and Elizur, D. (1994). *An Introduction to Facet Theory*. Newbury Park, CA: Sage.
- Simmel (1955) *The Web of Group Affiliations*. Glencoe, Ill: Free Press.
- Slater, M. (1955) "Role Differentiation in Small Groups." *American Sociological Review*, 20: pp. 300-10.
- Smith Jr., D.C. (1980) "Paragons, Pariahs and Pirates: A spectrum-based theory of enterprise." *Crime and Delinquency*, 26 (3): pp. 358-386.
- Sommers, I., Baskin, D.R. and Fagan, J. (1994) "Getting Out of the Life: Crime Desistence by Female Street Offenders." *Deviant Behaviour*, 15: pp. 125-49.
- Sparrow, M.K. (1991) "The Application of Network Analysis to Criminal Intelligence: An assessment of the prospects." *Social Networks* 13: pp. 251-74.
- Stephenson, K. and Zelen, M. (1989) "Rethinking Centrality: Methods and applications." *Social Networks* 11: pp. 1-37.
- Sterling, C. (1990) *The Mafia: The long reach of the international Sicilian Mafia*. London: Hamilton.
- Stewart, D.W. (1984) *Secondary Research: Information sources and resources*. Beverley Hills: Sage.
- Strang, J. and Gossop, M. (eds) (1994) *Heroin Addiction and Drug Policy: The British system*. Oxford: Oxford University Press.
- Strong, N. and Waterson, F. (1987) "Principles, Agents and Information." in Clarke and McGuinness (eds) *The Economics of the Firm*. Oxford: Basil Blackwell.
- Sutherland, E.H. (1937) *The Professional Thief*. Chicago: University of Chicago Press.
- Sutton, M. (1993) *From Receiving to Thieving: The market for stolen goods and the incidence of theft*. Home Office Research Bulletin No. 34.
- Taijfel, H., Flament, C., Billig, M. and Bundy, R. (1971) "Social Categorisation and Intergroup Behaviour." *European Journal of Social Psychology*, 1: pp. 149-78.
- Tate, T. (1990) *Child Pornography*. London: Methuen.
- Tate, T. (1991) *Children for the Devil*. London: Methuen.
- Tesch, R. (1990) *Qualitative Research : Analysis types and software tools*. London: The Falmer.
- Thompson, G., Frances, J. Levacic, R. and Mitchell, J. (eds) (1991) *Markets, Hierarchies and Networks: The coordination of social life*. London: Sage.
- Thornberry, T.P., Lizotte, A.J., Krohn, M.D., Farnworth, M. & Jang, S.J. (1994) "Delinquent Peers, Beliefs and Delinquent Behaviour: A longitudinal test of interactional theory." *Criminology*, 32 (1): pp. 47-83.
- Tonry, M. and Wilson, J.Q. (Eds) (1990) *Drugs and Crime. Crime and Justice: A review of the research, vol. 13*. University of Chicago Press: Chicago.

- Walmsley, R. (1989) *Special Security Units*. Home Office Research Study 109. London: HMSO.
- Walsh, D. (1986) *Heavy Business: Commercial burglary and robbery*. London: Routledge and Kegan.
- Waring, E.J. (1993) "Co-offending in White Collar Crime: A network approach." PhD Dissertation. Ann Arbor, MI: UMI.
- Warner, W.L. and Lunt, P.S. (1941) *The Social Life of a Modern Community*. New Haven, CN: Yale University Press. Referenced in Scott (1991).
- Warr, M. (1996) "Organization and Instigation in Delinquent Groups." *Criminology*, 34 (1): pp. 11-37.
- Wasserman, S. and Faust, K. (1994) *Social Network Analysis: Methods and applications*. Cambridge: Cambridge University Press.
- Webb, E.J., Campbell, D.T., Schwartz, R.L. & Sechrest, L. (1966) *Unobtrusive Measures: Non-reactive research in the social sciences*. Chicago: Rand McNally.
- Wellman, B. (1988) "Structural Analysis: From method and metaphor to theory and substance." In Wellman, B. and Berkowitz, S.D. (eds) *Social Structures: A network approach*. Cambridge: CUP.
- Wellman, B. and Berkowitz, S.D. (eds) (1988) *Social Structures: A network approach*. Cambridge: CUP.
- West, W.G. (1978) "The Short Term Careers of Serious Thieves." *Criminology*, 20: pp. 169-90.
- White, H. (1988) "Varieties of Markets." In Wellman, B. and Berkowitz, S.D. (eds) *Social Structures: A network approach*. Cambridge: CUP.
- White, H., Boorman, S. and Brieger, R. (1976) "Social Structure from Multiple Networks. I. Block models of roles and positions." *American Journal of Sociology*, 81: pp. 730-779.
- Wiegand, B. (1994) "Black Money in Belize: The ethnicity and social structure of black-market crime." *Social Forces* 73 (1) 135-54.
- Williams, P. (1993) "The International Drug Trade: An industry analysis." *Low Intensity Conflict and Law Enforcement* 2 (3) pp. 397-423.
- Wright, R. and Decker, S. (1994) *Burglars on the Job: Street life and residential break-ins*. Boston: Northwestern University Press.
- Wright, R., Decker, S., Redfern, A. and Smith, D. (1992) "A Snowball's Chance in Hell: Doing fieldwork with active residential burglars." *Journal of Research in Crime and Delinquency*, 29 (2): pp. 148-61.
- Yin, R.S. (1994) *Case Study Research: Design and methods*. Beverly Hills: Sage.
- Zhang, S.X. & Gaylord, M.S. (1996) "Bound for the Golden Mountain: The social organisation of Chinese alien smuggling." *Crime, Law and Social Change*, 25 (1): pp 1-16.

