

A Social Network Analysis of the Toronto 18

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ABSTRACT

This chapter employs social network analysis in order to empirically explore the communication network established by the Toronto 18 in the three years before their arrest. It provides a basic conceptual overview of the extent, breadth, and nature of ideological and operational communiques between the disparate members within the Toronto 18 to further stimulate scholarly inquiry into similar relational dynamics within analogous terrorist groups. This chapter also provides readers with an understanding of certain group, social, and structural characteristics across three distinct periods: (1) the radicalization phase (January 2003 to October 2005); (2) the winter training camp (November 2005 to December 2005); and (3) the three-month period surrounding the Opatatika property buying trip (January 2006 to March 2006). Research results are then presented and discussed, along with a brief overview of areas for future research.

I. INTRODUCTION

While not unique in the history of North American homegrown terrorism, the Toronto 18 presents an opportunity to parse out and understand various social and structural dynamics that contribute to the scholarly knowledge of the composition, radicalization towards violence, strategic operation, and eventual dissolution of homegrown terrorist groups. The sensational nature of the events leading up to, surrounding, and unfolding during and after the legal proceedings

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related to the Toronto 18 has provided scholars with a treasure trove of highly detailed relational data across the lifespan of the terrorist plot spearheaded by Zakaria Amara and Fahim Ahmad. Riveted by the circumstances surrounding the allegations against the members of the Toronto 18, the media produced highly detailed biographies¹ and coverage of the trials of its key members.² Transcripts of court proceedings and exhibits for the core membership of the homegrown terrorist cell have also provided in-depth details and data on various stages of their plot.³ In addition, one of the key RCMP informants that was embedded within the Toronto 18 (see Chapter 4 in this volume) wrote a tell-all book of his experiences infiltrating and acting within the group.⁴ When properly vetted and refined, all of these data sources allow social network analysts to put together a reasonable approximation of the inter and intragroup dynamics, ties, and social-structural characteristics of the Toronto 18 terrorism plot.

While most of the other scholars in Part I of this volume examine the Toronto 18 through theoretic or substantive lenses, this chapter presents an empirical exploration of the Toronto 18 social communication network over their ideological and operational lifespan, beginning with the radicalization of core members beginning in 2003 and ending with their arrests in 2006. There have been a limited number of other social-scientific works that have examined the Toronto 18⁵ and even fewer that have done so using social network analysis.⁶ Keeping in mind the varied audience and overall goals of this volume, this chapter takes a broad and accessible approach to examining the Toronto 18's communication network. Its main

¹ Isabel Teotonio, "The Toronto 18," *Toronto Star*, accessed 2016, <http://www3.thestar.com/static/toronto18/index.html>.

² Isabel Teotonio, "Publication ban lifted in Toronto 18 case," *Toronto Star*, September 10, 2009, https://www.thestar.com/news/crime/2009/09/10/publication_ban_lifted_in_toronto_18_case.html

³ For example, see *R v. Khalid*, 2009 CanLII 44274 (ON SC).

⁴ Anne Speckhard and Mubin Shaikh, *Undercover Jihadi: Inside the Toronto 18: Al Qaeda Inspired, Homegrown Terrorism in the West* (McLean, VA: Advances Press, 2014).

⁵ Lorne L. Dawson, "Trying to Make Sense of Homegrown Terrorist Radicalization: The Case of the Toronto 18," in *Religious Radicalization and Securitization in Canada*, eds. Paul Bramadat and Lorne Dawson (Toronto: University of Toronto Press, 2014); Jeremy Kowalski, *Domestic Extremism and the Case of the Toronto 18* (New York: Palgrave MacMillan, 2016).

⁶ Marie Ouellet and Martin Bouchard, "The 40 Members of the Toronto 18: Group Boundaries and the Analysis of Illicit Networks," *Deviant Behavior* 39, no. 11 (2018): 1467-482, <https://doi.org/10.1080/01639625.2018.1481678>.

purpose is to present a basic conceptual overview of the extent, breadth, and nature of the ideological and operational communication ties formed by members of the Toronto 18 prior to their arrest and to introduce and stimulate further inquiry into examining groups, like the Toronto 18, using social network analytical methodologies. An additional purpose of this chapter is to provide security practitioners, jurists, and academic scholars with an alternate way of understanding one aspect of the social and relational dynamics present within the Toronto 18 during the roughly three-year period before their arrests. As a result, the analysis is kept as descriptive and free of jargon as possible to make it accessible to a wider academic and practitioner audience.

This chapter begins with a brief description of social network analysis, which also highlights some of the challenges that researchers face when dealing with covert and illicit networks akin to the Toronto 18. This is followed by a primer on what the scholarly literature has identified as key characteristics of homegrown⁷ terrorist groups that are relevant to social network analysis. Next, the methodology for this research is outlined, which describes the research design and data coding procedures. The research results are then presented, followed by a discussion of the findings and study limitations. Lastly, this chapter concludes with a brief overview that also includes a brief discussion of areas for future research.

