

Are Bosses Brokers? A Network Approach to Leadership in Organized Crime

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Abstract

Although research has been conducted on leaders of various types of organizations, there are concerns that such research cannot be generalized to organized crime groups. Using data provided by the Criminal Intelligence Service of Alberta, the current study adopts a social network approach to analyzing leadership in organized crime in Alberta, Canada. More specifically, it looks at whether leadership status can be used to predict centrality. Understanding the network centrality of leaders can help shed light on what leaders do, how they behave, and who they talk to, which in turn allows law enforcement to more effectively plan and assess the appropriateness of intervention strategies against organized crime groups. While past studies have used centrality measures to predict leadership, I argue that centrality comes with the territory of being a leader. Results indicated that leadership status was a significant positive predictor of both degree centrality and betweenness centrality.

Keywords: Organized crime; social network analysis; leaders

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Chapter 1.

Introduction

Although research has been conducted on leaders of various types of organizations, there are concerns that such research cannot be generalized to organized crime groups. Unlike leaders of legitimate organizations, leaders in the criminal world are sought after by law enforcement, often needing to conceal their activities and their identities from the police to avoid legal consequences. Being in a high-risk and hostile environment plays a role in how criminals think and behave, making studies on leaders in legitimate organizations problematic to generalize to leaders within a criminal context. Therefore, police are to some extent left in the blind when it comes to understanding what it means to be a leader in organized crime groups. Having knowledge of what leaders do, who they interact with, and how many people they interact with is important because it can help law enforcement better plan and assess the appropriateness of interventions against organized crime groups, such as the prioritization targets (Hashimi & Bouchard, 2017; Malm & Bichler, 2011; McGloin, 2005).

The knowledge and perception of leaders in organized crime groups is often atheoretical and based on non-systematic information such as anecdotes, case studies, and (auto)biographies. However, social network analysis can offer both a theoretical framework and a set of associated methods and analyses to more systematically study these individuals. Social network analysis is based on the assumption that an individual's behaviour is influenced by the connections and associations they have with other people (Knoke & Yang, 2008). Members not only have ties with people within their own group, but they can also be connected to individuals belonging to other crime groups. These connections may be ad hoc associations brought upon by a one-time common goal (Gomis, 2005), or they can be ties of a more long-standing nature such as friendship. Network analysis looks at these relations and attempts to identify patterns among them.

The theoretical perspective of network analysis focuses on the interdependencies among individuals, with the assumption that these interdependencies influence how people behave (Wasserman & Faust, 1994). Typically, when researchers

set out to empirically explain criminal behaviour, the statistical methods used assume and treat individuals as independent units; however, the reality is that individuals are embedded in a web of social relations and rarely act in a silo (McGloin & Kirk, 2010). In addition to offering a theoretical perspective, social network analysis also encompasses a multitude of methodological techniques entrenched in graph theory. One of the main applications of network analysis is to identify the important players in a network. This is often accomplished by looking at centrality measures, which depending on the specific type of measure, provides an indication of how well an individual is connected in the network.

The two most common centrality measures found in the criminal network literature are degree and betweenness centrality. Degree centrality is determined by the number of direct connections an individual has with other people, while betweenness centrality is measured by counting the number of times an individual acts as a bridge along the shortest path between two other individuals (Freeman, 1979). High degree centrality may be valuable or detrimental depending on the context. For example, in Haynie's (2001) study on delinquent peers, degree centrality is associated with popularity of adolescents, which in most cases, can be considered as a valuable trait. Individuals in criminal networks with high degree centrality are often interpreted as being active members of the group, which is a positive attribute because it translates to higher social capital from knowing more people. However, it may also be considered a negative attribute since it could mean that the individual is overly visible in the network and therefore more vulnerable to law enforcement detection (Baker & Faulkner, 1993; Morselli, 2009). Being able to avoid law enforcement detection is a fundamental part of being a criminal, which is why betweenness centrality is often the more desirable trait in comparison to degree centrality. Betweenness centrality captures an individual's capacity of being a broker and their ability to connect to not necessarily a lot of people, but to the right people that can give them a competitive edge in their criminal ventures without the added visibility. Degree and betweenness centrality are the key measures that will be used in the current study to understand the positioning of leaders.

While the existing literature on leadership in organized crime is limited, the issue of whether status in a criminal group and centrality are related is not entirely new. Past studies have looked at centrality measures of leaders and high-status members and how these measures compare to non-leaders and low-status members within criminal

groups. Centrality measures have also been used to predict who the bosses are in a mafia network (Calderoni, 2014). The available literature largely indicates that leaders are embedded in their larger social networks in ways that are unique from other general members, suggesting roles and responsibilities that are specific to individuals with higher status. For instance, leaders have often been found to occupy positions that are suggestive of the role of a prolific broker within their groups, acting as the bridge between individuals who do not know each other (Calderoni, 2011; Calderoni, 2014). By being the broker, they have the power to control the flow of information and goods, which ultimately provides them with larger payoffs (Burt, 1992). However, not all leaders display the same network characteristics. While some criminal leaders make themselves present and interact with many of their group members, other leaders remove themselves from the centre stage and choose only to associate with a scarce number of individuals. Social network analysis can aid in uncovering these patterns, showing which leaders prefer to be at the centre of all the action and which leaders tend to stay behind the scenes and remain disengaged from the group.

The goal of this study is to further the understanding of network positions of leaders in organized crime groups with the help of social network analysis. It examines whether leadership status can be used to predict centrality. The data used in this study is an organized crime network in the province of Alberta, Canada. It contains information on persons of interest as well as their associates that have been flagged during police investigations as being involved in serious and organized crime. The majority of individuals were part of major drug smuggling and trafficking investigations, while others were involved in various types of instrumental crimes such as extortion and money laundering.

While past studies have used centrality measures to predict leadership with the argument that individuals become leaders due to their network connections, I argue that centrality comes with the territory of being a leader. Leaders have the authority to summon people to meet them, while ignoring others that may not benefit them. Others want an audience with leaders because of their status and power, whereas leaders can choose who they want to meet from this pool of offenders. Literature suggests that once individuals attain leadership status, they have greater control over who they are connected to and how they are positioned in the network (Morselli, 2003). It becomes problematic to use centrality to predict leadership, especially in the absence of

longitudinal data, because being a leader very likely facilitated a person's ability to exert control over the network, including how many people an individual connects to and who they actually connect with. These two stances are not mutually exclusive. For instance, an individual may spend years building network connections that allow them to climb the ladder to the top, but once they reach leadership status, they have the choice to cut off certain connections that are risky or redundant, and build new ones that they did not previously have access to before becoming a leader. This study focuses on the latter stage, with the aim of finding out how individuals are positioned in a network as leaders of their groups.

Chapter 2.

Leadership and Criminal Network Literature Review

A wealth of research has been done on leadership within social, economic, political, and religious movements. In legitimate organizations and movements, the importance of leaders has been documented, from recruitment of members to increasing efficiency in operations (Morris & Staggenborg, 2007). Organizations require strategizing to function both effectively and efficiently, in which leaders enable this process (Morris & Staggenborg, 2007). They also help facilitate and foster a sense of collective identity as groups are not completely homogenous, with members originating from diverse backgrounds and all with different characteristics, qualities, and skillsets (Barker, Johnson, & Lavalette, 2001). This leadership function can also be seen in criminal groups. Promoting collective identity is especially important in the criminal context as studies have shown that one of the main reasons why youths join gangs is due to a lack of self-identity and the need for a sense of belonging (Vigil, 1988; Clark, 1992; Omizo, Omizo, & Honda, 1997). Leadership type in social movements have been found to influence the division of labour of groups as well as the centralization of decision-making (Wilson, 1973). Similarly, leaders of criminal groups adopt various methods managing their groups, with some being hierarchically structured and highly organized, and others being flexible and decentralized. In most cases, leaders are imperative for the survival and proper functioning of groups and organizations, criminal or not. Despite the many resemblances, one would expect differences in the function, operation, and strategies adopted by leaders in crime groups compared to those in legitimate organizations due to the illegal nature of activities and the high-risk environment inherent in organized crime. For instance, leaders of legitimate organizations can turn to the police for help if they believe the group or members within the group have been victims of a crime. However, leaders in the criminal world are wanted by the police, therefore, unable to enjoy the same protective mechanisms as ordinary, law-abiding citizens. Not only do leaders of criminal groups have to evade the police, but they also need to protect themselves from competing crime groups. Intergang conflict and violence are common as groups are often fighting over territory, material goods, status, or dealing with personal conflicts between individual group members. Due to differences in the nature and legality of their

activities, leaders of legitimate and illegitimate organizations should not be grouped together as a single area of research.

Some scholars believe that leadership in general and more specifically in organized crime, can be best understood through a network perspective. Criminologists have used network analysis to examine a wide variety of illicit networks, from terrorist organizations, white-collar schemes, street gangs, organized crime groups, human trafficking, to prostitution. Social network analysis is a theoretical perspective that focuses on the underlying assumption that interdependencies among individuals affect how they think and act (Wasserman & Faust, 1994). As such, to gain a better understanding of leadership, it is necessary to move beyond looking at leaders as individual entities and separate from other members, but rather, in relation to the broader network. Network analysis also provides a set of methodological techniques rooted in graph theory. One of its strengths is its ability to create visuals that are intuitive, easy to understand, and help tell a story. It defines structures with nodes and ties, where nodes can be an individual or a group of individuals, and ties connect nodes.

A main application of network analysis is identifying the most influential person or persons in a network. In this case, researchers often turn to centrality measures as centrality tells us the importance of each node within a network by quantifying a person's interconnectedness within their network. In leadership literature, more central individuals are often perceived as influential, powerful, and in possession of greater social capital (Brass, 1992), and Yukl (1994) has argued that the most fundamental element of leadership is influence. As such, centrality should be expected to be significantly associated with leadership in organizations. However, criminal groups are unique from legitimate organizations due to their high-risk environment, making the association between centrality and leadership more complex when examining leadership in organized crime groups. In addition, what defines a node as "important" can vary depending on the nature of the network and the specific centrality measure used. This study employs the two most common centrality measures used in criminal network literature: degree and betweenness centrality.

2.1. Centrality in the Criminal World

2.1.1. Degree and Betweenness Centrality

Individuals with high degree centrality often enjoy greater social capital as they have more connections with the people around them. This may be a sign of power or influence and may translate into having more access to resources around them. However, social ties require time and energy to maintain. When an individual establishes more ties, it becomes increasingly likely that the information and resources each of their ties provide becomes redundant, eventually leading to a point of diminishing returns. While the first impression of degree centrality is often the more the merrier, there are certain situations where having a greater degree centrality is not necessarily advantageous. Since criminal groups operate in a hostile environment where they must conduct their activities in secret, degree centrality is not always considered as a positive attribute. In the criminal network literature, degree is more often interpreted as vulnerability due to the increased visibility that comes with having many social connections. Visibility can be dangerous both in terms of evading law enforcement detection and concealing activities from competing crime groups. Baker and Faulkner's (1993) study on illegal networks in the heavy electrical equipment industry found that individuals in price-fixing activities with high degree centrality were more vulnerable as it was more likely for them to be found guilty in court due to having a larger number of eyewitnesses to their crime. Their findings suggest that the more strategic players chose to remain in the periphery as having many connections in a criminal network is a strong indication of visibility, resulting in a greater likelihood of being found guilty in court and receiving harsher punishments.

