Using social network analysis to understand the interactions of a Cape Town gang

Khalil Goga, Eduardo Salcedo-Albaran and Charles Goredema

Summary

This case study uses social network analysis to study the interactions of a criminal network operating in a township outside Cape Town. Data was gathered from a court judgment following the trial. Code names are used throughout the study as many of those involved in the trial are appealing their sentences.

SOCIAL NETWORK ANALYSIS (SNA) is increasingly used as an analytical tool across disciplines to study the interactions of people and/or institutions. It can used to illustrate how people and/or institutions interact over a period of time and focuses on fluid interactions without becoming stuck in theoretical classifications.

Methodology

SNA is a more sophisticated method of illustrating and analysing the interactions of actors rather than just linking them or placing them within a hierarchy. It uses a set of mathematical measures that can demonstrate the proximity of varied individuals and illustrate how they are linked using a set of mathematical techniques to create 'neat', observable images.

The actors in the network can be then classified in terms of various roles and one can observe the structure of the network in greater detail. For example, an SNA map can illustrate those who are at or close to the 'hub' of the network, those who constitute the structural bridges (i.e. that link various individuals) and those who are the stabilisers of the network. SNA also allows one to highlight the types of social agents involved in a network, the types of relationships and the intensity of the networking process. On a larger scale it is known to be used by a variety of agencies and companies, such as intelligence agencies attempting to identify terrorism threats. It has also been used on a smaller scale to illustrate the actions of individuals in criminal networks.[1]

Any form of systemic crime in which interactions in the form of confrontation, collaboration, corruption, infiltration or cooptation are established between criminal groups and formal lawful institutions is arranged and can be analysed as a social network: 'Social networks can be defined as 'a group of collaborating (and/or competing) entities that are related to each other'.[2] In a simpler sense, 'a network is defined as a set of nodes connected by ties. Nodes are typically actors, and can be people, teams, organizations or information systems.'[3] Criminal intelligence

agencies and investigators have long used types of SNA to study criminal networks, although this was often done using a 'first-generation' link analysis in terms of which criminal relationships are visually mapped on a graph. This analysis can be physically carried out using tools (such as notes and string) or with a computer. However, the growth in data combined with technological progress has resulted in more systematic methods or 'second-generation' network approaches that automatically produce graphics that can then be interpreted. These second-generation techniques use a variety of mathematical techniques and the data can be manipulated to reflect a variety of dimensions of criminal linkages.

> Social network analysis is increasingly used as an analytical tool to study the interactions of people and/or institutions

This study uses a second-generation mapping technology developed by Vortex Incorporated. The software (Vortex Relationship System) creates a database of both nodes (actors) and edges (interactions) that are retrievable online. In this online database information and descriptions added to the system on all the actors involved are accessible, as is information on their interactions. This data is processed and analysed using the following 'grammar structure' of a 'relationship' or 'interaction' between two actors:

[[Name Actor 1[Description Actor 1]][interaction[verb wordV action word]] [[Name Actor 2[Description Actor 2]]]

What this grammar structure means is that there is an interaction between two actors. For example, actor 1 pays actor 2, or actor 1 murders actor 2. Each piece of information with this grammar structure is then organised through an SNA tool in order to consolidate a database giving the details of each interaction. The database is then used for generating the graphs and calculating the *centrality* (or relative importance) indicators.[4]

Therefore, in the present analysis each node represents and is defined as an agent, bearing in mind his/her capacity for determining developments within the network. Even if the role of a corporate actor is considered, it is possible to identify the location of decisional capacity within it. Each line connecting two nodes represents a social interaction. The line indicates the presence of interactions between nodes/agents, and the arrow in the line illustrates the specific direction of that interaction. For instance, if node/agent X interacts with node/agent Z, then there is an arrow from a node representing X to a node representing Z, in which X operates as the active individual –the one who executes the action – and Z operates as the passive individual – the one towards whom the action is directed. This means that the direction of the arrow explains the specific direction of the interaction, illustrating who are the active and passive node/agents.

The arrangement of the nodes and edges[5] may be represented through graphs. A graph is a finite set of connected nodes,[6] which in this context means a finite set of interacting individuals. In criminology, graphs and SNA have been used to identify the structural features of illicit networks.[7]

As mentioned above, the procedures applied in this paper enable the identification and analysis of the most relevant or 'central' nodes/agents, which means the most
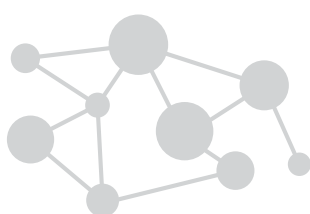
A NETWORK IS DEFINED AS A SET OF NODES CONNECTED BY TIES. NODES ARE TYPICALLY ACTORS, AND CAN BE PEOPLE, TEAMS, ORGANISATIONS OR INFORMATION SYSTEMS

connected nodes/agents or the ones with the highest capacity to intervene in the networks' routes.

On the one hand, through the direct centrality indicator it is possible to identify the number of direct interactions established by each node/agent in order to identify the most connected node.

Figure 1: Example of a network[8]
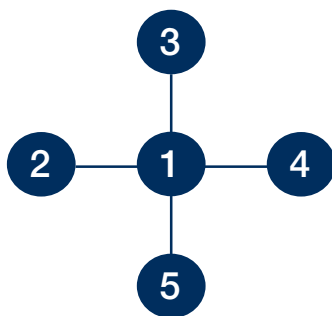
In Figure 1 the node/agent represented by the number 1 registers four direct connections or interactions, while nodes 2, 3, 4 and 5 only register one direct interaction (with node 1). This means that, after calculating the number of direct interactions (eight),[9] it can be stated that node/agent 1 establishes four of the eight interactions, which means that this node registers a direct centrality indicator of 50 per cent, while the other nodes/agents register indicators of 12,5 per cent each. In this sense, node/agent 1 is the hub of Figure 1.

The second sense of centrality allows the identification of the node/agent with the highest capacity to arbitrate or intervene in the[10] routes of the network; this node/agent is defined as a 'structural bridge'. In this case, the number of direct interactions is irrelevant while the number of routes is relevant.

While in Figure 1 there are four direct interactions, there is a higher number of geodesic routes. For instance, a geodesic route connects nodes 2 and 3 through node 1, another route connects nodes 2 and 4 through node 1, etc. After calculating the number of geodesic routes connecting the nodes/agents of the network, it is possible to identify the one that intervenes in the highest number of routes. This calculation is carried out using the 'betweenness' indicator. For example, as can be observed in Figure 1, node 1 intervenes in every route of the network and therefore registers a betweenness indicator of 100 per cent.

Case study and data collection methods

Background

The case study given below is drawn from a criminal case that was recently concluded in the Cape Town High Court.

The social network map was developed using information gathered from the case judgment, which was just under 800 pages in length. Care had to be taken in this process because, firstly, the judgment was delivered in Afrikaans, which was not a native language of the researchers and, secondly, the witnesses and accused made many contradictory and false statements. Therefore, sources of information added to the social network map came from the testimony accepted by the court, while that deemed unreliable or false was disregarded. Using a case judgment has limitations, because it is a summarised version of events, which means certain aspects of the cases and some events may be left out. The court transcript was not available at the time of data collection.

> Using a case judgment has limitations, because certain aspects of the cases and some events may be left out

The case developed during a period of gang violence between the gang that we call FB and the GU and R gangs. FB members were convicted of five murders and a number of other charges, including seven attempted murders, dealing in drugs and firearms, and assault. Other interactions were also added to the social network map that were not based on evidence given during the case but were sustained on media contextual information. Much of the case was built around the testimony of HIWVRVOF, who turned state witness. As it can be observed, no names are used in the present analysis given the sensitive facts involving execution of violence.

During the case HIWVRVOF was described as a 'phenomenal' witness and his testimony shed light on a number of violent interactions, interactions between gangs and drug dealing. Other witnesses with various levels of association to the gang gave other testimony about the selling of drugs, the use of firearms, assault and murder. Eyewitness accounts of a number of violent attacks were also noted. The state had to place 22 of the 68 witnesses under witness protection, including prosecutors and police personnel. The case ran for two years and two state witnesses were murdered after testifying against the gang and rejecting state protection. The prosecution was also able to build the case using evidence found in mobile phone records and photographs on mobile phones, which included incriminating pictures of the gang.

The case

A total of 16 defendants were convicted of many of the 50 crimes they were accused of. The crimes, committed over a period of six years from 2004 to 2010, do not tell the entire story of their criminal enterprise, but illustrate a microcosm of

the interactions of those actively involved in a criminal group. The judgment also shed light on the host of interactions between the criminal gang and those around them, including businessmen and family, as well as the social and economic conditions that plague areas of Cape Town.[11]

The network

A criminal we shall call CRFABOMP led the FB gang. He was undoubtedly its leader: a witness testified that when he came into gang headquarters everyone was 'in order' and that it was 'amper asof 'n god opgedaag het' (almost as if a god had arrived).[12] The gang was primarily developed as a drug distribution network and operated a few outlets through 'drug houses'. CRFABOMP was able to obtain large quantities of drugs from an unknown source in Cape Town, which were then sold to other gangs or through the drug houses. The drug dealing was predominately done at the wholesale level.

Violence was extended after other gangs, including the R and GU gangs, stopped dealing with the FBs. CRPABOMP gave the orders for the killings and liaised with other criminal groups to find hitmen. He gave orders for weapons and drugs to be obtained, and for setting up deals with civilians to hide these goods. He had a number of drug dealers working for him from a few properties, who shared responsibility for money, drugs and firearms.

He claimed to own a construction and tiling business, but there was limited evidence of this, and instead it was known that he owned seven houses in Atlantis and others in Athlone, Mitchells Plain and Hanover Park, as well as an apartment in Century City. He frequently hired members of his criminal network to help with the maintainence of these buildings. Media sources covering the trial claimed he earned between R300 000 (approximately $28 500 as of July 2014) and R500 000 ($47 600) a week from drug dealing. This could translate into a yearly earnings of between R15 000 000 ($1 428 190) and R26 000 000 ($2 475 530).

The criminals who worked for CRFABOMP included CR-FABORK, who operated as a manager and had a high level of responsibility in the criminal business. He claimed to be involved in the building company, earning R5 000 ($476) a month. His ex-wife was also extensively involved in the gang's operations.

CRFABOMP also employed a number of others to do both criminal and non-criminal work. This illustrates the type of work that the criminals in the gang did. Many were not able to financially support themselves exclusively through criminal activity. For example, in his testimony CIPAT illustrated a number of interactions with many of the members of the

gang and was involved in criminal activity. However, during the testimony it was evident that he was paid very little and took on other jobs, including washing the cars of those higher up in the criminal hierarchy.

The criminals were undoubtedly part of a gang and used a number of gang signs, hand signals, greetings, tattoos and insignia. However, despite sharing the same name, there were other gangs in the area who were not affiliated to the first one at all. This suggests that the 'decentralisation thesis' or 'franchise thesis' is true. The franchise thesis is built on the 2006 work of Andre Standing, whose interviewees stated that large supergangs operated like franchises rather than large conglomerates. Subsequent interviews with experts also seemed to confirm this observation.[13] Building an understanding of the larger network could include using other case studies and showing the interactions between various franchises, as well as with other gangs.

The criminals also had links to professional killers or 'hitmen', who did not live in the area and were brought in to kill rival gang members. They were moved in and out of the suburb in times of need and were given false identities. Similarly to the other members, they were paid a very low fee and often were given a small fee of around R500 ($48) for takkies (sneakers) or food. The court was shocked that they were able to carry out these violent actions for such small amounts of money.

> The court was shocked that hitmen murdered people for such small amounts of money

The links between the hitmen and the FB gang extended to the sharing of hitmen with other gangs, including a faction of the violent prison 'supergang' known as 'The 28s'.[14] The 28s members who were still on trial at the time this report was prepared were involved in a gang war in which 19 people were killed. There was a high level of complicity between these gangs, despite the geographic distance between their bases of operations, and the leaders of both gangs were known to meet to discuss operations and human resources.

Of concern was the use of family members and acquaintances to do the work of the gang. This included hiring non-gang members to be 'lookouts', using their houses to hide firearms and criminals after they had committed their crimes, and using their phones to avoid police surveillance, among other tasks.

The criminal gang undoubtedly had a level of control over the area it operated in. While the levels of violence were well known and evident in the case, much of the police work had to be

moved to another station to avoid case tampering, which illustrates the power the gang had over many in the police force. *This is not evident in the social network map, however, because corrupt relationships between the gang and the police were not prosecutable or known*. However, much of the case was built at a local station level and the case was one of the first in South Africa to take down a large criminal gang in this way, highlighting the potency of new legislation and policing techniques. The lack of information about the gang's financial structure, as well as the corruption sustaining the network, is discussed in the conclusion.

