Co-offending networks among members of outlaw motorcycle gangs across types of crime

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Abstract

Outlaw motorcycle gangs (OMCGs) have become synonymous with organised crime through engagement in criminal activities including illicit drug production and distribution, firearms trafficking, and serious violent crime. These crimes contribute significant social and economic harms in countries that feature a presence from these groups. The current paper uses network analytics to analyse the extent of co-offending within and across established clubs in Australia, including the relative involvement of senior, or office bearing, members. The majority of affiliates in this sample co-offended with another OMCG affiliate within the sample period, with office bearers, members, nominees and associates represented proportionally among co-offending networks to in the sample at large. However, within these clubs, criminal activities were conducted in small cliques or components of affiliates. This research supports the role of OMCGs as important facilitators of crime, and the role of co-offending in the criminal offending of affiliates. The findings hold important implications for understanding how offending is organised among OMCGs, differences between groups, differing levels of engagement from the club hierarchy.

Keywords OMCG · Co-offending · Social network analysis

Outlaw motorcycle gangs (OMCGs) have become synonymous with organised crime across Australia and internationally. They are often implicated in a range of organised criminal activities including illicit drug production and distribution, firearms trafficking, serious violent crime, tax evasion and money laundering (Harris 2016; Morgan et al. 2020; Quinn and Forsyth 2009; Quinn and Koch 2003). These crimes cause significant social and economic harms for Australian and international

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communities. In Australia, the average costs of crime and prison alone add up to approximately \$1.3 million per OMCG offender over the course of their criminal careers (Morgan et al. 2018). In addition, significant governmental resources are directed toward the prevention and disruption of offending by OMCG members. Despite the social and economic impacts of OMCGs, little is currently known about the nature of criminal collaboration within them, or whether patterns of co-offending reflect their formal organisational structure. While some previous studies have examined the criminal histories of individual OMCG members, research has tended to neglect the hierarchical organisational structure of these groups and the extent to which it facilitates the criminal activities of their members. Nonetheless, results to date suggest that there is some evidence for a relationship between criminal collaboration and the formal hierarchical structure of OMCGs (e.g., Morselli 2009a, b; Rostami and Mondani 2019; van Deuren et al. 2020). However, the extent and nature of this relationship between the hierarchical structure of OMCGs and the proclivity for co-offending is poorly understood. A clearer understanding of the nature of co-offending within OMCGs may offer alternate opportunities for law enforcement intervention, in particular, targeted disruption of OMCG members that are important in these networks. The current paper analyses criminal activity of OMCG members to examine the extent of co-offending within and across established clubs including the relative involvement of senior, or office bearing, members.

Outlaw motorcycle gangs

Over the last decade, many countries have enacted laws that prohibit participation in a *criminal organisation* and the association of individuals who have committed organised criminal activities. These anti-association laws have been used to make it more difficult for OMCGs to operate and their affiliates to interact, and include the use of control orders, consorting laws, restrictions on gatherings in public places, and prohibitions on the public display of club colours and symbols (e.g., Ayling 2017). To date, there is limited evidence that these laws have impacted OMCG membership or crime trends (Goldsworthy 2016) although traditional policing proactivity such as seizures of firearms and arrests have been used somewhat successfully (Ayling 2017; Cubitt and Morgan 2022). Comprehensive legislative regimes that target OMCGs through both criminal *and* civil legal mechanisms have also shown promise (Dowling and Morgan 2021; Klement and Blokland 2021). OMCGs tend to be organised in hierarchical fashion, with office bearers such as a president and vice-president at the top of the hierarchy managing the day-to-day business of chapters and clubs, and different membership ranks including full members, nominees (those seeking membership), 'hang-arounds' and other associates who sit at the lower echelons. Anti-association laws are predicated on the view that OMCGs operate primarily as criminal organisations, and that their criminal activities are organised according to these formal hierarchies, with lower ranking members instructed to undertake criminal activities by higher ranking and office bearing members. Based on this view, disrupting associations between members and targeting office bearing members will prevent and disrupt the criminal activity of OMCGs.

Overall, research suggests that up to 70–90% of OMCG members are likely to have criminal histories and to participate in crime, although there is some variation among members, chapters and clubs in the extent and types of crime committed (Blokland et al. 2020; Klement 2019; Morgan et al. 2020; van Deuren et al. 2021). For example, Morgan et al. (2020) found that four in five Australian OMCG members had a recorded criminal history, and that OMCG members were nearly three times as likely to have contact with the criminal justice system by age 33 as other men. One in four had been apprehended for a recent violent or intimidation offence and one in eight for a recent organise crime-type offence. Blokland et al. (2020) found that over 85% of OMCG members in the Netherlands had been convicted of a crime at least once and that such convictions appear to be consistent with participation in organised criminal activity. OMCG membership has also been found to increase the risk of involvement in crime (Klement 2016a, b, 2019) and offending among OMCG members has been shown to be more prevalent, more frequent and more serious compared with motorcycle owners who are not members of OMCGs (Blokland et al. 2019). Critically, there is evidence of an increasing prevalence of young members with recorded histories of crime, and especially violent crime (Lauchs 2017; Voce et al. 2021; Van Dueren et al. 2020). It has been posited that at least part of the attraction of these younger men to OMCGs is the potential for profitable criminal endeavours, including criminal collaboration in such crimes with established OMCG networks (Dowling et al. 2021; Boland et al. 2021).

Although this research sheds light on OMCG member criminality, the nature and extent of criminal collaboration by OMCG members, including the relationship between the formal organisation structure of OMCGs and participation in criminal activity remains largely unknown. Lauchs and Staines (2019) examined a sample of 112 members of OMCGs and found no evidence of criminal activity for 12 of 16 office-bearers, however four of the 16 had been convicted of trafficking in illicit drugs, sometimes in concert with other members and office-bearers. Separately, Lauchs & Staines (2019) concluded that OMCG members typically operate alone or in small groups when committing crime. In one of only a few studies to use official arrest data to explore the relationship between organisational structure of OMCGs and crime, Blokland et al. (2017) compared the relative proportion of members and office-bearers with criminal histories. Of the 12 OMCGs examined, all of those with a low proportion of members with criminal histories also had a low proportion of office bearers with criminal histories. In one club, neither members nor office bearers had a history of criminal offences, while in three clubs; there was a high proportion of members but a low proportion of office bearers with criminal histories. Overall, the majority of clubs (eight) had a high proportion of both members and office bearers with criminal histories. Replicating this analysis, but limiting it to organised crime-type offending, Morgan et al. (2020) found eight of 28 Australian clubs had more than 10% of office bearing and non-office bearing members with a recent recorded history of this offending. In a multilevel analysis of Australian OMCG involvement in organised crime, Morgan, Dowling and Voce (in press) found that—among other factors—organised crime-type offences were more common among patched members than prospects, while office bearers were no less likely to have been proceeded against than non-office bearers. Members with

a history of inter-jurisdictional mobility were also more likely to have recent organised crime offences while, at the group level, clubs with a higher degree of recruitment activity and a foothold in multiple jurisdictions were also more likely to be proceeded against for organised crime offences.