Another form of centrality that may be a better indicator of leadership than degree centrality is betweenness centrality. Betweenness centrality is calculated by determining the number of times an individual falls on the shortest path between two other people (Freeman, 1979). It represents a person's ability to control the flow of information within a network and the degree to which they act as gatekeepers to other parts of a network, thus, embodying the role of a broker (Morselli, 2001; Morselli, 2009; Hofmann & Gallupe, 2015). Brokers may or may not have as many connections as other people, but it is who they are connected to and who they are connecting that is meaningful. The origin of brokers can be traced back to Burt's structural hole theory

(1992), which was intended to define social capital and explain where variances in social capital originate from. Burt (1992) differentiates between three main types of capital that individuals bring to the competitive arena: financial capital, human capital, and social capital. Financial capital refers to the monetary assets of an individual, such as the amount of cash they have in hand and how much investment they own in the bank. Human capital refers to an individual's natural qualities and capabilities, such as their physical appearance and intelligence. Social capital, on the other hand, is not a property of the individual, but comes from the relationships that a person shares with other people. Through relationships with friends, colleagues, acquaintances, family, and other contacts, an individual receives opportunities to both use and gain their financial and human capital (Burt, 1992). For instance, employee referral is an internal recruitment strategy where companies set out to hire applicants from their current employees' social networks. In such cases, having the best resume, being the most qualified, or being well-liked and popular may not be enough if an individual does not know any existing employees or have the connections to be a part of the initial applicant pool. In other words, an applicant does not necessarily need to know a lot of people to get the job, they just need to know the right person in the network that can provide them with what they need.

At the core of structural hole theory is the notion of redundancy in one's social contacts. Structural holes connect non-redundant contacts, or contacts that do not know each other (Burt, 1992). An individual only has a limited amount of time and effort they can spend on other people, therefore, who they select to invest their time and effort on is key. When an individual is in a tightly knit network where all other individuals know each other (i.e., redundant contacts), it is likely that the information passed on in the network is also redundant, resulting in everyone in the network acquiring and learning the same information. However, if an individual is connected to two people that do not know each other (i.e., non-redundant contacts), it is more likely that the information they receive from either of their contacts is new or at the very least, different from each other. Therefore, in a competitive structure, selectively choosing contacts that are non-redundant yields better results in terms of the availability and quality of information and opportunities offered. By being in a structural hole position, or being a broker, individuals enjoy more benefits from the same amount of time and energy they invest into people (Burt, 1992). As such, according to Burt's structural hole theory (1992), brokers possess

greater social capital and can expect higher payouts than non-brokers due to their contacts being less redundant.

Another reason the position that brokers hold within a network is considered strategic is because they can control the flow of information and resources. Individuals on either end must rely on the discretion of the broker in order to obtain information or resources, and brokers profit from this reliance. The value of brokers has been documented in various types of illicit networks (see Kleemans & van de Bunt, 2003; Zhang & Chin, 2002; Bruinsma & Bernasco, 2004; Natarajan, 2006; Morselli, 2008; Morselli, 2009; Calderoni, 2014), and they are also more likely to be found in more sophisticated and organized criminal groups (Coles, 2001; Klerks, 2001). Morselli's case study (2001) on Howard Marks (a.k.a. Donald Nice) demonstrates the positional advantages of a broker within an illicit drug trade network. Marks was a successful and well-known international cannabis trader who was first introduced to the trade while he was an undergraduate student and a heavy consumer himself. He was taken under the wings of his dealer, Graham Plinston, who initially provided Marks with the necessary contacts and resources to build his drug trade network that eventually led to a career that lasted for two decades. Over the years, Marks network of importers, exporters, suppliers, distributors, and co-participants continued to grow, as he was able to establish more contacts through the original contacts Plinston had introduced him to. Marks had also started to communicate directly with Plinston's contacts independently without Plinston's involvement. As a result of his expansive network of contacts, Marks found himself to be the link between many individuals that were unconnected yet needed something from each other. What made Marks so valuable within the drug trade was that he was able to position himself between exportation and importation, either as a liaison or representative, and that brokerage position gave him access to many profitable opportunities. His brokerage position meant that he did not need to depend on any single individual, yet others depended on him. Even though his career ultimately ended with his arrest by the Spanish National Police, much of his success in the drug trade could be attributed to his brokerage capacities that allowed him to be the bridge between key individuals within the cannabis trade.

Morselli's (2003) in-depth analysis of Sammy Gravano's career in the Gambino family also demonstrates the advantages of being in a brokerage position and how minimizing redundancy in one's social network allows for more opportunities for criminal

success. Before being apprehended by law enforcement and turning into an informant, Gravano was second in command as the underboss in the Gambino family. Morselli (2003) recreated Gravano's network of legitimate and illegitimate businesses throughout his career, documenting all the contacts that entered and exited his working network which spanned over a period of nearly 30 years. Gravano's initial experiences with crime started with his association with the Rammers, a juvenile street gang in Brooklyn. Through an uncle of one of the members in the Rammers, Gravano was introduced into the Colombo family, one of the five families of the Cosa Nostra in New York City. Being associated with the Cosa Nostra provided him with some resources and protection, but his criminal activities largely remained as street crimes which limited the extent of his criminal earnings. As such, Gravano turned to legitimate work in the construction business. It is noteworthy that it was mainly during this legitimate phase in the construction industry that eventually allowed Gravano to rise within the ranks of the Gambino family.

After Gravano's return to crime and transition into the Gambino family, he was promoted to the position of a captain due to his unique connections and experience in the legitimate construction industry. Being a captain gave him his own crew of soldiers and put him in direct contact with the Gambino family administration. Gaining the status of a captain gave him the opportunity to be in a network position that brokered between three distinct clusters of contacts: his crew, the Gambino family administration, and the construction industry. Due to his exclusive connections in the construction industry, Gambino was indispensable to the family and therefore given many privileges that not only bolstered his wealth, but also helped him stay in control and out of the spotlight from law enforcement. Throughout most phases of his criminal career, from entering the Rammers to becoming the underboss of the Gambino family, Gravano regularly reduced the amount of high-constraining relationships in his working network, permitting him more freedom to discover new opportunities. For instance, by taking part in the murder of the Gambino family's former boss, Gravano was promoted into the family elite, which gave him access to contacts and resources that were not previously available to him. Gravano also orchestrated the elimination of another key member in the family, which gave him complete control over the Gambino's family interests in the city's construction industry. His career is an example of how the causal order between centrality and leadership can be true both ways. Morselli (2003) suggests that while violence played a

factor, Gravano's success was mainly due to the fact that he was relationally proficient, putting him in resourceful positions that allowed him to climb the ranks within the Gambino family. However, once Gravano became an underboss in the Gambino family, his leadership status gave him the opportunity to dictate his network position/centrality by having control over who he wants and does not want to interact with.

2.1.2. Leadership Status and Centrality Measures

Past literature indicates that brokerage capabilities are higher among the elite members and leaders of criminal groups (Morselli, 2009; Calderoni, 2014). Calderoni's (2014) study on the 'Ndrangheta network, a mafia from the Southern Italian region of Calabria, shows that centrality measures and more specifically betweenness centrality, can be a useful tool to help law enforcement identify mafia bosses. The network was generated from information gathered during a large-scale police investigation on the 'Ndrangheta, and while the most common methods employed to study criminal networks up until then have been through the use of arrest records and telephone intercepts, Calderoni (2014) examined whether patterns can be found by analyzing meeting attendance. Gathering information on meeting attendance was not only more cost-efficient for law enforcement agencies and less complicated when it comes to meeting procedural requirements, it could also better capture leadership roles in mafias as bosses may minimize telephone communications to limit the risk of being intercepted (Calderoni & Superchi, 2019). The study gathered data on 129 meetings and the results indicated betweenness centrality as being the best predictor of leadership, where leaders scored 14.5 times higher in betweenness centrality than other individuals (Calderoni, 2014). High betweenness centrality in the context of meeting attendance meant that bosses were more often able to meet with individuals that did not meet with each other throughout the investigation. This is suggestive of the role of a broker. However, Calderoni (2014) cautions that even though criminals who are successful typically have higher brokering capabilities, brokerage does not necessarily reflect leadership status.

While criminals with high brokerage capabilities enjoy greater social capital due to their unique positioning in a network, it has also been argued that brokers may be more common among middle-level members of a criminal group. Calderoni (2014) suggests that in drug-trafficking networks, high brokerage may actually be more

representative of middle-status traffickers as they are the ones responsible for the daily communication and coordination of smuggling operations. This is seen in his earlier study on the 'Ndrangheta, where Calderoni (2012) mapped out the network structures of two of their drug trafficking groups based on court orders relating to criminal investigations of the groups. The network was reconstructed from the information retrieved from intercepted telephone communications and meetings. From the content of the conversations between contacts, Calderoni (2012) assigned status scores to each individual and categorized them into three status classes. Both drug trafficking groups had a small number of high-status individuals, while the majority were middle and low-status members. The study found that leaders (i.e., high-status members) were not the most central players in the two networks, but rather, middle-status traffickers were the most connected and had the highest betweenness centrality scores in the two networks (Calderoni, 2012). The traffickers constituted the operational core, while leaders remained disconnected from the action, limiting their exposure and protecting themselves from the vulnerabilities associated with being in the operational core. Differences in findings between the centrality measures of leaders in Calderoni's 2012 and 2014 studies on the 'Ndrangheta may be a result of methodology, as the latter study relied solely on meeting attendance data to form the network, while the former study looked at both telephone communication and meetings. Calderoni and Superchi (2019) found that leaders minimized the amount telephone calls to avoid communication being intercepted by law enforcement. As a result, centrality scores of middle-level members relative to leaders may be higher when data from only telephone communications are taken into account. In addition, the objectives of the investigations that were used to create the networks were different between the 2012 and 2014 studies. The investigative sources for the 2012 study were centered primarily around the drug trafficking activities of the mafia, whereas the 2014 study focused on establishing the organizational structure of the group. As such, targeting bosses in the latter study was necessary to understand the structure of the mafia group, and as a result, may have highlighted leaders as more central players in the network. How leaders position themselves within the larger network can be part of a proactive strategy, yet sometimes it can be the result of a reactive strategy when factors around them force them into positions that are not ideal. Morselli (2010) argues that there are certain positions in a network that are more strategic than others and looking at degree and betweenness centrality simultaneously can help identify these various positions.

2.2. Strategic and Vulnerable Positions in Criminal Networks

While degree centrality and betweenness centrality can provide valuable information on their own, looking at the two centrality scores together can offer further insight into an individual's position within a network (Morselli, 2010). To examine the overlap between the two centrality measures, Morselli (2010) created a two-by-two matrix with degree centrality on one axis and betweenness centrality on the other axis as a method to assess whether an individual is positioned strategically or vulnerably in a criminal network. With the two-by-two matrix, there are four possibilities of network patterns as seen in Figure 1. The four network patterns are: 1. high degree centrality/high betweenness centrality (i.e., visible brokers); 2. high degree centrality/low betweenness centrality (i.e., social butterflies); 3. low degree centrality/high betweenness centrality (efficient brokers); and 4. low degree centrality/low betweenness centrality (i.e., peripheral players). Morselli (2010) argues that an individual who has a combination of a low degree centrality score and a high betweenness centrality score can be considered as occupying one of the most strategic positions within a network. Criminals in these positions can be thought of as "efficient brokers," as they enjoy high brokerage capabilities, but without the extra visibility that can expose them to law enforcement. On the other hand, individuals who score high in degree centrality and low in betweenness centrality occupy the most vulnerable position within a criminal network, as they have minimal brokerage capabilities but are highly visible to law enforcement. They are considered as "social butterflies" as they know many people, but their connections are redundant and therefore, of limited value. Individuals with high betweenness centrality scores and high degree centrality scores are considered "visible brokers" since they possess strong brokerage capabilities but are also highly visible to law enforcement. The last network pattern in the matrix are individuals who score low in both degree and betweenness centrality. These players are "peripheral players" as they are not very active in the network and typically play minor roles in the group.

