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The limits of digital liberation: The social locations of gang-affiliated girls and women in the digital streets

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ABSTRACT

This study investigates the social network structure of an online gang forum, focusing on the social location of gang-affiliated girls and women in the "digital streets." Existing studies highlight how gang members use social media for masculine posturing and promoting violent identities, but there is a significant gap in understanding the digital engagement of girls and women in gangs. Specifically, few studies have directly examined the network positionality of girls and women through social network analysis of digital data. Our research addresses this gap by analyzing user-to-user interactions on a public Facebook page popular among Chicago-area gang members, circa 2015–2016 (4231 positive and negative interactions across 37,403 comments from 6829 user profiles). Digital platforms could offer a space where girls and women who claim gang affiliation can be liberated from analog constraints in establishing gang centrality. Findings indicate, however, that girls and women remain in peripheral network positions, undermining the liberation hypothesis. Our findings challenge optimistic narratives about the liberating potential of social media, underscore the persistence of misogyny in gang culture, and contribute to understanding how digitalization affects gang dynamics.

1. Introduction

As with society at large, social media plays an increasingly significant role in street gang culture and socialization. Research on gang interactions in the "digital streets" (Lane, 2018) shows that gang members use social media to foment conflict, perform gang identity, and promote gang culture to a wider audience (Hellemont, 2012; Lauger & Densley, 2018; Leverso & Hsiao, 2021; Morselli & Décary-Hétu, 2013; Pawelz & Elvers, 2018; Pyrooz et al., 2015; Pyrooz et al., 2024; Stuart, 2020). The social and criminal consequences of the digital streets extend beyond the online world, as emerging research finds that analog and digital gang conflict networks are correlated (Hsiao et al., 2023; Leverso et al., 2024). Such findings provide important insights into contemporary gang networks and behaviors for academics, activists, and law enforcement, and suggest the digital streets are an increasingly important staging area for gang interactions and activity.

However, very little is known about girls and women in the digital streets (Urbanik & Bucerius, 2024), an alarming omission that excludes an estimated 20 % to 50 % of all gang members from digital gang studies (Esbensen & Weerman, 2005; Leverso & Matsueda, 2019; Thornberry et al., 2002). As a result, significant, rudimentary questions remain regarding the extent and intensity of girls' and women's engagement in online gang activities, and we know substantially less about how social media impacts this group compared to gang-involved boys and men.

Broadly, research on social media has established its ubiquity among girls and women, and even goes as far as to suggest they may be more active online than boys and men (Atske & Perrin, 2021; Council on Communications and Media, 2016; Massarat et al., 2022). It is possible that *digital affordances* – i.e. the unique ways technology facilitates social interaction, such as by removing physical boundaries and barriers – make it easier for people to engage in digital versions of behaviors that are otherwise inaccessible in the analog world (Boyd, 2010; Bucher & Helmond, 2018; Eklund et al., 2022; Moloney & Love, 2018). For girls and women in particular, it is possible these affordances constitute a type of "liberation", in that they create new and perhaps more egalitarian pathways to gang membership and involvement. This theorizing aligns with the feminist liberation hypothesis in criminology, which posits that women's gains in equality, power, and social freedom are

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positively associated with opportunities to commit crime. (Adler, 1975; Giordano & Cernkovich, 1979; Lauritsen et al., 2009). Although contemporary criminologists aiming to explain why girls and women engage in criminal activity have largely abandoned this hypothesis (Hunnicutt & Broidy, 2004), social media and its affordances merit a revisit of this controversial proposition.

Given the above, the purpose of this paper is twofold. First, we address the basic question of how prevalent girls and women are in affiliate (based on the positive sentiment) and conflict (based on the negative sentiment) gang networks in the digital streets. This descriptive analysis is an important step in examining emerging Online group processes within and between gangs on the digital street. Second, we examine the social positions of women and girls compared to boys and men through network analysis. We use these descriptive analyses to theorize whether digital affordances have influenced key theories on women and girls in gangs, with a focus on liberation sisterhood, and social injury hypotheses. Specifically, we aim to identify indications in our network analysis that show whether women and girls occupy particular positions of influence as suggested in extant literature on girls, women, and gangs. For example, we question whether their user profiles function as "staging areas[1]" to facilitate connections between boys and men in rival gangs, as found by Lane (2018). Such central roles would align with the liberation hypothesis. Furthermore, we assess whether women and girls in the network form connections with other women and girls. The existence of supportive networks between female gang members could provide evidence for the sisterhood hypothesis.

On the surface, there appears to be little value in revisiting the theory that gangs can be a liberating experience for girls and women overall. However, emerging research on the intersection of gangs, technology, and gender offers a compelling case for re-examining the liberation hypothesis with data from the digital streets. Specifically, the internet provides opportunities for exposure to nontraditional gender ideologies, pathways to independence through resources, employment, and socialization, and protection from many of the physical consequences of gang involvement. Consequently, girls and women may take advantage of their access to gangs and gang culture online, as well as the affordances of the digital environment, and experience liberation from gendered constraints in the form of more central and influential roles within the gang. If the migration of gang members from the analog to the digital streets has indeed netted gains for girls and women in terms of equality, power, and social freedom, we might expect their social location, influence, and opportunities for engaging in gang conflict will be similar to those of boys and men. Such a finding would indicate that the digital street differs profoundly for girls and women from the analog streets (Hughes et al., 2019; Messerschmidt, 1997a; Miller, 2000), offering evidence of "digital liberation."

To test our idea of digital liberation, we analyze user-to-user interactions, consisting of 4231 positive and negative interactions across 37,403 comments from 6829 user profiles collected from a public Facebook page popular among Chicago-area gang members, circa 2015–2016. We infer gang membership based on user language and assume affiliation and conflict from the context of interactions on a given post. While this approach has limitations—most notably that we cannot definitively confirm gang membership or guarantee that users making conflicting comments are always in direct conflict—it nonetheless provides evidence of the positioning of girls and women within these networks and informs theoretical discussion. We present this work, in part, as an invitation to scholars of gender and gangs to engage with our initial exploration of this topic and to build on these findings.

Relational data is particularly useful in the context of this study as it allows us to map and analyze the network of interactions on the focal Facebook page, providing insights into the social positioning and influence of individual social media users within the gang's digital environment (for reviews of the strengths of social network analysis, see Gravel & Tita, 2017; Papachristos et al., 2024; Sierra-Arevalo & Papachristos, 2015). We calculate a range of network centrality measures and compare the average network positions of girls and women and of boys and men within networks of these online gang-related interactions. Our findings indicate that girls and women are less central to the network on this particular Facebook page than boys and men. Although we cannot exclude the possibility that girls and women have gained some ground, our results generally challenge optimistic narratives about the liberating potential of social media and underscore the persistence of gendered hierarchy in gang culture.