While these results suggest some diversity in the criminal histories of members across OMCGs, including in relation to organised crime offending, they do not shed light on the extent of criminal collaboration within and between clubs, or on the nature of collaboration with office bearers. The current study utilises social network analysis (SNA) to examine co-offending among affiliates of OMCGs in Australia, and the extent to which office bearers participate in these co-offending networks.

Using social network analysis to understand criminal groups

Despite its potential utility, SNA has only been employed in four previous studies on OMCGs. McNally and Alston (2006) observed that centrality metrics, a measure of how connected actors are to other actors, did not mirror the formal hierarchical organisation of the club and concluded that "the organisational hierarchy of this OMCG is not indicative of the true power structure or influence of this criminal network" (2006, p. 16). Morselli (2009a) examined a Canadian Hells Angels OMCG using SNA and concluded that the network only partially mirrored the formal hierarchical organisation of the club and that higher-ranking members were less likely to be directly involved in criminal activities, thus protecting them from detection and criminal justice sanction. Rostami and Mondani (2019) examined co-offending networks of three Canadian OMCGs and found that while some club members tended to co-offend exclusively with members of the same local chapter, other club members did collaborate with chapters across the country. Finally, research has examined cooperation between different organised criminal groups in Canada, including OMCGs (Coutinho et al. 2020). This research used a sophisticated SNA technique known as exponential random graph modelling (ERGM) and found that, compared with other organised criminal groups, OMCGs were more likely to collaborate across groups when illicit markets overlapped in the same locations, suggesting enhanced capacity for criminal coordination within and across OMCGs. The current study builds on these findings by examining and comparing criminal collaboration within and across different OMCG clubs.

Theoretical and conceptual framework of co-offending

The research was guided by two integrated conceptual and theoretical frameworks: a network approach to co-offending (e.g., Bright et al. 2022; Sarnecki 2001) in concert with emerging frameworks of criminal collaboration in organised criminal groups, and co-offending of OMCG members. First, the network approach used in this study combines both theory and methods (Bouchard 2020). Network methods are imbued with deep theoretical assumptions about the ways in which social relations influence behaviour and attitudes (Borgatti et al. 2009; Knoke and Yang 2019).

Although there is no single network theory, the network approach is based on a set of assumptions and principles from which theory can emerge. For example, social capital theory examines the relationship between social relations and advantages that can accrue from such relations in different contexts. The network approach is consistent with resource sharing models (e.g., Haller 1990), particularly when considering involvement in illicit markets. These suggest that the need for participants to cooperate and collaborate with others to undertake the crime script that underpins certain criminal activities is at the core of club structure and dynamics (e.g., Bright and Delaney 2013).

Second, an emerging framework of criminal collaboration within OMCGs posits three scenarios to explain the relationship between organisational structures and criminal activities within organised criminal groups (von Lampe 2019; von Lampe and Blokland 2020). The *rotten apples* scenario in which individual members act alone or in collaboration with other members to commit crime suggests that criminal activity might occur with or without participation of the group's leadership. In this case, there is little overlap between the formal organisational hierarchy of the club and criminal activities. Criminal activities are conducted by small cliques within a club or chapter in which power and influence is not associated with formal hierarchical position. Alternatively, the *club within a club* scenario, in which there is significant overlap between the club's organisational structure and participation in criminal activities, but each must be analysed separately. In this case, authority within criminal networks does not flow from formal authority structures, but from the relative position of an individual, and their connectivity in the network. Finally, the club may operate as a *criminal organisation* for the purpose of committing a range of criminal activities, with criminal collaborations closely mirroring the formal hierarchy of the club. Bright and Deegan (2021) have suggested that scenarios one and two receive the most support from existing literature, and echo calls initially made by Blokland and colleagues (Blokland et al. 2017) that research on the relationship between organisation structure of OMCGs and criminal activity should be undertaken at a lower level of aggregation, such as by comparing clubs and chapters. The present research uses these three scenarios as a guiding theoretical framework for driving analyses and interpreting results at club level. Results will shed important light on patterns of criminal collaboration within and between OMCGs, and reveal the extent to which office-bearers are involved in co-offending within these clubs.

The present study

This study aims to examine networks of criminal collaboration among OMCGs to determine the extent of co-offending within and across clubs and the extent of participation of office-bearers within these networks. The research questions are: (1) What is the relationship between co-offending network structure and the formal organisational structure of OMCGs? (2) What positions do office-bearing, full and prospective members occupy in co-offending networks? and (3) What is the nature and degree of co-offending across clubs?

Methods

Sample and data

Data for this study were obtained from three agencies in the Australian state of New South Wales (NSW). First, de-identified data were obtained from the NSW Police Force describing offences in NSW for which police had apprehended and proceeded against an individual who had some affiliation with an OMCG. This was linked with data from the NSW Bureau of Crime Statistics and Research (BOCSAR) and NSW Corrective Services that described the custodial episodes of affiliates, and integrated into a single apprehension-level dataset which included person-level information on affiliates. The dataset included the following variables: (1) unique alphanumeric person identifier (anonymised) denoting affiliates; (2) unique reference number denoting crime events (i.e. apprehensions); (3) crime event date; (4) crime type, coded using Australian and New Zealand Standard Offence Classification divisions (Australian Bureau of Statistics 2011); (5) club affiliation at the time of data extraction, denoted with a unique numeric club identifier (anonymised); and (6) affiliate status/ rank within that club. The initial dataset contained information on 93,623 unique crime events attributed to 5513 affiliates across 23 OMCGs.

Coding and analysis

Although data was available from 1995 to 2020, this research partitioned data from 2015 to 2020 for analysis. The intention of using the most recent time-frame available in these data was to maximise the validity of club membership and rank information. Individuals' ranks can change over time, as can their membership of particular clubs and chapters (e.g., members can change allegiance, or one club may ingest another via what are known as "patch overs"). Since the current dataset only contains the rank and membership details of affiliates at the time of data extraction (20th of May 2020), this information becomes less accurate the further back in history one goes. Further, as Cubitt and Morgan (2022) suggested, limiting the time period for analysis limits the impact of any policy changes on data recording practices, further maximising the validity of findings. Alphanumeric identifiers, allocated by Police at the time events were recorded, were used to match individual affiliates to crime events. When two or more individuals were involved in the same crime event or events, they were assumed to be co-offenders. The most serious charge within each event was used as an attribute for ties between all individuals within that event. The method therefore allows for the translation of event-person links into an undirected co-offending network. The network is undirected because the links between individuals indicate only that they have co-offended together and therefore have no direction.