Appendix A - Case Study Results

Drug Networks

Drug Network 5

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	7.00	50.00
2	6.00	42.86
3	2.00	14.29
4	1.00	7.14
5	1.00	7.14
6	1.00	7.14
7	2.00	14.29
8	4.00	28.57
9	1.00	7.14
10	1.00	7.14
11	2.00	14.29
12	2.00	14.29
13	2.00	14.29
14	1.00	7.14
15	1.00	7.14

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	25.00	56.00
2	31.00	45.16
3	35.00	40.00
4	44.00	31.82
5	44.00	31.82
6	44.00	31.82
7	29.00	48.28
8	27.00	51.85
9	38.00	36.84
1	38.00	36.84
11	32.00	43.75
12	34.00	41.18
13	45.00	31.11
14	38.00	36.84
15	58.00	24.14

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	61.50	67.58
2	37.50	41.21
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	14.00	15.38
8	26.00	28.57
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	24.00	26.37
13	13.00	14.29
14	0.00	0.00
15	0.00	0.00

INFORMATION CENTRALITY

```

1      0.83
2      0.73
3      0.61
4      0.45
5      0.45
6      0.45
7      0.66
8      0.75
9      0.48
10     0.48
11     0.64
12     0.55
13     0.39
14     0.48
15     0.29

```

CLIQUEs

2 cliques found.

```

1:  1 8 11
2:  2 3 8

```

N CLANS

5 2-clans found.

```

1:  1 7 8 9 10 11 12 14
2:  1 2 3 7 8 11
3:  2 3 4 5 6 7 8
4:  1 12 13
5:  12 13 15

```

K-CORE

```

          1          1 1 1 1 1
DEGREE  1 2 3 7 8 1 4 5 6 9 0 2 3 4 5
-----  - - - - -
3      . . . . .
2      XXXXXXXXXXXX . . . . .
1      XXXXXXXXXXXXXXXXXXXXXXXXXXXX

```

BI CONNECTED COMPONENTS (BLOCKS)

BLOCKS:

```

Block  1:  2 4
Block  2:  2 5
Block  3:  2 6
Block  4:  1 2 3 7 8 11
Block  5:  1 9
Block  6:  1 10
Block  7:  13 15
Block  8:  12 13
Block  9:  1 12
Block 10:  1 14

```

Drug Network 6

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	7.00	63.64
2	4.00	36.36
3	1.00	9.09
4	1.00	9.09
5	1.00	9.09
6	1.00	9.09
7	1.00	9.09
8	2.00	18.18
9	1.00	9.09
10	3.00	27.27
11	3.00	27.27
12	3.00	27.27

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	15.00	73.33
2	19.00	57.89
3	25.00	44.00
4	25.00	44.00
5	25.00	44.00
6	25.00	44.00
7	25.00	44.00
8	23.00	47.83
9	33.00	33.33
11	27.00	40.74
12	27.00	40.74

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	48.00	87.27
2	24.00	43.64
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00
8	10.00	18.18
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00

INFORMATION CENTRALITY

```

1      0.89
2      0.69
3      0.51
4      0.51
5      0.51
6      0.51
7      0.51
8      0.56
9      0.38
10     0.56
11     0.56
12     0.56

```

 CLIQUES

```

1:  2 10 11 12

```

 N CLANS

```

3 2-clans found.

```

```

1:  1 2 3 4 5 6 7 8
2:  1 2 10 11 12
3:  1 8 9

```

 K CORE

```

          1 1 1
DEGREE  1 2 0 1 2 3 4 5 6 7 8 9
-  --  - - - - - - - - - -
      4  . . . . . . . . . .
      2  . XXXXXXXX . . . . .
      1  XXXXXXXXXXXXXXXXXXXXXXXX

```

 BI-CONNECTED COMPONENTS (BLOCKS)

```

9 blocks found.

```

```

Block  1:  2 10 11 12
Block  2:  1 2
Block  3:  1 3
Block  4:  1 4
Block  5:  1 5
Block  6:  1 6
Block  7:  1 7
Block  8:  8 9
Block  9:  1 8

```

Drug Network 7

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	4.00	26.67
2	4.00	26.67
3	5.00	33.33
4	6.00	40.00
5	1.00	6.67
6	4.00	26.67
7	3.00	20.00
8	3.00	20.00
9	3.00	20.00
10	1.00	6.67
11	1.00	6.67
12	1.00	6.67
13	3.00	20.00
14	1.00	6.67
15	1.00	6.67
16	1.00	6.67

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	33.00	45.45
2	29.00	51.72
3	26.00	57.69
4	29.00	51.72
5	43.00	34.88
6	34.00	44.12
7	46.00	32.61
8	46.00	32.61
9	46.00	32.61
10	43.00	34.88
11	43.00	34.88
12	43.00	34.88
13	39.00	38.46
14	53.00	28.30
15	40.00	37.50
16	47.00	31.91

