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Adolescent Social Networks and Physical Intimate Partner Violence Among Colombian Rural Adolescents

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ABSTRACT

The current study analyzes individual and social network correlates of adolescent engagement in physical intimate partner violence (IPV) utilizing socio-centric data from a high-school population of 242 adolescents from rural Colombia. We studied self-reported victimization and perpetration for boys and girls. First, we used logistic regression to explore the relationship between adolescents' IPV engagement and school peers' IPV engagement, school violence victimization, and social network position, controlling for gender and age ($N = 111$). Second, we used social network statistical methods to investigate if there were more friendships of similar IPV status to the adolescent than expected by chance in their social networks. Our results show that the proportion of friends perpetrating physical IPV increased the probability of adolescents' IPV perpetration. Contrarywise, the proportion of friends experiencing IPV victimization decreased with the adolescent's own victimization. Being a victim (a status significantly more common among boys) was also associated with reporting perpetration for both genders. Furthermore, our results contradicted the social network literature, as we found no preferential ties among perpetrators/victims (e.g. adolescents do not seem to befriend each other by IPV engagement). Our study is unique to the global adolescent IPV literature given the scarcity of research examining physical IPV among adolescents in the context of both girls and boys in the context of their school networks. We also add to the understanding of IPV in the case of the global majority of adolescents with the highest rates of IPV victimization (living in low and middle-income countries).

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Intimate Partner Violence (IPV) among adolescents has been identified as a global health priority, especially given that its effects persist long after the occurrence of violence (Abramsky et al., 2011; Ellsberg et al., 2018; Spivak et al., 2014). Specifically, experiencing or perpetrating IPV during adolescence

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impacts mental, physical, and emotional well-being trajectories into adulthood (Banyard & Cross, 2008; Ellsberg et al., 2018; Park et al., 2018). This is because adolescence is a critical period for establishing values, norms, and beliefs about intimacy, relationships, and violence, which in turn shape relationships and health trajectories across the lifespan (Armour & Sleath, 2014; Cui et al., 2013; Exner-Cortens, 2014; Leadbeater et al., 2018). Therefore, it is crucial to examine IPV among adolescents, given its developmental significance for establishing patterns of behaviors and cognitions related to intimate relationships later in life, including their effect on the next generation (Kidman & Kohler, 2020; Leadbeater et al., 2018).

Theoretical approach

Following previous research (Bukowski et al., 2018; Laursen, 2018; Rubin et al., 2006; Hinde & Stevenson-Hinde, 1987; Waitling & Veenstra, 2020), we approach the examination of adolescent IPV in this study using Hinde's and Stevenson-Hinde (1987) social complexity theory. Social complexity theory (Hinde & Stevenson-Hinde, 1987) is a multileveled framework for understanding behaviors in the context of adolescents' social networks with six social layers affecting adolescent development: psychobiological, individual, interactions, relationships, social networks, and socio-cultural. The first two levels of the social complexity hierarchy are the psychobiological and individual cognitions, predispositions, and the developmental trajectories the adolescent brings to a social context. These dispositions or constraints also change due to a history of interactions (violent or not).

These interactions frequently occur in relationships, the next level of social complexity. Relationships include higher-order cognitions, meaning, expectations, and more complex qualities than interactions. Therefore, a relationship's influence, strength, and importance (i.e., antipathy or closeness) can also shape an interaction's interpretation or effect. Patterns of relationships and interactions assemble social networks with emerging characteristics and properties that cannot result from the simple addition of dyadic ties or dynamics (e.g., segregations, identities, hierarchies). Finally, the socio-cultural level refers to the systems of values, inter-generational patterns, meanings, and beliefs shared in the historical context of the society where all the lower-level social exchanges occur. The societal and cultural level is mutually informed, limiting, and nesting social networks.