II. WHAT IS SOCIAL NETWORK ANALYSIS?

Social network analysis is a collection of theoretical- and mathematical-informed techniques and approaches that allow social scientists to examine network structure, social dynamics, trends, and how individuals or clusters of individuals affect, and are a part of, their larger relational networks.⁸ Rather than relying solely on quantitative (i.e., statistical) or qualitative (i.e., content analysis, interviews) data, social network analysis is primarily concerned with relational data: any sort of identifiable social interaction that connects, binds, or ties together two or more actors within a larger network (e.g., social ties, flows, transfers, connections, and so on). Once a set of actors (nodes) and their relational ties (edges) are identified and coded

⁷ Homegrown terrorism refers to violent terrorist acts committed by individuals who are naturalized or born in the home country which they are targeting. See chapter 2 in this volume for more information.

⁸ John Scott, *Social Network Analysis*, 4th ed. (Los Angeles: Sage Publishing, 2017), 8.

by researchers, these can be used to compute a variety of sociometric measurements that provide an array of different tools with which to interpret social structural, group, and individual-level dynamics. These measurements can help illuminate network cohesion, nodal/actor importance, the identification of structurally and socially significant actors, and numerous other insights that are not typically available from other commonly used methodologies.⁹

A. The Problem of “Dark” Networks

Social network analysts from criminology, security studies, and any research involving clandestine groups are confronted with persistent problems concerning the reliability and validity of relational data for “dark” networks: groups of connected actors who actively try to dissuade or prevent outside scrutiny by occluding a portion or all of their ties and/or actions from individuals or organizations who are not tied to the group itself (e.g., drug trafficking organizations, secret societies, terrorist groups, and so on). Politically violent groups like the Toronto 18 have a vested interest in hiding the extent and breadth of their connections while operational, but also during subsequent legal proceedings and police investigations. This presents numerous problems regarding the accessibility, validity, and reliability of relational data. As a result, scholars of dark networks have identified several prominent considerations that need to be taken into account when using social network analysis to examine clandestine groups.¹⁰ However, despite the potential of working with incomplete data and other methodological weaknesses, the consensus among scholars of dark networks is that there is merit and analytical utility in studying the known portions of criminal, terrorist, or secretive groups.¹¹

⁹ For more information on the basics of social network analysis, see Stephan P. Borgatti, Martin G. Everett, and Jeffrey C. Johnson, *Analyzing Social Networks*, 2nd ed. (Los Angeles: Sage Publishing, 2018); Scott, *Social Network Analysis*.

¹⁰ For example, see Daniel Cunningham, Sean Everton, and Philip Murphy, *Understanding Dark Networks: A Strategic Framework for the Use of Social Network Analysis* (Lanham, MD: Rowman & Littlefield, 2016), xvii–xix.

¹¹ Luke M. Gerdes, ed., *Illuminating Dark Networks: The Study of Clandestine Groups and Organizations* (New York: Cambridge University Press, 2015); David Hofmann, “How ‘Alone’ are Lone-Actors? Exploring the Ideological, Signaling, and Support Networks of Lone-Actor Terrorists,” *Studies in Conflict & Terrorism* 43, no. 7 (2020): 657–78, <https://doi.org/10.1080/1057610X.2018.1493833>.

III. WHAT DO WE KNOW ABOUT HOMEGROWN TERRORIST NETWORKS?

The academic literature on terrorist networks is largely informed by the criminological social network literature, which has provided pivotal insights into the structure, operations, and connections formed by a variety of covert and illicit networks.¹² While not as developed as their criminological equivalents, the literature on terrorist networks has become much more robust since 2002, when Valdis Krebs published the first modern network study of the 9/11 bombing plot.¹³ In order to better understand the dynamics of the Toronto 18 network, this section will briefly summarize some of the major findings from the more prominent studies on the networks that terrorist groups, cells, and organizations form in pursuit of their ideological or politically-motivated violent goals. It is not meant to be an exhaustive review of the literature on terrorist networks, nor is it a review of the most up-to-date literature on terrorist radicalization and social dynamics. Rather, it is meant to be a brief introductory primer on some of the larger takeaways from the scholarly literature, with a particular focus upon what insights social network analysis has to offer on homegrown terrorists and cells.

There are several network-level and structural characteristics of terrorist groups that a number of empirical studies have identified that provide a baseline comparison for the subsequent analysis of the Toronto 18's network. The first characteristic is that homegrown terrorist groups generally lack any formal operational ties with international and longstanding terrorist organizations.¹⁴ Instead, they tend to be small, self-contained, and carefully selected groups of individuals who operate with

¹² For example, see Gisela Bichler and Aili E. Malm, eds., *Disrupting Criminal Networks: Network Analysis in Crime Prevention* (Boulder, CO: First Forum Press, 2015); Martin Bouchard, "On the Resilience of Illegal Drug Markets," *Global Crime* 8, no. 4 (2007): 325-44, <https://doi.org/10.1080/17440570701739702>; Carlo Morselli, "Assessing Vulnerable and Strategic Positions in a Criminal Network," *Journal of Contemporary Criminal Justice* 26, no. 4 (2010): 382-92, <https://doi.org/10.1177/1043986210377105>.