	Low Betweenness	High Betweenness
High Degree	Social Butterfly	Visible Broker
Low Degree	Peripheral Player	Efficient Broker

Figure 1. Four network positions based on degree and betweenness centrality

Morselli (2010) examined whether the four different network positions (i.e., efficient broker, visible broker, peripheral player, social butterfly) would have an impact on the judicial outcomes (i.e., arrests) of a Hells Angels network in Quebec, Canada. Degree and betweenness centrality scores were dichotomized at the mean in order to create the four network groups. The results showed that 85% of individuals belonging in the high degree centrality/low betweenness centrality group (i.e., social butterflies) were arrested, which represented the highest percentage of arrests among all groups (Morselli, 2010). On the contrary, only 25% of individuals belonging in the low degree centrality/high betweenness centrality group (i.e., efficient brokers) were arrested. Although the low degree centrality/low betweenness centrality group (i.e., peripheral players) had the lowest proportion of arrests among all the groups at 10%, most of the individuals within this group played minimal roles and were not key players. These results support the competitive edge that brokers claim to have, as they can participate and control activities from a distant without holding the same risks as someone who exerts direct control over the group. In Morselli's (2003) study on Gravano's working network, it was discovered that once Gravano reached underboss status in the Gambino family, he began to reduce his network by removing contacts that were no longer useful to him. As a result, he was able to minimize his exposure, and at the same time, keep contacts that were valuable to him for maintaining his social capital. Morselli (2009) also found in his research on the Quebec Hells Angels that Nomads (i.e., individuals with the

highest ranked organizational position in the Hells Angels) generally scored lower in degree centrality than Nomad Prospects and Rockers (i.e., lower ranked members), suggesting that high-level members such as leaders may choose to avoid being in vulnerable positions and to keep a low-profile to limit outside exposure. Both studies also provide evidence that leadership status predicts centrality, as Gravano was given the power to dictate who he wanted to be in contact with, while the Hells Angels' Nomads were able to control their network position by minimizing the number of ties they had with other people.

Despite the highly strategic position of an efficient broker within a criminal network, not all leaders are capable of being in such a position. Leaders and bosses from established and sophisticated criminal organizations may have the organizational structure in place allowing them to control the group indirectly from a distance, but most criminal groups that exist today are small and opportunistic (Bouchard & Morselli, 2014). As such, they may lack the necessary structure that would allow them to remain distant from the group and their core activities. Leaders in small, opportunistic crime groups often have to be more "hands-on" participants and be directly involved in the day-to-day operations of the group. Thus, it is rare that they are able to occupy the position of an efficient broker, where they possess high brokerage capabilities but can still limit their visibility. One such example can be seen in Hofmann and Gallupe's (2015) study on leadership protection in drug-trafficking networks. Their research looked at a relatively large and successful Colombian cocaine-trafficking organization led by Hernan Prada who played an important part in the direction, coordination, and planning of various components of the cocaine supply chain. The qualitative data of the study suggested that the Prada network was decentralized and many of their operations had minimal control by the core group of leaders as a protective strategy. However, the quantitative data showed that Hernan Prada had the highest degree and betweenness score, indicating that he was the main actor in the flow of information between the multiple components across the whole Prada network, and was also the most visible node, being connected to almost a third of individuals in the network. This illustrates the difficulty of leaders being able to remain in control of operations without also being highly visible. In addition, according to Morselli, Giguère, and Petit's (2007) efficiency/security trade-off argument, profit-driven criminal enterprises like the Prada network require more action within a shorter time frame. In other words, these types of organizations cannot afford

the luxury of expanding distance in the network and having leaders work from the periphery.

The literature points to two distinct examples of how leadership can influence centrality. The first scenario is where leaders are autonomous and in control of who they meet, who they want as part of their groups, and consequently where they are positioned in the network. This is demonstrated in Morselli's (2003) work on Gravano, as Gravano was able to dictate his network position once he achieved underboss status in the Gambino family. The second scenario can be seen in Hofmann and Gallupe's (2015) study on Hernan Prada, where the pressures that come with leadership forces a hands-on, micro-management approach from leaders to ensure everything runs smoothly and that they are able to maintain power. In these cases, leaders are forced to be central as the alternative is most likely losing out on valuable information or being betrayed by other members. Researchers have pointed out that co-offending is inherently risky due to all the unpredictability that is part of criminal collaboration (see McCarthy, Hagan, & Cohen, 1998). Criminals can turn on each other anytime, even when they are part of the same group. Leaders have to be seen, involved, and make it known to group members that they are being watched, and that dishonesty will not be tolerated.

Chapter 3.

Current Study

The goal of this study is to further the understanding of network positions of leaders in organized crime groups using social network analysis. It looks at whether leadership status can be used to predict centrality, and if so, whether certain variables such as being part of a biker gang, moderate the effect of leadership on centrality. The typical configuration of organized crime groups is small and ephemeral (Bouchard & Morselli, 2014), thus, leaders may have to be more involved in the day-to-day operations of the group, resulting in higher degree centrality and lower betweenness centrality. On the other hand, biker gangs may be larger in size and have more sophisticated structure (Tremblay, Bouchard, & Petit, 2009), allowing for more opportunities for leaders to be positioned only as brokers rather than in direct contact with many group members.

The network was generated using data collected on individuals who have been flagged as being involved in organized crime in the province of Alberta. While the causal order between centrality and leadership is not entirely clear, I argue that leadership as a predictor of centrality is the stronger case. In Morselli's (2009) study on the Quebec Hells Angels, the data suggested that higher-ranked members had control over how they can position themselves in the network amongst other individuals. This meant that ranks defined the network structure, where individuals earned network privileges once they have attained certain ranks. Morselli's (2003) study on Gravano also supports this argument, as Gravano's working network showed that once he ascended to the rank of underboss, he was able to use his privileged access to resources to either create or remove certain ties.

Leaders in this study are expected to hold network positions that reflect visible brokers, where they are high in both degree and betweenness centrality (Morselli, 2010). Leaders should have the privilege of placing themselves in brokerage positions, which would give them control of the flow of information and goods between other individuals. However, similar to Hernan Prada in the Prada network (Hofmann & Gallupe, 2015), it is unlikely that leaders in the current study would be able to successfully manage and lead their groups without maintaining a relatively high number of connections with members.

Unlike mafias where family and kinship connections play a major role, the criminal organizations found in this network are unlikely to have the social structure that would allow leaders to govern from a distance. As such, leaders are expected to be high in degree centrality even though this may make them more vulnerable to law enforcement detection due to their increased visibility that comes with having many connections.

Chapter 4.

Method

4.1. Sample

The data used in the current study was provided by the Criminal Intelligence Service of Alberta (CISA), produced as part of their annual Provincial Threat Assessment reports from 2014-2015 and 2016-2017. CISA is an organization that acts as a hub for intelligence sharing and strategic analysis, collecting real-time information on serious and organized crime from various law enforcement agencies within the province. Their data management system provides information on persons of interest that have been flagged during police investigations as being involved in serious and organized crime, with the majority of individuals on this list being part of major drug smuggling and trafficking investigations. In addition, associates of the persons of interest are also identified and included within their database, from which I used to create the social network. While the network consisted of more than 3,800 persons of interest, I extracted the main component of the network to be used for analyses, which filtered out all nodes that did not have ties to the largest component of the network. This reduced the network size to 2,179 individuals. This process ensured that the resulting network focused on the main group of individuals, eliminating actors with minimal participation that were often disregarded by law enforcement. No leaders were removed from the sample as a result of extracting the main component. Similar network reduction procedures have been used in past research to capture the main group of individuals within criminal networks. For instance, in Calderoni's (2012) mafia network, he removed individuals that did not have a minimum of two ties and did not participate in a certain minimum number of communications.

Analysts received data from records sourced from independent or joint investigations from law enforcement agencies across the province, which included information on the demographic attributes of the persons of interest. Specifically, information on age, gender, ethnicity, involvement in crime (e.g., drug smuggling and/or trafficking, violent crimes, etc.), group rank (e.g., associate, member, leader), group affiliations (e.g., biker gangs), and location(s) of which the individual resided in and/or

operated out of was provided. For analysts to code whether a tie exists between two individuals or whether an individual is affiliated with a group, a connection between them must be recorded during one or more police investigations sourced from case files, confidential informants, physical surveillance, or street checks/carding. Case files include official documents from the police that were used to build investigations or aid in court cases. Street checks, sometimes known as “stop and checks” or “carding,” are initiated by officers, usually in response to public safety concerns or calls for service. It involves the identification and questioning of the individuals being checked, and the information obtained is recorded into the police’s records management system. Surveillance data comes from the monitoring of individuals’ behaviours and activities by law enforcement, which is often done by undercover police officers. Most network studies to date on organized crime have generally used arrest data, which would be equivalent to the use of case files from the data provided by CISA. However, merely relying on data produced from arrest records or case files limits the ability to construct a comprehensive network outside of co-offending captured by law enforcement. The current study addressed this limitation by drawing on various types of official data to provide a more complete picture of organized crime in Alberta.

4.2. Measures

4.2.1. Independent Variables

In addition to an edgelist of relational data indicating ties between actors, CISA also collected data on various individual attributes such as age, gender, ethnicity, leadership, location of which individuals reside in and/or operate from, and whether individuals are affiliated with outlaw motorcycle (biker) gangs. On top of controlling for basic demographic characteristics of age, gender, and ethnicity, it is suspected that affiliation to biker gangs may be a potential confounding variable between leadership and centrality. Many street gangs are ephemeral with many of the members frequently joining and leaving as opportunities present themselves, and this results in limited connections among members due to the high rate of membership turnover within groups. However, membership within biker gangs are typically not as transient. Unlike most street criminals where ties and especially co-offending ties are based on opportunism, members of biker gangs are connected at a deeper level. Biker gangs are

part of a motorcycle subculture where members conform to a set of ideals, thus, these groups are likely to be more tightly knit and better connected, resulting in higher centrality measures than non-biker groups. As such, controlling for affiliation to a biker gang may remove these effects on the regression analyses.

Age was a normally distributed continuous variable while ethnicity was coded into four categories (i.e., Caucasian, Asian, Indigenous, Minority Group). The location variable denotes the Census Metropolitan Areas/Census Aggregations (CMACAs) where the person of interest resides in and/or operates from. It initially consisted of six location dummies within the province of Alberta, but was recoded into a dichotomous variable (i.e., Large City Centre, Other Location) due to issues with limited sample size. The “Large City Centre” category included the Calgary and Edmonton CMACAs while all other CMACAs were recoded under “Other Location.” The biker variable was a dichotomous variable indicating whether the individual had links to outlaw motorcycle or biker gangs. The main variable in the study was leadership, which was dichotomized into whether an individual was a suspected or known leader of a crime group or not. I did not have access to the criteria in which analysts used to make determinations of leadership status.

4.2.2. Dependent Variables

Centrality scores, the dependent variables in this study, were calculated using the relational data, giving each individual a degree centrality and betweenness centrality score. Scores were calculated using the UCINET v.6.644 program (Borgatti, Everett, & Freeman, 2002). Degree centrality was a count variable and was computed based on the number of connections an individual had with other people. For instance, if a person had ties to four other people in the network, their degree centrality score would be “4.” Although normalized scores are often used as it allows direct comparisons with other studies to be drawn by converting the score into a percentage of the overall number of other nodes, the absolute score was used because it is intuitive and can be understood easily. Betweenness centrality was calculated by determining the number of times a

node falls between the shortest path between two other nodes (Freeman, 1979).¹ More than half of the individuals in the network had a score of zero, creating a large positive skew in the distribution.

4.3. Alberta Organized Crime Network

CISA provided two waves of data, one wave spanning from 2014 to 2015 (i.e., Wave I), and the second wave from 2016 to 2017 (i.e., Wave II). For the purpose of this study, a “Combined Wave” was created by joining the data from Wave I and Wave II in order to increase the sample size when running the regression analyses. Results from Wave I, Wave II, and the Combined Wave were very similar, thus, only results from the Combined Wave are presented as it encompasses both waves of data. If an individual was noted as a leader at any point of time between the two waves, they were included as a leader in the Combined Wave. There were issues with missing data as there was an upwards of 60% of missing data for certain attributes. Multiple imputations were used, where missing values were replaced using the expectation maximization method. Data were imputed variable-by-variable across waves, starting with variables that had the fewest missing values and ending with variables that had the most missing values. The imputed dataset was used for all presentations of data. For the leadership variable, analysts did not impute any values if an individual was not identified as a leader, thus, there was no way to differentiate between missing data and non-observation. Unless individuals were identified by analysts as leaders, they were all considered as non-leaders.