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	20.00	19.05
2	21.00	20.00
3	59.00	56.19
4	50.00	47.62
5	0.00	0.00
6	36.00	34.29
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	14.00	13.33
14	0.00	0.00
15	0.00	0.00
16	0.00	0.00

INFORMATION CENTRALITY

```

-----
1          0.72
2          0.78
3          0.84
4          0.76
5          0.46
6          0.59
7          0.48
8          0.48
9          0.48
10         0.46
11         0.46
12         0.46
13         0.63
14         0.41
15         0.48
16         0.44

```

 CLIQUES

4 cliques found.

```

1:  2 3 4
2:  1 2 3
3:  1 2 13
4:  6 7 8 9

```

 N-CLANS

6 2-clans found.

```

1:  1 2 3 4 6 15
2:  1 2 3 4 13
3:  2 3 4 5 10 11 12
4:  1 2 3 13 16
5:  3 6 7 8 9
6:  1 2 13 14

```

 K-CORE

```

          1  1 1 1 1 1
DEGREE  1 2 3 4 6 7 8 9 3 5 0 1 2 4 5 6
-----
4  . . . . .
3  . . . . XXXXXXX . . . . .
2  XXXXXXXXXXXXXXXXXXXX . . . . .
1  XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX

```

 BI-CONNECTED COMPONENTS (BLOCKS)

10 blocks found.

```

Block  1:  4 5
Block  2:  4 10
Block  3:  4 11
Block  4:  4 12
Block  5:  6 7 8 9
Block  6:  3 6
Block  7:  3 15
Block  8:  13 14
Block  9:  1 2 3 4 13
Block 10: 1 16

```

Drug Network 8

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	2.00	22.22
2	1.00	11.11
3	1.00	11.11
4	9.00	100.00
5	2.00	22.22
6	1.00	11.11
7	1.00	11.11
8	1.00	11.11
9	1.00	11.11
10	1.00	11.11

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	16.00	56.25
2	17.00	52.94
3	17.00	52.94
4	9.00	100.00
5	16.00	56.25
6	17.00	52.94
7	17.00	52.94
8	17.00	52.94
9	17.00	52.94
10	17.00	52.94

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	35.00	97.22
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00

INFORMATION CENTRALITY

1	0.77
2	0.61
3	0.61
4	1.20
5	0.77
6	0.61
7	0.61
8	0.61
9	0.61
10	0.61

CLIQUES

1: 1 4 5

N-CLANS

1 2-clans found.

1: 1 2 3 4 5 6 7 8 9 10

K-CORE

										1
DEGREE	1	4	5	2	3	6	7	8	9	0
-----	-	-	-	-	-	-	-	-	-	-
3	.	.	.	.	.	.	.	.	.	.
2	XXXXX	.	.	.	.	.	.	.	.	.
1	XXXXXXXXXXXXXXXXXXXX	.	.	.	.	.	.	.	.	.

BI-CONNECTED COMPONENTS BLOCKS

8 blocks found.

- Block 1: 2 4
- Block 2: 3 4
- Block 3: 4 6
- Block 4: 4 7
- Block 5: 4 8
- Block 6: 4 9
- Block 7: 4 10
- Block 8: 1 4 5

Drug Network 9

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	8.00	47.06
2	1.00	5.88
3	6.00	35.29
4	1.00	5.88
5	6.00	35.29
6	1.00	5.88
7	4.00	23.53
8	5.00	29.41
9	1.00	5.88
10	1.00	5.88
11	1.00	5.88
12	1.00	5.88
13	1.00	5.88
14	1.00	5.88
15	1.00	5.88
16	1.00	5.88
17	1.00	5.88
18	1.00	5.88

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	26.00	65.38
2	42.00	40.48
3	31.00	54.84
4	47.00	36.17
5	31.00	54.84
6	47.00	36.17
7	32.00	53.13
8	30.00	56.67
9	47.00	36.17
10	47.00	36.17
11	42.00	40.48
12	48.00	35.42
13	47.00	36.17
14	46.00	36.96
15	46.00	36.96
16	47.00	36.17
17	42.00	40.48
18	42.00	40.48

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	65.33	48.04
2	0.00	0.00
3	47.00	34.56
4	0.00	0.00
5	47.00	34.56
6	0.00	0.00
7	21.33	15.69
8	36.33	26.72
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00

BI-CONNECTED COMPONENTS (BLOCKS)

14 blocks found.

Block 1: 1 2
Block 2: 3 4
Block 3: 5 6
Block 4: 8 14
Block 5: 8 15
Block 6: 5 9
Block 7: 5 10
Block 8: 7 12
Block 9: 3 13
Block 10: 3 16
Block 11: 1 3 5 7 8
Block 12: 1 11
Block 13: 1 17
Block 14: 1 18

Drug Network 10

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	6.00	28.57
2	5.00	23.81
3	5.00	23.81
4	1.00	4.76
5	1.00	4.76
6	1.00	4.76
7	1.00	4.76
8	4.00	19.05
9	5.00	23.81
10	1.00	4.76
11	2.00	9.52
12	5.00	23.81
13	1.00	4.76
14	1.00	4.76
15	2.00	9.52
16	1.00	4.76
17	1.00	4.76
18	1.00	4.76
19	2.00	9.52
20	2.00	9.52
21	1.00	4.76
22	1.00	4.76