Below is an analysis of the criminal gang that highlights the types of agents involved (both criminal and civilian) and their interactions. The results are further analysed using SNA to illustrate how these interactions form loci of power.

Nodes/agents

There were 114 nodes/agents in total, distributed in the categories shown in Figure 2. *It is important to note that throughout the subsequent discussion the interactions and nodes referred to are those that were mentioned in the court judgment. In other words, these interactions and nodes are not the total number, but just those referred to during the trial. There were also specific references to other nodes and agents during the trial, so the total given is not all encompassing.*

Table 1 shows the distribution of the category 'criminal', which accounts for more than half the nodes/agents.

The FBs and Rs are the most important groups of criminals participating in the network. This can be explained by the fact that the case was built up against the FBs. During this period they were involved in a war against the Rs and GUs. The Rs suffered the most attacks. The leader of the FBs, CRFABOMP, had sent out an instruction for open 'hits' against the R's leadership and both his gang and outside hitmen regularly attacked the Rs. Table 2 gives a list of 10 nodes/agents classified as 'criminal – FB'.

Table 3 contains a list of 12 nodes/agents classified as 'criminal – R'.

The second and third most relevant types of nodes/agents are (1) civilians (29 per cent) and (2) police (13 per cent), without additional subcategories. As discussed below, some civilians can be defined as grey nodes/agents in the sense that, although operating in lawful organisational structures or social groups, they played an unlawful institutional role, furthering the criminal interests of the network. An example of this situation is the hiding of drugs and firearms by civilians at the behest of

Table 1: 'Criminal' activities

Type	Number of nodes/agents
Criminal – FB	12
Criminal – R	12
Criminal – drug pusher (FB)	5
Criminal	3
Criminal – drug dealer	3
Criminal – drug pusher	3
Criminal – 28s	2
Criminal – bodyguard (FB)	2
Criminal – 28s	2
Criminal – HL*	2
Criminal – hitman	2
Criminal – GU	2
Criminal – A*	1
Criminal – civilian/criminal (HL*)	1
Criminal – FB(2)	1
Criminal – FB associate	2
Criminal – GU (former)	1
Criminal – R (Flamingo Park)	1
Criminal – R/A*	1
Criminal – A*	1
Criminal – YA*	1
Criminal gang	1

* Codes for names of gangs.

Figure 2: Types of nodes/agents

● Criminal	54%
● Civilian	29%
● Police	13%
● Businessmen	2%
● Lawyer	2%
● Security guard	1%
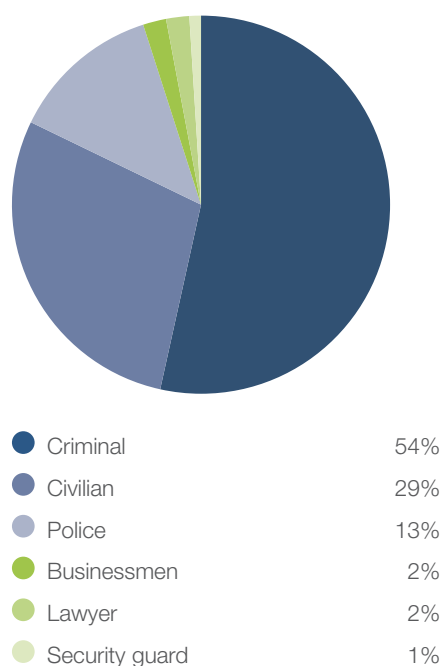
Table 2: Nodes/agents classified as 'criminal – FB'

Code
CRFABOMP
CR-FABORSB
CR-FABOM
CR-FABOCD
CR-FABOWB
CR-FABOLJ
CR-FABOIL
CR-FABOET
CR-FABOAG
CR-FABOMWD

Table 3: Nodes/agents classified as 'criminal – R'

Code
CR-RAAL
CR-RAGDGD
CR-RASGPPD
CR-RAFAL
CR-RADKB
CR-RAJEAA
CR-RALPD
CR-RACSO
CR-RAGMG
CR-RAALED
RAIL
RAGCC

Figure 3: Distribution of network interactions

● Crime	31%
● Social	21%
● Economic	10%
● Violence	14%
● Family	8%
● Logistics	4%
● Other	11%
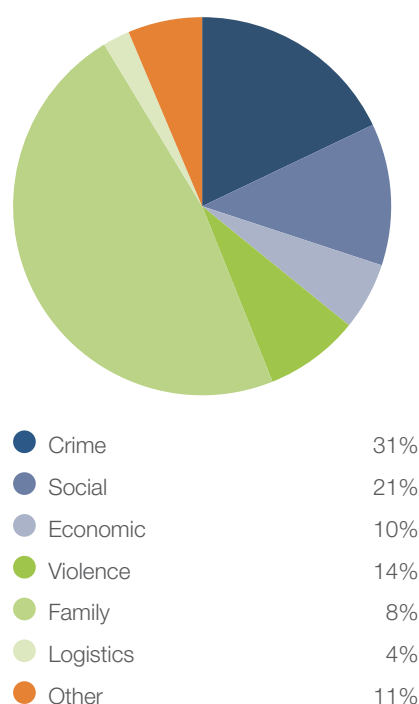
the criminal gang. Similarly, civilians were tasked with seeking out members of rival gangs so that they could be assassinated.

Interactions

The model of the network consists of 356 interactions, distributed as shown in Figure 3. *Again it is important to remember that these interactions are not the total number of interactions in the network, but the number identified during the trial. The next few sections also note a number of interactions, networks and nodes based on the case judgment.*

Bearing in mind that the network was mainly focused on drug trafficking and dealing, it can be expected that the most relevant types of interactions would be related to these activities. In this sense, the category of interactions grouping criminal relationships account for 31 per cent of the relationships in the network.

However, it should be noted that, as a result of the action of grey nodes/agents, the network also functioned through lawful and not only criminal interactions. The most relevant types of lawful interactions can be found in the 'social', 'economic', 'family' and 'logistics' structures of the network, which are discussed below. For instance, the 'social', 'economic' and 'logistics' interactions specifically and undoubtedly linked to drug trafficking activities were grouped under the 'crime' category. Only a few interactions without statistical relevance related to the consumption or movement of resources, in which it was difficult to determine the criminal and penal nature, were classified as 'social', 'economic', 'violence', 'family' and 'logistics' interactions.

Half of the 'crime' interactions consisted of activities specifically related to drug trafficking, which are classified as 'drug crimes'. Table 4 gives the subcategories grouped under the category 'crime – drug crime'.

The most relevant subcategory of interaction in the category 'drug crime' was that of selling drugs. The most relevant nodes/agents actively participating in this interaction – which means they 'sold drugs' – are shown in Table 5.

The active node/agent with the highest number of interactions in the category 'crime – drug crime – sold drugs to' was a drug dealer identified with the code DRDEEPDGB, who participated in five interactions. However, this node/agent participated in 20 interactions in total, which implies 15 additional interactions different to those in which he 'sold drugs to'. Specifically, this node/agent also participated in two interactions as an active buyer of drugs, in two more in which he fetched drugs and one in which he hid drugs. This in turn illustrates how drug use and addiction can create a self-sustaining market of users. Many

Table 4: Subcategories of the category 'crime – drug crime'

Type	Number
Crime – drug crime – sold drugs to	19
Crime – drug crime – bought drugs from	13
Crime – drug crime – employed to sell drugs	4
Crime – drug crime – bought drugs	4
Crime – drug crime – sold drugs for	3
Crime – drug crime – bought drugs together	3
Crime – drug crime – bought drugs for	3
Crime – drug crime – fetched drugs together	2
Crime – drug crime	2
Crime – drug crime – measured drugs together	1
Crime – drug crime – left drugs with	1
Crime – drug crime – hid drugs for	1

Table 5: Active nodes/agents in the interaction 'selling drugs'

Interactions	Type	Code
5	Drug dealer	DRDEEPDGB
4	Criminal – drug pusher (FB)	CR-DRPUFABOMPK
2	Criminal	CRHVW
2	Criminal – drug pusher (FB)	CR-DRPUFABOMND
2	Civilian	CIPAT
1	Drug dealer	DRDERKD
1	Criminal – FB	CR-FABORK
1	Criminal – drug pusher	CR-DRDES
1	Criminal – drug pusher	CR-DRDEUDD
1	Criminal – drug pusher	CR-DRDEUDDM

Table 6: Nodes/agents participating actively in the 'social – friends' subcategory

Number	Code	Type
6	CR-RAJEAA	Criminal – R
3	CR-FABOIL	Criminal – FB
3	CR-DRPUFABOMPK	Criminal – drug pusher (FB)
2	CR-RAFLPAJBVH	Criminal – R (Flamingo Park)
2	CRFABOMP	Criminal – FB
2	CR-FABORK	Criminal – FB
2	CIS	Civilian
2	HIWVRVOF	Hitman
1	CICR-HALICVS	Civilian/criminal – Hard Livings
1	CR-FABOET	Criminal – FB
1	DRDEEPDGB	Drug dealer
1	CIGSGOG	Civilian
1	CIG1	Civilian
1	CR-BOFABORC	Criminal – bodyguard (FB)

Figure 4: Structure of 'crime' interactions (blue lines)

NOTE: Graph with uniform radial distribution. Size of the nodes/agents illustrates the betweenness indicator (capacity to intervene in geodesic routes) and location illustrates the direct centrality indicator (number of direct interactions established by the node/agent).

Figure 5: Distribution of 'social' interactions

● Social—friends	38%
● Civilian—went to smoke drugs together	13%
● Social—met at the house	8%
● Social—visited in prison	5%
● Social other	36%
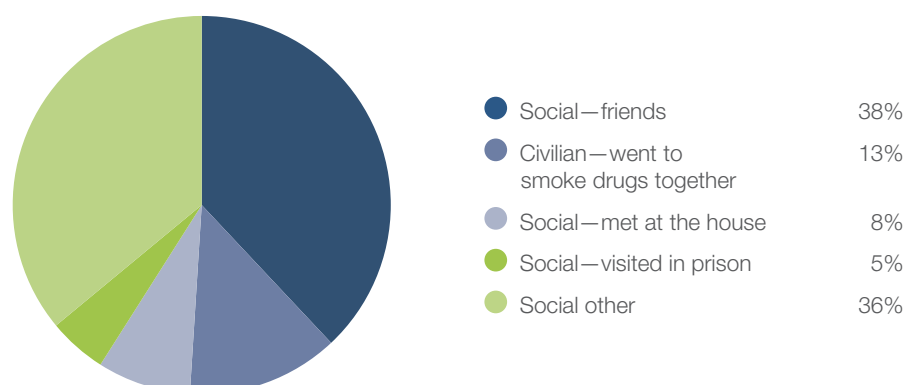
Table 7: 'Social' interactions classified as 'other'

Type of interactions	Number
Social – visited in prison	4
Social	3
Social – knew each other	3
Social – lived in the same house	3
Social – lived in the same area	3
Social – dated a sister	1
Social – at funeral	1
Social – at child's party	1
Social – at the house	1
Social – called by her before the shooting	1
Social – contacted him about the murder of Daniels	1
Social – family friends	1
Social – former friends	1
Social – gambled together	1
Social – in a relationship	1
Social – knew him/friends with his mother	1
Social – part of the same pool club	1
Social – partied together	1
Social – played cricket together	1
Social – slept there	1

Table 8: Nodes/agents involved in the interaction 'employs'

Number	Code	Type
9	CRFABOMP	Criminal – FB
3	CR-ALTHFOLEOFTHFABOYD	Criminal – FB
2	CR-RAALED	Criminal – R
2	BU-PRCOBS	Business – property company
1	DRDEEPDGB	Drug dealer
1	DRDEMK	Drug dealer
1	CR-FABORK	Criminal – FB