¹³ Valdis E. Krebs, "Uncloaking Terrorist Networks," *First Monday* 7, no. 4 (2002), <https://firstmonday.org/ojs/index.php/fm/article/view/941/863>.

¹⁴ Lorenzo Vidino, "The Hofstad Group: The New Face of Terrorist Networks in Europe," *Studies in Conflict & Terrorism* 30, no. 7 (2007): 579-92, <https://doi.org/10.1080/10576100701385933>.

limited formal terrorist training (although a number of homegrown terrorist groups, including the Toronto 18, attempted to send one or more of their members to overseas training camps). Marc Sageman's early work on Salafist Jihadist networks suggests that people join violent Islamist movements through pre-existing networks of friendship and kinship.¹⁵ In other words, people are either brought in or leverage pre-existing social connections when joining terrorist networks.

Although Sageman's findings are somewhat dated due to the evolving nature of terrorist threats, and dwarfed by more recent research, his observations remain an important cornerstone in terrorist network analysis. Several subsequent studies emphasize Sageman's findings and highlight the importance of interpersonal contacts and networks in explaining who, how, and why people join terrorist movements.¹⁶ Furthermore, the more recent radicalization research tends to support these aspects of earlier attempts to frame and understand how social ties and group dynamics play a role in terrorist group formation and operation but provides a more nuanced understanding of its social complexity.¹⁷

IV. METHODOLOGY

A. Research Design

The current research seeks to contribute to our understanding of homegrown terrorist group dynamics, and of the Toronto 18 in particular, by mapping out and comparing the changes in group dynamics and social structures of the communication ties formed by Toronto 18 as they progressed towards the culmination of their bomb plot and their eventual arrests in 2006. It takes a cross-sectional approach that examines and

¹⁵ Marc Sageman, *Understanding Terror Networks* (Pennsylvania: University of Pennsylvania Press, 2004).

¹⁶ Peter R. Neumann, *Joining al-Qaeda: Jihadist Recruitment in Europe* (New York: Routledge, 2009); Quintan Wiktorowicz, *Radical Islam Rising: Muslim Extremism in the West* (London: Rowman & Littlefield Publishers, 2005).

¹⁷ For example, see Chapter 2 of this volume. See also Lorne L. Dawson, "Sketch of a Social Ecology Model for Explaining Homegrown Terrorist Radicalisation," *The International Centre for Counter-Terrorism: The Hague* 8, no. 1 (2017), <https://dx.doi.org/10.19165/2017.1.01>; Petter Nesser, "Joining Jihadi Terrorism Cells in Europe: Exploring Motivations, Aspects of Recruitment and Radicalization," in *Understanding Violent Radicalization: Terrorist and Jihadi Movements in Europe*, ed. Magnus Ranstorp (New York: Routledge: 2009), 87-114.

contrasts the group across four distinct operational time periods (see Key Events Timeline in Appendix B): (1) the radicalization phase (January 2003 to October 2005); (2) the winter training camp (November 2005 to December 2005); (3) the three-month period surrounding the Opatatika property buying trip (January 2006 to March 2006); and (4) the bomb plot (March 2006 to May 2006). These time periods were chosen based upon significant changes in the nature and operation of the group itself, such as progressing towards formal operational training (i.e., moving from “talk” to “action”), attempting to acquire material goods for the bomb plot, and the schism between the Mississauga and Scarborough cells.

B. Data and Coding

Relational data on the Toronto 18 were gathered from an extensive examination of court documents related to the Toronto 18 trial, coupled with defendant testimonies, psychiatric evaluations, and other related legal documents. These data were supplemented and triangulated with open sources from news media stories,¹⁸ publicly available police documents, and the autobiographical account given by Mubin Shaikh in order to increase the validity and reliability of data.¹⁹ Actors and their communication ties were only included in the dataset if they were present in at least two independent data sources (e.g., a court document and Mubin Shaikh’s account, a legal testimony and a police report, and so on). Attribute data for a total of 34 individuals associated with or connected to the Toronto 18 were gathered and included in the network based upon evidence of multiple (i.e., more than once during a particular time period) communication events between actors whose content included at least one of the following themes: violent Jihadism, Islamist ideology, recruitment attempts, and/or information related to planning for or committing acts of Jihadist violence.²⁰ Binary undirected²¹ relational matrices were then coded (zero for

¹⁸ In particular, the excellent and detailed coverage by Isabel Teotonio. See, Isabel Teotonio, “The Toronto 18.”

¹⁹ Speckhard and Shaikh, *Undercover Jihadi*.

²⁰ The social network analysis of the Toronto 18 undertaken by Ouellet and Bouchard identified up to 40 individuals involved in the Toronto 18 bomb plot. The difference in actors is due to the network boundary chosen by the researcher in regard to inclusion and exclusion criteria. See Ouellet and Bouchard, “40 Members of the Toronto 18.”

²¹ An undirected network is one where the relational tie being measured “flows” both ways. For example, a network that examines romantic ties is likely to be undirected, since it is impossible to be in a “one way” consenting romantic relationship. A network

the absence of a tie, one for the presence of a tie) for each of the four identified time periods based upon communication between actors within the network. Gephi, MS Excel, R, and UCInet software packages were used to code, manage, and interpret the relational data.