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	51.00	41.18
2	52.00	40.38
3	44.00	47.73
4	71.00	29.58
5	71.00	29.58
6	72.00	29.17
7	71.00	29.58
8	57.00	36.84
9	56.00	37.50
10	76.00	27.63
11	71.00	29.58
12	43.00	48.84
13	76.00	27.63
14	77.00	27.27
15	72.00	29.17
16	77.00	27.27
17	72.00	29.17
18	72.00	29.17
19	53.00	39.62
20	60.00	35.00
21	71.00	29.58
22	63.00	33.33

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	74.00	35.24
2	57.00	27.14
3	120.50	57.38
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00

8	52.50	25.00
9	53.50	25.48
10	0.00	0.00
11	3.50	1.67
12	119.00	56.67
13	0.00	0.00
14	0.00	0.00
15	3.00	1.43
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00
19	0.00	0.00
20	0.00	0.00
21	0.00	0.00
22	0.00	0.00

INFORMATION CENTRALITY

1	0.59
2	0.57
3	0.67
4	0.38
5	0.38
6	0.38
7	0.38
8	0.52
9	0.56
10	0.37
11	0.46
12	0.68
13	0.37
14	0.35
15	0.45
16	0.35
17	0.38
18	0.38
19	0.57
20	0.51
21	0.38
22	0.42

CLIQUEs

3 cliques found.

- 1: 1 2 12
- 2: 3 9 20
- 3: 3 12 19

N-CLANS

7 2-clans found.

- 1: 1 2 4 5 7 12 21
- 2: 1 2 6 12 17 18
- 3: 1 2 3 12 19 22
- 4: 3 8 9 12 19 20
- 5: 3 9 10 11 13 20
- 6: 3 8 9 11 15
- 7: 3 8 14 15 16

K-CORE

					1	1	1	1	2						1	1	1	1	1	2	2	
DEGREE	1	2	3	8	9	1	2	5	9	0	4	5	6	7	0	3	4	6	7	8	1	2
-----	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3
2	XXXXXXXXXXXXXXXXXXXXXX
1	XX

BI-CONNECTED COMPONENTS (BLOCKS)

15 blocks found.

- Block 1: 2 6
- Block 2: 8 14
- Block 3: 9 10
- Block 4: 9 13
- Block 5: 8 16
- Block 6: 3 8 9 11 15 20
- Block 7: 3 12 19
- Block 8: 12 22
- Block 9: 2 17
- Block 10: 2 18
- Block 11: 1 2 12
- Block 12: 1 4
- Block 13: 1 5
- Block 14: 1 7
- Block 15: 1 21

Drug Network 11

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
1	4.00	21.05
2	6.00	31.58
3	5.00	26.32
4	8.00	42.11
5	4.00	21.05
6	1.00	5.26
7	1.00	5.26
8	1.00	5.26
9	1.00	5.26
10	1.00	5.26
11	1.00	5.26
12	1.00	5.26
13	1.00	5.26
14	1.00	5.26
15	1.00	5.26
16	1.00	5.26
17	1.00	5.26
18	1.00	5.26
19	1.00	5.26
20	1.00	5.26

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
1	40.00	47.50
2	35.00	54.29
3	38.00	50.00
4	30.00	63.33
5	42.00	45.24
6	60.00	31.67
7	60.00	31.67
8	58.00	32.76
9	58.00	32.76
10	48.00	39.58
11	60.00	31.67
12	48.00	39.58
13	48.00	39.58
14	48.00	39.58
15	56.00	33.93
16	56.00	33.93
17	56.00	33.93
18	53.00	35.85
19	53.00	35.85
20	53.00	35.85

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
1	35.00	20.47
2	57.00	33.33
3	51.00	29.82
4	116.00	67.84
5	51.00	29.82
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00

```

13      0.00      0.00
14      0.00      0.00
15      0.00      0.00
16      0.00      0.00
17      0.00      0.00
18      0.00      0.00
19      0.00      0.00
20      0.00      0.00

```

INFORMATION CENTRALITY

```

1      0.64
2      0.72
3      0.66
4      0.79
5      0.54
6      0.36
7      0.36
8      0.41
9      0.41
10     0.46
11     0.36
12     0.46
13     0.46
14     0.46
15     0.42
16     0.42
17     0.42
18     0.44
19     0.44
20     0.44

```

CLIQUE

2 cliques found.

```

1:  2 3 4
2:  1 2 4

```

N-CLANS

5 2-clans found.

```

1:  1 2 3 4 5 10 12 13 14
2:  1 2 3 4 18 19 20
3:  2 3 4 15 16 17
4:  1 2 4 8 9
5:  4 5 6 7 11

```

K-CORE

```

          1 1 1 1 1 1 1 1 1 2
DEGREE  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
-----  - - - - - - - - - - - - - - - -
3       . . . . .
2       XXXXXXX . . . . .
1       XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

```

BI-CONNECTED COMPONENTS (BLOCKS)

17 blocks found.