Laursen (2018) noted that cross-cultural research on adolescent violence should incorporate these multiple social complexity levels. The development, interpretation, and response to violent experiences of the global majority those living in low and middle income countries (LMIC) could have multi-final trajectories according to the socio-cultural environment. For example, physical acts of violence can be a normative form of discipline, a neutral interaction

among a dyad, or an intolerable feature of a romantic relationship, contigent to societal dynamics (Laursen, 2018; Rubin et al., 2006). Therefore, this paper aims to utilize individual level, dyadic, and social network approaches that simultaneously consider that these occur in unique patterns of beliefs and behaviors around violence and gender to better understand adolescent IPV perpetration and victimization.

Adolescent IPV in LMIC and high-risk settings

Increasingly, the research has noted the importance of including the diverse socioeconomic and geographic environments where adolescents live to identify factors influencing IPV experiences (Gressard et al., 2015; Kamndaya et al., 2017). Adolescents whose lives are negotiated in regions with higher rates of economic instability or situations of conflict face an increased likelihood of violence exposure (e.g., community-wide violence and crime) and the associated consequences (Cuevas et al., 2014, Exner-Cortens et al., 2014; Johnson et al., 2015; Natukunda et al., 2019; Peitzmeier et al., 2016; Spriggs et al., 2009). These community burdens can amplify the risk for engagement in individual-level IPV and poly-victimization (Kidman & Kohler, 2020; Taquette et al., 2019). For instance, research has shown that neighborhood disorganization and low economic wealth were significantly related to the experience of violence in LMIC countries (Spencer et al., 2020), while others have found a positive association between family disadvantage and adolescents' dating violence victimization in a LMIC nation (Spriggs et al., 2009). These empirical examples underscore the relevance of studying adolescents in LMIC areas while considering were the multi-leveled factors that inform adolescent IPV.

Additional work indicates that the broader social network in which adolescent IPV occurs affects its patterns and consequences. For example, research has shown that school (Giordano et al., 2015) and social network contexts are critical to consider for IPV prevalence at least in two ways: the network position affecting IPV engagement or mechanisms of social influence, contagion, or selection increasing individual IPV engagement (Cuartas & Roy, 2019; Metheny & Stephenson, 2020; Shakya et al., 2020). Furthermore, when looking at cultural factors, research has noted the need to expand the focus to incorporate societal-level influences such as location (e.g., rural vs. urban; McDonell et al., 2010; Spencer & Bryant, 2000) or the regional or country levels (e.g., LMIC status; Sardinha et al., 2018). For example adolescents living in rural areas are at increased risk for IPV engagement compared to their peers in urban areas (McDonell et al., 2010).

Colombia's record of having the lengthiest history of internal conflict in the Americas contributes to a complex experience with violence that research suggests informs adolescents' IPV perceptions and behaviors (Jiménez Bautista, 2018; Ministerio de Salud y Protección Social, 2019; Browne et al.,

2019). Studies have shown that community violence has shaped conduct and cognition toward violence perpetration/victimization among Colombian adolescents (Butti, 2019; Cuevas et al., 2014; Pasupathi et al., 2017). In addition, at least half of Colombian adolescents have experienced physical or psychological violence (Ministerio de Salud y Protección Social, 2019). These socio-historical experience with violence has been linked to IPV (Rozo-Sánchez et al., 2019). For example, Rey-Anacona's (2013) study found that IPV self-reports among Colombian adolescents are exceptionally high; 85.6% reported experiencing some form of IPV victimization (e.g., physical or psychological), while 40.3% reported physical violence perpetration and victimization. Since both adolescent boys and girls described similar levels of IPV perpetration and engagement (Rey-Anacona, 2013) it is critical to asses a gender-inclusive social network for IPV engagement when addressing IPV in a Colombian context which is one the study aims. In sum, examining LMIC rural adolescent IPV experiences and their social networks in complex, violent settings is a timely global priority (Bourey et al., 2015; Cuevas et al., 2014; Spriggs et al., 2009) that adds to the literature on social determinants of adolescent IPV, in seldom studied contexts such as rural Colombia.