V. RESULTS

A. The Radicalization Period (January 1, 2003 – October 31, 2005)

There are several prominent features of the Toronto 18 network that are evident during the two-year radicalization period examined in this study, from January 2003 until October 2005.²² The sociogram²³ displayed in the top left of Figure 1.0 shows that the overall structure of the network is known as a scale-free network. This type of network typically consists of a small number of well-connected hubs (in this case, centred around Ahmad (node 11) and Amara (node 34)) which support “the rapid diffusion of information and suggests that the network is more hierarchically organized with a few individuals having many ties relative to others”.²⁴ As scale-free networks grow, mechanisms of preferential attachment cause the network to self-organize into distinct groups or sub-groups of actors. Such mechanisms are “common to a number of complex systems, including business networks, social networks (describing individuals or organizations), transportation networks,” among others.²⁵ In other words, the most important actors, and social hubs, for the Toronto 18 during their radicalization period are quite unsurprisingly their two nominal leaders.

that examines money lending is likely to be directed, since people who lend money may not always borrow from the people they lend to.

²² This is not to suggest that violent radicalization in the Toronto 18 ceased after October 2005. Rather, this is the period where the radicalization process began and solidified.

²³ A sociogram is a visual representation of a social network. Each circle in the sociogram denotes an actor (node), and each line denotes the presence of a relational tie (edge).

²⁴ Albert-László Barabási and Réka Albert, “Emergence of Scaling in Random Networks,” *Science* 286, no. 5439 (1999): 509–12. See also Aili Malm and Gisela Bichler, “Networks of Collaborating Criminals: Assessing the Structural Vulnerability of Drug Markets,” *Journal of Research in Crime and Delinquency* 48, no. 2 (2011): 271–97; Mangai Natarajan, “Understanding the Structure of a Large Heroin Distribution Network: A Quantitative Analysis of Qualitative Data,” *Journal of Quantitative Criminology* 22, no. 2 (2006): 171–92.

²⁵ Barabási and Albert, “Random Networks,” 511.

Although Jihadist-related communication was not exclusively centred on them at this point of the Toronto 18 plot, the group was semi-hierarchical (when compared to more formalized social groups and organizations with more clear positions and titles) and hinged largely on the efforts of Ahmad and Amara to communicate Jihadist content to potential recruits. The clustering coefficient²⁶ (0.492) for the Toronto 18 during the radicalization period indicates that there is a moderate tendency for members of the group to connect with one another in highly cohesive clusters (see table 1.0). The assortativity²⁷ score (-0.308) indicates a somewhat moderate disinclination of actors within the network to connect with others who have similar network positions as themselves.²⁸

Table 1.0 – Network-level cohesion measurements for the Toronto 18

	Radicalization	Winter Camp	Opatatika	Bomb Plot
Number of Actors	24	23	24	30
Clustering Coefficient	0.492	0.758	0.684	0.612
Assortativity	-0.308	-0.164	-0.156	-0.197

When examining the nodal-level centrality scores for the Toronto 18 during this time period (see Table 1.1), Ahmad, who served as the nominal ideological leader of the group, also unsurprisingly emerges as the most important node in terms of bridging the various parts of the network

²⁶ The clustering coefficient is a network-level metric that measures the degree to which nodes tend to cluster together into small, highly connected groups. A score of 0 indicates there is no tendency of nodes to cluster together, while a score of 1 indicates that all nodes are clustered together.

²⁷ Assortativity is a coefficient that indicates nodal preference to attach to others with similar network positions as themselves (e.g., highly central nodes attach to other highly central nodes). A score of 0 indicates there is no tendency of nodes to attach with those similar to themselves, while a score of 1 indicates that all nodes have a tendency to attach with those similar to themselves.

²⁸ This makes sense given the clandestine nature of the Toronto 18.

together. His betweenness centrality²⁹ score (0.621) is the largest by far, indicating that he is the most important broker for bridging disparate parts of the Toronto 18 together during this time period. Amara emerges as the second most important broker within the network with a betweenness centrality score of 0.221. Closeness centrality³⁰ scores during the radicalization period indicate that Ahamad, Amara, Durrani (node number 8), James (node number 15), Ansari (node number 9), and Khalid (node number 25) are the most centrally located nodes. As shown in the sociogram in Figure 1.1, these individuals occupy a central clustered position and are the most important to the diffusion of communication related to Jihadist violence.

B. The Winter Camp Period (November 1, 2005 – December 31, 2005)

During the three-month period surrounding the planning, execution, and aftermath of the winter training camp (November 1, 2005, to December 31, 2005), at the network level (see, Table 1.0) we see a consolidation of communication ties within the network, with Ahmad emerging as the central hub in terms of the frequency of connections with other members of the Toronto 18. The clustering coefficient (0.758) indicates that there is a discernable positive shift in cohesiveness within the Toronto 18 during this time period when compared with the radicalization period, with a strong tendency for the network to cluster together into small but highly connected groups. We also see a slight improvement in the tendency of the Toronto 18 to attach to other actors within the network who have a similar network position to themselves (assortativity of -0.164), although the coefficient is still negative, indicating a weak aversion effect.