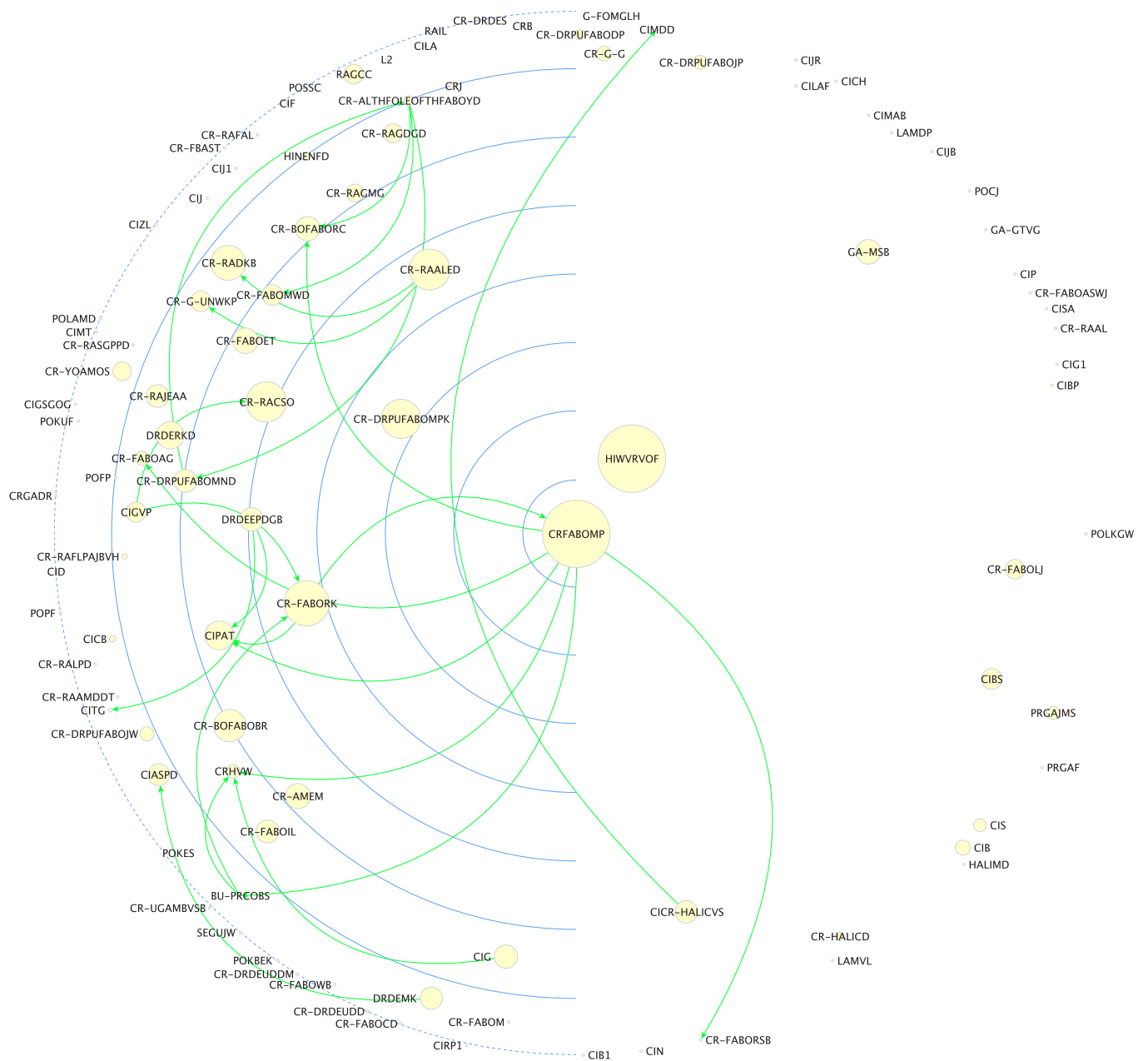## Figure 6: Structure of 'social' interactions (grey lines)
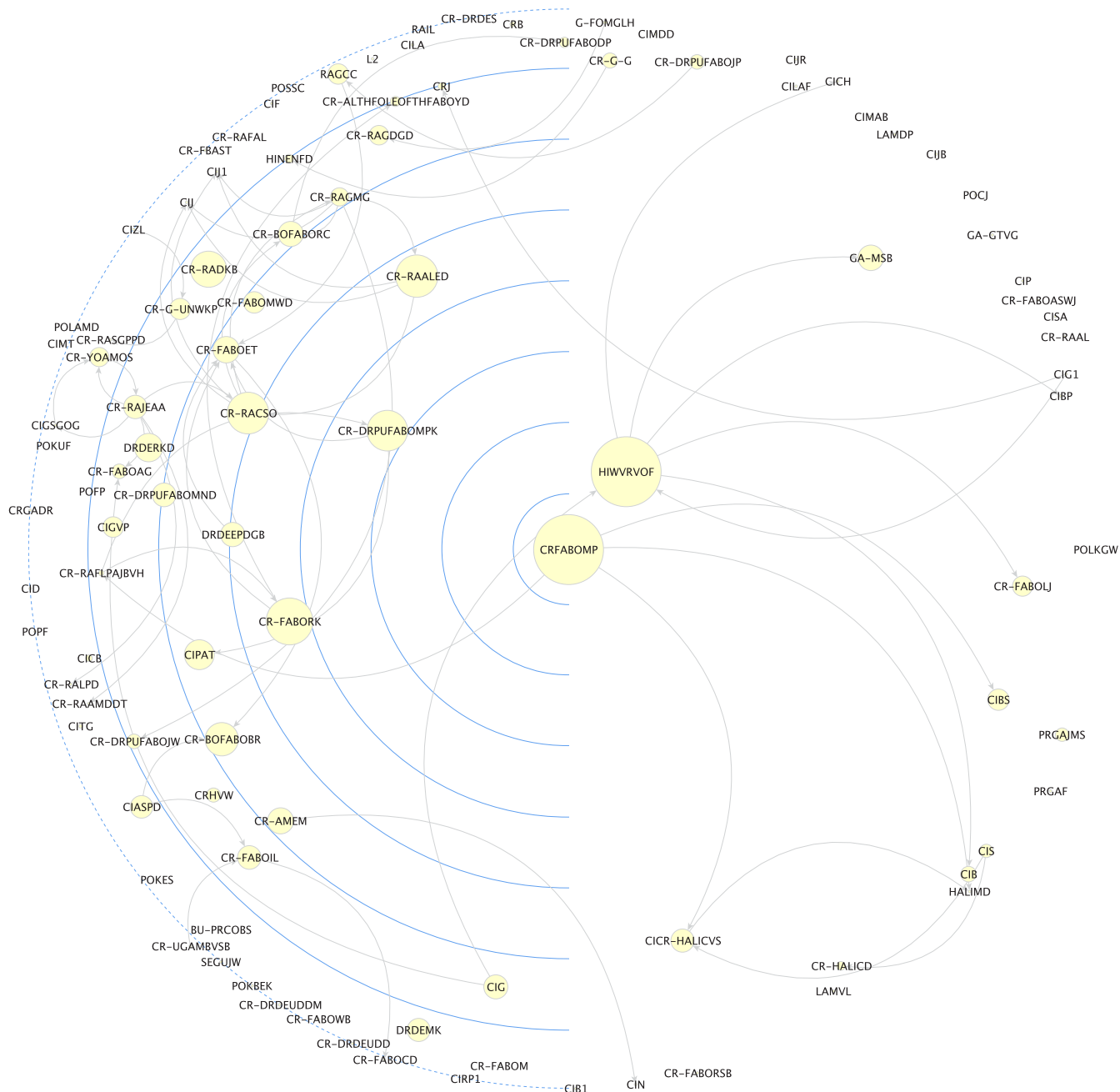
NOTE: Graph with uniform radial distribution. Size of the nodes/agents illustrates the betweenness indicator (capacity to intervene in geodesic routes) and location illustrates the direct centrality indicator (number of direct interactions established by the node/agent).

Table 9: 'Murders'

Type of interaction	Active node/agent		Passive node/agent	
	Code	Type of node/agent	Code	Type of node/agent
Violence – murder	HINENFD	Criminal – hitman	CR-RASGPPD	Criminal – R
Violence – murder	HINENFD	Criminal – hitman	CR-RAGDGD	Criminal – R
Violence – murder (unconfirmed)	CR-RAALED	Criminal – R	CIMDD	Civilian
Violence – murder	CRGADR	Criminal gang	DRDERKD	Criminal – FB
Violence – murder	HIWVRVOF	Criminal – hitman	CR-RAALED	Criminal – R
Violence – murder	CR-FABOIL	Criminal – FB	CR-RAAMDDT	Criminal – R/ Americans
Violence – murder	CR-FABOIL	Criminal – FB	CR-RALPD	Criminal – R
Violence – murder	CR-BOFABOBR	Criminal – bodyguard (FB)	CR-RAAMDDT	Criminal – R/ Americans
Violence – murder	CR-BOFABOBR	Criminal – bodyguard (FB)	CR-RALPD	Criminal – R
Violence – murder	CR-RADKB	Criminal – R	CRB	Criminal
Violence – murder	CR-FABOET	Criminal – FB	CR-RAGDGD	Criminal – R

Figure 7: Distribution of 'economic' interactions

● Economic—employed	58%
● Economic—worked for	9%
● Economic—worked for (building)	9%
● Economic—paid	6%
● Economic—employed to murder	3%
● Economic—owns	3%
● Economic—paid bail	3%
● Economic—paid for drugs	3%
● Economic—paid R25 000	3%
● Economic—rented	3%

Figure 8: Structure of 'economic' interactions (green lines)

NOTE: Graph with uniform radial distribution. Size of the nodes/agents illustrates the betweenness indicator (capacity to intervene in geodesic routes) and location illustrates the direct centrality indicator (number of direct interactions established by the node/agent).

of those involved in the drug trade are also users, creating a pool of labour reliant on the criminal economy and in need of drug counselling or rehabilitation.

The second most relevant subcategory related to drugs crime is 'crime – drug crime – bought drugs from'. The most relevant node/agent operating actively in this case, meaning that he 'bought drugs from' a passive node/agent who sold the drugs, is identified with the code CR-RACSO and classified as 'criminal – R', who participated in five interactions in which he bought drugs from (1) code CR-FABOAG and classified as 'criminal – FB' and (2) code CR-FABOMWD, classified in the same way.

Figure 4 illustrates the structure of 'criminal' interactions established in the network.

The second most relevant category of interactions are those classified as 'social', accounting for 21 per cent of the network's interactions, as shown in Figure 5.

As Figure 5 shows, the subcategory of 'social' interactions consisting of friendship – which of course relates to lawful interactions – is the most important. Table 6 lists the nodes/agents participating actively in this subcategory.

Table 7 shows the interactions classified in the subcategory 'other' in the category of 'social' interactions. Figure 6 shows the structure of 'social' interactions established in the network.

The third most relevant type of interactions are 'economic' interactions, distributed as shown in Figure 7.

As Figure 7 shows, the interaction in which an active node/agent, X, employs a passive node/agent, Y, is the most relevant form of economic interaction in the network, accounting for 58 per cent of interactions in the 'economic' category. The subcategory 'employs' comprises both lawful and unlawful actions, including payment

Direct centrality

The indicator of direct centrality allows one to measure the participation of each node/agent in the network's direct interactions . Only direct interactions and not the network's geodesic paths are measured by this indicator. Bearing this in mind, it was found that *the node/agent with the highest indicator of direct centrality* was classified as 'criminal – FB', identified with the code CRFABOMP and registering an indicator of 7,8 per cent. This node/agent participated in 70 direct interactions, in 47 cases in an active role. This highlights his importance as the network's leader. Not only did he employ and control his gang and members of the community, he was also involved in setting up hits and drug deals and

Figure 9: Subcategories in the category 'violence'