Adolescent IPV victimization and perpetration and peer social networks

According to the social complexity framework (culture, social network, relationship, interaction, individual) the role of school social networks in IPV experiences is important beyond the dyad, and constitutes the second level of analysis. Prior research has noted that adolescents' friendships and peer culture norms can influence violent experiences and intimate relationship decision-making (Foshee et al., 2013; Hébert et al., 2019; Shakya et al., 2020; Vagi et al., 2013). For example, perpetrators of IPV are more likely to be surrounded by other perpetrators of IPV (e.g., Ramirez et al., 2012); this is especially salient in friendship networks (Casey & Beadnell, 2010).

The peer context constitutes a social reference for this period of romantic onset, including violent and nonviolent influences (Connolly et al., 2000; Eaton & Stephens, 2018). A recent meta-analytic review by Garthe et al. (2017) found that peers' IPV engagement and being victimized by peers were associated with adolescents' IPV experiences. Further, for adolescents who experience IPV, peers' acceptance of those behavioral norms influenced their perspective of violence as normative (Dane et al., 2016; Volz & Kerig, 2010).

Social network methodologically guided studies further support the importance of peers. Studies that center on the utilization of social network analysis have consistently found evidence for selection (similarity due to an external selection, such as classrooms), homophily (the tendency to associate with similar peers), or contagion effects (social learning or influence), on overall

adolescent violence experiences in peer relationships (e.g., Berger, et al., 2019; Casper et al., 2020; Faris & Felmlee, 2014; Foshee et al., 2013; Huitsing et al., 2014; Jackson et al., 2015, Shakya et al., 2017; Watling & Veenstra, 2020). Theoretical explanations utilized to understand these effects include social norms (Reed et al., 2011), normative beliefs (Seff, 2021), social learning (Garthe et al., 2017), and peer influence (Sijtsema et al., 2019).

Current study

The present study examines IPV experiences of adolescents living in a rural, resource-limited Colombian village, utilizing socio-centrically mapped school peers' social network data (census information; all school-enrolled children are part of the study) and individual reports of IPV. Consistent with a social complexity theoretical perspective, we simultaneously attempt to answer the following research questions: What are the social network and individual associations to IPV engagement (victims or perpetrators) among boys and girls in the context of their school networks? Are IPV-engaged adolescents more likely to also befriend similar-status peers?

First, we explore the association of school peers' social network physical IPV engagement on individual reports of victimization and perpetration, accounting for school victimization, social network position, gender, and age. Second, we expand these individual analyses by examining social network ties (relationships) among adolescents experiencing physical IPV to assess the preferential tie formation among peers who share equal victimization/perpetration status in the school peers' social network.

Materials and methods

Participants and recruitment

Recruitment took place in the only public school in a rural Afro Colombian community in the Bolivar region of Colombia in the spring of 2019; in addition to flyers, several information meetings were held at the school for potential participants and their parents. Inclusion criteria required adolescents to be between 13 and 17 years of age, consistent with high school in the Colombian school system (6^{th} to 11^{th} grade). Participation was voluntary, and all eligible adolescents ($N = 294$) were invited to participate. We had a 90% of response rate. This study focuses on a subsample ($n = 111$) of adolescents that reported being in an heterosexual intimate relationship during data collection for the individual analyses. For statistical modeling of social networks, we utilized socio-centric data reported from all survey participants ($n = 242$). Partnered adolescents included 45.2% girls and 56.7% boys (49.6% girls, 49.2% boys, and 0.81% as another gender in the entire survey). Regarding

age, 70% of partnered participants were late adolescents aged 15–17 years (54.5% in the study), and 38.2% were early adolescents aged 13–14 years (45.5% in the rest of the study). Most respondents were native to the community (74%), and ethnically identified as belonging to Afro-Colombian *Comunidades Negras*. The remaining 26% was mixed (24%) and indigenous (2%).