²⁹ Betweenness centrality is a sociometric measurement that indicates how important a node is for connecting disparate parts of the network together. It is synonymous with the concept of “brokerage,” with actors with high betweenness centrality being those that occupy positions within the network that allow them to leverage that position to broker or connect individuals or subgroups in the network with others.

³⁰ Closeness centrality measures how “far” a node is from other nodes within a network. In other words, nodes with high closeness centrality are those who exhibit the shortest distances from other nodes, which is an indicator of the importance, strength, or value of that particular node to the overall network.

Figure 1.0 – Sociograms for the Toronto 18 across four time periods

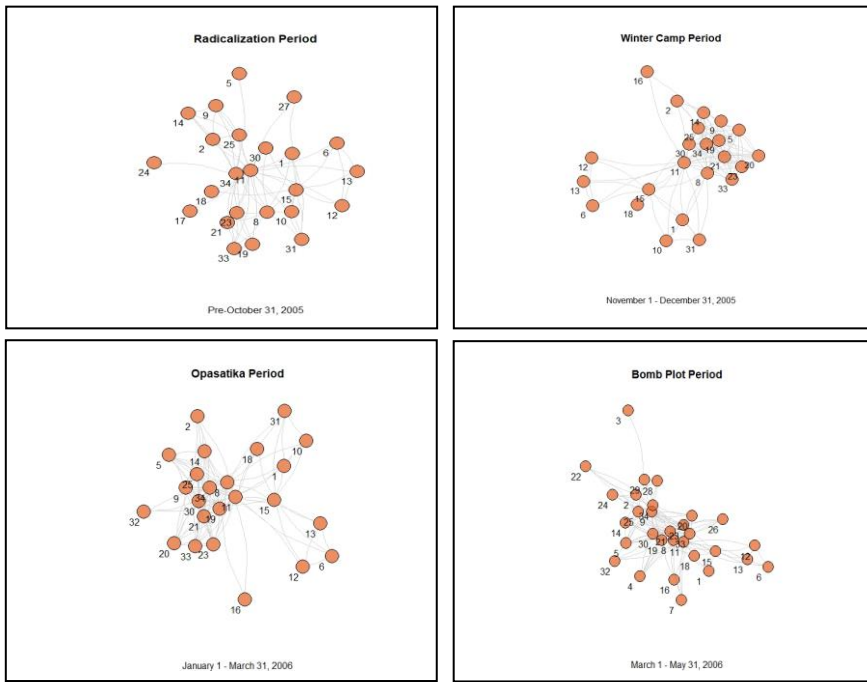


Table 1.1 – Nodal-level betweenness and closeness centrality for the six most central actors of the Toronto 18

Actor(s)	Radicalization		Winter Camp		Opatatika		Bomb Plot	
	Btwn	C	Btwn	C	Btwn	C	Btwn	C
Ahmad	0.621	0.920	0.500	1.000	0.526	1.000	0.433	0.829
Amara	0.221	0.697	0.011	0.710	0.029	0.742	0.223	0.725
Durrani	0.021	0.639	0.057	0.786	0.044	0.767	0.029	0.690
James	0.027	0.605	0.031	0.648	0.021	0.639	0.004	0.580
Ansari	0.000	0.561	0.004	0.710	0.005	0.697	0.392	0.725

Khalid	0.000	0.561	0.006	0.710	0.008	0.697	0.031	0.690
Remaining Actors	0-0.003	0-0.575	0-0.011	0-0.710	0-0.012	0-0.719	0-0.069	0-0.674

As shown in the top right of Figure 1.0, the sociogram displays a contraction of ties that radiates from a central node (Ahmad, node 11) when compared to the previous time period. In other words, the network exhibits more hierarchy than in other phases of the bomb plot, with Ahmad as the clear pillar of the Toronto 18's communication ties. Ahmad is also the only significant broker in the network during this three-month span, with by far the highest betweenness centrality score (0.500) and a closeness centrality score of 1.000. As a result, the network structure changed from a scale-free structure to what is known as a star or star-like structure: where a single, critically important node (or in some cases, a pair of nodes or more) is the most connected in terms of the number of ties and their ability to bridge disparate parts of the network together. Of other particular note is Amara's diminished centrality during the winter camp period: his importance as a broker is on par with some of the most peripheral members of the network (betweenness centrality of 0.011), and his closeness centrality score (0.710) is also on par with the vast majority of the other members of the Toronto 18. In fact, both Durrani (betweenness centrality of 0.057) and James (betweenness centrality of 0.031) are more important communication brokers during the winter camp than Amara.

C. The Opasatika Period (January 1, 2006 – March 31, 2006)

During the three-month period at the beginning of 2006, the Toronto 18 began to plan material acquisitions to aid with their plots, including a trip to the Opasatika area to purchase land to serve as a safe house (see Key Events Timeline in Appendix B). This demarcates a transition from "talking the talk" to "walking the walk" in terms of the operational aspects of the Toronto 18's plans to commit acts of violence. The network's clustering coefficient (0.684) indicates that there is a moderate-to-strong tendency among network members to cluster together into small, highly connected groups but exhibits a slight drop in network cohesion when compared to the winter camp period. There is a negligible change in assortativity (-0.156)

when compared to the winter camp period, with the network still exhibiting a weak aversion effect between nodes within the network that share similar network positions.