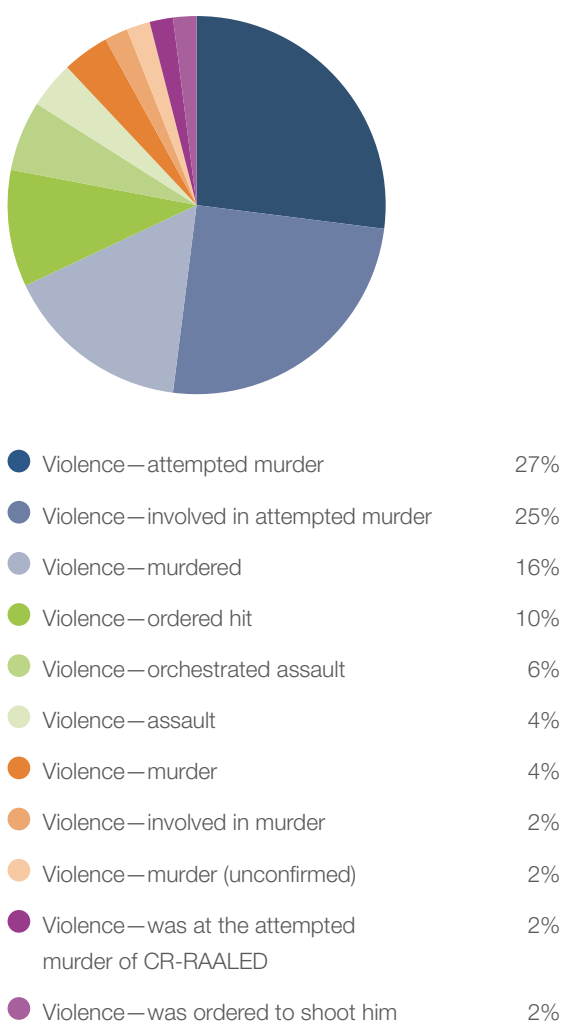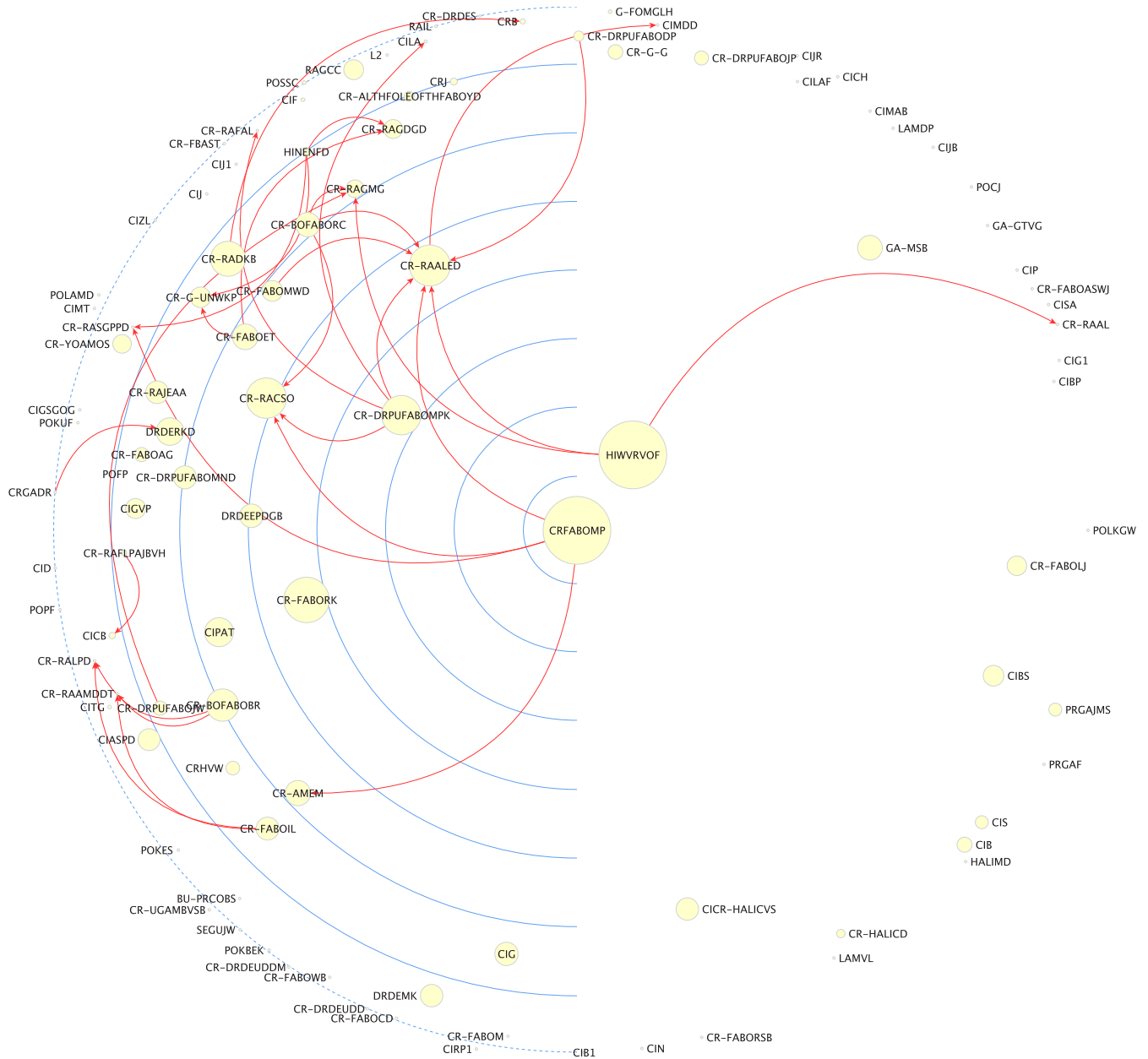|		
● Violence—attempted murder		27%
● Violence—involved in attempted murder		25%
● Violence—murdered		16%
● Violence—ordered hit		10%
● Violence—orchestrated assault		6%
● Violence—assault		4%
● Violence—murder		4%
● Violence—involved in murder		2%
● Violence—murder (unconfirmed)		2%
● Violence—was at the attempted murder of CR-RAALED		2%
● Violence—was ordered to shoot him		2%

Figure 10: Structure of interactions categorised as 'violence' (red lines)

NOTE: Graph with uniform radial distribution. Size of the nodes/agents illustrates the betweenness indicator (capacity to intervene in geodesic routes) and location illustrates the direct centrality indicator (number of direct interactions established by the node/agent).

providing firearms to the gang. Figure 14 shows CRFABOMP's participation as an active node/agent.

As can be observed, the 'crime' interactions are the most relevant interactions in which this node/agent actively participated; Figure 15 gives the subcategories of these interactions.

It should also be noted that CRFABOMP also participated in the 'economic' subcategories illustrated in Figure 16. In this sense, CRFABOMP's capacity to participate in lawful and unlawful economic and criminal activities helped to structure the network and allowed the flows of social capital and financial resources between lawful and unlawful structures.

The node/agent with the second highest indicator of direct centrality, classified as 'hitman' and identified with the code HIWVRVOF, has an indicator of 6,4 per cent. This node/agent participated in 49 direct interactions, in 26 cases in an active role. This role is slightly distorted, however, because he was a key informant in the case against the rest of the gang. This in turn meant that he had to give first-hand accounts of the acts in which he was involved, increasing his importance in our perception of the network. The distribution of interactions in which HIWVRVOF actively participated is shown in Figure 17.

HIWVRVOF openly admitted in court that his principal economic activity was being a professional killer. At the same time the most relevant type of interactions in which he actively participated were 'social' relationships that could be defined as lawful. In part this can be explained by the fact that he was a witness at the trial and therefore provided more detail as to his whereabouts.

The nodes/agents that HIWVRVOF visited in prison are classified as (1) 'gang – 28', identified with the code GA-MSB and (2) 'civilian', identified with the code CIBS, who was a grey node/agent in a lawful civilian role while simultaneously participating in unlawful 'crime' interactions. The passive nodes/agents interacting with HIWVRVOF through the subcategory of 'friends' are classified as 'civilian' and identified with the codes CICH and CILAF.

Table 14 shows the 'crime' interactions in which HIWVRVOF actively participated. The passive nodes/agents that participated with HIWVRVOF in the interaction 'crime – hitman for' are classified as 'criminal – FB' and identified with the codes CR-FABOAG and CRFABOMP. This means that HIWVRVOF operated as a 'hitman' hired by or under the instructions of CR-FABOAG and CRFABOMP.

The passive nodes/agents that interacted with HIWVRVOF in the subcategory 'crime – went to shoot someone' are

Figure 11: Distribution of 'family' interactions

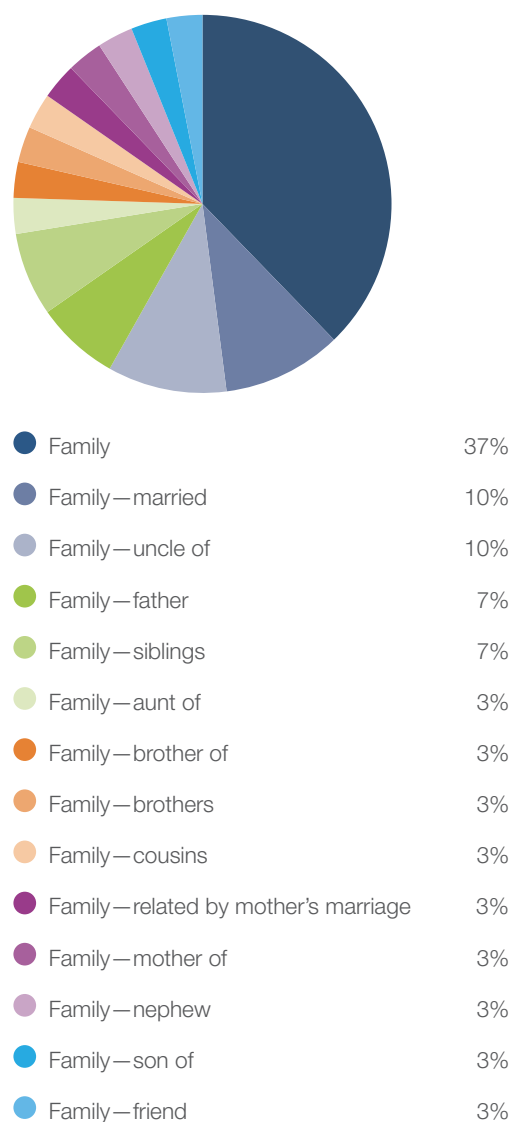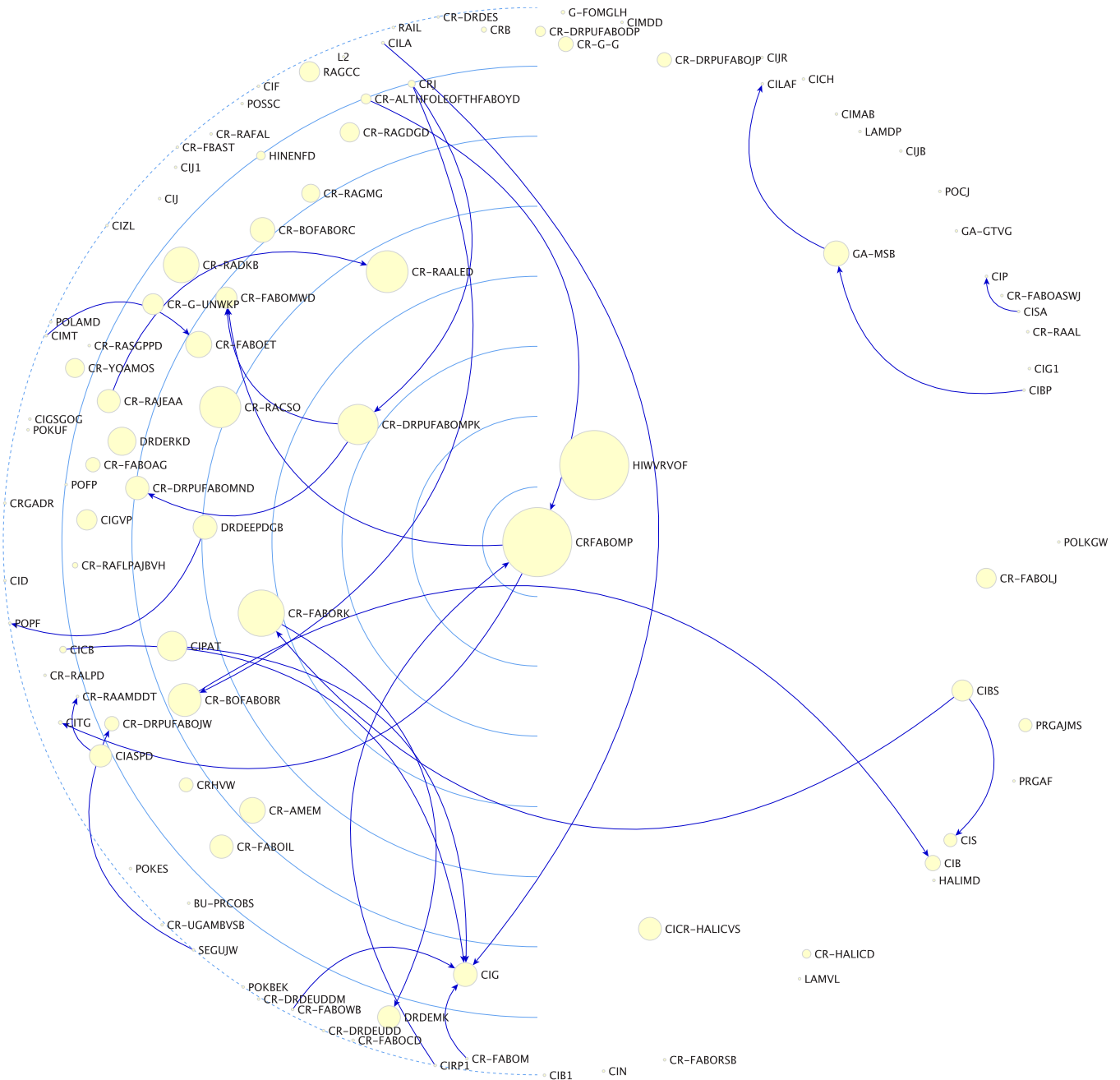|	
● Family	37%
● Family—married	10%
● Family—uncle of	10%
● Family—father	7%
● Family—siblings	7%
● Family—aunt of	3%
● Family—brother of	3%
● Family—brothers	3%
● Family—cousins	3%
● Family—related by mother's marriage	3%
● Family—mother of	3%
● Family—nephew	3%
● Family—son of	3%
● Family—friend	3%

Figure 12: Structure of 'family' interactions (dark blue lines)

NOTE: Graph with uniform radial distribution. Size of the nodes/agents illustrates the betweenness indicator (capacity to intervene in geodesic routes) and location illustrates the direct centrality indicator (number of direct interactions established by the node/agent).