Partnered adolescents

Adolescents selected the best description of their status as one of the following options: 1) being married or cohabiting; 2) engaged, having a boyfriend/girlfriend; or 3) having more than one boyfriend/girlfriend (follow-up questions for this option requested to pick the partner who was most important to them). All responses were coded as partnered. Excluded (not partnered) respondents marked the options of not being in a relationship (currently or ever) or refused to answer. Finally, because only one partnered participant reported belonging to a third category of gender (options were boy, girl, or other), they were excluded from the for lack of statistical power for that variable. The resulting subsample was 111. This socio-centric study uses all relationships to analyze the full data set (the school networks of all 242 adolescents that hosted the relationships of the 111 partnered individuals) for the network analyses.

Measures

School peers social network

The survey included two name-generator questions for capturing school-based relationships. First, each adolescent respondent was an "ego" in the social network then they could name up to 10 friendships among their high-school peers with whom they report discussing important matters (friends are referred to as alters in a social network). The second name generator asked each ego for people in their community with whom they shared important matters. We combined both name generators in one social network inclusive of all socio-centric relationships for a total of 20 possible relationships among adolescents. Participants typed all four names (first, middle, and two last names) of their nominated peers,[1] which allowed discerning all possible relationships among survey respondents. Non-participant nominations (names of friends who were not participants too) were not considered to be part of the social network in this study (which resulted in a full socio-centric graph in which we could discern all possible relationships). For each friend-(alter), the survey respondent (ego) reported the occurrence of physical

[1]In the Colombian context, legal names include first, middle, and two last names (paternal and maternal names). In the context of this study, this was helpful to discern among cousins, for example, given that it is culturally common practice to repeat the same names among families.

violence in the past year in both directions (if they were a victim or a perpetrator;options were not mutually exclusive). We utilized these follow-up questions to assess school peer victimization as described in the next section. The school peers' social network was graphed using undirected ties among survey participants, meaning both the ego (the adolescent who responding to the survey) and alter (the friend) could nominate the social network relationships in any of the two questions and report a violent interaction (Figure 1 includes the school network graph).

Intimate partner physical violence perpetration and victimization

We utilized six items from the Global Early Adolescent Study questionnaire (World Health Organization, 2017) for physical IPV. The instrument was culturally adapted to local idiomatic terms in pilot tests and validations with our community partners. IPV questions in the survey were only available to those who reported a partner and they were prompted to answer only about their present partnership. Questions for victimization and perpetration were identical (e.g., have you? or has your partner?). The survey included three questions related to physical IPV: 1) dragging, pushing, or aggressively shaking; 2) slapping; and 3) hitting. Responses ranged from: yes, many times; yes, once; or no. Any affirmative response on the three questions was coded as physical IPV engagement (one for victims or perpetrators or zero otherwise).

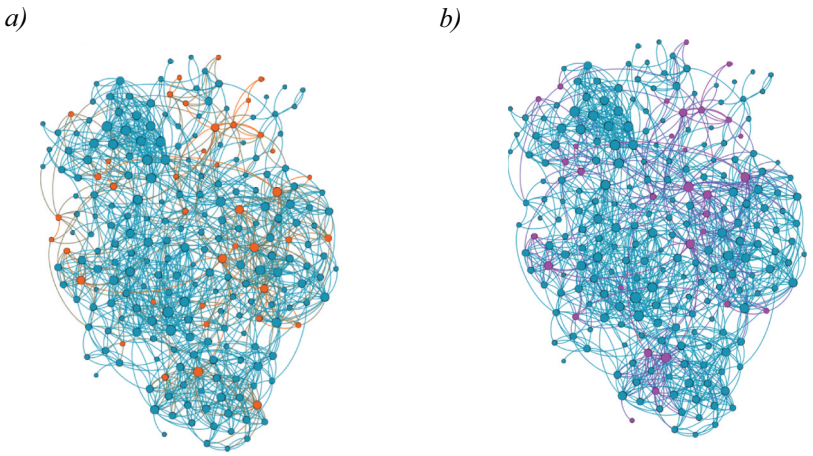

Figure 1. a) School network and IPV perpetration. b) School network and ipv victims.
Note. a) Nodes represent adolescents and ties the nominated relationships among them. Size of the node is indicative of the degree (number of social connections). Color indicates perpetration status. Orange nodes are perpetrators; blue nodes are non-perpetrators or non-partnered adolescents. For references to color, please see online version. b) Nodes represent adolescents and ties the nominated relationships among them. Size of the node is indicative of the degree (number of social connections). Color indicates victimization status. Purple nodes are perpetrators; blue nodes are non-victims or non-partnered adolescents. For references to color, please see online version.