All offences were classified into five offence categories (see Table 1) consistent with previous research on OMCGs (e.g., Barker 2015; Voce et al. 2021). This categorisation facilitated analyses of collaboration networks by crime types.

Table 1 The five offence categories

Offence category	Description
Violence and intimidation	Crimes against the person (e.g., assault, murder, attempted murder, kidnapping and threatening behaviour)
Short-term instrumental acts	Crimes committed for short-term material gain (e.g. robbery, burglary, theft, minor fraud and non-commercial drug dealing)
Ongoing criminal enterprise	Crimes committed within illicit markets (e.g., commercial supply of drugs and firearms, serious fraudulent activity and serious regulatory offences)
Public order and regulatory offences	Offences against public safety and regulations (e.g., possess/use illicit drugs, trespass)
Other offences against the person	Crimes against the person not classified under 'violence and intimidation' (e.g., stalking, child pornography offences)

Violence and intimidation and ongoing criminal enterprise offences were of particular interest, as these are most commonly associated with organised criminal activity.

Ranks of OMCG affiliates were included in data provided by the NSW Police Force. The following ranks were included in our analyses:

- Office bearer: A member of an OMCG club/chapter who occupies an executive role (e.g., president, vice-present, sergeant-at-arms).
- Member: A current fully patched member of a club/chapter who is not in an office bearing role.
- Nominee: Someone who is undertaking a period as nominee, seeking full membership of the club.
- Associate: An individual who is an associate of a club/chapter but not a nominee or member. These individuals may be seeking to undertake a period as nominee.

There were two primary steps to convert the data into a form that facilitates the social network analyses: First, person identifiers were matched to the unique event reference numbers to determine which affiliates, or actors, were linked with crime events. This is known as a 'two-mode' network as there are two types of nodes in the network. Next, the two-mode network was transposed to a one-mode network which indicates which actors committed offences together. This process produced a matrix which linked actors who were involved in the same crime events. Each actor in the matrix had two types of attribute information: membership of a particular club and rank within that club.

All data were analysed using the software package R with social network analysis packages. A cross-sectional social network analysis was conducted to examine network position of office bearing members to determine the relationship between co-offending network positions and leadership roles. This analysis examined not only who committed crime with whom, but also who was committing specific types of crimes with whom.

Table 2 Ranks of actors and relative proportions in the co-offending network

Rank	Frequency	Percentage
Office Bearer	283	12.0%
Member	1137	48.1%
Nominee	201	8.5%
Associate	743	31.4%
Total	2364	100.0%

Table 3 Proportions of co-offenders of the total of actors by offence type and rank

Crime category	All co-offenders (N)	Office bearers (%)	Members (%)	Nominees (%)	Associates (%)
All crime types	1345	11.82	44.76	9.14	34.28
Ongoing criminal enterprise	325	11.69	44.30	11.69	32.31
Short term instrumental acts	344	11.34	44.48	7.27	36.92
Violence and intimidation	553	11.93	43.94	7.78	36.35
Public order offences	680	10.88	43.38	10.00	35.74
Other offences against the person	156	14.74	44.87	8.33	32.05

Results

Membership ranks

There were a total of 2364 actors in the dataset. Table 2 displays the ranks of actors and the relative proportions of OMCG affiliate by rank. Members comprise almost half of actors (48.1%), around one-third of actors were associates, office bearers represent 12% of actors, and just fewer than 10% were nominees.

Co-offenders and isolates

A total of 1345 OMCG affiliates (56.90% of actors) co-offended with at least one other OMCG affiliate in the five-year reference window. Table 3 presents the data for co-offending across the five crime categories and by rank.

There were a total of 1019 isolates in the network (43.10% of actors). Approximately uniform proportions of all ranks were found to be isolates in the network. In other words, they did not co-offend with any other OMCG affiliate (of any rank) over the period under study. We classify these isolates as examples of *bad apples* using the three-pronged framework of von Lampe and Blokland. That is,

these were affiliates who offended on their own - or possibly with non-OMCG affiliates who are not captured in the dataset (or OMCG affiliates from other states) - but did not co-offend with other OMCG affiliates.

As shown in Table 4, around 12% of isolates were office bearers across all five categories of crime type. Across all crime types, between 48.21% and 52.40% of isolates were members. Between 7.65% and 8.51% of isolates were nominees. Between 27.67% and 31.39% of isolates were associates.

Network maps

Network maps were constructed for the overall network including all crime categories, and individually for each crime category. The network maps are displayed in Figs. 1, 2 and 3. Figure 1 displays the network maps by crime type and club. Figure 2 shows the networks by crime type and rank. Finally, Fig. 3 presents network maps for the seven clubs which had more 100 or more actors in the co-offending network and 10 or more actors in the network once isolates were removed. These network maps reveal that office bearers are involved in a range of crime types, often in small groups or cliques and appear to be frequently involved in co-offending between members of different clubs rather than only involving co-offending by members of the same clubs.

To determine the extent of participation of members and office-bearers in collaboration networks across the range of crime types, we undertook two sets of analyses: (1) core-periphery analyses and (2) network component analyses. Core-periphery analyses were used to examine the composition of the network core (those individuals with a relatively large number of co-offenders). Component analyses were used to determine the size of small cliques or subgroups (comprised of 2 or more actors) within the networks and the extent to which office bearers were present within such subgroups.