Figure 13: Structure of 'logistics' interactions (orange lines)
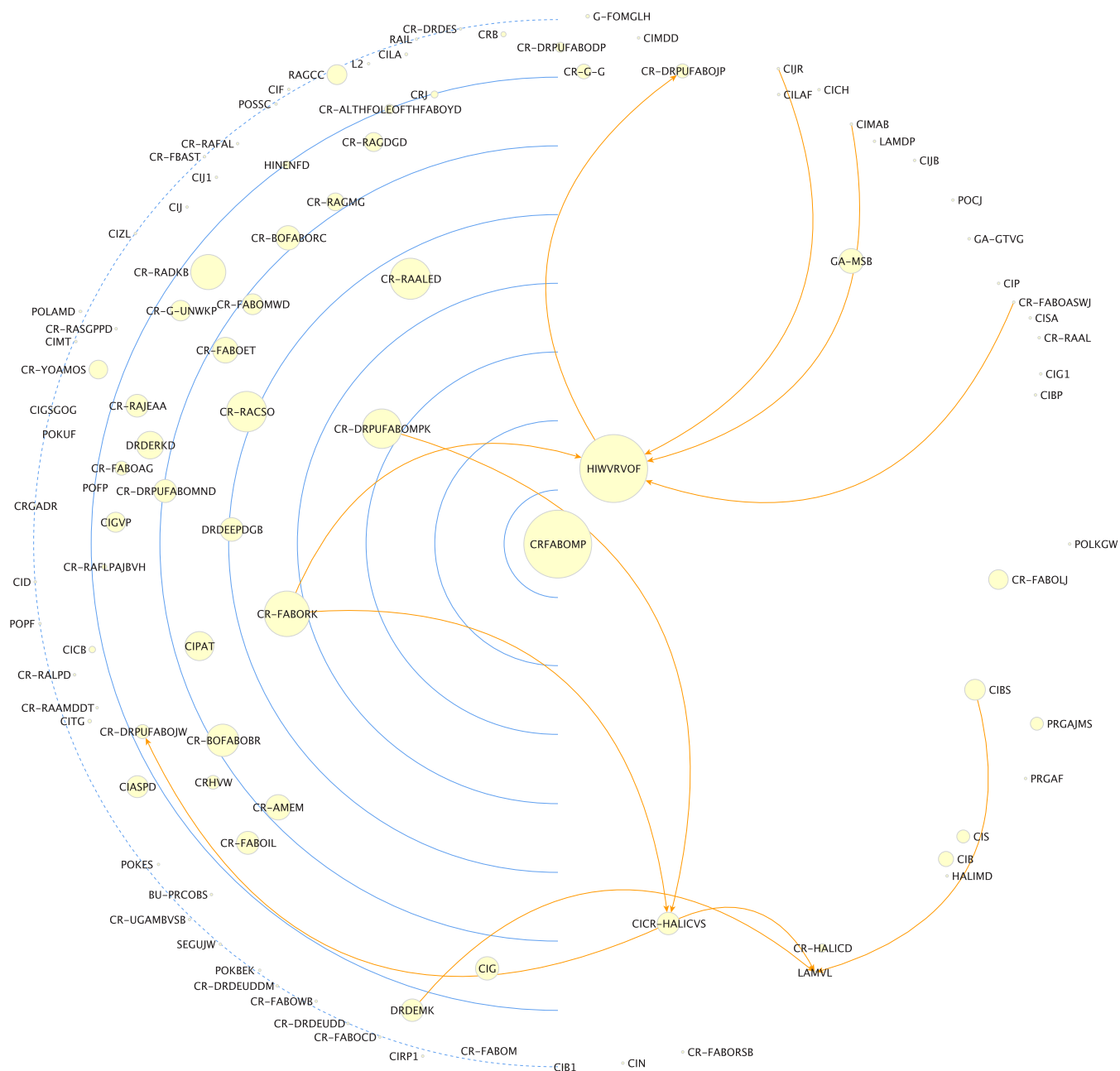
NOTE: Graph with uniform radial distribution. Size of the nodes/agents illustrates the betweenness indicator (capacity to intervene in geodesic routes) and location illustrates the direct centrality indicator (number of direct interactions established by the node/agent).

Table 10: 'Violence – attempted murder'

Number	Code	Type
6	CR-DRPUFABOMPK	Criminal – drug pusher (FB)
3	CR-BOFABORC	Criminal – bodyguard (FB)
2	CR-FABOET	Criminal – FB
1	CR-DRPUFABOJW	Criminal – drug pusher (FB)
1	HINENFD	Hitman
1	HIWVRVOF	Hitman

Table 11: 'Violence – involved in attempted murder'

Number	Code	Type
1	CR-FABOAG	Criminal – FB
2	CRHVW	Criminal
1	CR-FABOIL	Criminal – FB
1	CR-DRPUFABOJP	Criminal – drug pusher (FB)
1	CR-DRPUFABOJW	Criminal – drug pusher (FB)
1	CR-FABOLJ	Criminal – FB
1	CR-FABOMWD	Criminal – FB
1	CR-FABORK	Criminal – FB
1	HIWVRVOF	Hitman

Table 12: 'Logistics' interactions

Type	Number
Logistics – met with	3
Logistics – brought him a gun	2
Logistics – fetched gun	2
Logistics – bought him fruit and vegetables	1
Logistics – fetched hitman in a taxi after he shot CR-RAALED	1
Logistics – gave him a gun	1
Logistics – gave him a ride after the shooting	1
Logistics – gave him a SIM card	1
Logistics – helped him change clothes after a murder	1
Logistics – hid gun and stole gun of	1
Logistics – acted as getaway driver	1
Logistics – took him to Eagle's Nest	1

Table 13: 'Social' interactions in which HIWVRVOF actively participated

Social – visited in prison	2
Social – friends	2
Social – slept there	1
Social – partied together	1
Social – member of the same pool club	1
Social – lived in the same house	1
Social – at the house	1

classified as 'criminal – FB' and identified with the codes CR-FABORK and CIBS (see above).

The third highest indicator of direct centrality is registered by the node/agent classified as 'criminal – drug pusher (FB)', identified with the code CR-DRPUFABOMPK and with an indicator of 4,7 per cent. This node/agent actively participated in 27 interactions distributed as shown in Figure 18.

As can be observed, this node/agent participated most actively in activities classified as 'violence'. In general, 'violence' and 'crime' interactions account for 74 per cent of the interactions in which CR-DRPUFABOMPK actively participated. This illustrates his role as a 'soldier' in the crime network and the fact that he had a degree of control over other members of the gang. He was mandated to shoot rival gang members on sight, which explains the large number of murders and attempted murders in which he participated. Specifically, CR-DRPUFABOMPK participated in 11 'violence' interactions, distributed as shown in Figure 19.

The passive nodes/agents in the subcategory 'violence – attempted murder', who were therefore the victims of node/agent CR-DRPUFABOMPK, are all classified as 'criminal – R' and identified with the codes CR-RAFAL, R-RAFAL, CR-RACSO and R-RAALED.

The fourth highest indicator of direct centrality is classified as 'criminal – FB' and identified with the code CR-FABORK. This node/agent registers an indicator of 3.7 per cent and actively participated in 12 interactions, as shown in Figure 20. CR-FABORK actively participated in the three 'crime' interactions shown in Table 15. CR-FABORK also actively participated in two 'economic' interactions.

CR-FABORK's role in a variety of actions, including violence and economic interactions, illustrates his role as an operations manager. In theory he was 'second in command' and was more hands-on in the drug business and the operations of the gang, including violent interactions.

The fifth highest indicator of direct centrality is classified as 'criminal – R' and identified with the code CR-RAALED. This node/agent registers an indicator of 3,5 per cent and participated in 24 direct interactions, but only actively in six cases. This means that CR-RAALED is more relevant as a passive node/agent in the network than as an active one. Specifically, discussed below, he was the victim of a murder. However, the interactions in which CR-RAALED actively participated are also relevant due to their lawful and unlawful nature (see Table 17).

Figure 21 shows the distribution of interactions in which CR-RAALED played a passive role.

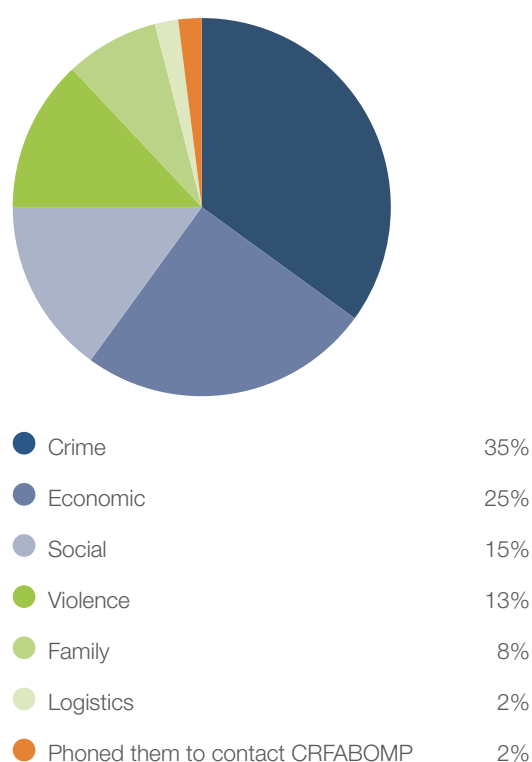## Figure 14: Distribution of CRFABOMP's participation as an active node/agent

● Crime	35%
● Economic	25%
● Social	15%
● Violence	13%
● Family	8%
● Logistics	2%
● Phoned them to contact CRFABOMP	2%

Figure 15: Distribution of 'crime' interactions in which CRFABOMP actively participated

● Crime—packaged drugs together	24%
● Crime—drug crime—employed to sell drugs	18%
● Crime—discussed criminal activity	12%
● Crime—supplied a gun	12%
● Crime	6%
● Crime—lent a car to transport drugs	6%
● Crime—ordered accomplice to help RV with a murder	6%
● Crime—ordered the murder of EGG	6%
● Crime—used 'No Fear' as hitman	6%
● Crime—gave the order to murder CR-RAALED	6%
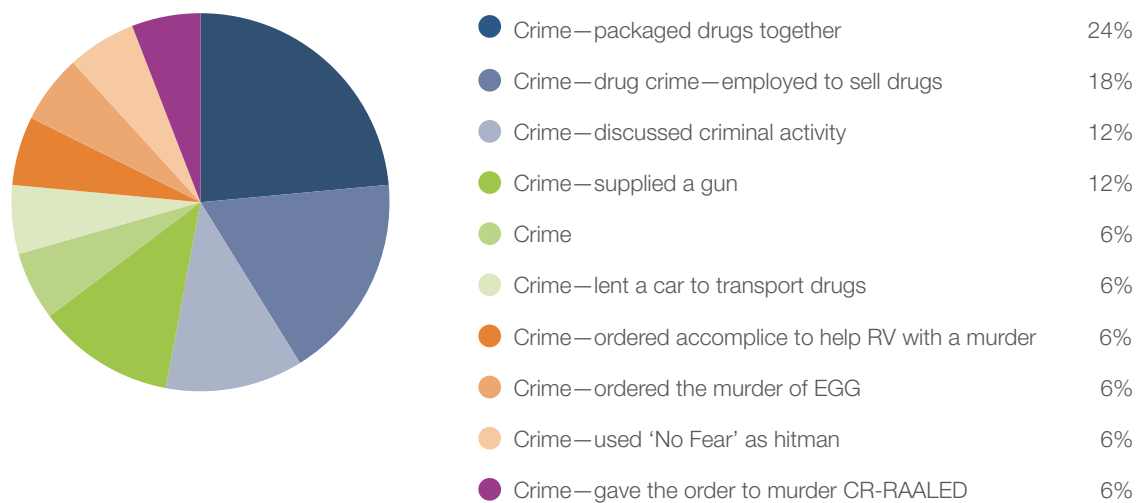
Figure 16: Distribution of 'economic' interactions of CRFABOMP in which participated with an active role