Refusal to answer or blank IPV questions was categorized in this study as missing data. We utilized a case deletion approach (14.2%).

Physical violence in school social networks

Utilizing the school peers' social network, we created an individual-level variable for adolescents who were victims of physical violence by a school peer by utilizing bidirectional reports. The victim or the perpetrator could report the victimization in the undirected network. Each dyad was asked separately about physical violence in the past year, so adolescents reported for each nominated relationship if their friend had hit, thrown rocks or something else, pinched, pushed, kicked, dragged, shook, aggressively, or slapped them in the past year; or if they have done to them. Those with at least one victimization were coded as school peer physical violence victims (one for victims, zero otherwise).

Social network status among peers

To assess social status among school peers, we estimated the eigenvector centrality score of each adolescent. The eigenvector centrality takes a higher value for adolescents connected to highly connected peers in the school network. The eigenvector centrality is a measure of influence in the school network (Bonacich, 1972).

The proportion of social networks friends and victimization or perpetration status

Utilizing the school social network, we extracted the neighborhood (one degree of separation) of friends for each participant. Next, we estimated a variable for victimization and perpetration status utilizing the proportion of each adolescent's social network neighbors (friends) who were IPV perpetrators or victims. Here, adolescents were assigned a value ranging from zero to one (zero indicated no ties to peer victim or perpetrators, one if all connected peers had that status).

Covariates

We controlled for gender (boys or girls) and age. Age groups were divided into early adolescents (13–14 years) and late adolescents (15–17 years).

Statistical network analyses

We conducted separate analyses for victimization and perpetration. First, we explored the relationship between the proportion of school peers' IPV engagement, individual victimization at school, and social network status, over the probability of individual-level engagement in IPV, controlling for gender and age, utilizing logistic regression models.

Second, we analyzed the social network data to investigate preferential tie formation by perpetration or victimization status in the school network (victims/perpetrators having more victimized friends in the social network than expected by chance). We employed a two-degree constrained null model to statistically test preferential tie formation among adolescents experiencing IPV (perpetrators or victims separately) and school peers from similar (or different) statuses. The degree-constrained null model was created by generating 1000 random permutations of the original network and retaining structural properties. Then, we randomly allocated the corresponding attribute to each adolescent in the network (IPV perpetrator or not; IPV victim or not). We considered a valid permutation of the network when it preserved the mean degree of the observed school network. Each realization of the null model is conditioned to avoid deviance of more than 5% from the observed mean degree of perpetrators/victims in the observed network. To conclude, if preferential tie formation was present, an alternative hypothesis was tested utilizing all valid realizations of the null model and estimating a p-value under the null hypothesis of non-preferential tie formation by IPV status. We used the Fischer test for nonsymmetrical distributions. In other words, we tested if according to their violence engagement, adolescents who are perpetrators or victims would befriend similar-status peers in the school social network, with a probability higher than chance ($p > .05$).

Results

A total of 32% of partnered adolescents reported being perpetrators of IPV and 26% reported being victims. Most of those who reported IPV engagement were boys (72% of perpetrators and 93% of victims). The average degree (number of socially connected peers) for perpetrators was 11.57, while the non-perpetrators average was 14.02. Those who reported being IPV victims had an average degree of 12.10 compared to 13.84 for non-victims.