Figure 2 is a graph of the combined wave network, with the darker shade nodes indicating leadership status and node size denoting degree centrality. The network appears to have two components, a large core-like centre with the majority of nodes and ties, and a tail extending from the centre connecting a smaller component. While there seems to be a concentration of leaders within the core-like centre, leaders are also found in the smaller pocket of the network, effectively spanning the entire network. There appears to be a disproportionate number of larger nodes (i.e., high degree centrality)

¹ Betweenness centrality measures will be larger in graphs with many nodes (e.g., the Alberta organized crime network) because it is calculated by counting and adding the number of times a node falls on the shortest path(s) between all pairs of nodes in the network. As such, the larger the network size, the more pairs to count and values to add, resulting in larger betweenness centrality scores.

that are leaders, providing initial support for the hypothesis that leaders are highly connected individuals. Figure 3 is a graph of the same network, but instead of node size denoting degree centrality, it is indicative of betweenness centrality. There is a concentration of brokers situated along the tail of the network, which would be expected as they are responsible for connecting the centre component to the smaller pocket. While it appears that the individual with the highest betweenness centrality is not a leader, there is still seemingly a disproportionate number of larger nodes (i.e., high betweenness centrality) that are leaders, which provides preliminary support for the hypothesis that in addition to being highly connected individuals, leaders also play brokering roles in the network.

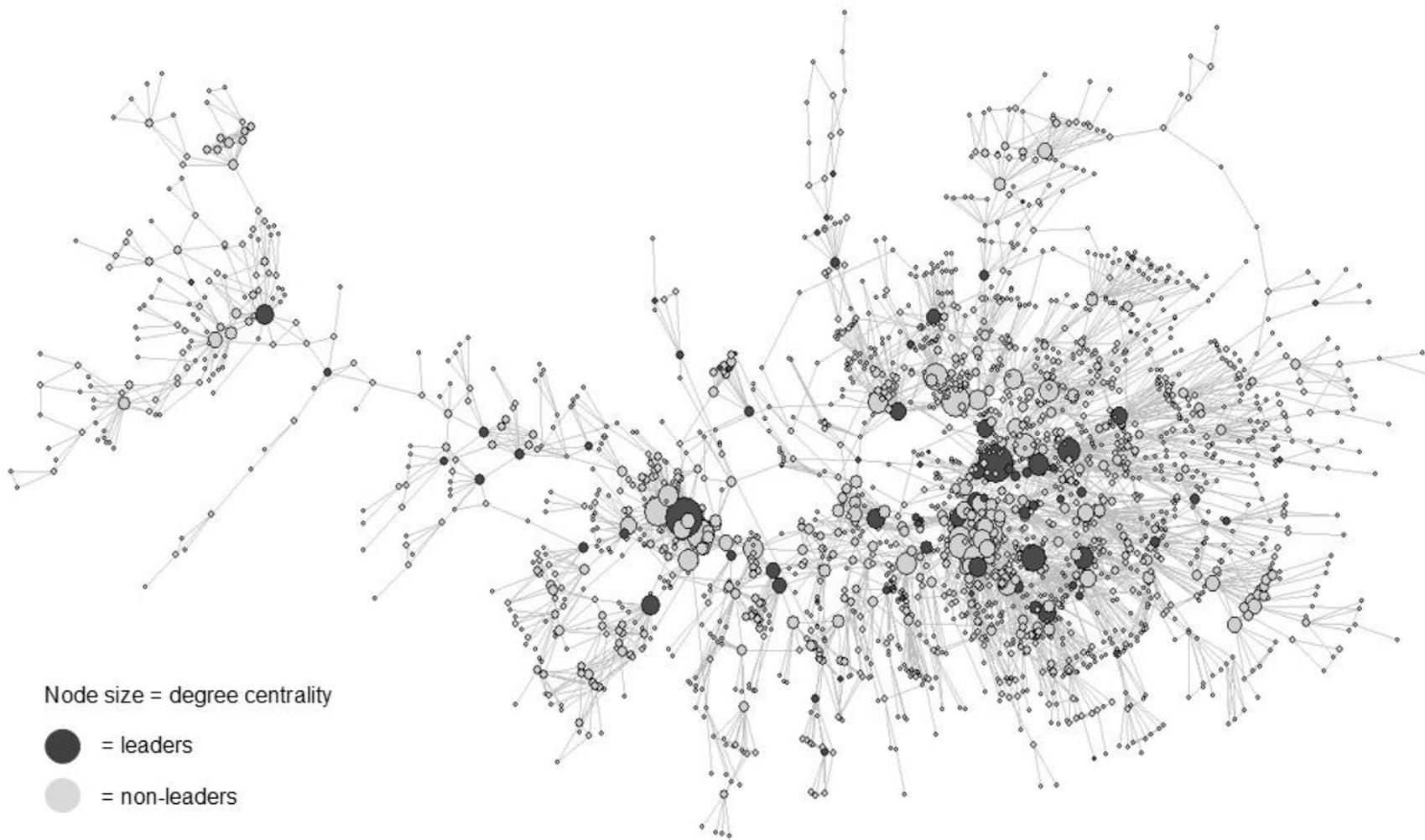


Figure 2. Alberta organized crime network. Node size by degree centrality

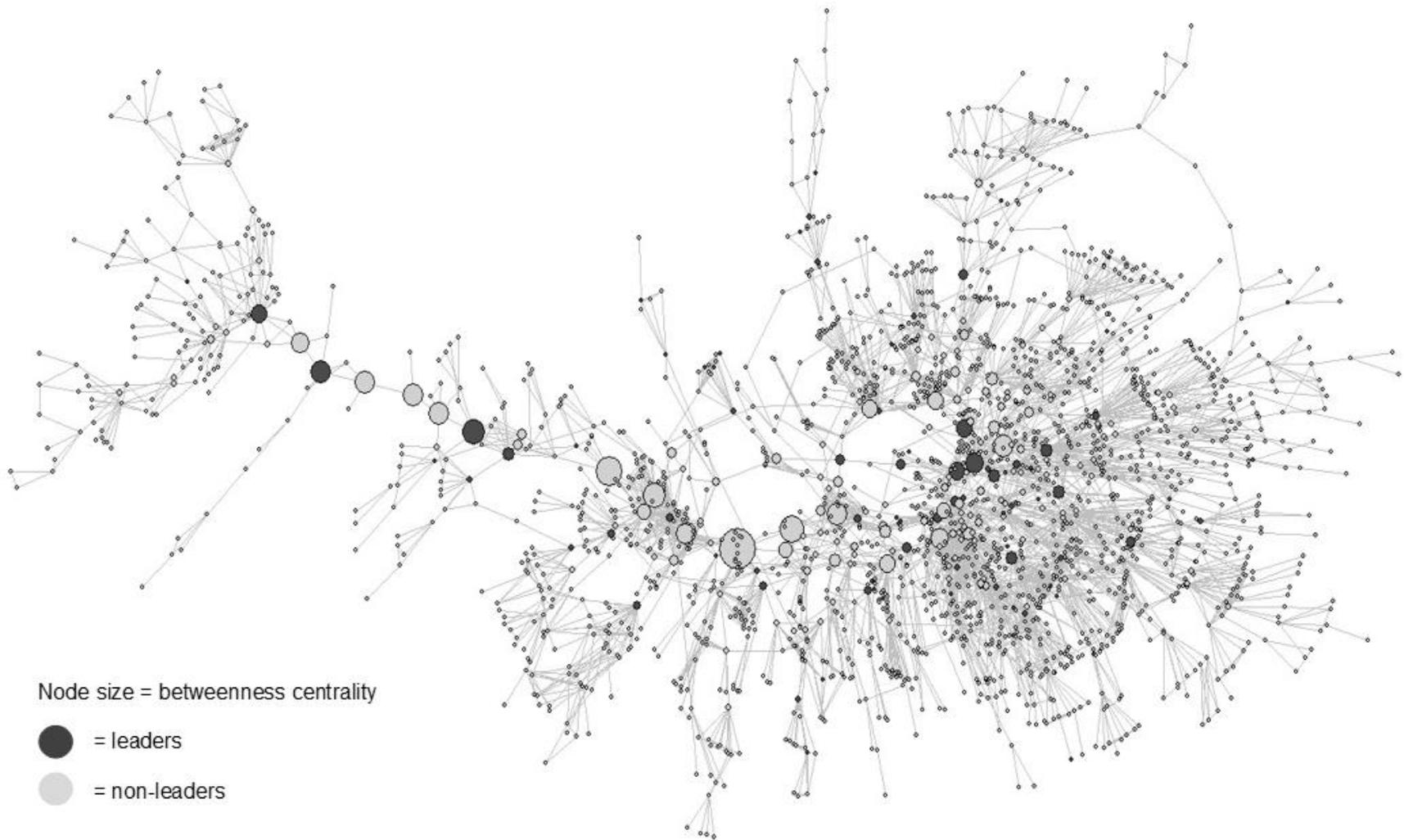


Figure 3. Alberta organized crime network. Node size by betweenness centrality

4.4. Analytic Approach

Preliminary bivariate analyses were performed using the Statistical Package for Social Sciences (i.e., SPSS) 25 for all variables to see if any patterns emerged from the network. Negative binomial regression was used to model degree centrality. Since degree centrality is a count variable, ordinary least squares regression was not an appropriate choice of method for the data. Poisson regression was better suited for modeling count measures; however, Poisson regression assumes that the mean and the variance of the dependent variable are equal. This assumption was not met as the variance value for degree centrality was high compared to its mean. Running a Poisson regression with overdispersion in the data can create deflated standard errors and consequently inaccurate significant tests (Osgood, 2000). Thus, negative binomial regression, a variation of Poisson regression, was used instead as it accounts for overdispersion in the data and produces conservative standard errors. Similar to degree centrality, betweenness centrality is also a count variable, making ordinary least squares regression an unsuitable method of analysis. Due to the overdispersion in the data, the standard negative binomial regression was used to model betweenness centrality.

Additional analyses were performed to examine Wave I and Wave II leadership dynamics. Specifically looking at whether Wave I leadership and centrality predicted Wave II leadership centrality. The analyses were exploratory in nature due to a lack of confidence in the consistency of data collection across waves, as well as an insufficient number of leaders per individual wave. In addition, I recreated Morselli's (2010) two-by-two matrix with the Alberta organized crime network to examine whether leaders in the sample held a strategic or vulnerable position in the network.

Chapter 5.

Results

5.1. Descriptives

The Combined Wave network has a total of 2,179 actors, of which 4.3% are leaders ($n = 93$). 83% of the sample are males ($n = 1,808$), 67% reside in or operate from a large city centre in Alberta ($n = 1,464$), and 92% of individuals have no links to biker gangs ($n = 1,997$). A little more than half are Caucasian ($n = 1,273$), and the mean age of the sample is 33 years old ($SD = 9.5$). There is a total of 4,883 ties in between individuals within the Combined Wave network, with an overall network density of 0.001. This means that 0.1% of all possible ties are present in the network. While density can provide useful information on the overall cohesiveness of groups, the measure can be skewed as the size of a network increases since there is an inverse relationship between network size and density. This is because the addition of every individual to a group exponentially increases the number of possible ties that could be present in the network (see Scott, 2000). To address this issue, average degree can be used to complement density, as average degree looks at the mean amount of connections individuals have with other nodes within the network and is not influenced by the size of the network. The average or nodal degree in the combined network is 4.12, meaning that on average, each person is connected to four other individuals. Although still relatively low, this number is comparable to the average degree found in the Al Qaeda attack networks during the War on Terror era, where individuals, on average, were connected to five other people across the different attacks (Ouellet, Bouchard, & Hart, 2017).