At the nodal level, there is also little change between the Opasatika period and the winter camp period: Ahmad remains the most central node in terms of his role as a broker for the network (betweenness centrality of 0.526), although Amara's betweenness centrality score (0.029) exhibits a slight increase. Closeness centrality scores for network members also remain largely the same when compared with both time periods, also indicating a somewhat hierarchical structure with Amara as the most centrally located actor within the network in regard to communication between members of the Toronto 18. Just like the winter camp period, the Toronto 18 communication network exhibits star-like properties, with a single, highly central node at the centre of the network, as shown in the bottom left of the sociogram in Figure 1.0.

D. The Bomb Plot Period (March 1, 2006 – May 31, 2006)

As the Toronto 18 progressed towards the terminal stages of their bomb plot, a schism occurred between the group, causing a division into the Mississauga (led by Amara) and Scarborough (led by Ahmad) cells. As a result, the Toronto 18's network structure breaks into a mixture of star-like and scale-free structures, with Ahmad's cell maintaining a star-like configuration and Amara/Ansari's cell taking on more of a scale-free configuration. Due to the length of this time period, and the nature of the ties being examined (communication), this division is not readily evident in the sociogram at the bottom right of Figure 1.0 since communication still occurred between the two cells that fit this analysis' coding criteria. If a different type of tie (e.g., operational communications, transfer of material or non-material forms of support related to the bomb plot) was examined, the schism would perhaps be more visible. Regardless, there are a number of interesting sociometric trends that emerge from the final stage of the analyzed time periods. The clustering coefficient (0.612) indicates a moderate-to-strong level of cohesion and is slightly less than during the Opasatika period, likely due to the schism between Amara and Ahmad. Much like the preceding three time periods, the Toronto 18's assortativity (-0.197) displays a weak aversion effect, but it is slightly stronger than during the preceding three-month period.

Quite logically, Amara becomes much more significant during this period when compared to the previous three when it comes to his position as a network broker (betweenness centrality of 0.223) due to the schism between the Mississauga and Scarborough cells. Remarkably, Ansari also becomes a prominent broker (betweenness centrality of 0.392), second only to Ahmad (betweenness centrality of 0.433). These three actors also emerge as the three most central individuals, with Ahmad (closeness centrality of 0.829) as the most important, followed by Amara and Ansari (both with closeness centrality scores of 0.725).

VI. DISCUSSION

While generalizing the results of the above analyses is impossible with a single case study, there are several notable trends, changes in nodal characteristics and network structures, and social dynamics that provide interesting insights into how the Toronto 18 communicated their ideologies and operational plans over the four time periods examined. Below, observations taken from the results section are discussed, followed by an outline of the study limitations. While there is a multitude of nuances that can be drawn from the research findings, space constraints limit the discussions to those that are deemed most important and informative for the themes discussed in this volume and the eventual creation of policy-relevant practical approaches to interdicting homegrown terrorist groups, once additional research of a similar nature is conducted.

There is a robust and growing criminological scholarly literature that analyzes how the structure and composition of networks present various vulnerabilities and points of interdictions for police and government agencies tasked with disrupting and destroying covert networks.³¹ As a result, there is an established body of knowledge on some of the key structural vulnerabilities (such as the targeted removal of brokers)³² that can be exploited within covert and dark networks akin to the Toronto 18.³³ The

³¹ See e.g., Bichler and Malm, *Disrupting Criminal Networks*; David C. Hofmann and Owen Gallupe, "Leadership Protection in Drug-Trafficking Networks," *Global Crime* 16, no. 2 (2015): 123-38, <https://doi.org/10.1080/17440572.2015.1008627>; George Wood, "The Structure and Vulnerability of a Drug Trafficking Collaboration Network," *Social Networks* 48 (2017): 1-9, <https://doi.org/10.1016/j.socnet.2016.07.001>.

³² Morselli, "Criminal Network."

³³ However, it is important to note that the ultimate goal of criminal networks (profit) differs from that of terrorist networks (ideological or politically inspired violence).

results described above offer some interesting insights into some of the structural vulnerabilities present within the Toronto 18's communication network.

During the Toronto 18's radicalization period, the communication network exhibited a scale-free network structure, with Ahmad and Amara as the most important brokers or hubs. During the early stages of feeling out potential recruits, sharing ideological material, and communicating future operational plans, it makes sense for a homegrown terrorist group like the Toronto 18 to adopt a scale-free structure, with the most trusted members (or nominal leaders) occupying the most central positions. In other terms, the sociometric results suggest that during the Toronto 18's early radicalization stage, the group employed strong ideological and inspirational figureheads in order to catalyze the radicalization of potential recruits. If this is a generalizable finding found in future research that employs similar case studies of homegrown terrorist networks, it suggests a semi-hierarchical network structure (with ideological leaders serving as hubs) might be efficacious or efficient when trying to attract potential recruits. It also suggests a certain amount of structural vulnerability.