Table 4 Proportions of isolates by offence type and rank

| Crime category	All isolates (N)	Office bearers (%)	Members (%)	Nominees (%)	Associates (%)
All crime types	1019	12.17	52.50	7.65	27.67
Ongoing criminal enterprise	349	10.89	41.83	9.74	37.54
Short term instrumental acts	478	12.13	41.21	9.00	37.66
Violence and intimidation	392	10.20	46.43	6.38	36.99
Public order offences	1443	12.75	49.13	7.90	30.21
Other offences against the person	188	10.11	43.62	7.98	38.30
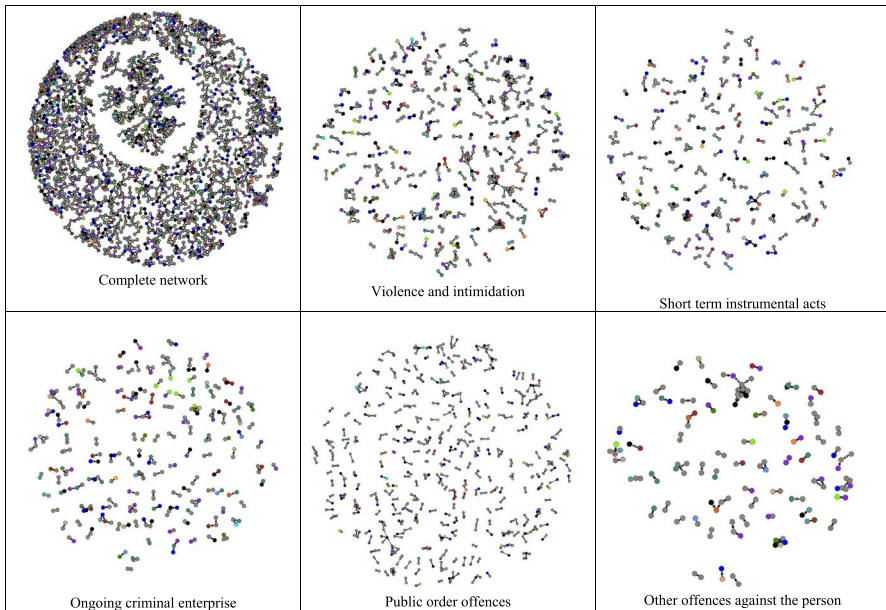
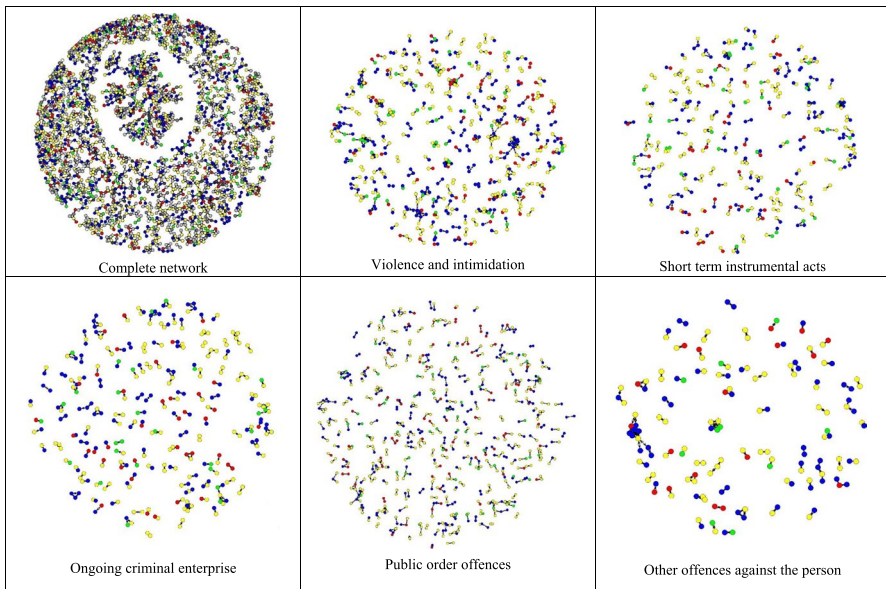**Fig. 1** Network maps by crime type and gang

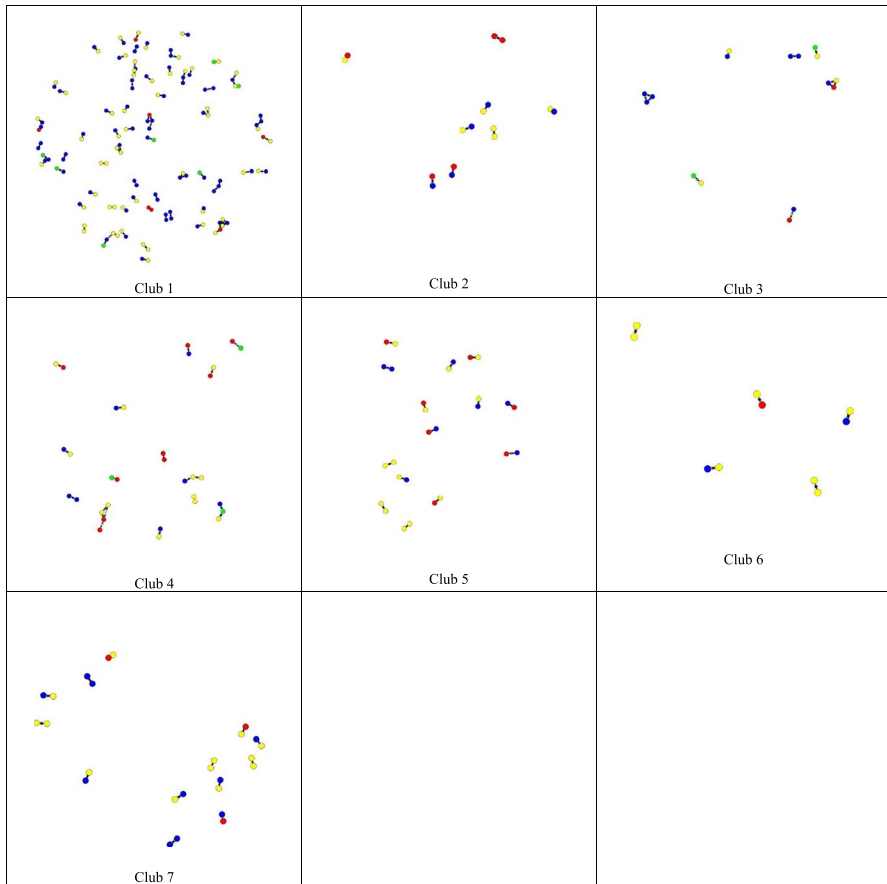

Fig. 2 Network maps by crime type and rank

Fig. 3 Network maps of the top clubs (> 100 actors; >10 co-offenders) displaying member ranks

Core-periphery analyses: Crime categories

Core-periphery analyses were modelled on the earlier work of Sarnecki (2001) and Morselli et al. (2015). The core of each network was defined as the top 5% of actors by degree centrality scores. These are individuals with the largest number of co-offending partners in each network and can therefore be considered to be individuals who were most prominently involved in criminal collaborations for each category of offending. The presence of office bearers in the network core would suggest that some office bearers are centrally involved in these criminal collaborations and have a relatively large number of co-offenders. The network periphery includes actors who have co-offended with at least one actor from the core. The mass is comprised of actors who have not co-offended with actors in the core. We conducted core-periphery analyses by crime type to determine patterns of involvement by office bearers disaggregated by type of crime (see Table 5).