● Economic—employed	75%
● Economic—owned	8%
● Economic—paid	8%
● Economic—worked for (building)	8%
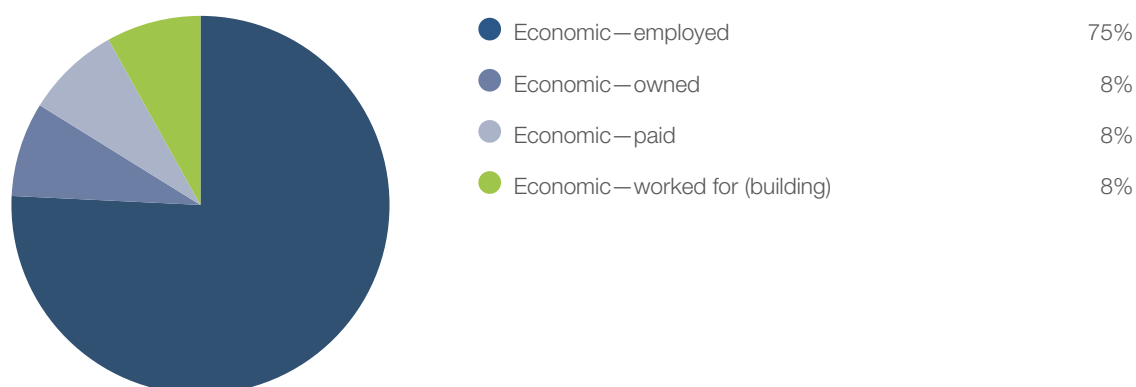
Figure 17: Distribution of interactions in which HIWVRVOF actively participated

● Social	35%
● Crime	27%
● Violence—ordered to shoot someone	15%
● Made a confession	4%
● Gave testimony to	4%
● Hid at CIP's house	4%
● Logistics—helped CR-DRPUFABOJP change clothes after a murder	4%
● Phoned someone to contact CRFABOMP	4%
● Was meant to kill CR-G-G	4%
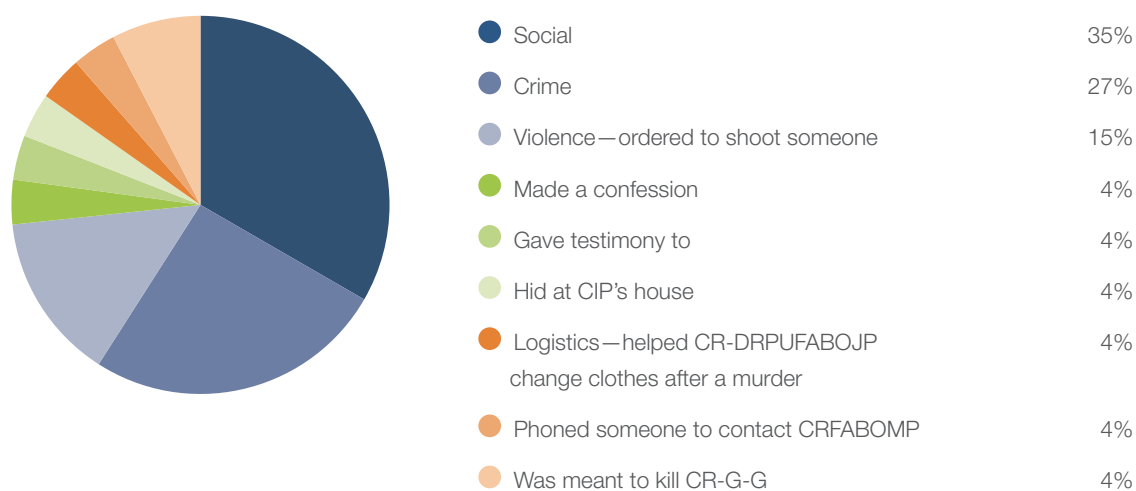
Specifically, the interactions related to his murder were part of the network's activities. Table 18 shows the 'violence' interactions accounting for 50 per cent of the cases in which CR-RAALED played a passive role.

In general, the five node/agents with the highest indicators of direct centrality accounted for 26 per cent of the network's direct interactions, which means that 4 per cent of the nodes/agents concentrated a quarter of all the direct interactions established. In this sense, the network had a moderate or low level of centralisation and, therefore, a moderate level of resilience, because any change in the structure of the interactions of those five nodes/agents would affect 26 per cent of the network's direct interactions. Although the level of centralisation and concentration of the direct centrality indicator is moderate, the degree of centralisation in terms of the capacity to intervene in the network's geodesic routes is greater. In this sense, the network was decentralised in terms of the structure of direct interactions, which is consistent with the hypothesis discussed above.

Betweenness indicator

The betweenness indicator allows one to identify the nodes/agents with the greatest capacity to intervene in the network's geodesic paths. This means that a node/agent should have both an active and passive role in order to register any level different to zero (0) in terms of the betweenness indicator. In this sense, a large number of geodesic routes in which the node/agent intervenes implies a high betweenness indicator.

Bearing the abovementioned in mind, it was found that *the node/agent with the highest indicator of betweenness* is classified as 'Criminal – FB' and identified with the code CRFABOMP. This node/agent registers an indicator of 13,3 per cent and participates in 70 interactions: 48 as an active node/agent and 22 as a passive one.

The node/agent CRFABOMP also registers the highest indicator of direct centrality, which means that he operated as the hub of the network, participating the most direct interactions, and also as the structural bridge of the network, with the highest capacity to intervene in its geodesic routes.

As discussed in the previous section, the interactions in which CRFABOMP actively participated are shown in Figure 22.

However, bearing in mind that the betweenness indicator not only relates to the capacity to concentrate direct interactions, but also to the capacity to intervene, the interactions in which CRFABOMP participated passively are shown in Figure 23.

As can be observed, CRFABOMP intervened in 'crime', 'economic', 'social' and 'family' interactions. Additionally, this node/agent actively participated in 'violence' interactions, which

Table 14: 'Crime' interactions in which HIWVRVOF actively participated

Crime – hitman for	2
Crime – went to shoot someone	2
Crime – got gun from	1
Crime – involved in the murder of CR-RAALED	1
Crime – stole phone	1

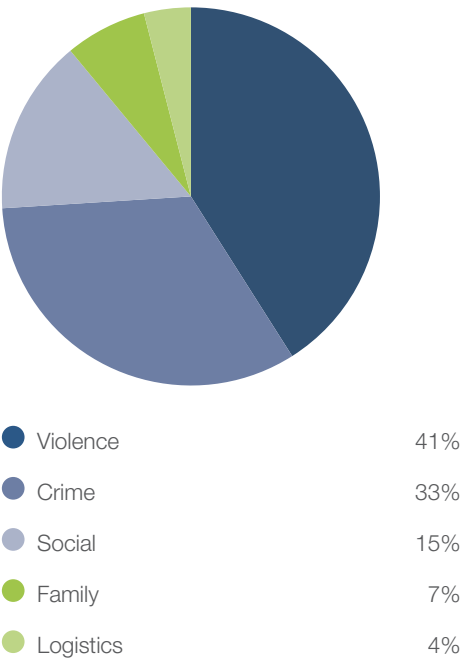Figure 18: Distribution of interactions in which CR-DRPUFABOMPK actively participated

Violence	41%
Crime	33%
Social	15%
Family	7%
Logistics	4%

Figure 19: Distribution of 'violence' interactions in which CR-DRPUFABOMPK actively participated

● Violence—attempted murder	55%
● Violence—orchestrated assault	18%
● Violence—assaulted	9%
● Violence—acted as lookout before a murder	9%
● Violence —was at the attempted murder of CR-RAALED	9%
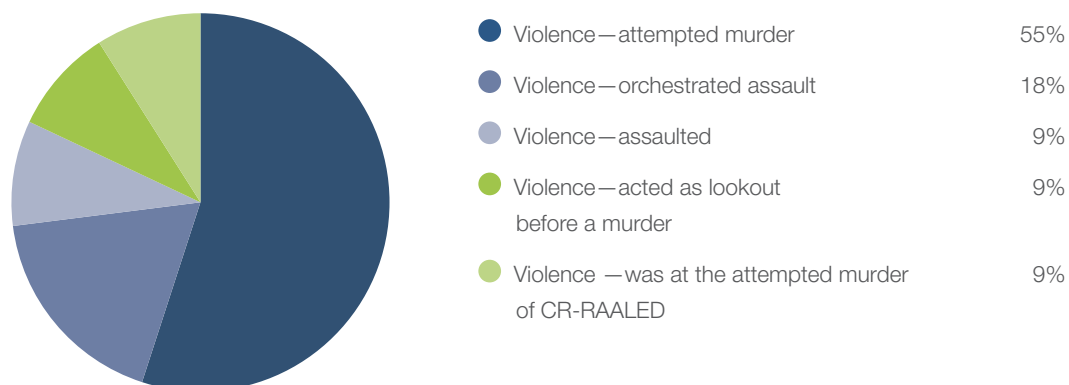
Figure 20: Interactions in which CR-FABORK actively participated

● Crime	25%
● Economic	17%
● Logistics	17%
● Social	17%
● Family	8%
● Violence	8%
● Worked together	8%
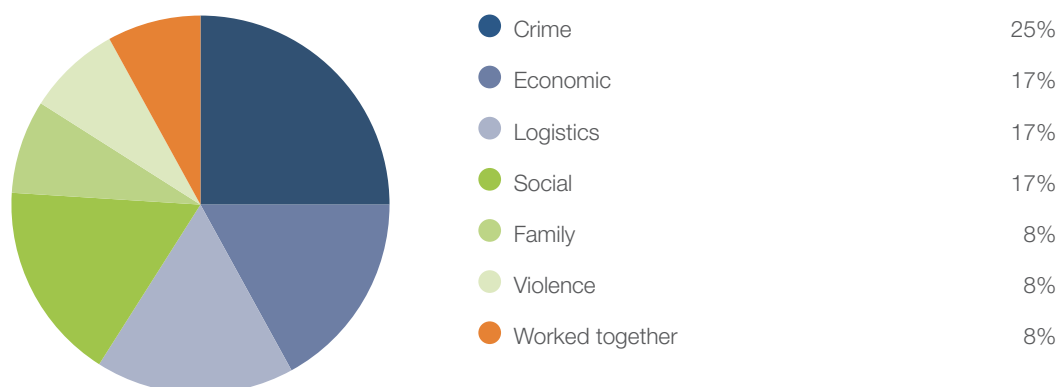
Figure 21: Distribution of interactions in which CR-RAALED played a passive role

● Violence	50%
● Crime	22%
● Social	11%
● Family	6%
● Logistics	6%
● Work for	6%

Table 15: 'Crime' interactions in which CR-FABORK actively participated

Type of interaction	Active node/agent	Passive node/agent	
		Code	Type
Crime – drug crime – employed to sell drugs	CR-FABORK	DRDEEPDGB	Drug dealer
Crime – drug crime – sold drugs to	CR-FABORK	CR-RAFLPAJBVH	Criminal – R (Flamingo Park)
Crime – packaged drugs together	CR-FABORK	CR-DRPUFABOMPK	Criminal – drug pusher (FB)

Table 16: 'Economic' interactions in which CR-FABORK actively participated

Type of interaction	Active node/agent	Passive node/agent	
		Code	Type
Economic – employed	CR-FABORK	CIPAT	Civilian
Economic – paid R25 000	CR-FABORK	CRFABOMP	Criminal – FB

## Table 17: Interactions in which CR-RAALED actively participated

Type of interaction	Active node/agent	Passive node/agent	
		Code	Type
Violence – murder (unconfirmed)	CR-RAALED	CIMDD	Civilian
Economic – employed	CR-RAALED	CR-G-UNWKP	Criminal – G
Economic – employed	CR-RAALED	CR-RADKB	Criminal – R
Social – went to smoke drugs together	CR-RAALED	CIJ	Civilian
Social – went to smoke drugs together	CR-RAALED	CIJ	Civilian
Social – went to smoke drugs together	CR-RAALED	CR-RACSO	Criminal – R