2. Gangs, social media, and liberation

2.1. The liberating potential of Gangsterhood

Gang research has a history of dismissing girls and women, and for a long time, it was thought that they were largely auxiliary to the gang involvement of boys and men (Decker et al., 2022; Thrasher, 2013). Later research specifically focused on girls and women—particularly ethnographies enabling them to share their experiences in their own words—debunked such assertions (Hughes et al., 2019; Hughes & Broidy, 2024; Hunt & Joe-Laidler, 2001; Messerschmidt, 1997b; Miller, 2000; Urbanik & Bucerius, 2024). It has been reliably established that girls and women are active gang members involved in various aspects of gang activity, beyond being merely used for sexual purposes or to carry firearms for boys and men (for reviews see: Panfil et al., 2015; Peterson, 2012; Sutton, 2017). Though no prevalence rates or estimates currently exist for gang-involved girls and women in the digital streets, it is reasonable to assume they have migrated to digital spaces alongside their fellow gang members.

Following a period of relative invisibility among gang researchers, the question of why girls and women participated in gangs became one of obvious importance. Given that gang and 'street' culture are largely organized around dangerous and violent masculine-coded behaviors (Anderson, 2000; Leverso & Hess, 2021; Rios, 2009), participation in gang life is often presented as counter indicative of traditional femininity, as it forces girls and women to navigate a hostile, violent, and androcentric social environment through the adoption of masculine-coded behaviors (Messerschmidt, 1997b; Miller, 2000)—if they choose to navigate it at all. Driven, in part, by the desire to understand the allure of gang membership for girls and women, gang scholars have explored the idea that liberation from conventional social controls was motivation enough for girls and women to commit crime and join street gangs (for reviews see: Chesney-Lind, 1999; Curry, 1998; Decker et al., 2022). Gang involvement was theorized as offering respite from traditional gender roles, an avenue to independence and agency, and protection from domestic violence and abuse. These ideas are loosely consolidated under the umbrella of the liberation hypothesis and are rooted within the broader second wave feminist discourse of the 1970s and 1980s, which posited that participation in deviant subcultures could serve as a form of resistance against patriarchal oppression (Adler, 1975; Chesney-Lind, 1999).

Early proponents of the liberation hypothesis argued membership in street gangs allowed girls and women to escape the bonds of patriarchy. For example, Campbell (1990, 1992) found gang membership freed girls and women from domestic labor, child-rearing responsibilities, the isolation of the housewife, and feelings of powerlessness associated with their social class. Though the gang was revealed as potentially liberating, ethnographies such as Campbell's (see also: Miller, 2000) still

[1] We use the term "staging area" because it aligns with the language commonly found in literature on gang and street culture (see: Anderson, 2000; Lane, 2018), and as gang scholars, we prioritize this terminology. In the context of this research, it also constitutes an approximation of the social network concept of a "structural hole," which refers to a position in a network where an individual connects otherwise disconnected groups, facilitating the flow of information or influence.

suggested girls' and women's social positions within the gang differed in important ways from those of boys and men. This led to the theorization of gang-sisterhood—clusters of girls and women interacting outside of the central, male-dominated gang network, providing mutual support and solidarity in the face of external challenges and internal gang dynamics. Specifically, Campbell noted that relationships observed among girls and women in gangs in Los Angeles (Quicker, 1983) and Philadelphia (Brown, 1977) suggested the potential for solidarity among these gang members (see also Harris, 1988; Taylor, 1993). However, evidence of this dynamic in the analog streets is limited.

Campbell pushed back against existing literature arguing "a more visible solidarity and sisterhood appears within the gang" (p. 32), as her research in New York City revealed that gang-involved girls and women experienced mistreatment from all gang members, not just boys and men. Behind the facade of sisterly relations and professed allegiance, there were significant interpersonal conflicts, including disputes over boyfriends. "The sisterhood of the gang is reinforced conversationally to compensate for the internal divisions that are not uncommon" (Campbell, 1990, p. 176). Most research pairs sisterhood-affirming findings with indications these friendships are not a central part of girls' and women's gang membership. Although they failed to find evidence of liberation broadly, Joe and Chesney-Lind's (1995) qualitative research on Hawaiian girls in gangs, for example, found evidence of gender-segregated friendship networks and "sista-hood" among girls in gangs, but both were oriented around non-gang social activities. More recently, and in more direct opposition to the liberation hypothesis, neither Miller's (2000) qualitative study of girls and women in gangs in the American Midwest, nor Hughes et al.'s (2019) quantitative analysis of group cohesion among girls and women in gangs found meaningful evidence of sisterhood. It is possible, however, that the digital streets offer opportunities for a fuller realization of gang sisterhood as access to gangs in general, and girls and women in gangs are less socially constrained in social media forums.

Generally speaking, studies in support of the liberation hypothesis integrate or modify the original hypothesis to account for additional economic and social realities commonly encountered by girls and women at risk of offending (Hunnicutt & Broidy, 2004). Nurge's qualitative study of self-reported gang and clique members in Boston, for instance, framed gang membership as both personally liberating and socioeconomically limiting (Nurge, 2003). Nurge found girls and women were liberated from individual circumstances such as domestic abuse and poverty, but limited by the misogynistic, restrictive, and dangerous aspects of street and gang life. This contrasts with early iterations of the feminist liberation hypothesis, which suggest increasing opportunities to engage in masculine-coded behavior are tied to gains in equality and power. However, Nurge emphasized that this sense of female empowerment was fleeting, as gang involvement also brings about constraints and dangers that significantly limit their autonomy and safety. These findings suggest that although girls and women in gangs may feel empowered through participation in gang life, they are unlikely to have the same level of influence as boys and men.