Block 1: 5 6
Block 2: 5 7
Block 3: 5 11
Block 4: 4 5
Block 5: 4 10
Block 6: 4 12
Block 7: 4 13
Block 8: 4 14
Block 9: 3 15
Block 10: 3 16
Block 11: 3 17
Block 12: 2 18
Block 13: 2 19
Block 14: 2 20
Block 15: 1 2 3 4
Block 16: 1 8
Block 17: 1 9

Drug Network 12

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
1	5.00	17.24
2	4.00	13.79
3	4.00	13.79
4	6.00	20.69
5	1.00	3.45
6	1.00	3.45
7	5.00	17.24
8	3.00	10.34
9	3.00	10.34
10	2.00	6.90
11	4.00	13.79
12	5.00	17.24
13	1.00	3.45
14	4.00	13.79
15	3.00	10.34
16	1.00	3.45
17	1.00	3.45
18	1.00	3.45
19	8.00	27.59
20	6.00	20.69
21	7.00	24.14
22	8.00	27.59
23	5.00	17.24
24	5.00	17.24
25	5.00	17.24
26	4.00	13.79
27	4.00	13.79
28	1.00	3.45
29	9.00	31.03
30	2.00	6.90

CLOSENES CENTRALITY MEASURES

	Farness	Closeness
1	77.00	37.66
2	101.00	28.71
3	101.00	28.71
4	76.00	38.16
5	86.00	33.72
6	84.00	34.52
7	77.00	37.66
8	102.00	28.43
9	78.00	37.18
10	104.00	27.88
11	78.00	37.18
12	75.00	38.67
13	86.00	33.72
14	81.00	35.80
15	101.00	28.71
16	132.00	21.97
17	89.00	32.58
18	89.00	32.58
19	58.00	50.00
20	61.00	47.54
21	58.00	50.00
22	56.00	51.79
23	80.00	36.25
24	80.00	36.25
25	80.00	36.25
26	105.00	27.62
27	105.00	27.62
28	83.00	34.94

29	55.00	52.73
30	80.00	36.25

 FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	20.25	4.99
2	0.25	0.06
3	0.67	0.16
4	32.92	8.11
5	0.00	0.00
6	0.00	0.00
7	20.67	5.09
8	0.25	0.06
9	54.00	13.30
10	28.00	6.90
11	9.25	2.28
12	16.00	3.94
13	0.00	0.00
14	6.75	1.66
15	0.00	0.00
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00
19	91.00	22.41
20	55.00	13.55
21	120.00	29.56
22	160.00	39.41
23	16.67	4.11
24	16.67	4.11
25	16.67	4.11
26	0.00	0.00
27	0.00	0.00
28	0.00	0.00
29	159.00	39.16
30	0.00	0.00

 INFORMATION CENTRALITY

1	0.81
2	0.74
3	0.72
4	0.83
5	0.54
6	0.54
7	0.82
8	0.69
9	0.71
10	0.44
11	0.85
12	0.92
13	0.54
14	0.84
15	0.75
16	0.31
17	0.52
18	0.52
19	1.09
20	1.02
21	1.06
22	1.10
23	0.79
24	0.79
25	0.79
26	0.71

```

27          0.71
28          0.55
29          1.12
30          0.69

```

```

*****
CLIQUE

```

```

13 cliques found.

```

```

1: 19 20 21 22 29
2: 12 19 29
3: 11 12 29
4: 9 29 30
5: 1 2 4 7
6: 1 2 3 4
7: 3 4 8
8: 1 4 7 22
9: 4 7 8
10: 11 12 14 15
11: 12 14 19
12: 3 24 25 26 27
13: 21 23 24 25

```

```

*****
N-CLANS

```

```

11 2-clans found.

```

```

1: 9 11 12 19 20 21 22 28 29 30
2: 11 12 14 19 20 21 22 29
3: 5 12 13 14 19 20 21 22 29
4: 1 4 6 7 19 20 21 22 29
5: 17 18 19 20 21 22 29
6: 19 20 21 22 23 24 25 29
7: 1 2 3 4 7 8 22
8: 9 10 29 30
9: 9 10 16
10: 11 12 14 15 19 29
11: 21 23 24 25 26 27

```

```

*****
K-CORE

```

DEGREE	1	2	3	4	7	8	1	2	4	5	9	0	1	2	3	4	5	6	7	9	9	0	5	6	0	3	6	7	8	8	
5
4
3	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	
2	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	
1	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	

```

*****
BI-CONNECTED COMPONENTS (BLOCKS)

```

```

12 blocks found.

```

```

Block 1: 6 22
Block 2: 5 19
Block 3: 10 16
Block 4: 9 10
Block 5: 9 29 30
Block 6: 17 20
Block 7: 18 20
Block 8: 21 23 24 25 26 27
Block 9: 28 29
Block 10: 13 19
Block 11: 11 12 14 15 19 20 21 22 29
Block 12: 1 2 3 4 7 8 22

```

```

*****

```

Property Crime Networks

Property Network 5

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	8.00	36.36
2	4.00	18.18
3	1.00	4.55
4	2.00	9.09
5	2.00	9.09
6	2.00	9.09
7	1.00	4.55
8	3.00	13.64
9	3.00	13.64
10	2.00	9.09
11	3.00	13.64
12	3.00	13.64
13	2.00	9.09
14	2.00	9.09
15	2.00	9.09
16	2.00	9.09
17	1.00	4.55
18	4.00	18.18
19	1.00	4.55
20	1.00	4.55
21	3.00	13.64
22	1.00	4.55
23	1.00	4.55