Table 18: 'Violence' interactions in which CR-RAALED played a passive role

Type of interaction	Active node/agent		Passive node/agent
	Code	Type	
Violence – attempted murder	CR-DRPUFABOMPK	Criminal – drug pusher (FB)	CR-RAALED
Violence – attempted murder	CR-BOFABORC	Criminal – bodyguard (FB)	CR-RAALED
Violence – attempted murder	CR-DRPUFABOMPK	Criminal – drug pusher (FB)	CR-RAALED
Violence – attempted murder	CR-DRPUFABOMPK	Criminal – drug pusher (FB)	CR-RAALED
Violence – kept lookout before his murder	CR-DRPUFABOMPK	Criminal – drug pusher (FB)	CR-RAALED
Violence – kept lookout before a murder	CR-FABOMWD	Criminal – FB	CR-RAALED
Violence – kept lookout before a murder	CR-DRPUFABODP	Criminal – drug pusher (FB)	CR-RAALED
Violence – murdered	HIWVRVOF	Hitman	CR-RAALED
Violence – ordered hit	CRFABOMP	Criminal – FB	CR-RAALED
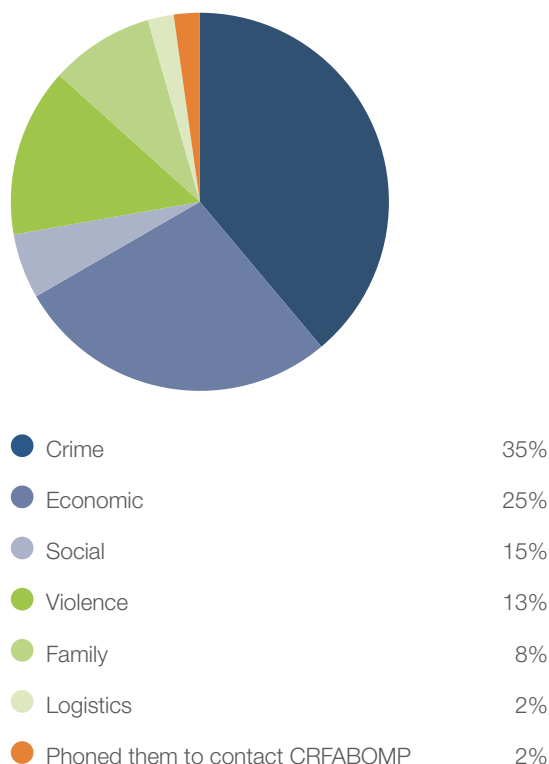
means that CRFABOMP was able to simultaneously intervene in lawful and unlawful interactions that allowed the successful operation of the network.

In total, CRFABOMP actively participated in 17 'crime' interactions, some of them related to drug trafficking: 'crime – packaged drugs' (four interactions), 'crime – drug crime – employed to sell drugs' (three interactions), 'crime – discussed criminal activity' (two interactions) and 'crime – supplied a gun' (two interactions).

Also, the 'crime' interactions in which CRFABOMP participated passively were classified as: 'crime – drug crime – sold drugs to' (three interactions), 'crime – hid weapons for' (two interactions), 'crime – drug crime – sold drugs for' (two interactions), 'crime – drug crime – bought drugs from' (two interactions), and 'crime – discussed criminal activity' (two interactions), among other drug-crime-related interactions.

In general, the node/agent CRFABOMP intervened in geodesic routes directly related to drug-trafficking activities, which also relates to his active participation in 12 'economic' interactions that in nine cases were classified as 'economic – employed'. Again, this illustrates CRFABOMP's importance as leader of the criminal network.

The node/agent with the second-highest indicator of betweenness is classified as 'hitman' and identified with the code HIWVRVOF. This node/agent registers an indicator of 12,9 per cent and participated in 49 direct interactions, 26 in an active role and 23 passively. As stated in the previous section, this node/agent also had the second highest indicator of direct centrality, with a relevant active participation in lawful 'social' interactions.

The interactions in which HIWVRVOF participated passively were mainly 'crime' interactions. This represents his capacity to operate as a grey actor between lawful interactions classified as 'social' and unlawful interactions classified as 'crime'. Specifically, Table 19 shows the unlawful 'crime' interactions in which HIWVRVOF participated.

The node/agent with the third-highest indicator of betweenness is classified as 'criminal – FB' and identified with the code CR-FABORK. This node/agent registered an indicator of 5,6 per cent and also had the fourth-highest indicator of direct centrality, participating actively in 12 interactions. These 12 interactions have already been discussed above and are shown in Figure 20. Figure 26 shows the interactions in which CR-FABORK participated passively.

As can be observed, the 'crime' interactions are the most relevant type in which CR-FABORK participated passively,

Figure 22: Distribution of interactions in which CRFABOMP actively participated

● Crime	35%
● Economic	25%
● Social	15%
● Violence	13%
● Family	8%
● Logistics	2%
● Phoned them to contact CRFABOMP	2%

which means that, in general, 'crime' interactions affected the most relevant geodesic routes in which he intervened. Specifically, among these 'crime' interactions, six out of 11 consisted of 'drug crimes'. Table 20 lists the 'crime' interactions in which CR-FABORK participated.

However, CR-FABORK also participated in five lawful 'economic' interactions, which means that he not only intervened in unlawful geodesic routes. This is, therefore, another example of a grey node/agent with the capacity to establish direct interactions and intervene in geodesic routes across lawful and unlawful structures.

The node/agent with the fourth-highest indicator of betweenness is classified as 'Criminal – R' and identified with the code CR-RAALED. This node/agent registered an indicator of 5,4 per cent and was also the fifth-highest indicator of direct centrality, operating actively only in six of 24 cases. This means that CR-RAALED interacted passively in 18 cases, as was illustrated in the previous section.

Since CR-RAALED was murdered, he was a passive agent/node in several 'violence' interactions as the murder victim. However, this node/agent also participated actively in interactions classified as 'economic' and 'social', which means that he intervened in both lawful and unlawful geodesic routes, which is why he can also be defined as a grey node/agent.

The node/agent with the fifth-highest indicator of betweenness is classified as 'criminal – R' and identified with the code CR-RACSO. This node/agent, who is the only one who does not have the higher indicators of direct centrality, registers a betweenness indicator of 5,2 per cent and participated actively in 11 interactions, specifically in six classified as 'crime – drug crime' and five as 'social'. Among the 'social' interactions, three are related to social drug consumption. Additionally, this node/agent participated passively in 11 interactions.

In general, the five nodes/agents with the highest indicator of betweenness intervened in the 43,4 per cent of the network's geodesic routes. This concentration represents a high level of centralisation of the capacity to intervene in the interactions among nodes/agents and subnetworks in the network. Also, this high concentration implies a low level of resilience, because it would be enough to affect the five nodes/agents discussed in the present section in order to modify and intervene in almost half the network's geodesic routes. The concentration of the capacity to intervene in the network's geodesic routes is, therefore, more concentrated than the capacity to establish direct interactions, which was measured and discussed in the previous section.

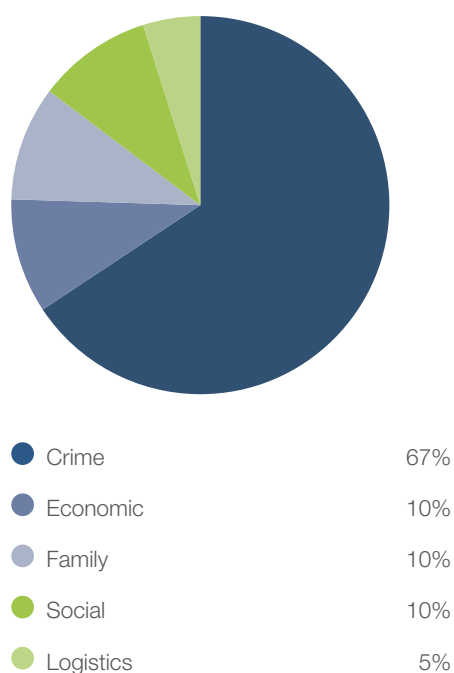## Figure 23: Distribution of interactions in which CRFABOMP participated passively

● Crime	67%
● Economic	10%
● Family	10%
● Social	10%
● Logistics	5%

Figure 24: Distribution of interactions in which HIWVRVOF actively participated

● Social	35%
● Crime	27%
● Violence—ordered to shoot someone	15%
● Made a confession	4%
● Gave testimony to	4%
● Hid at CIP's house	4%
● Logistics—helped CR-DRPUFABOJP to change clothes after a murder	4%
● Phoned someone to contact CRFABOMP	4%
● Was meant to kill CR-G-G	4%
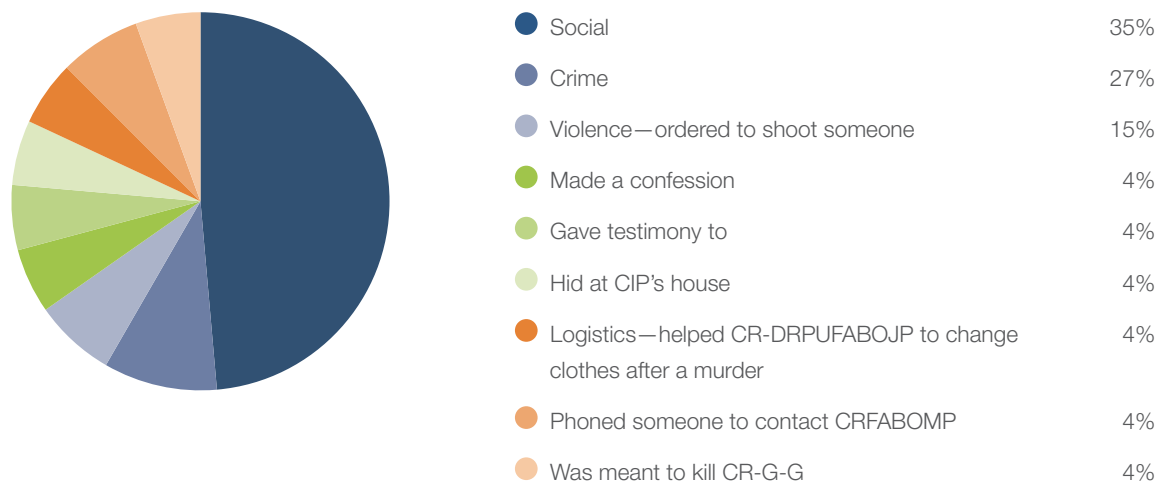
Figure 25: Distribution of interactions in which HIWVRVOF participated passively

● Crime	43%
● Logistics	26%
● Economic	9%
● Social	9%
● Law—represented	4%
● Provided hideout	4%
● Suggested they shoot RV	4%
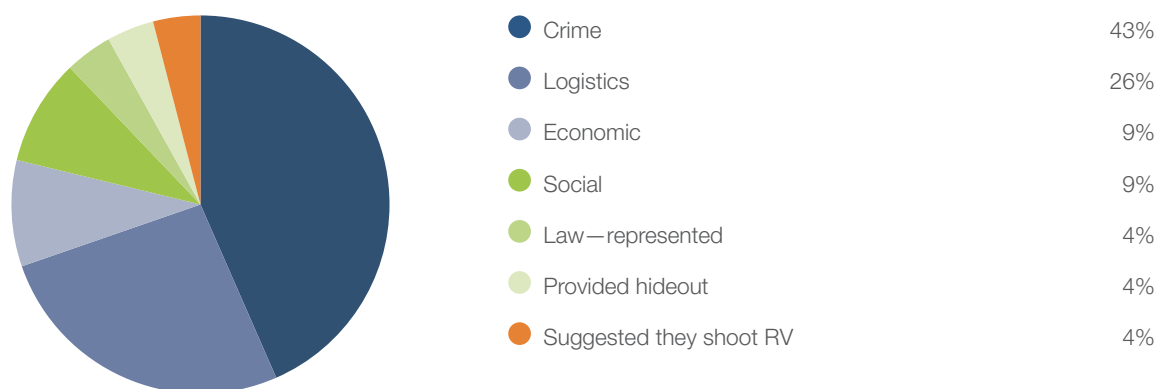
Conclusion

From the above analysis it is noticeable that the power of the network lay primarily with a single individual and was mainly directed by this node/agent. This structure therefore exemplifies centralisation with a limited level of resilience, which means that affecting – neutralising, isolating or removing – the most relevant node/agent would affect both the general structure of direct interactions and the structure of the network's geodesic routes. Therefore, if it were possible to remove such a central node/agent from the network, it would suffer a massive disruption. In the case under discussion the crime investigators managed to break up a much larger network completely, disrupting the power relations in the area in which it operated.