Pursuant to the findings described above, research on gangs, gender, and the experiences of girls and women within gangs has shifted away from the notion of gang membership as a liberating experience and focused more on the unique ways gangs disadvantage girls and women. Studies have found gang-involved girls and women are excluded from core activities and subjected to persistent misogyny (for reviews see Curry, 1998; Decker et al., 2022). These findings support the social injury hypothesis, which posits gang-involved girls and women experience gendered patterns of exploitation, sexual victimization, subjugation, and stigmatization for defying gender norms, in addition to the violent victimization common among boys and men in gangs (Fleisher, 2000; Miller, 2000; Moore, 1991; Ward, 2012). For instance, girls and women in gangs may experience sexual violence from fellow gang members and rivals (Peterson, 2012) and are typically excluded from leadership positions (Miller, 2000; Moore & Hagedorn, 2001; Peterson, 2012). Social injury research further indicates girls and women in gangs are low status, which makes it difficult for them to exert significant influence within the gang's social network and culture. They exist on the periphery, disconnected from key players in gang culture, and are generally subordinate to boys and men i.e. the primary beneficiaries of the patriarchal structure of the gang. Consequently, boys and men within gangs as well as external observers (such as researchers and law enforcement) minimize the contributions of girls and women to gang culture. Importantly, many of the limitations and injuries girls and women in gangs suffer, such as social exclusion and exposure to violence, could be specific to the analog streets and/or ameliorated by digital affordances.

Taken together, liberation and social injury lines of inquiry suggest gang membership involves a mix of gender-specific gains and losses for girls and women in the analog streets. The full picture of what gang membership means for this important subset of gang members in the digital streets, however, remains obscured, in part because of lingering, androcentric inclinations that have long shaped criminological research and spurred feminist pushback (Cook, 2016; Urbanik & Bucerius, 2024).

2.2. *Digital affordances and the social location of girls and women in gangs*

Digital affordances, broadly defined as the unique ways technology facilitates social interaction relative to the analog world (Boyd, 2008; Boyd, 2010; Marwick, & boyd, danah., 2011), may allow girls and women more control over their social locations in gang contexts, potentially moving them from positions of marginality to positions of centrality. We conceptualize these affordances as allowing gang-involved girls and women to make interactional gains in terms of equality, power, and social freedom, and argue they could be understood as having a liberating influence on their gang involvement. We suggest three digital affordances as key factors in the potential liberation of girls and women in the digital streets: 1) the removal of physical obstacles and decreased inherent risks of gang-related face-to-face interactions, 2) increased latitude for strategic identity curation in the digital space, and 3) additional flexibility in forming relationships and creating communities.

First, and most obviously, the digital streets are less physically demanding than the analog streets. Online gang fights consist of an exchange of insults and threats, and though participants certainly reference violence they cannot generally put people in instantaneous physical peril. These dynamics have been shown to influence people's experiences in the digital streets. For example, research on drug-related activity shows subjective feelings of safety are higher, and the risk of violent victimization lower, among those buying and selling illegal drugs online rather than offline, and this may be especially true for gang members (Aldridge et al., 2018; Barratt et al., 2016). Criminological research has long suggested girls' and women's offending patterns—specifically their lesser share in violent offending—are tied to their smaller physical presence relative to boys and men, and, relatedly, their aversion to physical risk (Chesney-Lind & Pasko, 2013; Felson, 1996; Grasmick et al., 1996). Given that the digital streets remove size-related obstacles to gang participation as well as the immediate threat of physical harm, gang-involved girls and women may be more or differently active in the digital streets. Traditionally, street gangs have been tied to specific physical locations (their neighborhoods), and analog conflicts often occur under particular geographic circumstances (Papachristos et al., 2013). However, this dynamic is shifting, as digital spaces allow individuals to engage in gang-related activity beyond physical boundaries. In the digital streets, a poster or commenter can insert themselves into the midst of a gang conflict through their screen and from a safe distance, regardless of their claims to residency or "repping" certain neighborhoods. This removal of physical threats and obstacles may have an equalizing effect, reducing the barriers to network centrality that girls and women typically face in analog street

settings.

Second, digital interactions enable the strategic curation of online personas, allowing girls and women to perform enhanced online gang identities (Panfil et al., 2015). Just as individuals manage their impressions in the analog streets (Goffman, 1959), technology allows gang members to engage in internet-mediated impression management (Lauger & Densley, 2018). Constant access to social media profiles and digital records of online engagements (e.g., Facebook walls, post histories, and comment sections) facilitates this process. For example, gang members can thoughtfully represent and revise their gang identity through user profiles rather than repeatedly performing that identity on-demand in person. They can also strategically choose when, where, and how to interact with or ignore fellow gang members or "wannabe" gangsters (Leverso et al., 2024).

However, it is important to note that this flexibility is not without pressure. Research has shown that gang-involved individuals are often compelled to respond in specific, and sometimes violent ways due to the social risks of not doing so (Stuart, 2020; Urbanik & Haggerty, 2018). The threat of online reputational damage can mirror, or even amplify, the need for immediate response and conformity seen in the analog streets. In criminological terms, the ability to carefully curate one's digital identity represents the relaxation or absence of certain social controls governing gang involvement in the analog streets. According to the liberation hypothesis, where social controls are relaxed, female offending may follow, and online gang networks may reflect this. With less need to continually prove their gangster status, and fewer obstacles to doing so, girls and women could have more freedom and flexibility in choosing their interactions, particularly by observing other conversations and participants.

Third, going online opens new opportunities for girls and women seeking community in gang contexts. The online visibility of girls and women may signal to curious individuals that the digital streets are a more accessible and inclusive space than the analog streets. Further, online social forums may allow atypical gang members—such as girls and women—to find and bond with one another where they were previously too isolated to do so. This echoes the sisterhood and solidarity arguments presented by Adler, Campbell, and others, suggesting girls and women may gravitate towards the liberating potential of like-minded "sisters" in crime. The influence of members of these sisterhood clusters may extend to the broader social network, allowing girls and women to establish specialized roles within the online gang community. This could give girls and women important roles as bridges in online gang networks, fostering greater possibilities for sisterhood and support that physical spaces might not make possible.

Overall, while girls and women have traditionally remained at the periphery of gang networks, the shift of gang interactions to online platforms may enhance their social positions. Digital affordances could lead to a more prominent role for them in contemporary gangs. This raises the question: will we find evidence of "liberation" in the digital streets?

3. Current study

Given the open question of "digital liberation," this study addresses the following questions: What is the prevalence of women and girls in affiliate and conflict networks on the Facebook page? What is the social location of gang-affiliated girls and women in these digital networks compared to boys and men? Based on our understanding of the analog streets, we would expect a continuation of the marginalization of girls and women within gang networks. However, if digital affordances do indeed liberate these individuals from the social structural constraints of the patriarchal analog streets, we would expect them to be as central to gang networks as boys and men. Though we are unable to evaluate if or how migration to digital spaces *changes* girls' and women's network positionality, we can provide a first-of-its-kind "snapshot" of where (and to what extent) they are situated in the digital streets.