Logistic regressions for IPV victimization and perpetration among partnered adolescents

The multivariate logistic regression for IPV perpetration explained significant variance in the individual perpetration status (Nagelkerke Pseudo $R^2 = 0.36$). Odds ratios (OR) for boys and girls did not differ (OR = 0.61, [CI: 0.18, 2.02]), meaning that our model did not find gender differences for IPV perpetration statistically (Figure 2). Compared to early adolescents, late adolescents did not have increased odds of reporting IPV perpetration (OR = 0.46, [CI: 0.16, 1.31]). Victims of physical violence at school were more likely to report IPV perpetration than non-victims (OR = 1.04, CI: [1.03, 2.70]). The eigenvector centrality coefficient was non-

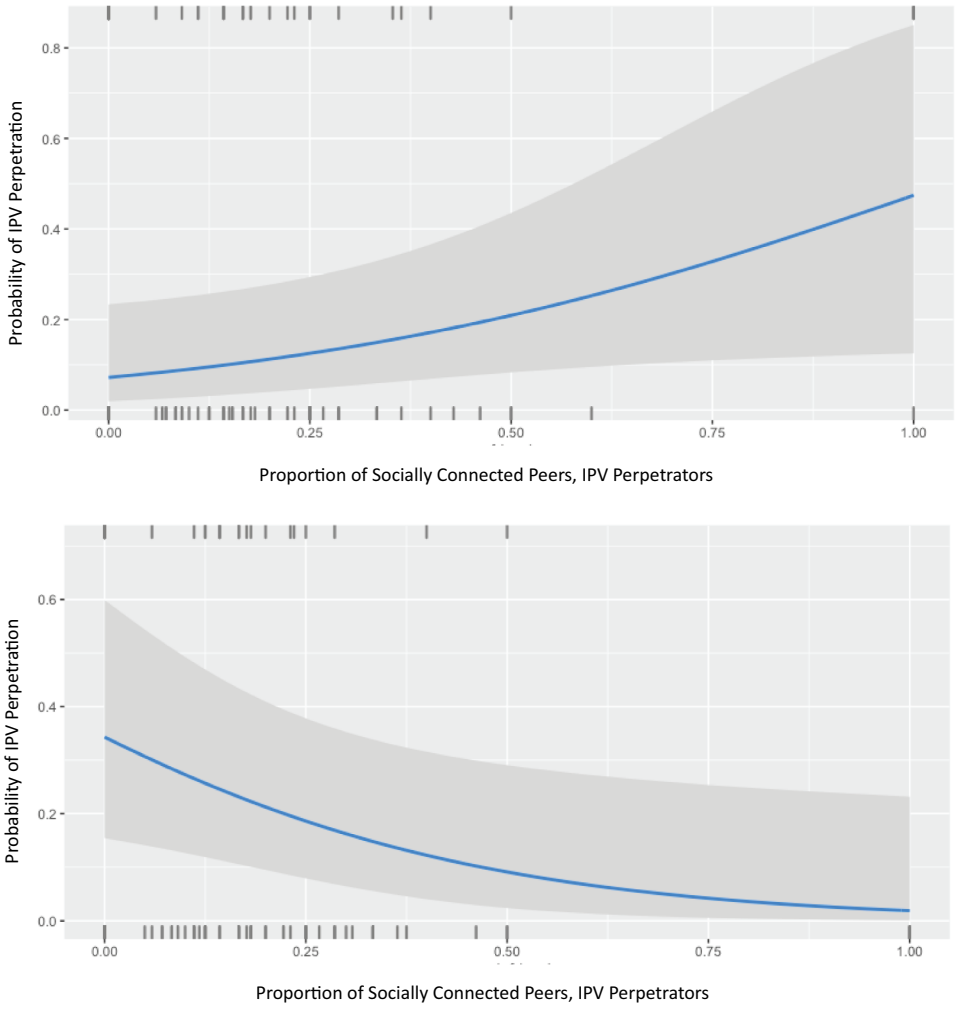

Figure 2. Probability of perpetrating IPV and proportion of friends that perpetrate IPV victims controlling for age, gender, social network position, school victimization and IPV victimization. Note: For references to color, please see online version. Probability of IPV Victimization and Proportion of Friend that are IPV Victims Controlling for Age, Gender, Social Network Position, School Victimization and Perpetrator Status. For references to color, please see online version.