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	41.00	53.66
2	55.00	40.00
3	76.00	28.95
4	60.00	36.67
5	74.00	29.73
6	60.00	36.67
7	81.00	27.16
8	58.00	37.93
9	71.00	30.99
10	59.00	37.29
11	73.00	30.14
12	86.00	25.58
13	106.00	20.75
14	106.00	20.75
15	69.00	31.88
16	54.00	40.74
17	77.00	28.57
18	56.00	39.29
19	77.00	28.57
20	77.00	28.57
21	58.00	37.93
22	79.00	27.85
23	79.00	27.85

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
1	192.83	83.48
2	39.83	17.24
3	0.00	0.00
4	8.33	3.61
5	1.33	0.58
6	21.00	9.09
7	0.00	0.00
8	15.83	6.85
9	4.33	1.88
10	8.00	3.46
11	1.50	0.65
12	40.00	17.32
13	0.00	0.00
14	0.00	0.00
15	57.00	24.68
16	72.00	31.17
17	0.00	0.00
18	60.00	25.97
19	0.00	0.00
20	0.00	0.00
21	41.00	17.75
22	0.00	0.00
23	0.00	0.00

INFORMATION CENTRALITY

	Inform
1	0.66
2	0.54
3	0.36
4	0.48
5	0.45
6	0.43
7	0.31
8	0.52
9	0.50
10	0.49
11	0.49
12	0.29
13	0.25
14	0.25
15	0.37
16	0.48
17	0.32
18	0.46
19	0.32
20	0.32
21	0.44
22	0.32
23	0.32

CLIQUEES

2 cliques found.

1: 8 9 11
 2: 12 13 14

Property Crime Network 6

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	2.00	33.33
2	2.00	33.33
3	2.00	33.33
4	2.00	33.33
5	9.00	150.00
6	4.00	66.67
7	7.00	116.67

CLOSNESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	10	60
2	10	60
3	10	60
4	10	60
5	6	100
6	10	60
7	8	75

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	9.50	63.33
6	0.00	0.00
7	1.50	10.00

INFORMATION CENTRALITY

1	1.25
2	1.32
3	1.25
4	1.32
5	2.39
6	1.74
7	2.10

CLIQUES

4 cliques found.
 1: 4 5 7
 2: 5 6 7
 3: 2 5 7
 4: 1 3 5

N-CLANS

1 2-clans found.

1: 1 2 3 4 5 6 7

BI-CONNECTED COMPONENTS (BLOCKS)

2 blocks found.

Block 1: 2 4 5 6 7

Block 2: 1 3 5

Property Crime Network 7

	Degree	NrmDegree
1	14.00	200.00
2	6.00	85.71
3	8.00	114.29
4	8.00	114.29
5	6.00	85.71
6	16.00	228.57
7	14.00	200.00
8	16.00	228.57

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
1	7.00	100.00
2	8.00	87.50
3	8.00	87.50
4	10.00	70.00
5	8.00	87.50
6	7.00	100.00
7	7.00	100.00
8	7.00	100.00

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
1	0.75	3.57
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.75	3.57
7	0.75	3.57
8	0.75	3.57

INFORMATION CENTRALITY

1	7.03
2	4.66
3	5.45
4	5.24
5	4.66
6	7.39
7	7.03
8	7.39

CLIQUES

2 cliques found.

- 1: 1 2 3 5 6 7 8
- 2: 1 4 6 7 8

N CLANS

1 2 clans found.

1: 1 2 3 4 5 6 7 8

BI-CONNECTED COMPONENTS (BLOCKS)

1 blocks found.

1: 1 2 3 4 5 6 7 8

K-CORE

DEGREE	1	2	3	5	6	7	8	4
-----	-	-	-	-	-	-	-	-
7	.	.	.	.	.	.	.	.
5	XXXXXXXXXXXXX	.						
4	XXXXXXXXXXXXX							

Property Crime Network 8

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
	-----	-----
1	19.00	158.33
2	12.00	100.00
3	13.00	108.33
4	13.00	108.33
5	13.00	108.33
6	13.00	108.33
7	15.00	125.00
8	14.00	116.67
9	13.00	108.33
10	13.00	108.33
11	13.00	108.33
12	13.00	108.33
13	14.00	116.67

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
	-----	-----
1	12	100
2	12	100
3	12	100
4	12	100
5	12	100
6	12	100
7	12	100
8	12	100
9	12	100
10	12	100
11	12	100
12	12	100
13	12	100

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
	-----	-----
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00

Property Crime Network 9

FREEMAN'S DEGREE CENTRALITY MEASURES

GRP531S

	Degree	NrmDegree

1	11.00	157.14
2	9.00	128.57
3	5.00	71.43
4	7.00	100.00
5	3.00	42.86
6	5.00	71.43
7	7.00	100.00
8	3.00	42.86

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness

1	7.00	100.00
2	7.00	100.00
3	9.00	77.78
4	9.00	77.78
5	11.00	63.64
6	9.00	77.78
7	9.00	77.78
8	11.00	63.64

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween

1	4.00	19.05
2	4.00	19.05
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00

INFORMATION CENTRALITY

1	4.15
2	3.91
3	2.95
4	3.37
5	2.18
6	2.95
7	3.37
8	2.18

CLIQUEES

2 cliques found.

- 1: 1 2 3 4 6 7
- 2: 1 2 5 8

N-CLANS

1 2-clans found.

1: 1 2 3 4 5 6 7 8

BI-CONNECTED COMPONENTS (BLOCKS)

1 blocks found.