To explore this, we use data from a popular Facebook group created for Chicago-based gangs and gang members in 2015, and predominantly used by Latino[2] gang-members and affiliates. We examine the digital networks of individuals who claim to be gang-involved and assess the position of girls and women within these networks using methods from social network analysis. This approach allows us to use network metrics that reveal social positioning, influence, and sorting. Specifically, measures such as degree centrality, betweenness centrality, and eigenvector centrality provide insights into how connected an individual is and their overall influence in the network. By calculating and comparing these measures by gender, we can determine whether girls and women who claim gang membership occupy peripheral or central positions in the digital streets compared to boys and men. Additionally, network analysis can reveal the extent to which girls and women act as staging areas within the network, connecting different groups or clusters that might otherwise remain isolated, quantitatively assessing the qualitative findings of Lane (2018). Finally, we explore the presence of potential clustering among girls and women within these networks by assessing gender-related assortativity, which offers preliminary insights related to the sisterhood hypothesis.

Taken together, our study addresses two gaps in the studies of girls and women in the digital streets. First, we quantitatively describe patterns of interaction by gender and outline how people engage in gang networks by documenting gendered patterns concerning the intensity of affiliate and hostile interactions. This is an important first step as research has yet to investigate the prevalence of girls and women in these networks. Second, and in keeping with the theoretical goals of this research, we focus on the gender differences in the users' position within the networks of these interactions by calculating and comparing a range of node-level network statistics. Thus, our study examines whether the affordances of the digital streets contribute to fostering liberation.

4. Data and methods

4.1. Positive and negative gang-related messages from a Facebook group

This study examines digital liberation among gang-involved girls and women using a novel dataset of gang interactions collected over a 23-month period, from January 2015 to November 2016, on a public Facebook page dedicated to Chicago gangs and mostly used by Latino gang affiliates and members. The data were collected through automated web scraping and captured all public interactions that took place on the page during that time. Common posts include performances of gang identity, such as disrespecting rival gangs and displaying images of gang members brandishing weapons. Typically, these posts feature individuals "throwing up" (displaying) gang signs or "throwing down" rival signs (displaying them upside down). These images are the most prevalent in our dataset. Gang graffiti, either photographed or digitally created, is the second most common type of post. Similar to gang signs, graffiti can positively reference a gang's name and symbol or negatively distort a rival gang's name and symbol. Attachments to gang names, like "love" for positive references and "killer" or "k" for negative references,

[2] We use the terms "Latino" (as a neutral and masculine adjective and noun) and "Latina" (as a feminine adjective and noun) because this is the language used by the people in our group, because these terms are more commonly used among Spanish speakers and people whose ethnic origins can be traced to Latin America than alternatives (NOE-Bustamante et al. 2020), and because these terms "offers greater clarity for an audience not as familiar with the evolution in multiplicity of identity terms" (Hernández, 2022:32). We are conscious of ongoing debates regarding the terms "Latino/a," "Latinx," and—to a lesser extent—"Latine" and reviewed multiple sources regarding appropriate use of these terms in general parlance and in academic writing (see: Scharrón-del Río and Aja, 2015; Vidal-Ortiz and Martínez, 2018; Mora et al., 2022; Guerra & Orbea, 2015).

indicate the intent. For example, claiming to be or dubbing others a "Cobra killer" is an insult to members of the Insane Spanish Cobras. Photographs are often taken in gang territories or, more provocatively, in those of rivals. Images include computer-generated memes and scanned hand-drawn graphics. Occasionally, posts feature the name or picture of a deceased rival followed by "burns" or "rotz," indicating that they are not resting in peace but "burning in hell" or "rotting in the ground."

Comments on posts appear instantly and are typically hostile, reflecting contemporary Chicago gang culture, where inter-gang alliances are nonexistent. These comments often involve back-and-forth exchanges mocking each other or the material posted. From the comments and replies posted on this page, we operationalize affiliate and conflict messaging which we then use to construct digital gang networks. We detail this process below.

4.1.1. Operationalizing positive and negative messages

We subset messages from all the comments and posts by extracting positive and negative comments and replies related to specific gangs. Specifically, we created binary variables for each gang, which were coded from comments posted to the Facebook page. Each comment was categorized as either a positive comment directed at a gang, a negative comment directed at a gang, or not mentioning a gang. To classify comments as negative or positive, we developed a dictionary containing negative and positive words and phrases for each gang. For example, a comment including "Gent love" likely originates from a Harrison Gent gang and is coded as a positive comment towards the Harrison Gents. Conversely, "Harrison Gent killer" or "HGK" indicates the commenter belongs to a rival gang of the Harrison Gents. Subsequently, coding algorithms were developed to analyze all comments and replies. If a comment or reply contained a positive or negative phrase for any of the 36 gangs in the study, it was coded as 1; otherwise, it was coded as 0 (see Blinded for Peer Review for more on the construction of the networks).

We also infer the probable gang affiliation for each user based on positive messages directed at gangs. If a user did not leave any positive mentions of any gangs, we record the affiliation as unidentifiable. While the specifics of gangs and related affiliations are not the focus of this study, we use gang affiliation as a validity check of our network-creating approach: in the affiliate networks, we expect clustering among users belonging to the same gangs, which is exactly the case, as we will show later; it also allows for better visual comprehension in the layouts of our networks.

A key methodological consideration for this study is the challenge of determining the authenticity of gang membership among users who posted and commented on the analyzed Facebook page. We cannot always verify that they are self-identified members or individuals law enforcement would classify as such. But we can scrutinize their comments to assess their "authenticity" by checking if they align with those actual gang members typically use. For example, if a user both represented and disrespected the same gang within a single comment, it would suggest a lack of understanding of gang culture. Similarly, instances where a user claimed affiliation with multiple gangs over the 23-month study period could indicate that the person was not genuinely affiliated. To evaluate the validity of our assumption that the users were gang members, we analyzed the data across four conditions: (1) positive and negative mentions of the same gang within the same comment, (2) two positive mentions of different gangs within the same comment, (3) positive and negative mentions of a gang by the same individual across separate comments, and (4) positive comments from an individual regarding two different gangs over time. Our analysis showed that the majority of comments were consistent with communication patterns expected from actual gang members. Most users did not contradict themselves by both representing and disrespecting the same gang, and they typically maintained allegiance to one gang throughout the study period. From these observations, we inferred that it is plausible that most users were genuine members of street gangs or, at the very least, possessed enough familiarity with the specific gang culture to be considered associates, peripheral participants, or hangers-on. However, to be conservative in our assessment, we refer to people in our sample as claiming gang membership, rather than being confirmed gang members.