Table 5 Core-periphery analyses by offence categories

Rank	Core (%)	Periphery (%)	Mass (%)
All offence types (n=2364)			
Office Bearers	8.51	7.63	12.36
Members	42.55	43.22	48.61
Nominees	6.38	14.41	8.27
Associates	42.55	34.75	30.76
Ongoing criminal enterprise (n=674)			
Office Bearers	5.00	15.79	11.33
Members	55	52.63	42.36
Nominees	10.00	5.26	10.87
Associates	30.00	26.32	35.43
Short-term instrumental acts (n=822)			
Office Bearers	10.34	20.00	11.70
Members	34.48	33.33	43.06
Nominees	3.45	6.67	8.48
Associates	51.72	40.00	36.76
Violence and intimidation (n=945)			
Office Bearers	6.38	5.56	11.72
Members	44.68	58.33	44.43
Nominees	2.13	8.33	7.42
Associates	46.81	27.78	36.43
Public order offences (n=2123)			
Office Bearers	10.20	8.00	12.30
Members	48.98	38.00	47.48
Nominees	6.12	12.00	8.55
Associates	34.69	42.00	31.67
Other offences against the person (n=334)			
Office Bearers	16.67	0	12.16
Members	50.00	66.67	43.77
Nominees	0	0	8.51
Associates	33.33	33.33	35.56

For the network of all offences combined, office bearers comprised 8.51% of the core while members comprised 42.55% of the core. In the network of ongoing criminal enterprise offences, 55% of the core was made up of members while 5% was comprised of office bearers. For the network of short-term instrumental acts, 34.48% of the core was comprised of members and 10.34% was made up of office bearers. The core of the network for violence and intimidation offences was comprised of both members (44.68%) and office bearers (6.48%). For the network of public order offences, just over half of the core (48.98%) was made up of members and 10.20% was comprised of office bearers. For other offences against the person, 50% of the core was comprised of members and 16.67% of office bearers. These results suggest that *some* office bearers are centrally positioned participants in networks of criminal

collaborations across all crime types. There was some variation in the observed patterns, with the lowest participation rates observed for ongoing criminal enterprise (5%) and violence and intimidation (6.48%), and the highest participation was seen for public order offences (10.20%), short term instrumental acts (10.34%) and other offences against the person (16.67%).

Core-periphery analyses: Clubs

We now turn to the core-periphery analyses for the discrete OMCG clubs. We focus on the seven clubs who had 100 actors in more in the complete network (i.e., including affiliates who were never charged with co-offences) and 10 actors or more in the co-offending network. Note that the table only includes results for clubs 1, 3, and 4. The remaining clubs, clubs 2, 5, 6, and 7 could not be analysed into core and periphery as the network comprised only dyads (see network maps, Fig. 3). Given the smaller numbers involved at club level, the numbers in the cells in the below table (Table 6) are raw numbers of actors rather than proportions.

Table 5 shows that there was some variation across the three clubs with respect to office bearer involvement in the core of the networks. Club 3 had six actors in the core of the network, but none of these were office-bearers, whereas Club 4 had five actors including office bearer in the core of the co-offending network. Club 1, which shows twenty-seven actors including two office bearers in the core of the co-offending network. All three clubs had affiliates (including office bearers) who were isolates (i.e., who did not co-offend over the five-year data window).

Table 6 Core-periphery analyses by club

Rank	Core	Periphery (n)	Mass (n)	Isolates (n)
Club 1				
Office Bearers	2	0	43	38
Members	9	7	266	225
Nominees	0	3	31	27
Associates	16	7	238	188
Total	27	17	578	478
Club 3				
Office Bearers	0	0	33	32
Members	4	0	107	104
Nominees	0	0	11	10
Associates	2	0	80	75
Total	6	0	231	221
Club 4				
Office Bearers	1	1	65	58
Members	3	2	81	74
Nominees	1	0	41	39
Associates	0	2	79	73
Total	5	5	266	244

Component analysis

Previous scholarship has suggested that OMCG members might collaborate in small cliques or subgroups (Bright and Deegan 2021). To investigate this possibility, we conducted component analyses for the complete network (all crime types), the networks for each crime type, and for the seven largest clubs.

Component analysis: all offence categories

Table 7 displays the component analysis for the full network (all offence categories). The full network consisted of 368 separate components. The mean component size was 3.65 ($SD = 4.67$) and the median was 2. For the complete network, collaboration components ranged from a size of 2 to 53 co-offenders. The number of components with at least one office bearer was 119 or 32.34%.

Table 8 displays the component analyses by each crime type. The network for ongoing criminal enterprise offences consisted of 136 components. The mean for the component size was 2.39 ($SD = 0.74$) and the median was 2. For ongoing criminal enterprise, collaboration components ranged from a size of 2 to 6 co-offenders.

Table 7 Component analysis (all crime categories combined) showing participation by office bearers

Component Size	Frequency	With Office Bearer / n (%)
2	195	40 (20.51)
3	86	34 (39.53)
4	28	17 (60.71)
5	18	8 (44.44)
6	13	3 (23.08)
7	6	1 (16.67)
8	5	2 (40.00)
9	3	3 (100.00)
10	1	1 (100.00)
11	1	1 (100.00)
12	1	0
13	1	1 (100.00)
14	1	1 (100.00)
17	2	0
18	1	1 (100.00)
20	1	1 (100.00)
21	1	1 (100.00)
25	1	1 (100.00)
27	1	1 (100.00)
50	1	1 (100.00)
53	1	1 (100.00)

Table 8 Component analysis (by offence type) showing participation by office bearers

Component Size	Frequency	With Office Bearer / n (%)
Ongoing criminal enterprise		
2	98	25 (25.51)
3	28	7 (25.00)
4	6	2 (33.33)
5	3	2 (66.67)
6	1	0
Short-term instrumental acts		
2	95	17 (17.89)
3	32	13 (40.63)
4	5	4 (80.00)
5	5	2 (40.00)
6	1	0
7	1	0
Violence and intimidation		
2	123	27 (21.95)
3	47	20 (42.55)
4	8	2 (25.00)
5	3	1 (33.34)
6	3	2 (66.67)
7	2	1 (50.00)
8	2	1 (50.00)
9	2	1 (50.00)
10	1	0
13	1	1 (100.00)
15	2	0
Public order offences		
2	182	38 (20.88)
3	53	15 (28.30)
4	24	8 (33.33)
5	7	2 (28.57)
6	1	0
7	1	0
13	1	1 (100.00)
Other offences against the person		
2	53	11 (20.75)
3	10	5 (50.00)
4	1	0
5	1	0
11	1	1 (100.00)

The number of components with at least one office bearer was 36 or 26.47%. Short-term instrumental act offences consisted of 139 components. The mean for the component size was 2.47 ($SD=0.88$) and the median was 2. The size of collaboration components ranged from between 2 and 7 actors. The number of components with at least one bearer was 36 or 25.90%. The network for violence and intimidation offences consisted of 194 components. The mean for the component size was 2.85 ($SD=1.97$) and the median was 2. For violence, collaboration components ranged from 2 to 15. The number of components with at least one office bearer was 56 or 28.87%. The network for public order offences consisted of 269 components. The mean for the component size was 2.43 ($SD=0.88$) and the median was 2. For public order offences collaboration components ranged from 2 to 13. The number of components with at least one office bearer was 64 or 23.79%. The network for other offences against the person consisted of 46 components. The mean for the component size was 2.36 ($SD=1.20$) and the median was 2. For other offences against the person, collaboration components ranged from 2 to 11. The number of components that included at least one office bearer was 27 or 36.96%.

Component analysis: Clubs

We conducted component analyses for the seven largest OMCG clubs using the threshold described above (greater than 100 actors for the complete network and greater than 10 actors in the network once isolates were removed; see Table 9).