Figure 4 is a bar graph comparing the degree centrality scores of leaders and non-leaders, while Figure 5 compares the betweenness centrality scores of leaders and non-leaders. It can be seen that leaders score much higher in degree centrality than non-leaders, suggesting that leaders in the Alberta organized crime network are very active players relative to their counterparts. It also appears that leaders score much higher in betweenness centrality than non-leaders, indicating that leader possesses extensive brokerage capabilities compared to others in the network. This provides initial

support that leaders may indeed be visible brokers who are high in both degree and betweenness centrality.



Figure 4. Comparison of degree centrality among leaders and non-leaders

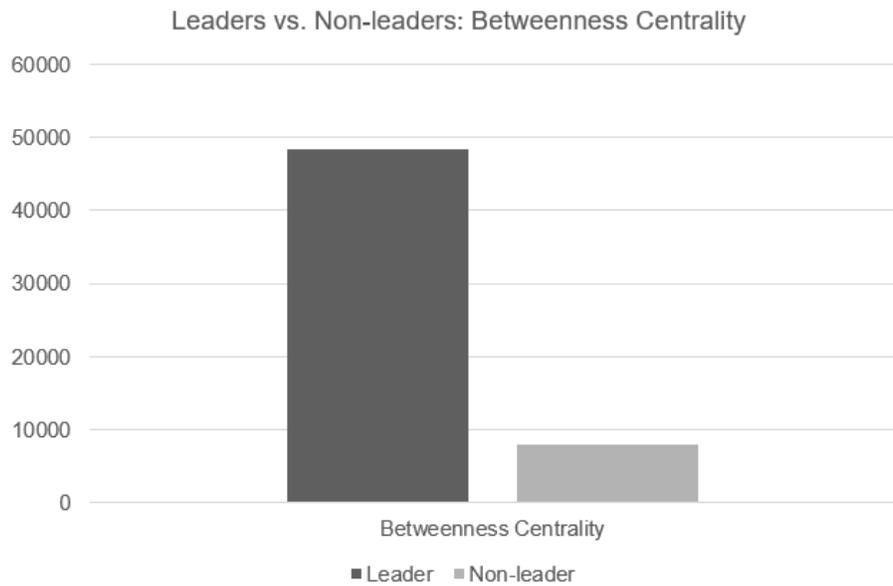


Figure 5. Comparison of betweenness centrality among leaders and non-leaders

Table 1 provides descriptive statistics of the Combined Wave, showing the distribution of each variable across being a leader/non-leader. The mean age of non-leaders is 33.1 ($SD = 9.5$) while the mean age of leaders is 35.3 ($SD = 9.4$). The percentages of individuals that are male, located in a large city centre, and have ties to biker gangs are higher among leaders than non-leaders. The mean degree centrality of non-leaders is 3.8 ($SD = 4.2$), which is substantially lower than the mean degree centrality of leaders ($M = 11.0$, $SD = 9.2$). The mean betweenness centrality of non-leaders is 7,871 ($SD = 33,609$), which is also much lower than the mean betweenness centrality of leaders ($M = 48,363$, $SD = 70,076$).

Table 1. Descriptive statistics of leaders vs. non-leaders

	Non-leaders (n = 2086)		Leaders (n = 93)	
	n (%)	M (SD)	n (%)	M (SD)
Age		33.1 (9.5)		35.3 (9.4)
Gender				
Male	1717 (82.3%)		91 (97.8%)	
Female	369 (17.7%)		2 (2.2%)	
Location				
Large City	1385 (66.4%)		79 (84.9%)	
Other	701 (33.6%)		14 (15.1%)	
Biker				
Biker	167 (8.0%)		15 (16.1%)	
Non-biker	1919 (92.0%)		78 (83.9%)	
Ethnicity				
Caucasian	1222 (58.6%)		51 (54.8%)	
Asian	435 (20.9%)		20 (21.5%)	
Indigenous	239 (11.5%)		10 (10.8%)	
Minority	190 (9.1%)		12 (12.9%)	
Degree Centrality		3.8 (4.2)		11.0 (9.2)
Betweenness Centrality		7,871 (33,609)		48,363 (70,076)

5.2. Bivariate Analyses

Results of the bivariate analyses between all variables are shown in Table 2, with the cells indicating effect size. Results from chi-square analyses suggest that leaders within this sample were more likely to be male, live in and/or operate from a large city centre, and be affiliated with biker gangs. Independent t-test results show that leaders, on average, were older than non-leaders and scored higher in degree centrality and betweenness centrality. Degree centrality was positively associated with all variables except for age, where the association was found to be negative. Betweenness centrality was also positively associated with all variables except for age, where no significant associations were found. The findings from the bivariate analyses show that degree centrality and betweenness centrality were significantly associated with most of the other variables aside from leadership, suggesting that these variables may have a significant effect on the outcome when predicting centrality scores. This underscores the importance of controlling for these potentially confounding variables that may skew the results of subsequent analyses.

Table 2. Bivariate associations between individual attributes

Variables	1	2	3	4	5	6	7
1 Leader	-						
2 Male	0.084 ^{a***}	-					
3 Large City	0.080 ^{a***}	0.107 ^{a***}	-				
4 Biker	0.059 ^{a**}	0.106 ^{a***}	0.045 ^{a*}	-			
5 Ethnicity	0.028 ^a	0.164 ^{a***}	0.211 ^{a***}	0.251 ^{a***}			
6 Age	0.233 ^{b*}	0.226 ^{b***}	0.080 ^b	0.840 ^{b***}	0.056 ^{c***}	-	
7 Degree	1.528 ^{b***}	0.290 ^{b***}	0.323 ^{b***}	0.378 ^{b***}	0.008 ^{c**}	-0.061 ^{d**}	-
8 Betweenness	1.100 ^{b***}	0.219 ^{b***}	0.213 ^{b***}	0.357 ^{b***}	0.022 ^{c***}	0.000 ^d	0.717 ^{d***}

a. Effect size of chi-square (Phi) b. Effect size of independent t-test (Cohen's *d*) c. Effect size of one-way ANOVA (Eta-squared) d. Spearman's rank correlation

* $p < .05$, ** $p < .01$, *** $p < .001$

5.3. Regression Analyses

Table 3 presents the results of the negative binomial regression analysis examining degree centrality based on the set of control variables and leadership status. The Pearson Chi-Square value was greater than 0.05, meaning the model adequately fit the data. Five of the control variables were statistically significant as well as the main predictor variable. Specifically, changes in age, gender, location, affiliation with biker

gangs, leadership status, and being in a minority ethnic group compared to Caucasian were significantly related to degree centrality.

In terms of the magnitude of relationships, the incident rate ratios suggest that, holding all other variables constant, each unit increase in age was associated with a 0.9% decrease in the incident rate of degree centrality. Being male rather than female led to a 23.1% increase in the incident rate of degree centrality, living in and/or operating from a large city centre as opposed to other areas led to a 38.9% increase in the incident rate of degree centrality, and having ties to bikers compared to not having any ties to bikers led to a 57.2% increase in the incident rate of degree centrality. While being in a minority ethnic group as opposed to Caucasian led to a 38.3% increase in the incident rate of degree centrality, being in an Asian or Indigenous group did not lead to significant changes compared to being Caucasian. Leadership displayed the strongest effects on degree centrality, as being a leader rather than a non-leader led to a 160.9% increase in the incident rate of degree centrality.

Table 3. Negative binomial regression predicting degree centrality

	Degree Centrality		
	B	SE	IRR
Control IVs			
Age	-0.009**	0.003	0.991
Male	0.208**	0.068	1.231
Large City Centre	0.329***	0.054	1.389
Biker	0.452***	0.090	1.572
Ethnicity (Caucasian) ^a			
Minority	0.324***	0.086	1.383
Asian	0.096	0.0635	1.101
Indigenous	0.121	0.082	1.128
Main IV			
Leader	0.959***	0.112	2.609
Log Likelihood	-5401.76		

a. Reference category for ethnicity is "Caucasian"

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4 presents the result of the negative binomial regression analysis predicting betweenness centrality based on age, gender, location, affiliation to biker gangs, ethnicity, and leadership. Five of the control variables were statistically significant as well as the main predictor variable. Specifically, changes in gender, location, affiliation to biker gangs, leadership status, being in a minority group compared to Caucasian, and being in an Indigenous group compared to Caucasian.

The incident rate ratios indicate that, holding all other variables constant, being male rather than female led to a 77.6% increase in the incident rate of betweenness centrality, living in and/or operating from a large city centre as opposed to other areas led to a 186.4% increase in the incident rate of betweenness centrality, and having ties to biker gangs as opposed to not having any ties to biker gangs led to a 184.7% increase in the incident rate of betweenness centrality. Being in an Indigenous group led to a 53.7% increase in the incident rate of betweenness centrality compared to being Caucasian and being in a minority group led to a 399.9% increase in the incident rate of betweenness centrality compared to being Caucasian. Being a leader compared to non-leader led to a 378.6% increase in the incident rate of betweenness centrality.

Table 4. Negative binomial regression predicting betweenness centrality

	Betweenness Centrality		
	B	SE	IRR
Control IVs			
Age	0.003	0.003	1.003
Male	0.575***	0.062	1.776
Large City Centre	1.052***	0.049	2.864
Biker	1.046***	0.085	2.847
Ethnicity (Caucasian) ^a			
Minority	1.609***	0.079	4.999
Asian	-0.089	0.056	0.915
Indigenous	0.430***	0.073	1.537
Main IV			
Leader	1.566***	0.107	4.786
Log Likelihood	-21243.852		

a. Reference category for ethnicity is "Caucasian"

* $p < .05$, ** $p < .01$, *** $p < .001$

5.4. Additional Analyses

5.4.1. Moderation Analyses

Results from the negative binomial regression analyses indicate that leadership predicted both degree and betweenness centrality. In the bivariate analyses, leadership was found to be significantly associated with all but one of the control variables (i.e., ethnicity), which begs the question of whether leadership centrality might be conditional upon certain variables. As an attempt to tease apart why leaders were central, moderation analyses were performed with leadership and each of the control variables, except for gender. I want to know if leadership centrality was conditional on being

connected to bikers, being a large city centre, being part of a certain ethnic group, or being of a certain age. There were only two leaders in the Alberta organized crime network that were female, thus, gender was not included in the moderation analyses because of the limited number of cases. Age may have a moderating effect as people who are older may be more experienced in the underworld, therefore having had the opportunity to make more connections and meet more people. Ethnicity may also have a moderating effect due to differences in cultural norms. For instance, Western countries are typically associated with individualism, while non-Western countries (especially Asia) are normally described as collectivist countries. Since collectivist cultures tend to emphasize the importance of group goals over individual goals (Hofstede, 1980), non-Western groups may be more cohesive and therefore more connected.

Table 5 presents the negative binomial regression results predicting degree centrality. Model 1 includes the control variables, leadership status, and the interaction effect between leadership and biker. Model 2 includes the same variables as Model 1, but instead it looks at the interaction effect of leadership and location. Model 3 examines the interaction effect of leadership and ethnicity, while Model 4 looks at the interaction effect of leadership and age. All four models indicate that there were no significant interaction effects, meaning that leadership degree centrality was not conditional upon being a biker, being in a large city centre, being of a certain ethnic group, or being of a certain age.

Table 6 presents results from the negative binomial regression predicting betweenness centrality. Model 1 includes the control variables, leadership status, and the interaction effect between leadership and biker, while Model 2 includes the same variables but looking at the interaction effect between leadership and location. Model 3 looks at the interaction effect between leadership and ethnicity, and Model 4 includes the interaction effect of leadership and age. The only model that indicated a significant interaction effect was Model 1, which was between leadership and affiliation to biker gangs. A significant interaction suggests that the effect of leadership on betweenness centrality was different for bikers and non-bikers. Specifically, the effect of leadership on betweenness centrality was stronger for individuals not affiliated to biker gangs, and weaker for individuals that were affiliated to biker gangs. In other words, leadership betweenness centrality was conditional upon not being a biker. This is opposite from what was expected, as I had hypothesized that since biker gangs are typically larger and

more structured, it would allow for more opportunities for leaders to be brokers compared to leaders in non-biker gangs. Bikers were in fact significantly higher in betweenness centrality than non-bikers (as seen in the negative binomial regression), but this was not exclusive to only bikers that were leaders. The effect of biker on betweenness centrality may have weakened the effect of leadership on betweenness centrality for bikers.