4.1.2. Operationalizing gender

We inferred the gender of each user through a two-step process. Initially, we reviewed the user profiles of the 6829 individuals who contributed content through comments or replies. We hand coded each profile, and assigned a gender of "boy or man" or "girl or woman" based on the presentation in profile photos, user names, and, in some instances, the stated gender of the user. Additionally, we employed the R "gender" package (Blevins & Mullen, 2015) to machine code missing gender values using first names, likely birth cohorts, and Census data regarding the gender of a particular name in a particular cohort. We compared our hand-coded and machine-coded results and found they were overwhelmingly in alignment. A coauthor then reviewed data associated with the few users for whom the hand- and machine-coded gender were not in alignment. We found the majority of disagreements were the result of nicknames and other user name anomalies. For example, if a user's name was listed as "LolaKK" (which we could decode as "Lola the killer of [Latin] Kings") the machine coding could not discern a gender. However, the name "Lola" was machine-coded as belonging to a girl or women, in alignment with our hand-coding.

4.2. Constructing co-commenting networks from positive and negative interactions

For this project, we focus on the comments and replies ($N = 37{,}403$) posted on 3213 posts during the study timeline to construct both affiliation and conflict networks. We began by subsetting the messages with at least one positive or negative sentiment towards any of the gangs, resulting in 8911 messages from 1971 authors. This provides us with a labeled message-level dataset that we will use to construct co-commenting networks.

We consider two scenarios of online interactions in our study. The first scenario is a hostile interaction. We define this as a pair of users expressing opposite sentiments towards the same gang within the same post. For example, if Kate leaves a comment with a negative sentiment towards Gang A, and John leaves a comment with a positive sentiment towards Gang A in the same post, we consider it a conflicting or "hostile" interaction, even if there is no directly reply and the comments do not display in sequence. In social network analysis terms, Kate and John become nodes in the graph, and the edge weight between them is set to 1. If Kate and John engage in a similar interaction in another post, the edge weight is incremented by 1 (with a limit of one hostile interaction per post). The second scenario is an affiliate interaction, where Kate and John both leave messages with strictly positive sentiments towards Gang A in the same post. The operationalization of this interaction is similar to that of the hostile interaction, but tweaked to capture positive, affiliate engagements. Our classification of two comments as an interaction even if they make no mention of one another and are not displayed consecutively, so long as they are commenting on the same post, is based on qualitative work on the same data indicating that in such cases individuals knowingly interact with each other even in such cases (Blinded for Review). Nonetheless this approach may cause some false positives. We revisit this issue in the limitations section.

We loop through messages with gang-focused sentiments and create two multi-component undirected one-mode networks: the affiliate network of positive interactions and the hostile network of negative-positive or positive-negative interactions. In both networks, each user is a node, and the number of respective interactions determines the edge weight between nodes. For each node, we add information about the inferred gender and gang affiliation. These two resulting networks constitute our main analytic dataset.

4.3. Analytic strategy

Our analytical strategy is inspired by Smith's (2020) study on women in Chicago's historic organized crime networks, where we gleaned insight on how to quantify networked gender inequality. We quantitatively describe the interaction networks by documenting the gender-related intensity of online gang interaction, network- and node-level measures, and then test for group-based differences between boys and men, and girls and women.

We first present descriptive statistics for our underlying message-level data. Then, we analyze hostile and affiliate networks to document the number of nodes (users) and edges, density, and network diameter, along with several measures of overall network connectivity. Specifically, we calculate average degree, average eigenvector, normalized average betweenness, and average closeness (Borgatti & Everett, 2006; Landherr et al., 2010). The average degree measures the mean number of connections each node has within the network (Nieminen, 1974) – or how many people each user is connected to. The average eigenvector centrality assesses the influence of a node within the network, in a way that a node with high eigenvalue centrality is a node that has a high ranking determined by the stationary distribution of a random walk on the network (Bonacich, 1972) – or how often someone randomly inserted into the flow of interactions in our network would encounter that particular user. Average normalized betweenness quantifies the number of times a node acts as a bridge along the shortest path between two other nodes (Freeman, 1977) – or how often a user serves as an intermediary between two other users. Average closeness measures how close a node is to all other nodes in the network (Freeman, 1978) – or the "social distance" between users. We separately calculate the gender-based assortativity index (Newman, 2003) and transitivity (clustering coefficient; Vasques Filho & O'Neale, 2020). This allows us to capture the descriptive differences between two opposite ways of interacting online.

Next, we calculate node-level centrality measures—degree, eigenvector, normalized betweenness, and closeness centrality—and then average them by gender for both networks: We then present the averaged node-level centrality measures for users side-by-side for both types of networks. By dividing the averaged node-level statistics for boys and men by those for girls and women, we obtain ratios that indicate the magnitude of difference between the two. These ratios tell us the magnitude of the difference in centrality of girls and women compared to boys and men in these networks of interactions. Taken together, these outputs help us describe where girls and women are in these networks, whether their social positions differ in a meaningful way from those of boys and men, and what those differences are.

We also employ a nonparametric permutation (node-label randomization) test for these ratios to determine if the gender differences in estimates are likely due to random chance (Croft et al., 2011). To perform this test, we randomly shuffle the gender labels and recalculate the node-level statistics 1000 times. We then calculate how many times the randomly shuffled dataset results in ratios smaller than those observed. This results in a p-value representing the proportion of 1000 permutations that yield a smaller ratio estimate than observed. This allows us to perform a one-sided hypothesis test with a conventional threshold for null hypothesis rejection of 0.05, testing whether men's centrality is consistently higher than women's or not.

5. Results

We begin by presenting descriptive statistics for our web-scraped datasets in Table 1. Our initial dataset consists of users ("authors") and their posts, comments, and replies ("messages") posted on a public Facebook page created for Chicago-based gangs and gang members in 2015 and predominantly used by Latino gang-members and affiliates. It consists of 6829 users and 37,403 messages. We estimate 13 % of the users in this dataset are girls or women. After filtering for messages that contain at least one mention of a gang, we are left with 1971 users, 7 % of whom are girls or women, across 8977 messages.