Although the existing criminological literature on covert and illicit networks points to the fact that the nominal leader is not always the most central figure within a network,³⁴ in this particular case, and at this particular juncture in the Toronto 18's overall progression towards their bomb plot, both Amara and Ahmad were central. Therefore, during the Toronto 18's radicalization period, both Ahmad and Amara are the lynchpins of communication, and, therefore, they are the most strategically vulnerable nodes whose removal would disrupt the efficacy of the network.

The Toronto 18's network structure changed during the winter camp period, shifting towards a star-like configuration with Ahmad as the most

Therefore, each type of illicit network tends to structure themselves differently: criminal networks tend to prioritize efficiency over security, and terrorist networks tend to prioritize security over efficiency. This influences how they structure themselves. For more information, see Carlo Morselli, Cynthia Giguère and Katia Petit, "The Efficiency/Security Trade-off in Criminal Networks," *Social Networks* 29, no. 1 (2007): 143-53.

³⁴ Gisela Bichler, Aili Malm and Tristen Cooper, "Drug Supply Networks: A Systematic Review of the Organizational Structure of the Illicit Drug Trade," *Crime Science* 6, no. 2 (2017): 1-23, <https://doi.org/10.1186/s40163-017-0063-3>; Carlo Morselli and Julie Roy, "Brokerage Qualification in Ringing Operations," *Criminology* 46, no.1 (2008): 71-98, <https://doi.org/10.1111/j.1745-9125.2008.00103.x>.

central node and broker. This star-like structure persisted into the Opasatika period as well, with a slight increase in Ahmad's importance as a broker. This, rather unsurprisingly, suggests that the structure of the Toronto 18's communication network shifted and adapted based upon their progression towards an act of violence. As the need for recruitment and radicalization dwindled, there is a contraction of communication activity, centralized around a single actor rather than diffusing it among multiple actors.

The relevant network analysis literature highlights that hierarchical organizations and groups with clear chains-of-command tend to be more efficacious, although with the trade-off that they are less resilient to sudden changes or removals of upper-level leaders.³⁵ Star-like networks are perhaps the most structurally vulnerable configurations that dark networks may adopt since they rely heavily on a single central actor whom the majority of network activity flows through. Star-like networks also tend to be the most hierarchical (when compared to other configurations of dark networks) since the most central node is typically someone with both formal and informal authority and power. Therefore, it is during these two time periods where the Toronto 18 is the most structurally vulnerable since the communication within the network revolves almost exclusively around Ahmad (with Durrani and James occupying secondary diminished roles as communication brokers). Last, the schism between the Mississauga and Scarborough cells during the bomb plot period created two distinct configurations within the network, with Ahmad's cell maintaining a star-like structure and Amara/Ansari's network shifting back towards a scale-free configuration that was exhibited during the radicalization period. With this type of bifurcated, cell-like structure, the most structurally weak portions of the network tend to be the pivotal nodes who bridge and coordinate communication between both cells (in this case, Amara, Ahmad, and Ansari).

The assortativity metric across the Toronto 18's four time periods remains relatively the same, all indicating a weak tendency for network actors to avoid nodes within similar network positions as themselves. This finding is consistent with the star-like and scale-free structures exhibited by the Toronto 18 throughout their lifespan (i.e., only a very few highly central

³⁵ Chris Dishman, "The Leaderless Nexus: When Crime and Terror Converge," *Studies in Conflict & Terrorism* 28, no. 3 (2005): 237-52; Natarajan, "Understanding the Structure."

nodes). It also suggests that communication was “cell-like” (as in an operational terrorist cell) in nature, with a more central actor controlling the flow of information for all of, or a portion of, the network. This makes sense in the high-security environment of a terrorist group, where network actors are wary of outside scrutiny and interdiction efforts by law enforcement and government agencies.

The changes in actor-level sociometric measurements across the four observed time periods also offer some interesting insights into the communication dynamics within the Toronto 18. Although the number of actors remains relatively the same over the group’s lifespan, the most important actors within the network stay relatively the same, with some exceptions. Unsurprisingly, the two nominal leaders of the Toronto 18, Ahmad and Amara, generally emerge as the most central nodes across the four time periods, with Ahmad emerging as the more connected of the two actors. What is also notable is the importance of Durrani and James to the Toronto 18’s communication network, particularly during the radicalization and winter camp periods. In fact, Durrani is more central and a more important broker than Amara in the winter camp period, which is similar to other criminological research that suggests the nominal leaders of illicit networks are not always the most central actors.³⁶ This provides additional empirical support that researchers and security practitioners should not always assume that the nominal leaders are the most connected or “important” (in network terms) actors within their organizations.³⁷

Informed by the wider scholarly literature on homegrown terrorist networks, the Toronto 18 generally fits the scholarly literature’s operational and ideological definitions of “homegrown” terrorists. They are a relatively small group who, for the most part (aside from their connection to the Atlanta terrorist cell and Aabid Khan), were disconnected from other, larger terrorist organizations. While this research did not include a thorough discussion on the types of social ties network actors had with one another (e.g., friendship, kinship, and so on), there is sufficient evidence to suggest that pre-existing relationships played a role in who communicated with whom (e.g., Amara and Ahmad brought in their former friends/school mates and branched out from there). However, the Toronto 18 differs somewhat from previous conceptions of “terrorist cells,”³⁸ which generally

³⁶ Hofmann and Gallupe, “Leadership Protection.”