Club 1 consisted of 622 affiliates. There were 62 components in total (range 2–6). The mean for the component size was 2.32 ($SD=0.76$) and the median was 2. For Club 1, there were 6 components or 9.68% with at least one office bearer. Club 2 consisted of 192 affiliates. There were 8 components (of 2 actors). The mean for the component size was 2 ($SD=0.00$) and the median was 2. For Club 2, there were 4 components or 50% with at least one office bearer. Club 3 consisted of 237 affiliates. There were 7 components (range 2–3). The mean for the component size was 2.28 ($SD=0.45$) and the median was 2. For Club 3, there were 2 components or 28.57% with at least one office bearer. Club 4 consisted of 276 affiliates. There were 14 components (range 2–4). The mean for the component size was 2.23 ($SD=0.59$) and the median was 2. For Club 4, there were 7 components or 50% with at least one office bearer. Club 5 consisted of 203 affiliates. There were 14 components. The mean for the component size was 2 ($SD=0$) and the median was 2. For Club 5, seven components or 50% of total components had at least one office bearer. Club 6 consisted of 119 affiliates. There were 5 components (size = 2). The mean for the component size was 2 ($SD=0.00$) and the median was 2. For Club 6, there was components or 20% with at least one office bearer. Club 7 consisted of 200 affiliates. There were 13 components (size = 2). The mean for the component size was 2 ($SD=0$) and the median was 2. For Club 7, there were 3 components or 23.08% with at least one office bearer.

Overall, one club (Club 1) exhibited less than 10% of co-offending components that included an office bearer, two clubs (Clubs 6 and 7) had 20% of co-offending components that included an office bearer, and for one (Club 3) club almost 30% of

Table 9 Component analyses by club

Component Size	Frequency	With office bearer / n (%)
Club 1		
2	50	4 (8.00)
3	6	0
4	5	1 (20.00)
6	1	1 (100.00)
Club 2		
2	8	4 (50.00)
Club 3		
2	5	1 (20.00)
3	2	1 (50.00)
Club 4		
2	11	6 (54.55)
3	2	0
4	1	1 (100.00)
Club 5		
2	14	7 (50.00)
Club 6		
2	5	1 (20.00)
Club 7		
2	13	3 (23.08)

co-offending components that included an office bearer. For three clubs (Clubs 2, 4, and 5) half of co-offending components included an office bearer.

Discussion

Summary

This study examined the nature and extent of co-offending among a sample of Australian OMCG affiliates. It adds to the emerging literature on this topic by examining a comparatively large, comprehensive and well-maintained criminal justice dataset of OMCG affiliates across NSW, and through the application of SNA to more rigorously model the co-offending networks of these affiliates.

Approximately 43.10% of OMCG affiliates in the sample were isolates, meaning they had no co-offending with other OMCG affiliates in NSW recorded over the period under study, and therefore sat outside of the criminal network. The representation of office bearers, members, nominees and associates among isolates was proportional to their representation in the sample at large, and this remained consistent when networks for specific crime types were examined. Further core-periphery analysis found that, among the 5% most highly connected affiliates, associates were

over-represented in relation to overall crime, short-term instrumental offending and violence and intimidation. Members were also over-represented among the 5% most highly connected affiliates in relation to ongoing criminal enterprise offending, but proportionally or under-represented in relation to other forms of crime, and crime overall. Office-bearers were not generally disproportionately present among the 5% most connected affiliates except in relation to other offences against the person. However, they were over-represented on the peripheries of ongoing criminal enterprise and short-term instrumental crime networks. This suggests that while office-bearers were not in the 5% with the highest number of co-offenders, they appear to have a high propensity for co-offending with the members of the network core. Office-bearers might in fact be 'centrally positioned' and, especially in the case of ongoing criminal enterprise and violence and intimidation play a role in directing fellow affiliates, but perhaps the protection that is offered to them as office bearers means they do not tend to appear in the network core. Members were also over-represented on the peripheries of criminal networks based on other offences against the person, while associates were over-represented on the peripheries of criminal networks based on public order and short-term instrumental offending. Nominees were proportionally or under-represented among the cores and peripheries of all crime networks. Component analysis revealed a large number of small criminal collaborations, for crime overall and specific crime types, which typically consisted of 2–3 affiliates. Around a quarter of these collaborations encompassed at least one office bearer, although larger collaborations involving more affiliates (5+) more often included office bearers.

At the level of clubs, there was some variation across the results in support of the notion that clubs are not uniform in their engagement in criminal activities (Morgan et al. 2020; Morgan et al. in press). For example, for Club 1, there were 27 actors in the core of the network including nine members and two of these were office bearers suggesting that both members and office bearers were deeply involved in co-offending in this club. However at the level of network components, only 10% of such components included office bearers. In Club 3, there were 6 affiliates in the core of which 4 were full members. Almost 30% of co-offending components in this club comprised office-bearers suggesting the significant involvement of office bearers in the criminal activities undertaken by affiliates of this club. For club 4, there were five actors in the core of the network of which three were members and one was an office bearer. Club 4 was also one of three clubs (clubs 2, 4, and 5) for which 50% of components included an office bearer. This suggests that in these clubs, criminal activities were conducted in small cliques or components of affiliates and that office bearers were involved in half of these co-offending cliques.

Conclusions and implications

Overall the results show a substantial degree of co-offending among OMCG affiliates. These findings further support the role of OMCGs, in a very general sense, as important facilitators of crime, and particularly co-offending, by bringing together large numbers of criminally inclined men into consolidated formal and informal

networks (Klement 2016a, b, 2019). In this sense, they also provide some justification for legislative and policing regimes which target or exploit the organisational structures of OMCGs underpinning these networks. However, findings provide the clearest evidence for the *rotten apple* and *club within a club* conceptions of OMCGs, and suggest that, where affiliates do co-offend with each other, they most often do so in small cliques that may or may not include office bearers. This builds on prior research which similarly suggests that the criminal collaborations of OMCG affiliates often deviate to some degree from the formal hierarchy of their clubs (Lauchs and Staines 2019; McNally and Alston 2006; Morselli 2009a; see also Bright and Deegan 2020 for a review). It is also consistent with research showing that illicit markets tend to favour smaller, less hierarchical and more ephemeral collaborations which can quickly and covertly exploit opportunities for profit, and adapt to disruption, competition and market downturns (Bouchard and Morselli 2014; Morselli 2009b). While it could be argued that OMCGs in some ways lend themselves to criminal activity, their rigid structures and public visibility probably make it difficult for them to operate for any length of time as criminal organisations, particularly in less permissive legislative and policing environments. Critically, the findings of the current study could also reflect the growing power of younger, more criminally motivated members in many Australian OMCGs (Dowling et al. 2021; Lauchs 2017). This research notes influxes of young men into OMCGs over the last few years who are motivated less by the traditional values of these clubs, values espoused by older and predominately more senior members, and more by status and access to opportunities for illicit profit. This could partially explain the greater prevalence of non-office bearing affiliates, who are likely to be younger, in the core of OMCG co-offending networks.