Table 1
Descriptive statistics for mentions

	Total	Boys and men	Girls and women
Number of authors	6829	5873	956
Number of messages	37,403	34,422	2981
Number of authors mentioning gangs	1971	1819	152
Number of messages mentioning gangs	8977	8552	425
Number of all gang mentions	12,392	11,840	552
Number of positive gang mentions	2365	2262	103
Number of negative gang mentions	10,027	9578	449
Mean number of gang mentions per person	1.815	2.016	0.577
Mean number of positive gang mentions per person	0.346	0.385	0.108
Mean number of negative gang mentions per person	1.468	1.631	0.470

A single message can contain mentions of multiple gangs, resulting in a total of 12,392 gang mentions across these messages, with an approximately 20/80 split between positive and negative sentiments towards gangs. On average, a user who is a boy or man mentions two gangs, whereas a user who is a girl or woman mentions 0.5 gangs. Similar to boys and men, girls and women are more likely to leave negative rather than positive mentions towards gangs, although they do so three to four times less frequently than male authors. Overall, boys and men write posts and comments more often, and these messages are more likely to mention gangs in either a positive or negative context compared to girls and women.

Table 2 presents the network-level statistics for hostile and affiliate co-commenting networks. The hostile network consists of 1171 nodes (co-commenters) with 3511 edges (cases of negative co-commenting towards the same gang within the same post) between them. The affiliate network is smaller, with 490 nodes, and it has 74 components not connected to each other through co-commenting, in contrast to the more centralized hostile network, which has only 17 components.

Both networks are sparse and exhibit low measures of centralization as measured by degree, eigenvalue, betweenness, and closeness. However, the network of hostile interactions is more connected overall than the affiliate interactions network, as evidenced by slightly higher values in degree, betweenness, and closeness. Conversely, the transitivity coefficient is higher for affiliate interactions, suggesting community-forming behavior with patterns of tight, small-group co-commenting. This makes sense: positive, affirming behavior towards members of the same gang create the ties in the affiliate network, whereas the hostile network can be summarized as a "war of all against all," resulting in a disorganized, single-cluster structure of everyone connected to everyone.

Gender assortativity measures the tendency to form ties with nodes

Table 2
Network-level statistics

	Hostile network	Affiliate network
# of nodes	1171	490
% of girls and women	0.065	0.051
# of edges	3511	720
# of components	17	74
Density	0.005	0.006
Degree	0.112	0.066
Eigenvalue	0.944	0.962
Betweenness	0.155	0.047
Closeness	1.413	0.939
Transitivity	0.030	0.325
Diameter	9.000	9.000
Gender assortativity	0.025	0.036

of similar gender and, similar to the correlation coefficient, can range from −1 to 1. In both networks, the gender assortativity is positive and low (0.03), indicating a barely noticeable pattern of affiliate and hostile interactions among people of the same gender. Thus, consistent with Hughes et al. (2019), we find no evidence of gang-involved girls and women forming a sisterhood in the digital streets.

Figs. 1 and 2 present layouts of hostile and affiliate networks, substantiating the network-level statistics from Table 2 and highlighting differences in hostile and affiliate interactions. The layouts were created in Gephi using the Force Atlas 2 as the layout algorithm (Bastian et al., 2009). Hostile network layout only shows the largest component for better readability. Node size shows the degree (number of ties). Girls and women are shown in red so they are easily distinguishable in the visualization, while boys and men are color-coded per their gang affiliation. Consistent with the fractured nature of contemporary Chicago gangs (Aspholm, 2019; Leverso, 2020; Stuart, 2020) the conflict network resembles a "war of all against all" with one major component and little evidence of competing communities. Girls and women can be visually distinguished across the whole network, yet their node size based on degree does not indicate they occupy particularly central positions. Ultimately, Fig. 1 does not show any clusters, and thereby underscores the chaotic, unstructured nature of hostile co-commenting, where distinct affiliations dissolve into a generalized conflict.

Fig. 2 presents the affiliate network. The reader can observe tight clusters of authors. These clusters occur based on gang affiliation, confirming the internal validity of our network creation process. Again, as with the previous network layout, it is clear girls and women are present within this network. However, they do not hold positions with a large number of ties in all components of the graph. These layouts help us visualize their positions in affiliate and hostile networks together with some evidence of the internal validity of these networks.

To quantitatively compare the structural positions of users in both networks, we report the node-level network statistics by gender and network type in Table 3. Boys and men are 14 times more likely to engage in hostile interactions, and they form ties within these interactions 22 times more often than girls and women, with similar but slightly larger numbers for affiliate interactions. Average centralization measures are consistently larger for boys and men: almost all male to female centrality ratios exceed one in both networks, with the sole exception being closeness centrality in affiliate networks. In hostile and affiliate networks respectively, boys and men have 1.5 and 1.3 times more direct connections than girls and women based on average degree. They also have 1.4 and 1.5 times more connections to central nodes based on average eigenvector centrality, making them more influential within the networks. Additionally, boys and men have three times higher normalized betweenness, suggesting that they are more likely to be bridges and intermediaries in the network. Thus, in contrast with qualitative findings from Lane (2018) we do not find support for the notion girls and women (or their user profiles) serve as staging areas in online networks. Finally, boys and men have 1.6 times higher closeness centrality in the hostile network, indicating that their nodes are closer to all other nodes than are girls' and women's nodes. Average closeness in the affiliate network is the only network statistic where the value is substantively similar across boys and men and girls and women.

The results of permutation tests reported in the columns "p" in Table 3 provide evidence of the precision of the observed differences between boys and men and girls and women. *P*-values for between-group ratios in the hostile network are significant for 3 out of 4 centrality measures; however, none are significant when comparing our groups in the affiliate network. The small sample size of only 25 girls and women who engaged in affiliate co-commenting behavior likely drives this, and hypothesis testing suggests our results for the hostile network are more precise.

Put plainly, our network findings are as follows: Boys and men are more active than girls and women in gang-related online interactions, particularly in contexts where they are referring to other gangs. Negative, conflict-driven interactions occur more often than positive ones for both boys and men and girls and women, an unsurprising finding given gangs have long been argued as organized around the perpetuation of between-gang conflict. When contextualized alongside extant literature, results suggest girls and women remain in peripheral positions with regards to key group activities. Positive, affiliative interactions result in tight clusters of users who feel the same way towards a particular gang; in contrast, negative interactions are more universal and do not show any clustered structure. Across both affiliative and hostile interactions, girls and women are less "central" than boys and men: interact with fewer people, and do form distinguishable clusters with other girls or women.