Table 5. Negative binomial regression predicting degree centrality– interaction effect

	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	SE	IRR									
Control IVs												
Age	-0.009**	0.003	0.991	-0.009**	0.003	0.991	-0.009**	0.003	0.991	-0.009**	0.003	0.991
Male	0.207**	0.068	1.230	0.210**	0.068	1.233	0.208**	0.068	1.231	0.208**	0.068	1.231
Large City	0.328***	0.054	1.388	0.334***	0.054	1.396	0.329***	0.054	1.389	0.329***	0.054	1.389
Biker	0.462***	0.091	1.587	0.456***	0.090	1.577	0.452***	0.091	1.572	0.453***	0.092	1.573
Ethnicity												
Minority	0.323***	0.086	1.382	0.325***	0.086	1.383	0.325***	0.088	1.385	0.324***	0.086	1.382
Asian	0.095	0.064	1.100	0.095	0.064	1.099	0.097	0.064	1.102	0.096	0.064	1.101
Indigenous	0.121	0.082	1.129	0.117	0.082	1.124	0.121	0.082	1.129	0.121	0.082	1.128
Leader	0.977***	0.115		0.894***	0.126	2.445	0.943***	0.231	2.568	0.999*	0.455	2.717
Interaction												
Leader*Biker	-0.017	0.017	0.983									
Log Likelihood	-5401											
Leader*Large City				0.031	0.030	1.032						
Log Likelihood				-5401								
Leader*Ethnicity							0.008	0.097	1.008			
Log Likelihood							-5402					
Leader*Age										-0.001	0.013	0.999
Log Likelihood										-5402		

a. Reference category for ethnicity is “Caucasian”

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 6. Negative binomial regression predicting betweenness centrality – interaction effect

	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	SE	IRR	<i>B</i>	SE	IRR	<i>B</i>	SE	IRR	<i>B</i>	SE	IRR
Control IVs												
Age	0.003	0.003	1.003	0.003	0.003	1.003	0.003	0.003	1.003	0.003	0.003	1.003
Male	0.574***	0.062	1.776	0.577***	0.062	1.781	0.573***	0.062	1.774	0.574***	0.062	1.775
Large City	1.047***	0.049	2.848	1.064***	0.493	2.898	1.054***	0.049	2.868	1.052***	0.049	2.963
Biker	1.062***	0.085	2.891	1.057***	0.085	2.877	1.044***	0.085	2.841	1.046***	0.085	2.847
Ethnicity												
Minority	1.607***	0.079	4.986	1.613***	0.079	5.019	1.630***	0.081	5.106	1.608***	0.079	4.995
Asian	-0.090	0.056	0.914	-0.089	0.056	0.914	-0.078	0.056	0.925	-0.088	0.056	0.916
Indigenous	0.428***	0.073	1.534	0.426***	0.073	1.531	0.436***	0.073	1.547	0.429***	0.073	1.536
Leader	1.593***	0.109	4.916	1.448***	0.119	4.254	1.273***	0.223	3.570	1.770***	0.573	5.870
Interaction												
Leader*Biker	-0.034*	0.0165	0.966									
Log Likelihood	-21241											
Leader*Large City				0.054	0.028	1.056						
Log Likelihood				-21242								
Leader*Ethnicity							0.136	0.094	1.145			
Log Likelihood							-21243					
Leader*Age										-0.006	0.016	0.994
Log Likelihood										-21244		

a. Reference category for ethnicity is “Caucasian”

* $p < .05$, ** $p < .01$, *** $p < .001$

5.4.2. Wave I and Wave II Leadership Dynamics

The question of whether leadership predicts centrality or centrality predicts leadership may be best answered with longitudinal data, where temporal order can be established. The dataset provided by CISA contains two waves of data, with the first wave spanning from 2014 to 2015, and the second wave spanning from 2016 to 2017. Although it would have been ideal to use the two waves individually to establish a temporal order (i.e., to see if Wave I leadership and centrality predicted Wave II leadership and centrality), I was not confident enough in the consistency of data collection between the two waves to draw conclusions on changes. In addition, there would not have been a large enough sample of leaders in each wave separately, which contributed to my decision to combine them. However, despite lacking the research design in practice for a longitudinal study that can describe temporal order, I can descriptively examine the dynamics between leadership and centrality in the two waves in a mostly exploratory nature.

Figure 6 is a two-by-two matrix showing the number of individuals that were leaders and non-leaders in the two waves of data. There were 93 individuals in total that were leaders at one point of time, yet only 11 of those individuals were leaders at both points of time (i.e., leaders at both Wave I and Wave II). 35 individuals were leaders in Wave I but had either lost their leadership status ($n = 12$) or was no longer part of the dataset by Wave II ($n = 23$). 47 individuals were leaders in Wave II that were either not found in the dataset at Wave I ($n = 28$) or were not leaders at that time ($n = 19$).

Table 7 lists the 11 individuals that were leaders at both waves, whether they were bikers or affiliated to biker gangs, and their degree and betweenness centrality measures at each wave. Out of all 93 individuals from both waves that were leaders at one point of time, 16% were bikers ($n = 15$). However, of the 11 individuals that maintained their leadership status at both waves, 36% were bikers ($n = 4$). The numbers suggest that perhaps individuals that are bikers or are affiliated to biker gangs are more likely to hold onto their leadership status over time, or leadership in biker gangs are in general less transient than leadership in non-biker criminal groups. A chi-square test was conducted to explore these hypotheses, or more specifically to see if there was a significant association between bikers and consistent leadership (i.e., maintaining leadership in both waves). The results indicated no significant association between having ties to biker gangs and

maintaining leadership status throughout both wave I and wave II, $\chi^2 (1, N = 93) = 3.78, p = 0.052$.

If leadership influences centrality, I expect there to be changes in centrality from Wave I to Wave II for the 11 individuals that were leaders at both waves. Leaders would be able to use their status to actively try and get more connections or remove unnecessary connections (i.e., changes in degree centrality), and/or use their status to position themselves in brokerage positions (i.e., changes in betweenness centrality). For instance, if law enforcement was cracking down on groups and the risks of being detected or apprehended increases, the need to stay out of sight may influence leaders to cut ties and remove themselves from a central position. Another example would be if leaders were looking to expand the size of their operations and their groups, they would be actively trying to recruit new members which may lead to a significant increase in centrality. To examine whether the changes in degree centrality and betweenness centrality from Wave I to Wave II were significant for the individuals that maintained leadership status, the Wilcoxon signed-ranks test was used. Contrary to expectations, results of the test indicated that the degree centrality observed in Wave I did not significantly change in Wave II ($Z = -1.290, p = 0.197$), and the betweenness centrality scores observed in Wave I also did not significantly change in Wave II ($Z = -0.889, p = 0.374$).

		Wave II	
		<i>Non-leader</i>	<i>Leader</i>
Wave I	<i>Non-leader</i>	$n = 258$	$n = 19$
	<i>Leader</i>	$n = 12$	$n = 11$

Figure 6. Leadership status of individuals overlapping in Wave I and Wave II

Table 7. Consistent leadership: leaders in both Wave I and Wave II

ID	Biker	Degree Wave I	Degree Wave II	Betweenness Wave I	Betweenness Wave II
1818	No	36	29	77,056	78,651
1871	No	20	4	10,548	0
1960	Yes	5	19	35,911	32,373
1972	Yes	6	17	5,481	12,308
2286	Yes	5	6	726	654
2350	No	6	0	46,501	0
2364	No	6	8	50,496	4,659
2629	No	3	11	0	5,653
2708	No	9	26	29,166	825
2985	No	2	8	0	366
3515	Yes	3	15	8	8,134

Table 8 lists the 19 individuals that were not leaders in Wave I but gained leadership status by Wave II. If an increase in centrality was observed from Wave I to Wave II for individuals that gained leadership status, this may suggest that from becoming a leader, they were given access to people they previously did not have access to. It may also mean that the responsibilities that comes with being a leader required them to be connected to more people. However, this was not the case. The Wilcoxon signed-ranks test was used to examine whether changes in centrality between waves were significant. The results showed no significant changes in degree centrality ($Z = -1.354$, $p = 0.176$) and betweenness centrality ($Z = 0.000$, $p = 1.000$) between waves.

Table 8. Gained leadership: Wave II leaders that were not leaders in Wave I

ID	Biker	Degree Wave I	Degree Wave II	Betweenness Wave I	Betweenness Wave II
1805	No	3	3	1,007	0
1870	No	11	10	9,006	3,801
1877	Yes	3	1	4	0
1916	No	14	5	3,451	97
1926	No	11	1	1,624	0
1933	No	3	4	2	6
2082	No	16	21	32,810	26,771
2182	No	3	2	0	0
2423	No	6	7	32,816	3,803
2424	No	4	9	3,900	17,808
2511	No	3	5	73	3,402
2630	No	3	26	0	42,545
2760	No	3	6	7,010	5
3627	No	25	38	196	45,704
3840	Yes	2	6	72	25
4804	No	13	15	6,323	5,071
4812	No	10	18	54	29,014
4968	No	2	4	2	22,091
5028	No	15	10	5,220	77

Table 9 lists the 12 individuals that were leaders in Wave I but lost their leadership status by Wave II. These individuals showed no significant changes in degree centrality ($Z = -1.296$, $p = 0.195$), but observed a significant decrease in betweenness centrality from Wave I to Wave II ($Z = -2.223$, $p = 0.026$). This finding may suggest that when individuals lost their leadership status, they also lost access to certain people and privileges, and more specifically, possession of brokerage capabilities. A possibility for why degree centrality did not decrease as well could be because after losing access to privileged connections to important players, these individuals had to move quickly to find new connections. However, because they no longer had status, their new connections were only to average Joes, which helped in maintaining degree centrality, but not betweenness centrality. While the small number of cases limited the amount of power for statistical testing and ability to provide temporal order, they help paint a picture of how centrality changes with the loss and attainment of leadership. It also supports the justification of having leadership status as the independent variable and centrality as the dependent variable.

Table 9. Lost leadership: Wave I leaders losing leadership status in Wave II

ID	Biker	Degree Wave I	Degree Wave II	Betweenness Wave I	Betweenness Wave II
1797	No	18	3	79,733	347
1806	No	4	3	3,015	0
1826	No	9	3	4,961	1,495
1999	Yes	14	5	61,421	15,371
2051	No	11	4	7,516	852
2152	Yes	1	4	0	3
2247	Yes	9	4	31,737	1,670
2279	No	19	2	99,475	1,671
2709	No	2	7	0	0
2710	No	7	20	5,523	493
3699	No	18	3	12,067	4,068
3915	Yes	2	15	0	9,321

5.4.3. Strategic and Vulnerable Positions

Results of the negative binomial regression analyses indicated that leadership status was a significant predictor of both degree and betweenness centrality, which according to Morselli's (2010) work, would suggest that leaders were in the position of visible brokers. To further examine whether leaders were indeed visible brokers, I created a scatterplot of degree and betweenness centrality of all the actors as Morselli (2010) did in his study on the Hells Angels network (see Figure 7). While Morselli (2010) used the mean values of degree and betweenness centrality to split the sample into four distinct network positions, I chose to split it at one standard deviation above the mean. By using one standard deviation above the mean, it makes the criteria for being in a position with high centrality more restrictive, therefore producing a smaller number of individuals in the more strategic positions. This is important for pragmatic reasons, as it creates a smaller and more realistic pool of key individuals for law enforcement agencies to target.