³⁷ For e.g., see Morselli and Roy “Brokerage Qualifications.”

³⁸ See Morselli, Giguere, and Petit, “The Security/Efficiency Trade-off.”

assume a flattened, non-hierarchical structure in order to mitigate risk. Although the current findings are not completely analogous with other similar research due to the difference in measuring communication ties, the evidence suggests that the Toronto 18 adopted a hybrid-leadership model more akin to certain types of for-profit criminal networks.³⁹ Flattened “cell-like” networks tend to be, by design, less cohesive and decentralized, with very few highly-central individuals. This allows for these types of networks to be resilient to outside interdiction and to maintain certain levels of operational security.⁴⁰ While the Toronto 18 does share some of these characteristics, the fact that Ahmad, Amara, and several other network actors occupy extremely central positions across some or all four time periods suggests that the group operated with some form of explicit hierarchy – with communication originating from, or filtering through, network leaders. Whether this was done purposefully or was due to the relative inexperience of the Toronto 18’s leaders is debatable.

A. Study Limitations

Perhaps the most obvious study limitation is the lack of generalizability of any findings. A single case study does not allow for any of the conclusions in this chapter to be applied to any other case of homegrown terrorism. It is, however, a first step towards creating generalizable results and contributes to future studies that examine homegrown terrorist groups using social network analysis. However, much more research of a similar nature to this study needs to be conducted before any solid insights into the structure and nature of homegrown terrorist communication networks can be codified.

Another study limitation was the minimal amount of primary data available when coding the communication networks for the Toronto 18. The golden standard in social science is quality primary data, and while there were several data sources (i.e., transcripts of interviews with health professionals and police, Mubin Shaikh’s memoir) used in this study that can be considered as “primary” sources, there was undoubtedly an overreliance on secondary source material (i.e., court documents, police reports, media stories). This overreliance on secondary source data is a

³⁹ For e.g., see Hofmann and Gallupe, “Leadership Protection,” 133–34.

⁴⁰ Bouchard, “On the Resilience of Illegal Drug Markets.”

common problem in terrorism studies,⁴¹ where a variety of factors such as access to primary data, danger to researchers and subjects, and the secretive nature of terrorist investigations create significant hurdles for researchers seeking to obtain and use primary data.

Last, the current research provides a cross-sectional approach to examining the Toronto 18's communication ties by reducing the four examined time periods into multi-month "snapshots" of communication ties. There are longitudinal and dynamic social network methodologies that, if there is sufficient quality relational data, can offer a much more nuanced understanding of how certain social ties form and break within smaller timeframes (over days or weeks rather than months) that can offer additional insight into how the Toronto 18 communicated with one another.

VII. CONCLUSION

The purpose of this chapter was twofold. The first was to provide readers with a general concept of the overall communication structure of the Toronto 18 during four significant time periods as they progressed towards the culmination of their bomb plot. The second was to contribute to the nascent empirical literature on homegrown terrorist groups that employ social network analysis as a primary methodology. It is important to note that social networks are extremely complex and multiplex constructs, where actors can have dozens upon dozens of simultaneous ties with other network actors (i.e., communication ties, friendship ties, business ties, romantic ties, and so on) that can manifest in different network- and nodal-level dynamics. This chapter offers a glimpse into just one of those types of ties; it is a first step to better understand some of the operational and ideological ties that homegrown terrorist groups form, break, and change as they progress towards violence. While space constraints prevented an exhaustive overview of all the various sociometric dynamics that could have been discussed, this chapter provides a fairly accessible discussion of some of the more important communication ties and changes in the overall network structure that the Toronto 18 adopted during the three-year period prior to their arrests.

⁴¹ Bart Willem Schuurman and Quirine A.M. Eijkman, "Moving Terrorism Research Forward: The Crucial Role of Primary Sources," *The International Centre for Counter-Terrorism: The Hague* 4, no. 2 (2013), <http://dx.doi.org/10.19165/2013.2.02>.

As a final consideration, there are a number of areas for future research that can build upon the findings in this chapter. As discussed in the study limitations section, the development of a body of case studies of homegrown terrorist groups akin to the Toronto 18 would allow for the generalization of study findings and may provide practical policy advice for security agencies and police who are tasked with detecting and interdicting terrorist plots. There is also a great deal of room for more nuanced social network analyses of the Toronto 18 that examine the interplay between different types of social ties (e.g., recruitment, exchange of material goods for the purpose of completing the terrorist plot, kinship/friendship ties, and so on) that existed between the members of the Toronto 18. Each of these approaches has the potential to offer additional insight into the operations and structure of Toronto 18. Finally, the available relational and attribute data on the Toronto 18 may provide some interesting insights into how and why individuals radicalize towards political violence. These and many other research avenues that employ social network analysis have much to offer academics, jurists, and security practitioners interested in better understanding a variety of social, relational, and transactional dynamics within terrorist groups.