K-CORE

DEGREE	1	2	3	4	6	7	5	8
-----	-	-	-	-	-	-	-	-
6	.	.	.	.	.	.	.	.
4	XXXXXXXXXX	.	.					
3	XXXXXXXXXXXXXXXXXX							

Property Crime Network 10

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
1	3.00	21.43
2	1.00	7.14
3	1.00	7.14
4	2.00	14.29
5	1.00	7.14
6	1.00	7.14
7	6.00	42.86
8	1.00	7.14
9	1.00	7.14
10	1.00	7.14
11	6.00	42.86
12	1.00	7.14
13	7.00	50.00
14	1.00	7.14
15	1.00	7.14

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
1	28.00	50.00
2	41.00	34.15
3	34.00	41.18
4	31.00	45.16
5	36.00	38.89
6	36.00	38.89
7	23.00	60.87
8	36.00	38.89
9	34.00	41.18
10	34.00	41.18
11	22.00	63.64
12	34.00	41.18
13	21.00	66.67
14	35.00	40.00
15	35.00	40.00

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
1	13.00	14.29
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	38.50	42.31
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	33.50	36.81
12	0.00	0.00
13	50.00	54.95
14	0.00	0.00
15	0.00	0.00

INFORMATION CENTRALITY

	Inform
1	0.76
2	0.46
3	0.52
4	0.71
5	0.50
6	0.50
7	0.90
8	0.50
9	0.52
10	0.52
11	0.93
12	0.52
13	0.95
14	0.51
15	0.51

CLIQUEs

3 cliques found.

- 1: 7 11 13
- 2: 1 11 13
- 3: 4 7 11

N-CLANS

4 2-clans found.

- 1: 1 3 7 9 10 11 12 13
- 2: 1 4 7 11 13 14 15
- 3: 4 5 6 7 8 11 13
- 4: 1 2 11 13

K-CORE

	1	1	1	1
DEGREE	1	4	7	1
-----	-	-	-	-
3	.	.	.	.
2	XXXXXXXX	.	.	.
1	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	.	.	.

BI-CONNECTED COMPONENTS (BLOCKS)

11 blocks found.

- Block 1: 1 2
- Block 2: 5 7
- Block 3: 6 7
- Block 4: 7 8
- Block 5: 3 13
- Block 6: 9 13
- Block 7: 10 13
- Block 8: 12 13
- Block 9: 11 14
- Block 10: 11 15
- Block 11: 1 4 7 11 13

Property Crime Network 11

FREEMAN'S DEGREE CENTRALITY MEASURES

	Degree	NrmDegree
1	12.00	66.67
2	6.00	33.33
3	1.00	5.56
4	1.00	5.56
5	1.00	5.56
6	1.00	5.56
7	2.00	11.11
8	1.00	5.56
9	1.00	5.56
10	1.00	5.56
11	1.00	5.56
12	1.00	5.56
13	1.00	5.56
14	1.00	5.56
15	1.00	5.56
16	1.00	5.56
17	1.00	5.56
18	1.00	5.56
19	1.00	5.56

CLOSENESS CENTRALITY MEASURES

	Farness	Closeness
1	24.00	75.00
2	31.00	58.06
3	48.00	37.50
4	48.00	37.50
5	48.00	37.50
6	41.00	43.90
7	39.00	46.15
8	41.00	43.90
9	41.00	43.90
10	41.00	43.90
11	41.00	43.90
12	41.00	43.90
13	41.00	43.90
14	48.00	37.50
15	48.00	37.50
16	41.00	43.90
17	56.00	32.14
18	41.00	43.90
19	41.00	43.90

FREEMAN BETWEENNESS CENTRALITY

	Between	nBetween
1	137.00	89.54
2	75.00	49.02
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	17.00	11.11
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
16	0.00	0.00

```

17      0.00      0.00
18      0.00      0.00
19      0.00      0.00

```

```

*****
INFORMATION CENTRALITY

```

```

----- Inform -----
1      0.79
2      0.61
3      0.40
4      0.40
5      0.40
6      0.46
7      0.49
8      0.46
9      0.46
10     0.46
11     0.46
12     0.46
13     0.46
14     0.40
15     0.40
16     0.46
17     0.34
18     0.46
19     0.46

```

```

*****
CLIQUEs

```

```

0 cliqueS found.

```

```

*****
N CLANS

```

```

3 2-clans found.

```

```

1:  1 2 6 7 8 9 10 11 12 13 16 18 19
2:  1 2 3 4 5 14 15
3:  1 7 17

```

```

*****
K-CORE

```

```

          1 1 1 1 1 1 1 1 1 1
DEGREE  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
-----  - - - - -
      2  . . . . .
      1  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

```

```

*****
BI-CONNECTED COMPONENTS (BLOCKS)

```

```

18 blocks found.