The nodes were colour coded by leadership status, with the light grey outlined nodes denoting non-leaders and the black outlined nodes denoting leaders (see Figure 7). For reference, the dotted lines across the X-axis and Y-axis represent the mean values of degree and betweenness centrality. The solid lines across the axes represent one standard deviation above the mean values and were used to separate the sample into four categories: 1) visible brokers (i.e., high in degree centrality, high in

betweenness centrality), 2) efficient brokers (i.e., low in degree centrality, high in betweenness centrality), 3) social butterflies (i.e., high in degree centrality, low in betweenness centrality), and 4) peripheral players (i.e., low in degree centrality, low in betweenness centrality).

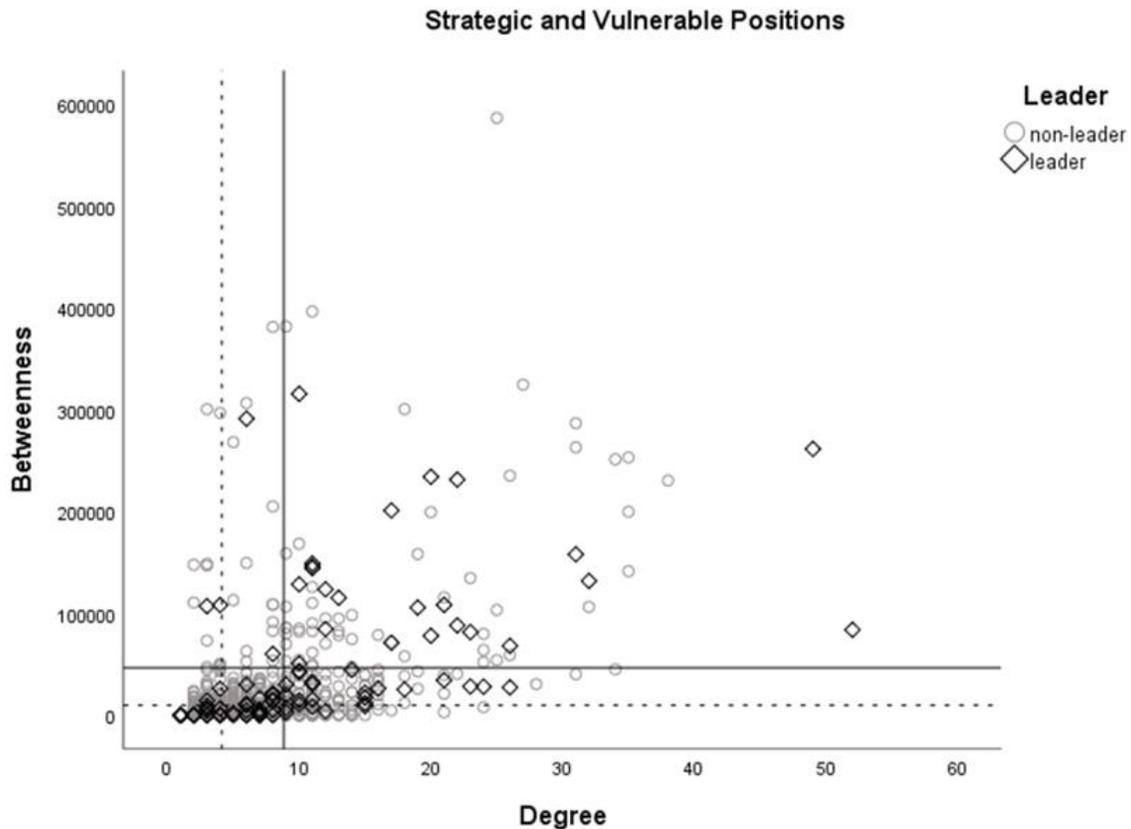


Figure 7. Scatterplot of degree and betweenness centrality within the Alberta organized crime network

Figure 8 is a bar graph that shows the percentages of leaders and non-leaders in in each of the four categories, as well as the entire Alberta organized crime network. Leaders comprised of 4.3% of the entire Alberta organized crime network ($n = 93$), which is lower than the percentage of leaders found in the visible broker, efficient broker, and social butterfly categories, and higher than the percentage of leaders found in the peripheral player category. I conducted chi-square tests to see whether leadership status was significantly associated to any of the four network positions. Results indicated that leadership status was significantly associated with being a visible broker, $\chi^2(1, N = 2,179) = 130.24, p < 0.001$, an efficient broker, $\chi^2(1, N = 2,179) = 6.97, p = 0.008$, and a

social butterfly $\chi^2(1, N = 2,179) = 50.27$. However, leaders were significantly less likely than non-leaders to be a peripheral player, $\chi^2(1, N = 2,179) = 169.27, p < 0.001$. This suggests that it is unlikely to find leaders in the periphery of a network, and leaders do not belong to one specific network position as they can be visible brokers, efficient brokers, or social butterflies. However, the strength of association between leadership and visible broker was the strongest ($\phi = 0.244$) in comparison to the association between leadership and efficient broker ($\phi = 0.057$), and leadership and social butterfly ($\phi = 0.152$). This supports the results from the negative binomial regression analyses, where leadership status was a significant predictor of both high degree centrality and high betweenness centrality.

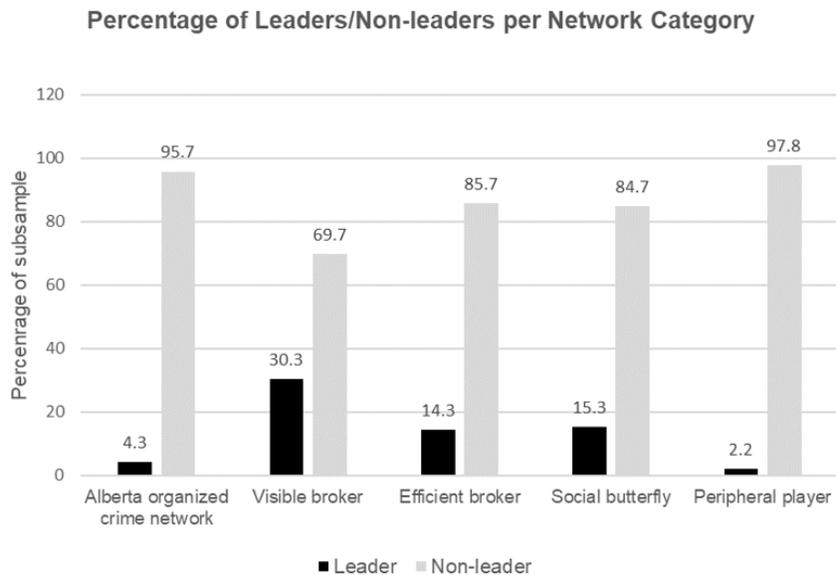


Figure 8. Percentage of leaders/non-leader per network category

Chapter 6.

Discussion

Within the criminal network literature, degree centrality is frequently equated with vulnerability as individuals with many ties are more active in the network and therefore more visible to law enforcement detection. On the other hand, betweenness centrality is typically highly sought-after as it represents a form of social capital that allows individuals to have control over the flow of information and resources in a network, and with less risk of being exposed. However, not all leaders are able to be in a strategic position where they are high in betweenness centrality and low in degree centrality, because degree centrality is often a consequence of the trade. Gaining leadership status opens up opportunities for individuals to pursue brokerage positions (i.e., betweenness centrality), but at the same time, it is difficult for leaders to escape the day-to-day duties and responsibilities that are necessary to keep the group functioning effectively (i.e., degree centrality). This study looked at whether leadership status was predictive of centrality, and the hypotheses were that leadership would be a significant positive predictor of both degree and betweenness centrality. Consistent with initial hypotheses, the two main results of the current study indicate that: 1) leadership status in the Alberta organized crime network was a significant positive predictor of degree centrality, and 2) leadership status was a significant positive predictor of betweenness centrality.

6.1. High Degree Centrality among Leaders

In legitimate organizations, having ties to lots of people typically means that the individual is well connected, therefore more resourceful and in possession of greater social capital. While this is also true in criminal organizations, there is an important distinction between legitimate and criminal organizations that strongly influences what it means to have many ties with other people. Members of criminal organizations are normally wanted by law enforcement due to direct and indirect participation in unlawful activities. This means that for every additional person an individual has ties to, it is added risk that the person can sell them out to law enforcement or enemy crime groups. This was seen in Baker and Faulkner's (1993) work where they found that the higher the degree centrality a conspirator had, the more eyewitnesses to their participation in price-

fixing activities which resulted in a higher likelihood of them being found guilty. This does not take away from the advantages that come with being well connected, but it does mean that degree centrality also comes with great risks as it makes an individual more vulnerable.

While it is widely accepted in the criminal network literature that degree centrality translates to vulnerability, there has been inconsistent findings on whether leaders are generally high or low in degree centrality. Morselli's (2009) study on the Quebec Hells Angels found that higher-ranking members scored lower in degree centrality than low-ranking members, suggesting that individuals with status and power tend to limit the number of ties they have with others to protect themselves from the risks that come along with knowing many people. On the other hand, Hofmann and Gallupe's (2015) study showed that the leader of a Columbian cocaine-trafficking organization scored extremely high in degree centrality, having ties to approximately a third of the entire network. The leader played a big part in the day-to-day operations of the group. The findings from the current study also found that leaders in the Alberta organized crime network had significantly higher degree centrality than non-leaders. These contrasting results with regards to the relationship between leadership and degree centrality may be the result of several factors. In an ideal situation, even if leaders prefer to avoid the radar and limit their connections to minimize the risk of detection/apprehension, it may not be possible for all leaders to do so if they wish to successfully manage their groups. Some leaders may have to be directly involved in group operations, whether it is because of a shortage of manpower, or a lack of trust to delegate tasks to other members. It could also be the product of leadership styles, as some leaders may actually have a desire to be at the centre of all the action instead of hiding behind the curtains. Krebs' (2002) had stated that networks are at its most vulnerable when they are active. Criminal networks such as the one responsible for the September 11th, 2001 terrorist attack were designed to be covert and focused mainly on security, limiting the activity needed to accomplish their goal (Krebs, 2002). However, gangs may not always fall in this category where the goal is to remain covert. For example, the Hells Angels wear patches and have a dress code as they want everyone to know they are Hells Angels. The Independent Soldiers, a street gang in British Columbia, started their own clothing line to build their brand. There are some criminal groups that are not concerned with staying out of sight, and instead, want as much attention as they can get. In addition, Calderoni and Superchi (2019)

argue that as leaders, there are social obligations to fill that require interactions and ties with other people. For instance, while attending meetings to manage group affairs is risky for mafia leaders, participation cannot be avoided as it displays power and is considered a social obligation (Calderoni & Superchi, 2019). This also provides support for the notion that leadership drives centrality. If leadership comes with a set of social obligations, then once an individual attains leadership status, they are expected to behave in certain ways as part of these obligations. These social obligations would then have an impact on who the leaders are connected to and how they are positioned in the network. There can be several explanations for why degree centrality is different among leaders. This study attempted to examine whether variables such as having ties to biker gangs or being in a certain type of location had any influence on leadership degree centrality. The results of the moderation analyses suggested that these variables did not have any significant effects. However, future research should look for factors that have an impact on the degree centrality of leaders, for example, differences in group size, leadership styles, and the level of sophistication of organizations.