However, the possibility that at least some OMCGs have been operating as criminal organisations cannot be discounted on the basis of the current findings. Indeed, office bearers were present in a small but substantial proportion of criminal collaborations, and critically, around half of larger collaborations. Furthermore, while some clubs showed some office bearer involvement in co-offending (e.g. club 1 and 3), suggesting that they operated in a manner consistent with either the *club within a club* or the *criminal organisation* scenario, other clubs had much higher levels of office bearer involvement in co-offending cliques (e.g. clubs 2, 4, 5) offering more substantive evidence that these clubs operated as criminal organisations. Consistent with prior research showing variation across clubs in the extent of members' criminal involvement (Blokland et al. 2017; Morgan et al. 2020; Morgan et al. in press), the results of this study caution against attempts to classify *all* OMCGs as operating in accordance with any one of these three scenarios, and instead suggest a more nuanced approach that takes account of the heterogeneity between clubs. Additionally, there are questions about the extent to which studies that rely on apprehension data, as the current study does, can detect criminal collaborations supportive of either the *club within a club* or, especially, the *criminal organisation* scenarios. Morselli (2009a) has suggested that many office bearers minimise their direct involvement in criminal collaborations with other affiliates to protect themselves from detection and sanction, instead controlling or influencing these activities indirectly. The over-representation of office bearers on the peripheries of criminal

networks, particularly ongoing criminal enterprise networks, in the current study is certainly consistent with this hypothesis. If this is the case, then apprehension data would, by definition, underestimate the true prevalence and frequency of criminal activity by office bearers, and their actual importance in the offending networks of OMCGs, making the identification of clubs operating in a manner consistent with the *criminal organisations* scenario difficult.

The current study only examines the correspondence of co-offending networks and formal hierarchies at a club level. The critical organisational units within OMCGs are the regional chapters, which comprise small semi-independent groups of members who are governed day-to-day by chapter-level office bearers, and who answer irregularly to club executives or 'mother chapters' only on more significant issues. As such, any overlap between formal OMCG hierarchies and co-offending networks may occur at the chapter, rather than club, level, with affiliates of the same chapter co-offending frequently together and chapter-level office bearers playing a more obvious role. Data used for the current study did not contain information on chapter affiliations, and it was therefore not possible to further examine this hypothesis. However, it is consistent with the findings of Dowling and colleagues (2021), and Rostami and Mondani (2019), which indicate the involvement of chapter-level governance structures in criminal activity across some OMCG chapters, and a tendency for OMCG members to more often co-offend with members of the same chapter, respectively. It is also consistent with the predominate pattern of co-offending in the current study as many small cliques of members, rather than a few large networks.

Limitations and directions for future research

Aside from the limitations already noted, there are several others that warrant mention. The current study uses apprehension data which neglects offending that did not come to the attention of police and result in arrest. These were also data recorded for administrative, rather than research, purposes, and therefore lack reliable information on variables not critical for the processing of apprehensions (Cubitt et al. 2020). This means that, as a basis for establishing criminal collaborations, these data are limited in that they omit indicators of collaboration which do not involve directly undertaking recorded criminal activity. Used in international research to establish connections between criminal collaborators (e.g. Calderoni and Piccardi 2014), including OMCG affiliates (e.g. Morselli 2009a; Rostami and Mondani 2019), and often drawn from police intelligence and court documents, these indicators can include frequent phone or in-person contacts, shared finances or assets, and family connections. Further research using these alternative indicators is needed to more accurately map the criminal networks of Australian OMCGs.

When considering co-offending, among the small groups identified, we cannot be certain whether there was one individual that directed, or led the offending. For example, while we can identify groupings in which an office bearer was present, and based on this we can infer the likelihood that this individual was a leader in this group, it is based on the hierarchical arrangement of the club that we make this

assertion. Additionally, as discussed, there was no way with the current data to reliably examine the overlap of criminal networks and chapters, or the extent to which chapter-level hierarchies were involved in the criminal collaborations of chapter affiliates. These limitations, again, point to a need for further research that draws on information outside of police apprehension data, including qualitative information that sheds light on the authority structures of OMCG criminal collaborations.

This study operationalised co-offending as a measure of criminal collaboration, as it is defined in a range of literature (Rostami and Mondani 2019; van Deuren et al. 2020). However, while it is exceptionally unlikely that two or more members of the same gang, being arrested at same offence, at the same time, were not collaborating, we cannot be absolutely certain that the intention was to co-offend. While there were some instances in which different clubs were present, and arrested at the same event, we have not attempted to examine cross-club collaborations, as there is a greater likelihood that this was an event featuring competition between gangs, rather than criminal collaboration. Although we can be fairly certain that co-offending within gangs has been identified using the network methodology applied here, the same cannot be said for inter-gang incidents. We were also unable to explore the networks that extended beyond OMCGs (or OMCGs not in NSW), because we were limited to data on OMCG members in NSW. Given recent reports of OMCG collaboration with other criminal entities, which was highlighted during the recent Operation Ironside arrests, there is a need to find ways to measure inter-gang and inter-group collaboration in a way that can provide better insight into the wider networks in which OMCGs are alleged to operate.

Declarations

Research involving human participants and/or animals Data was sourced in the form of de-identified police arrest/charge data. No human subjects were recruited for the study.

Ethical approval Ethics approval for the study was provided by Flinders University HREC (Project #4107).

Informed consent Not applicable.

Conflicts of interest No conflicts of interests to declare.

References

Australian Bureau of Statistics (2011) Australia and New Zealand Standard Offence Classification. Australian Bureau of Statistics, Canberra

Ayling J (2017) Combating organized crime Aussie-style: from law enforcement to prevention. Contemporary Organized Crime. Springer, Cham, pp 189–212

Barker T (2015) Biker gangs and transnational organized crime, 2nd edn. Anderson Publishing, Newark

Blokland A, Soudijn M, van der Leest W (2017) Outlaw bikers in the Netherlands: Clubs, social criminal organizations, or gangs? In: Bain A, Lauchs M (eds) Understanding the outlaw motorcycle gangs: International perspectives. Carolina Academic Press, Durham, pp 91–114

Blokland A, Van Der Leest W, Soudijn M (2020) Officially registered criminal careers of members of Dutch outlaw motorcycle gangs and their support clubs. Deviant Behavior 41(11):1393–1412

Blokland A, van Hout L, van der Leest W, Soudijn M (2019b) Not your average biker: Criminal careers of members of Dutch outlaw motorcycle gangs. Trends Organ Crime 22:10–33