Specifically, regarding the indicator of direct centrality, which defines the structure of direct interactions established in the network, it was found that the group of five node/agents with the highest indicators of direct centrality only accounted for 26 per cent of the network's direct interactions. Therefore the network was characterised by a significant level of resilience because of the low level of centralisation.

On the other hand, in terms of the betweenness indicator, which defines the capacity to intervene in the network's geodesic routes, it was found that five nodes/agents with the highest indicator of betweenness intervened in 43,4 per cent of theses geodesic routes. This concentration represents a high level of centralisation and a low level of resilience, because it would be enough to affect any of those nodes/agents to modify and intervene in almost half the geodesic routes. In this sense, the network was highly centralised in terms of the capacity to intervene in its geodesic routes, but not highly centralised in terms of the structure of direct interactions.

The network itself also showed how relations between gangs can significantly change due to changes in business interactions and, in general, how violent these interactions can become. The violence meted out was aimed at opposing gang members and the attacks took place in front of many witnesses. Due to the gang's power and influence its members were not concerned about this and once the trial began they put significant pressure on those testifying against them. This reflects the fact that a structure of violence and coercion was highly relevant to the present case, specifically accounting for 14 per cent of the network's interactions.

Unlike other networks analysed, this criminal network was primarily built on the drug trade and used violence to maintain control of this trade. This is an interesting example of a criminal network that lacks sophistication in the type of interactions used for achieving its criminal purposes – a level of sophistication that was observed in other cases in which economic interactions,

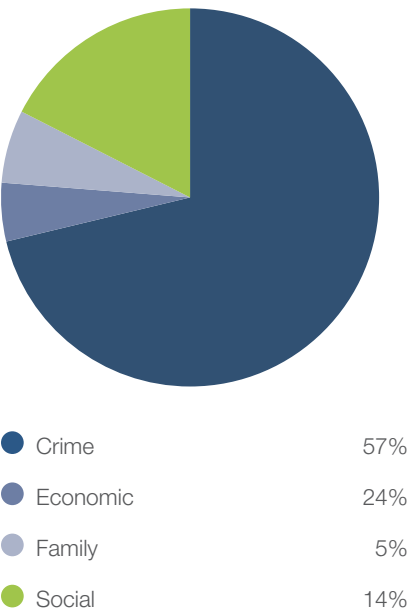**Figure 26: Distribution of interactions in which CR-FABORK participated passively**

● Crime	57%
● Economic	24%
● Family	5%
● Social	14%

Figure 27: Distribution of interactions in which CR-RACSO actively participated

● Social	45%
● Violence	27%
● Crime	9%
● Economic	9%
● Family	9%
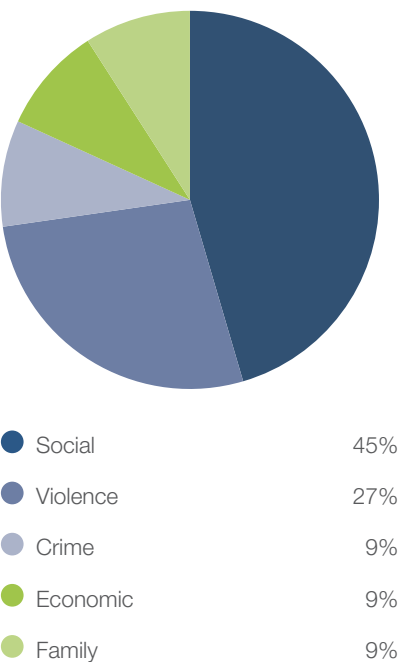
Table 19: 'Crime' interactions in which HIWVRVOF participated passively

Crime – involved in the murder of CR-RAALED	3
Crime – supplied a gun	1
Crime – hid weapons	1
Crime – hitman for	1
Crime – lookout	1
Crime – told someone to murder EGG	1
Crime – violent – gave the order to murder CR-RAALED	1
Crime – went to shoot someone	1

Table 20: Crime interactions in which CR-FABORK participated passively

Crime – drug crime – sold drugs for	3
Crime – drug crime – bought drugs from	1
Crime – drug crime – employed to sell drugs	1
Crime – drug crime – fetched drugs together	1
Crime – kept weapons for	1
Crime – lent car for drug transport	1
Crime – packaged drugs together	1
Crime – transported drugs	1
Crime – went to shoot someone	1

among other forms of lawful relationships with bright nodes/agents, were more important than violent interactions. In terms of the operation of the network, the criminal structure was therefore the most relevant one, accounting for 31 per cent of the network's interactions. In this sense, the 'crime' and 'violence' structures accounted for 45% per cent of the interactions. However, it should be remembered that criminal networks do not operate only through violence and coercion; in fact, when a certain level of corruption, infiltration and cooptation is achieved, the use of violence tends to be replaced by political or economic agreements with grey nodes/agents that operate in lawful social structures but provide social, political or financial resources for achieving criminal objectives. This can be interpreted as a form of sophistication, because network members reduce their exposure by manipulating formal institutions, resulting in the criminal network being able to operate more successfully and less violently. An intense use of violence and coercion, such as the one observed in the network under study, attracts the attention of law enforcement agencies and journalists and decreases the successful functioning of the network.

However, this does not mean that only criminal and violent interactions took place in the network under study. In fact, engagement with licit businesses and activities were also observed. 'Social' is the second most relevant category of interactions, mainly lawful actions. This is because even when violence and coercion are relevant to a criminal network's activities, it needs to establish interactions with lawful structures in order to obtain basic social, financial and political resources. In the case under study the most relevant interactions between dark and grey nodes/agents operating in lawful areas of society or through lawful interactions consisted mainly of economic relationships (10 per cent of interactions), among other types of social relationships. Bearing in mind that almost 10 per cent of interactions were lawful in the network under study, certain levels of corruption could be expected; however, it was impossible to access information about this, which also made it impossible to identify and analyse corrupt activities.

Most of the grey nodes/agents were categorised as civilians who straddled the line

AN INTENSE USE OF VIOLENCE ATTRACTS THE ATTENTION OF LAW ENFORCEMENT AGENCIES AND JOURNALISTS AND DECREASES THE SUCCESSFUL FUNCTIONING OF THE NETWORK

between gang membership and complicity in its crimes. For instance, their activities included hiding weapons, acting as lookouts or providing transport. In this sense, the grey areas of the network mainly consisted of actions executed by low-profile actors, which means that the information available does not reflect the involvement of those providing social, political or financial resources for the successful functioning of the network. If we bear in mind the fact that this network was mainly focused on drug-trafficking activities, a stronger and complex financial grey structure underlying its operation should be expected. While the gang was able to make significant amounts of money, this was almost always directed to the leader of the network; in fact, other actors earned very low wages. The gang was structured as a loose hierarchy in which those at the top had cemented their positions. Therefore, it is important to access additional information that reveals the hierarchy of the network other than the nodes/agents analysed in this report in order to understand its true financial structure.

The most relevant types of nodes/agents (54 per cent) were those classified as 'criminal', which coincides with the fact

> While the gang was able to make significant amounts of money, this was almost always directed to the leader of the network

that 'crime interactions' was the most relevant type of activity. Specifically, gang members were the most common actors in the network. Some gang members belonged to a gang that was franchised in a particular suburb. Although another gang with the same name operated in a nearby area, the two gangs had little in common and did not help each other in times of distress. This reveals a certain level of decentralisation as reflected in the direct centrality indicator and discussed in the first section of this study. However, the gang was deeply involved with other violent gangs in the Western Cape region, sharing personnel and drug markets. Additionally, women were extensively involved in the network, although not at the core. Only a single female was regarded as a gang member, although this was debateable. Other relevant criminals involved in the network were 'hitmen' who operated both inside and outside gang structures.

Regarding the present model, it should be noted that additional information would allow a more comprehensive picture of the general structure of interactions between lawful and unlawful actors constituting the general structure of the gangs that operate in Cape Town. However, significant obstacles were

encountered when we tried to access the information that was used in the present analysis, even when it was related to closed investigations. For instance, obtaining court transcripts is very expensive, which makes it very difficult to go into the networks' makeup in depth. Secondly, and quite understandably, law enforcement agencies are unwilling to work with bodies outside their structures. While this can in part be based on fears of intelligence leaks and safety, it also leads to research being undermined. The long-awaited South African Police Service research unit is a possible solution to this problem, although its development is still delayed, and whether its research will be made available to those outside official security structures remains to be seen. These obstacles decrease the possibility of undertaking research to inform law enforcement agencies and policymakers about the complex structures that they face when dealing with organised crime at the local level of the city, which also decreases the possibilities of taking action not only against violent gangs, but also against the criminal infiltration of formal institutions.

Notes

1   C Morselli, Inside criminal networks, Montreal: Springer, 2008.

2   PV den Bossche and M Segers, Transfer of training: adding insight through social network analysis, *Educational Research Review* 8 (2013), 39.

3   J Worrell, M Wasko and A Johnston, Social network analysis in accounting information systems research, *International Journal of Accounting Information Systems* 14 (2013), 128.

4   More detail on the centrality indicators used in the current paper is given below.

5   An 'edge' is the point of interaction.

6   A Degenne and M Forsé, *Introducing social networks*, London: SAGE, 1999, 63.

7   Morselli, *Inside criminal networks*; JA Johnson et al, *FBI Law Enforcement Bulletin*, March 2013, http://www.fbi.gov/stats-services/publications/law-enforcement-bulletin/2013/March/social-network-analysis; SM Radil, C Flint and GE Tita, Spatializing social networks: using social network analysis to investigate geographies of gang rivalry, territoriality, and violence in Los Angeles, *Annals of the Association of American Geographers* 100(2) (2010), 307–326.

8   All the figures in this document were created by the authors.

9   Since the direction of the interaction is relevant for understanding the structure of the model, the interaction going from node/agent 1 to node/agent 2 is counted as one direct interaction and is different from the interaction going from node/agent 2 to node/agent 1. This is why eight direct interactions are registered in Figure 1.

10 Geodesic: the shortest line between two points on a curved surface.

11 See case study on drug trafficking

12 Testimony taken from court judgment, p. 98.

13 This was referenced in a workshop held in Cape Town in 2013.

14 South African prison gangs developed initially in the prison system, but have now spread beyond the prison walls and have become one of the most dangerous threats facing Cape Town.

About the authors

Khalil Goga is a researcher in the ISS Transnational Threats and International Crime Division. He has been researching organised crime in Africa since 2009 and has been affiliated with the ISS since 2012. He previously lectured at the University of KwaZulu-Natal, from where he received both his undergraduate and master's degrees.

Eduardo Salcedo-Albaran has a master's in political science. As director of Scientific Vortex Inc. he collaborates with institutes and universities worldwide researching the structure of transnational criminal networks that participate in corruption, drug trafficking and state capture. He is also part of the EDGE Foundation, which gathers together thinkers 'who are at the center of today's intellectual, technological, and scientific landscape'.

Charles Goredema is a research consultant, who has studied economic crime in Africa since 2001. A former prosecutor and law lecturer, Charles led the research on crime networks in Cape Town, as part of a project on the impact of organised crime on governance in Cape Town and Dakar.

About the ISS

The Institute for Security Studies is an African organisation that aims to enhance human security on the continent. It does independent and authoritative research, provides expert policy analysis and advice, and delivers practical training and technical assistance.

ISS Pretoria
Block C, Brooklyn Court
361 Veale Street
New Muckleneuk
Pretoria, South Africa
Tel: +27 12 346 9500
Fax: +27 12 460 0998
pretoria@issafrica.org

ISS Addis Ababa
5th Floor, Get House
Building, Africa Avenue
Addis Ababa, Ethiopia
Tel: +251 11 515 6320
Fax: +251 11 515 6449
addisababa@issafrica.org

ISS Dakar
4th Floor, Immeuble Atryum
Route de Ouakam
Dakar, Senegal
Tel: +221 33 860 3304/42
Fax: +221 33 860 3343
dakar@issafrica.org

ISS Nairobi
Braeside Gardens
off Muthangari Road
Lavington, Nairobi, Kenya
Tel: +254 20 266 7208
Fax: +254 20 266 7198
nairobi@issafrica.org

www.issafrica.org