6.2. High Betweenness Centrality among Leaders

An individual's betweenness centrality score can be interpreted as their brokerage capabilities as it captures the amount of times an individual falls on the shortest path between two other people (Freeman, 1979). Being positioned in between people that are not directly connected can be extremely advantageous. While knowing a lot of people might avail an individual to a lot of opportunities, they may also need to compete with others for these opportunities. An advantage of betweenness centrality can come in the form of increased availability of opportunities, as well as the ability to control the flow of information or goods between individuals or groups in which they bridge or broker (Burt, 1992). Unlike degree centrality, the literature around the relationship between leadership and betweenness centrality has been quite consistent. High betweenness centrality has been found to be predictive of leadership status (Calderoni, 2014), and criminal leaders benefit from being in these exclusive positions with high brokerage capabilities (DellaPosta, 2017; Demiroz & Kapucu, 2012; Krebs, 2002; Lo, 2010). In line with past findings, the results of this study also indicated that leaders were more likely to have high betweenness centrality than other members. Once individuals reach leadership status, they can choose to cut ties with people that no

longer benefit them and situate themselves in brokerage positions. For example, when Gravano reached the status of a capo, he began to trim his network over the next several years to reduce his risk of exposure (Morselli, 2003). While trimming an individual's network may reduce their centrality, the contacts that Gravano chose to remove were ones that were no longer useful to him. Thus, even though he kept fewer number of contacts (i.e., lower degree centrality), his constraints also decreased significantly, which provided him with greater network freedom and brokerage capabilities.

6.2.1. Types of Brokers

The Alberta organized crime network is unique from most studies done in the past on criminal networks because this network encompasses not only one criminal group, but rather numerous criminal groups all combined into one network. This is important because when multiple groups are combined into one larger network, the way we interpret betweenness centrality and brokerage can be more elaborate. More specifically, it would be possible to distinguish between different types of brokers. Gould and Fernandez (1989) developed a typology of brokers within transaction networks, arguing that there are five categories of brokers (i.e., coordinator, itinerant broker, gatekeeper, representative, liaison). One of the main distinguishing features of these brokers is whether the brokerage relation is internal or external to the group. This feature creates two broader groups of brokers: within-group brokers and between-group brokers. Within-group brokers bridge individuals within their own criminal group, while between-group brokers act as the bridge between individuals who are not from the same group (Gould & Fernandez, 1989).

While the current study only focused on determining whether leadership can predict network position, future research can go one step further to understand brokerage by making the distinction between within-group and between-group brokers. Most research on criminal networks have only looked at individual crime groups, and as such, betweenness centrality scores typically identify within-group brokers. However, since the CISA dataset includes multiple crime groups, brokers identified from betweenness centrality may either be within-group brokers, between-group brokers, or both. Identifying each would allow us to be more refined with the interpretation of betweenness centrality, which may be valuable when trying to understand the role that

leaders play within the larger network. Do leaders act as brokers within their own groups, or are they the bridge between their group and other groups? Leaders could also be the link between their group and individuals within legitimate businesses, which allows them to access not only resources from the criminal underworld, but also resources from the legitimate world.

A potential way to approach this in future studies would be to calculate betweenness centrality when all the crime groups are combined into one larger network, much like the Alberta organized crime network, and calculate betweenness centrality again when the network is separated into multiple smaller networks representing individual crime groups. This way, a comparison can be made between the two betweenness centrality scores. If an individual has a high betweenness score when the analysis is only looking at his or her own crime group but has a low score when looking at the combined larger network with all crime groups, it can likely be concluded that this individual is a within-group broker. On the other hand, if a person scores low in betweenness centrality within their own group network but high in the combined multiple crime group network, they can mostly likely be categorized as a between-group broker.

6.3. Leaders as Visible Brokers

While several studies have alluded to the dynamics between degree and betweenness centrality, Morselli (2010) was the first to focus on the overlap between these two measures, creating a two-by-two matrix combining degree and betweenness centrality and arguing that examining the two centrality measures simultaneously can provide more information on strategic and vulnerable positions within a network. His analysis looked at how judicial outcomes were affected by the various positions individuals were in, which served as a method to define what position is considered strategic and what is considered vulnerable. I recreated Morselli's (2010) matrix to see where leaders in the Alberta organized crime network were positioned. Results indicate that leaders were significantly more likely to be visible brokers than non-leaders, and significantly less likely to be peripheral players than non-leaders. This is consistent with findings from Hofmann and Gallupe's (2015) study on Hernan Prada, as well as Calderoni's (2014) study on the 'Ndrangheta bosses. In both cases, leaders and bosses were found to score high in degree and betweenness centrality, where leaders acted as brokers in the groups and were also highly connected with many group members.

However, according to Morselli's (2010) study on the Hells Angels, visible brokers were among the most likely to be arrested, suggesting that the risks that come along with having a high degree centrality may outweigh whatever strategic benefits that come from betweenness centrality. In other words, despite being in possession of great social capital, visible brokers are in a vulnerable position in the network. Another reason why leaders may struggle to maintain low degree centrality despite having a high brokerage capabilities could be due to low self-control (Gottfredson & Hirschi, 1990). Even if leaders are in a good position, they may not be able to resist the temptation of acting on immediate opportunities to increase criminal earnings due to low self-control (Morselli & Tremblay, 2004). Nevertheless, it is difficult for leaders to move from the position of a visible broker to a strategic broker, for reasons such as lacking organizational structure or trust to delegate tasks to other members. Leaders in criminal organizations are always trying to balance between the attainment of power and influence and protecting themselves, and this balancing act is what brings about the interplay between degree and betweenness centrality.

Even though Individuals who score high in betweenness centrality and low in degree centrality (i.e., efficient brokers) are considered by Morselli (2010) to occupy the most strategic position in a criminal network, it could be argued that peripheral players may in fact be the best position for leaders to be in. If the top priority is maximizing security in terms hiding from law enforcement and other criminal groups, leaders should aim to be low in both degree and betweenness centrality by minimizing the amount of direct and indirect connections with others. While peripheral players are often low-level members within groups, they could also be leaders that simply do a great job avoiding detection and managing their groups from afar. Being on the periphery does not necessarily mean an individual is unimportant. However, being able to control a criminal group from the periphery is a difficult task. Members of organizations, criminal or not, look to their leaders for guidance, which may pose quite the challenge for leaders if they are trying to avoid the spotlight.

How leaders position themselves in the network has implications on law enforcement interventions. It is often assumed that the most effective way to disrupt a criminal network is to target the leaders, with hopes that once the leader is removed, the group will unravel on its own. While this may occur in some situations, it is not always the case and police agencies are now turning towards network research and adopting

various network-based target prioritization strategies to aid in target selection. For instance, building on past literature, Hashimi and Bouchard (2017) set out a clear, systematic framework for target prioritization based on the concept of network capital. They define network capital as a combination of degree centrality, betweenness centrality, and several other crime-affiliated attributes such as presence of a criminal record and gang ties. With data from the Royal Canadian Mounted Police, they constructed two networks and identified two lists of key players to target based on whether the goal is to capture individuals who have the greatest contribution to the network, or if the objective is to find individuals that can provide the most value for investigative purposes. The framework they set out is an example of how network analysis can be employed in a practical way for target selection. Despite the lack of inclusion of crime-affiliated attributes, the findings from the current study suggest that leaders are indeed valuable targets given their network capital derived from their high degree and betweenness centrality. This means that traditional methods of targeting leaders may in fact be a justifiable decision when it comes to target selection for the purpose of disrupting a criminal network. This may not have been the case if results have indicated that leaders were not central in the network.

6.4. Limitations and Future Research

Network data is limited in providing us with the complete story on its own, and this can affect how we understand the results and the implications that flow from it. For example, from a network perspective, leaders who score low in degree and betweenness centrality are ineffective targets to remove when trying to fragment the network because they do not occupy central positions within the network. Significant changes would not be expected to occur in the network as a result of their removal as they lack in both quantity and quality of connections. However, centrality cannot tell us everything as leaders can be important for reasons that do not show in a network (Bright et al., 2015). For instance, a leader with only ties to one or two other members of the group may be the main financial provider or be in possession of an important resource in which the group relies on. If this leader were to be removed, it would not affect the network substantially on paper as they are only connected to one or two other individuals and not necessarily positioned in any strategic brokerage positions. However, the group may still collapse as a result of their removal because it no longer has the

financial means to continue without the leader's support. This underscores the importance of having qualitative data to complement network data (Bouchard & Konarski, 2014).

This study also faces other limitations. Leaders may be more central simply due to the increased attention received from law enforcement. It is also unclear the extent in which an individual may have been identified as a leader by police simply because they were especially visible and interacting with lots of people. This may create a tautological problem if an individual was labeled as a leader because they had a lot of connections, and then being a leader was used in the current study to predict degree centrality. In addition, the ties in the Alberta organized crime network have no direction or value, meaning all ties were treated equally even though they can mean completely different things in reality. For instance, two individuals that were best friends in the same gang would be coded as having a tie, and two rivals gang members who have attempted to kill each other in the past would also be coded as having a tie. Yet, the data does not allow us to distinguish between the drastically different types of ties. This can be improved on in the future if data collection and coding can include the nature of ties, even if it is as simple as whether the nature of the relationship is positive or negative. This is also another example of how qualitative data can be beneficial in a network study. The study is also based on secondary data which comes with its own set of limitations. Leaders may have higher centrality because of increased attention from law enforcement rather than actually being more central in the network. I did not have access to the criteria in which analysts used to make determinations on leadership status. However, these data resemble what was available to law enforcement at the time that they made their decisions about who to target, rather than being retrospective constructions of network as found in those created from biographies. Finally, multiple coders were involved which may have resulted in inconsistencies or variation in coding of data.

There are several avenues for future research that can help fill the gap in literature on leadership in organized crime. Most research done in the past have focused on the "top" leader of groups, while failing to address the other levels of leadership. The most senior leadership figure is likely to play a different role than middle-level leaders (e.g., middle-level leaders might more likely be brokers), therefore, researchers needs to be nuanced when it comes to recognizing that leadership occurs at various levels within a group, and that there is a need to understand the roles that different types of leaders

play. It is also important to recognize that crime groups can vary in size, sophistication, ethnic composition, and the types of crimes they commit, among other factors. These factors can influence the role that leaders take on, as well as the leadership style they adopt. It would be of value to examine if there is a pattern between types of groups across various factors, and the role and style of leaders. Similarly, future studies of leadership in crime groups can borrow ideas from research on leadership in legitimate contexts and examine whether certain styles of leadership are associated with the success or effectiveness of crime groups. Finally, leadership on organized crime can benefit from an interdisciplinary approach. There is a large body of research on the concept and role of leadership in other fields outside of criminology. Researchers should aim to bring in ideas and theories of leadership from different disciplines and incorporate it into the study of leadership in criminal groups with the goal of developing more refined theories and models of leadership in organized crime.

6.5. Conclusion

The present study aimed to address the lack of research around leadership in organized crime using a social network approach. More specifically, this study compared network characteristics of leaders and non-leaders in a large organized crime network in Alberta, Canada, and examined whether leadership is predictive of centrality. While the casual order between leadership status and centrality is unclear, previous studies on leadership in criminal networks have typically used centrality to predict leadership. However, literature also provides support that once individuals gain status and power, they gain more control over where and how they are positioned in the network. Status allows individuals to have the privilege to add ties that are beneficial to them and remove ties that are not. This study is the first of its kind that approaches leadership and centrality in this specific order. Future research requires longitudinal data that allows for temporal order to be established to provide further clarity on this matter.

Findings from the current study provide evidence suggesting that leaders score significantly higher in both degree and betweenness centrality. Having ties to biker gangs had a moderating effect as it diminished the effect that leadership had on betweenness centrality. The results suggest that leaders were “visible brokers” where they played a strategic role of bridging unconnected individuals but were also vulnerable to law enforcement detection due to the increased visibility from having many ties. This

study built on a limitation of past network studies done on leadership in organized crime as it drew on information from multiple data sources rather than a single source. The size of the dataset is also unprecedented in criminal network research and geographically spanned an entire province by merging investigations across jurisdictions, allowing for a more complete picture of organized crime in Alberta. While the literature on leadership in organized crime is growing, it is still an underdeveloped area of research. Parts of what is currently known about these exclusive individuals is still heavily based off novels, anecdotes, and other non-empirical sources. Future work needs to draw on theories from available literature from other areas, such as leadership in legitimate social groups and organizations, in order to close this gap in research.

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