```

```

Block  1:  2 3
Block  2:  2 4
Block  3:  2 5
Block  4:  2 14
Block  5:  2 15
Block  6:  1 2
Block  7:  1 6
Block  8:  7 17
Block  9:  1 7
Block 10:  1 8
Block 11:  1 9
Block 12:  1 10
Block 13:  1 11
Block 14:  1 12
Block 15:  1 13
Block 16:  1 16
Block 17:  1 18
Block 18:  1 19

```

```

*****

```

Appendix B - Association Matrices

Drug Network 1

```
0
1 0
1 0 0
1 0 0 0
1 0 0 0 0
1 0 0 0 0 0
1 0 0 0 0 0 0
0 1 1 1 1 1 1 0
1 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 0
```

Drug Network 2

0
00
110
1000
10000
100000
1000000
00000010
000000100
0000001110
10111110000
010000000010
0000000000010
00000000000010
000000000010000
0000000000100000
00000010000100110

Drug Network 3

0
10
110
1110
10000
111100
1111010
10001000
111101100
1111011010
1111111110
111101101110
1111011011110
11110110111110
100010010010000
1111011011111100

Drug Network 4

4
46
366
3333
46674

243324
3444242

Drug Network 5

0
01
010
0100
01000
110000
1110000
10000000
100000000
1000000100
10000000000
000000000001
1000000000000
00000000000010

Drug Network 6

1
10
100
1000
10000
100000
1000000
00000001
010000000
0100000001
01000000011

Drug Network 7

1
11
011
0001
00100
000001
0000011
00000111
000100000
0001000000
00010000000
110000000000
0000000000001
00100000000000
10000000000000

Drug Network 8

0
00
111
1001
00010
000100
0001000
00010000
000100000

Drug Network 9

1
10
001
1000
00001
101010
1010100
00001000
000010000
1000000000
00000010000
001000000000
0000000100000
00000001000000
001000000000000
1000000000000000
10000000000000000

Drug Network 10

1
00
100
1000
01000
100000
0010000
00100000
000000001
0000000010
1110000000
000000001000
0000000100000
00000001001000
000000010000000
0100000000000000
01000000000000000
001000000001000000
001000001000000000
100000000000000000
00000000000100000000

Drug Network 11

1
01
111
0001
00001
000010
1000000
10000000
000100000
0000100000
00010000000
000100000000
0001000000000
00100000000000
001000000000000
0010000000000000
0100000000000000
01000000000000000
010000000000000000

Drug Network 12

1
11
111
0000
00000
110100
0011001
00000000
000000001
0000000000
00000000001
000000000000
0000000000000
0000000000110
00000000001101
000000000100000
0000000000000000
0000000000000000
000010000001110000
0000000000000000111
0000000000000000011
10010110000000000111
000000000000000000010
0000000000000000000101
00000000000000000001011
00000000000000000000111
000000000000000000001111
000000000000000000000000
00000000101100000111100001
00000000100000000000000001

Property Crime Network 1

1
01
111
0111
00010
000001
0011011
00010000
000010000
0001000000
00001000000
000010000000
0010100000000
00001000000000
000010000000000
0000000100000000
0100000000000000
01000000000000000
001000000000000000
0010010100000000000

Property Crime Network 2

1
00
111
1001
00010
000101
0001101
00000000
000000001
0000000001
00000000010
000000000000
0000000000001
00000000000000
000000000000000
0000000000000000
0000000000000000
0000000000000000
000001110100011111
00000000000000000001
000000000000000000011
0000000000000000000100
0000000000000000000000
000000000000000000010101
000000000000000000000001
0000000000000000000000010
0000000000000000000000000
0000000000000000000000000
00000000000000000001010010111
00000000000000000000000001
000000000000000000000000010
0000000000000000000000000101
000000000000000000010100100001000
000000000000000000000000000001
00000000000000000001010010000100111
000000000000000000000000000001
00000000000000000000000000000111
00000000000000000000000000000101
0000000000000000000000000000010
0000000000000000000000000000010001
00000000000000000000000000000100001
000000000000000000000000000001000000
0000000000000000000000000000010000001
00000000000000000000000000000100000011
000000000000000000000000000001000000111

Property Crime Network 3

0
10
010
0100
01000
010000
0100010
00000100
000001000
1100000000
10000000010
010000000000
0100000000000
01000010000000
010000000000000
0100000000000000
01000000000000000
010000000000000000
0100000000000000000
01000000000000000000
010000000000000000000
0100000000000000000000
01000000000000000000000
010000000000000000000000

Property Crime Network 4

0
10
110
1110
11110
111110
1111110
11111110
111111110
1111111110
11111111110
00010000010
000100000010
0101001001000
01010000011010
010100000100110
1111111111000000

Property Crime Network 5

0
10
010
1000
01010
100000
0000010
10000000
010000010
1000000000
00000001110
000000000000
0000000000010
00000000000110
000000000001000
100000000000010
0000000000000000
10000000000000010
000000000000000010
0000000000000000100
1000000000000000000
0000000000000000010
00000000000000000100

Property Crime Network 6

0
00
100
0000
11110
000020
0101320

Property Crime Network 7

0
10
110
1110
11000
111100
1111010
11001000

Property Crime Network 8

0
10
110
1110
11110
111110
1111110
11111110
111111110
1111111110
11111111110
111111111110
1111111111110

Property Crime Network 9

0
10
110
1000
11100
111110
1111110
11111110

Property Crime Network 10

1
00
000
0000
00000
000111
0000001
00000000
000000000
1001001000
0000000000
101000101111
0000000000100
00000000001000

Property Crime Network 11

1
01
010
0100
10000
100000
1000000
10000000
100000000
1000000000
10000000000
010000000000
0100000000000
10000000000000
0000001000000000
1000000000000000
10000000000000000

Organised Sexual Abuse Network 1

0
00
000
1111
00001
000010
0000101
0000001
00000010

Organised Sexual Abuse Network 2

0
00
000
0001
00000
000000
0111111