6. Discussion

Our study is one of the first attempts to quantitatively assess the role

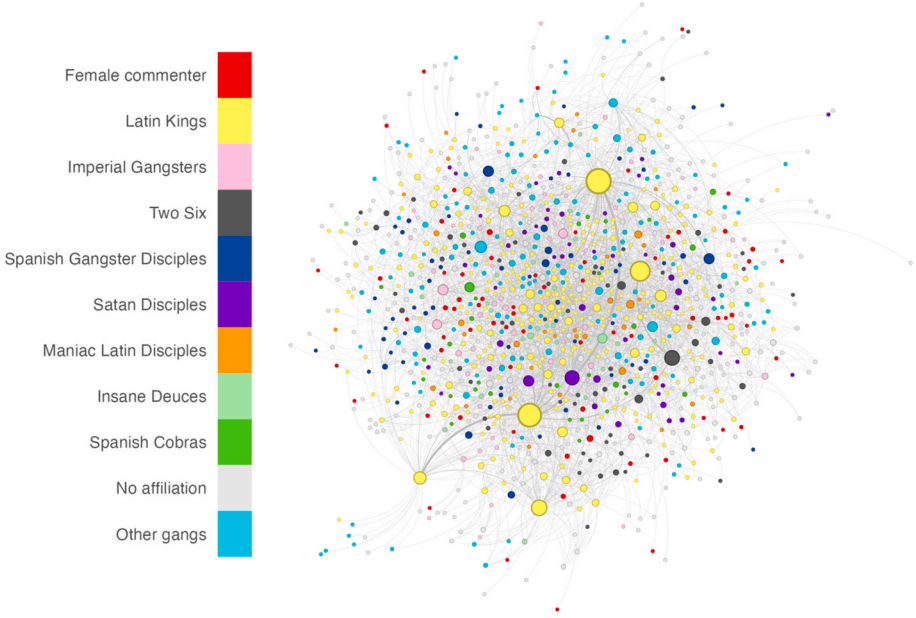

Fig. 1. The layout of the hostile network.

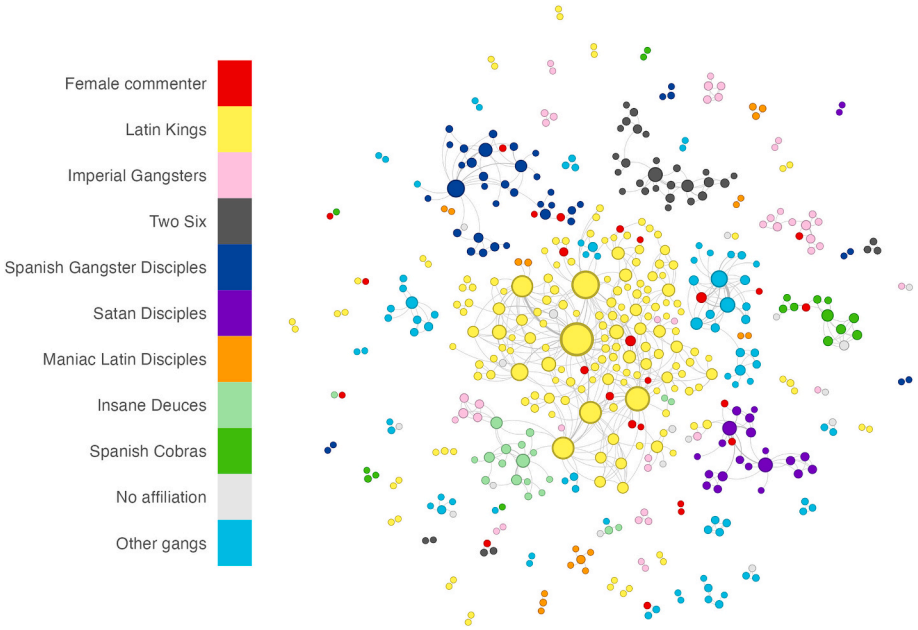

Fig. 2. the layout of the affiliate network.

Table 3
Node-level statistics

	Hostile network				Affiliate network			
	Boys and men	Girls and women	Ratio	p	Boys and men	Girls and women	Ratio	p
# of nodes	1095	76	14.408	–	465	25.000	18.600	–
# of edges	6721	301	22.329	0.009	1385	55	25.182	0.116
Average degree	6.138	3.961	1.550	0.009	2.978	2.200	1.354	0.134
Average eigenvector	0.059	0.042	1.402	0.039	0.043	0.028	1.501	0.315
Average normalized betweenness	0.002	0.001	2.862	0.010	0.001	0.000	2.949	0.288
Average closeness	0.026	0.016	1.646	0.308	0.242	0.248	0.977	0.515

of girls and women in the digital streets by describing within-gang interactions and hostile interactions between gangs. Using user- and message-level data from a popular Facebook group created for Chicago gang members, we find that girls and women account for 13 % of users generally and 7 % of those who display positive or negative sentiments towards particular local gangs. By transforming the messages containing negative and positive sentiments towards gangs into two co-commenting networks with affiliate and hostile interactions, respectively, we document the gender-differentiated network characteristics of these exchanges. Our analysis suggests affiliate interactions are more clustered and formed by members of the same gangs, whereas hostile interactions are more broadly connected. Furthermore, we compare the centrality of boys and men and girls and women in both networks and find consistent evidence that boys and men dominate both hostile and affiliate exchanges online. Specifically, across all indicators of network positionality—with the exception of average closeness in the affiliation network—girls and women occupy more marginalized positions in digital gang networks. However, these results are only statistically significant in the hostile networks and not in the affiliation networks. Given the small sample size in the affiliation network, we hesitate to conclude there are no differences. Rather, we consider this finding an important first step in understanding this issue and encourage future research to investigate further. Nevertheless, our study leads to several important conclusions.

First our analysis reveals that girls and women are active in online networks. By documenting the involvement of this group in online gang networks, we address a significant research gap, offer a fuller understanding of gang dynamics, and establish a set of results that fellow gang scholars can leverage in future research. Girls and women often hold specific roles within gangs, such as disseminating information, mediating conflicts, and otherwise exerting a "civilizing influence" on boys and men in their social networks (Joe & Chesney-Lind, 1995; Lane, 2018; Lane & Stuart, 2022; Lauritsen et al., 2009). Better understanding the transmission of gender-coded behaviors through online gang networks may provide valuable insight into gang prevention, intervention, and suppression, particularly as they relate to the understudied issues of how female-coded behaviors can reduce risk of offending (e.g. O'Neill, 2020). Additionally, understanding how gender-based violence and stigmatization manifests online is crucial for comprehending contemporary gang life, given the shift of many interactions to digital spaces (Peterson & Panfil, 2014; Sutton, 2017).