Boland D, Morgan A, Cubitt T, Voce I, Chiu Y-N, Webster J, Dowling C, Lowe R (2021) Effects of outlaw motorcycle gang membership and the support needs of former members. Trends Issues Crime Crim Justice 614:1–16

Bouchard M (2020) Collaboration and boundaries in organized crime: a network perspective. Crime Justice 49(1):425–469

Bouchard M, Morselli C (2014) Opportunistic structures of organized crime. In: Paoli L (ed) The Oxford handbook of organized crime. Oxford University Press, New York, pp 288–302

Borgatti SP, Mehra A, Brass DJ, Labianca G (2009) Network analysis in the social sciences. Science 323(5916):892–895

Bright DA, Delaney JJ (2013) Evolution of a drug trafficking network: Mapping changes in network structure and function across time. Glob Crime 14(2–3):238–260

Bright DA, Deegan S (2021) The organisational structure, social networks and criminal activities of Outlaw Motorcycle Gangs: Literature review. Trends Issues Crime Crim Justice 621:1–16

Bright D, Whelan C, Ouellet M (2022) Assessing variation in co-offending networks. Global Crime 23(1):101–121

Coutinho JA, Diviák T, Bright D, Koskinen J (2020) Multilevel determinants of collaboration between organised criminal groups. Soc Netw 63:56–69

Calderoni F, Piccardi C (2014) Uncovering the structure of criminal organizations by community analysis: The infinito network. In: 2014 tenth international conference on signal-image technology and Internet-based systems. IEEE, pp 301–308

Cubitt TIC, Wooden K, Roberts K (2020) A machine learning analysis of serious misconduct among Australian police. Crime Sci 9(22):1–13

Cubitt TIC, Morgan A (2022) Predicting high-harm offending using machine learning: An application to outlaw motorcycle gangs. Trends Issues Crime Crim Justice 646:1–18

Dowling C, Boland D, Morgan A, Webster J, Chiu Y-N, Lowe R (2021) The changing culture of outlaw motorcycle gangs in Australia. Trends Issues Crime Crim Justice 615:1–16

Dowling C, Morgan A (2022) Regulatory approaches to preventing organised crime among outlaw motorcycle gangs. Trends Issues Crime Crim Justice 652:1–16

Dowling C, Morgan A (2021) Criminal mobility of outlaw motorcycle gangs in Australia. Trends Issues Crime Crim Justice 619:1–16

Goldsworthy T (2016) Criminalising conversations: Australia's damaging love affair with consorting laws. The Conversation. Retrieved From https://theconversation.com/criminalising-conversationsaustralias-damaging-love-affair-with-consorting-laws-53633. Accessed 21 Aug 2022

Haller MH (1990) Illegal enterprise: a theoretical and historical interpretation. Criminology 28(2):207–236

Harris KJ (2016) The fierce commitment to 1% motorcycle clubs. J Polic Intell Count Terrorism 11(1):73–83

Klement C (2016a) Crime prevalence and frequency among Danish outlaw bikers. J Scand Stud Criminol Crime Prev 17(2):131–149

Klement C (2016b) Outlaw biker affiliations and criminal involvement. Eur J Criminol 13(4):453–472

Klement C (2019) Outlaw biker violence and retaliation. PLoS ONE 14(5):1–27

Klement C, Blokland A (2021) Preventing outlaw biker crime in the Netherlands or just changing the dark figure? Estimating the impact of the Dutch whole-of-government approach on outlaw biker crime using interrupted time series analysis. Eur J Criminol. Advance online publication

Knoke D, Yang S (2019) Social network analysis. SAGE Publications, Thousand Oaks

Lauchs M (2017) Nike bikies. In: Bain A, Lauchs M (eds) Understanding the outlaw motorcycle gangs: International perspectives. Carolina Academic Press, Durham, pp 115–138

Lauchs M (2019) A global survey of outlaw motorcycle gang formation. Deviant Behav 18(1):1–16

Lauchs M, Staines Z (eds) (2019) An analysis of outlaw motorcycle gang crime: Are bikers organised criminals? Glob Crime 20(2):69–89

Lusher D, Koskinen J, Robins G (Eds.) (2013) Exponential random graph models for social networks: Theory, methods, and applications. Cambridge University Press, Cambridge

McNally D, Alston J (2006) The use of Social Network Analysis (SNA) in the examination of an outlaw motorcycle gang. J Gang Res 13(3):1–25

Morgan A, Dowling C, Voce I (in press) In: Blokland A, von Lampe K (eds) Outlaw motorcycle gangs in Australia: Exploring variability in gang member involvement in organised crime. Outlaw Bikers as Organized Crime. Routledge, London

Morgan A, Dowling C, Voce I (2020) Australian outlaw motorcycle gang involvement in violent and organised crime. Trends Issues Crime Crim Justice 586:1–18

Morgan A, Brown R, Fuller G (2018) What are the taxpayer savings from cancelling the visas of organised crime offenders?. Statistical Report no. 8. Australian Institute of Criminology, Canberra

Morselli C (2009a) Hells Angels in springtime. Trends Organ Crime 12:145–158

Morselli C (2009b) Inside criminal networks. Springer-Verlag, New York

Morselli C, Grund TU, Boivin R (2015) Network stability issues in a co-offending population. In: Bichler G, Malm A (edited by), Disrupting Criminal Networks: Network Analysis in Crime Prevention. Lynne Rinner, pp.47–65

Quinn JF, Forsyth CJ (2009) Leathers and Rolexs: The symbolism and values of the Motorcycle club. Deviant Behav 30(3):235–265

Quinn J, Shane Koch D (2003) The nature of criminality within one-percent motorcycle clubs. Deviant Behav 24(3):281–305

Rostami A, Mondani H (2019) Organizing on two wheels: Uncovering the organizational patterns of Hells Angels MC in Sweden. Trends Organ Crime 22(3):34–50

Sarnecki J (2001) Delinquent networks: Youth co-offending in Stockholm. Cambridge University Press, Cambridge

Van Deuren S, Kleemans E, Blokland A (2020) Outlaw motorcycle gangs and their members' crime: Examining the social organization of crime and its relationship to formal club hierarchy. Eur J Criminol. OnlineFirst

van Deuren S, Blokland AA, Kleemans ER (2021) Differentiating between outlaw motorcycle gangs (OMCGs): Estimating the effect of membership of the most crime-prone OMCGs on crime using matching weights. J Dev Life-Course Criminol 7(4):649–675

Voce I, Morgan A, Dowling C (2021) Early-career offending trajectories among outlaw motorcycle gang members. Trends Issues Crime Crim Justice 625:1–18

Von Lampe K (2019) Public nuisance, public enemy, public servant? Introduction to the special issue on outlaw bikers in Europe. Trends Organ Crime 22(1):1–9

Von Lampe K, Blokland A (2020) Outlaw motorcycle clubs and organized crime. Crime Justice 49(1):521–578