Second, our study makes theoretical contributions by further supporting a nuanced, but limited form of liberation for girls and women in online gang network. They contribute to online gang activities, both by participating in virtual fights with rival gang members and by acting as supportive crew members, often with considerable intensity. However, their involvement is not equal to that of boys and men, as indicated by the comparative rate and intensity of interactions and the centrality of girls and women in these networks. Though this exclusion limits girls and women's ability to fully embed themselves within the gang, it may also insulate them from the sometimes violent spillover effects that are increasingly chronicled in research on the digital streets (Hsiao et al., 2023; Stuart, 2020).

Our interpretation of our results is rooted in a liberation perspective, as we posit suppression and marginalization of girls and women in the digital streets differs from suppression and marginalization in the analog

streets. As such, we term our finding based on social network analysis that girls and women are more freely able to engage in gang life "liberation." This does not mean, however, that all gang-affiliated girls and women find such latitude desirable. It is possible that we do not find more support for the liberation hypothesis because an unknowable number of girls and women glimpse an environment they do not want to enter on social media, and therefore they remain at the periphery by choice, not because of suppression.

The finding that our assortativity index outcomes did not reveal gender-based homophily may play a role in female responses to the Facebook page; it is possible that in-gang sisterhood would have increased female participation. Additionally, we find no evidence of girls' and women's social media pages acting as staging areas in the network. Given the newness of this topic, we encourage further research to investigate our findings in diverse samples and emphasize that exploring potential liberating impacts of social media on girls and women is a fruitful and important avenue for future research. More generally, theorization from second-wave feminism could significantly contribute to future research on girls, women, and gangs online. Digital affordances are changing contemporary society, including gang members, suggesting that these ideas should be scrutinized for their utility in the digital age.

Third, our study makes methodological contributions. We respond to calls for using data beyond police records in network analysis of gangs (Bouchard, 2020) by transforming raw social media data with information on online engagements and the users that contribute this content into communication networks that, to some extent, reveal the underlying social structure of gangs. While scholars routinely employ social media data to create and analyze networks, this study outlines the steps to turn gang-related comments on Facebook into co-commenting networks showing gender structure and gang affiliations among the users. Facebook may not currently be the ideal social media platform for gang members, but our methods can be replicated on Instagram, Reddit, and other social media sites where gang members leave records of the communication. By applying social network analysis to gendered interactions within gangs, this study provides an approach for future research to analyze how digital spaces impact different demographic groups within gangs.

This study has several limitations. First, the analyses are constrained by the lack of access to the users who contributed content on the Facebook page. This limitation required us to rely on messaging related to gangs to classify gang members, raising questions about the authenticity of the users. In other words, we had to infer that the users commenting were gang members based on their contributions to the group. As discussed in the methods section, sensitivity analyses were conducted to determine if comments contradicted local knowledge (e.g., claiming and disrespecting the same gang in a given comment or claiming membership in multiple gangs over the study's duration). Any such inconsistencies would call into question the authenticity of the user. Generally, we found the language used in the group was consistent with what we would expect from gang members, making it reasonable to assume these comments were from gang-involved individuals. Additionally, while our analysis captures user interactions through shared posts and subsequent comments and replies, it cannot account for directed, user-to-user conversations. Notably, in the context of this online environment, content contributions are visible to all group members, regardless of who it was "meant" for. Therefore, the flow of information through these digital streets is less dependent on dyadic interaction than information on the analog streets. Our own qualitative research somewhat alleviates this concern (Blinded for Review), as we have observed many direct user-to-user interactions. However, we still note this as a limitation. To address these gaps and build on our findings, we encourage future research to test these gendered gang dynamics through netnography, using the approaches taken by Lane (2018), Urbanik and Roks (2020), and Stuart (2020). Nevertheless, we believe that the multi-component undirected one-mode networks constructed from these interactions provide valuable insight into user behaviors, interactions, and gender dynamics in digital gang environments. This understanding is essential for mapping the positions of girls and women within these networks, even as we remain cautious about drawing definitive conclusions regarding direct interactions or confirmed gang affiliations.

A notable data-related limitation is the small number of girls and women in the digital gang network captured in our dataset. This led to imprecise estimates of network statistics, particularly within the affiliate networks. While this issue is inherent in the data—we can only observe what is present—it underscores the importance of considering our sample when interpreting the results: a majority-Latino/a group of past and present Chicago-area gang members and affiliates. Future research should explore how girls and women in Latino/a gangs compare and contrast with those in Black gangs, both in Chicago and other locations. To achieve this, innovative methods like digital web-scraping in different locations, as well as more traditional methods involving newer survey data, are needed. These efforts will provide a more nuanced understanding of girls and women in the digital streets. A final, notable limitation of this study is related to the scope of racial and ethnic representation within our dataset. While the data at its peak represented nearly all active Latino gangs and many gang subgroups in Chicago, we cannot definitively claim that it includes all gang members in the area and likely have "undersampled" members of non-Latino gangs that remain active in Chicago. Although our formerly gang-involved research assistants and lead researcher are confident the dataset accurately reflects local gang culture during the sampling period, the exact proportion of gang members represented is unknowable. Our goal is to start a conversation on this important topic—girls and women in the digital streets—and encourage scholars to engage and build upon our work to deepen the understanding of gendered dynamics within digital gang environments.

7. Conclusion

Our study provides significant insight into the position of gang-involved girls and women in the digital streets, addressing an important, emerging gap in gang research. By documenting the active participation of girls and women in the digital streets, we enrich our understanding of gang dynamics and highlight the position of girls and women in this unique social network. Despite the liberating potential of digital affordances, our findings suggest the involvement of girls and women in gang activities online remains unequal compared to boys and men, with limited evidence of gender-based homophily or significant centrality within the networks. Our methodological approach, using social network analysis of social media interactions, presents a novel way to study gang dynamics and underscores the importance of moving beyond police data.

The implications of our research extend to both theoretical and practical domains, suggesting that digital spaces offer new avenues for understanding and addressing challenges faced by girls and women in gangs, as well as achieving a more holistic view of how gangs operate in the digital streets. We urge future researchers to be deliberate about ensuring girls and women are not presumptively relegated to the margins of research in the digital streets. In our sample, girls and women are present and active members of the online gang community. The possibilities presented by digital data mean we, as researchers, have more access than ever to detailed records of gang member and affiliate interactions, and given what we already know about the prevalence of girls and women in the analog streets it is a near certainty that they are present and deserve to be accounted for in digital data.

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CRediT authorship contribution statement

John Leverso: Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Kate K. O'Neill:** Writing – review & editing, Writing – original draft, Conceptualization. **Alex Knorre:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation. **George Mohler:** Writing – review & editing, Supervision, Methodology.

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