significant (OR = 1.00, 95% CI: 1.00, 1.00), meaning social network position in the school network did not affect the odds of adolescents' IPV perpetration. The proportion of nominated friends who perpetrate IPV in the school peers' social network significantly increased the probability of individual perpetration (OR = 11.65, [CI:1.03,133.43]). Adolescents with more connections with perpetrators of physical IPV are 12 times more likely to report being a perpetrator of physical IPV. Finally, reporting physical violence victimization in the same romantic relationship was a statistically significant predictor of increased odds of also reporting

being a perpetrator by a factor of 18 (OR = 18.21, [CI: 5.12, 64.69]). See Table 1.

The multivariate logistic regression for IPV victimization explained significant variance in the individual perpetration status (Nagelkerke Pseudo $R^2 = 0.55$). The odds ratio of reporting being a victim was statistically significantly higher for boys compared to girls (OR = 22.82, [CI: 4.22, 123.48]). Boys were 23 times more likely to report being a physical violence victim in their partnership compared to partnered girls. The age group was not a statistically significant predictor of victimization. Compared to early adolescents, late adolescents did not have different odds of reporting IPV victimization (OR = 2.44, [CI: 0.61, 9.75]). Victimization in the school social networks did not yield a statistically significant difference in the likelihood of reporting IPV physical violence. Peer victimization did not affect the odds of being a victim (OR = 1.09, [CI: 0.33, 3.58]). The eigenvector centrality coefficient was not statistically significant (OR = 1.00, [CI: 1.00, 1.00]); adolescents' social network position in the school network did not affect the odds of adolescents' IPV victimization. The proportion of friends who were IPV victims in the school peers' social network had a statistically significant effect on IPV physical victimization, decreasing the odds of victimization (OR = 0.04; [CI: 0.00, 0.83]). Finally, reporting physical violence perpetration increased the odds of being a victim statistically significantly (OR = 17.45, [CI: 4.85, 62.76]). Perpetrators of physical violence were 17 times more likely to report victimization.

Table 1. (a) Logistic Regression Model for Individual Probability of Intimate Partner Violence Perpetration.

	OR	95% CI
Intercept	0.27	0.10 0.73
Boys	0.61*	0.18 2.02
Late Adolescent	0.46*	0.16 1.31
School Violence Victim	1.03*	0.39 2.70
Victim of IPV Violence	18.21***	5.12 64.69
Eigenvector centrality	1.00	1.00 1.00
Proportion of friends perpetrators	11.65*	1.02 133.43
Pseudo R^2 (Nagerlkelke)		0.36

*P-value <.05, **P-value <.01, ***P-value <.001.

Table 1. (b) Logistic Regression Model for Individual Probability of IPV Victimization.

	OR	95% CI
Intercept	0.01	0.00 0.08
Boys	22.82***	4.22 123.48
Late Adolescent	2.44*	0.61 9.75
School Violence Victim	1.09*	0.33 3.58
Perpetrator of IPV Violence	17.45***	4.85 62.76
Eigenvector centrality	1.00	1.00 1.00
Proportion of friends victims	0.04*	0.00 0.83
Pseudo R^2 (Nagerlkelke)		0.55

*P-value <.05, **P-value <.01, ***P-value <.001.

Additional regression analyses

We estimated two models, including an interaction term, to explore whether the effects of socially connected peers' IPV engagement would differ by gender. No significant result of additional explained variance showed boys or girls were similar in the relationship of peer-IPV engagement and their own IPV reports. Likewise, to test if the results were robust to the choice of social network centrality (eigenvector centrality), we also tested the models, including in-betweenness centrality. Again, estimations had non-significant added explanatory variance.

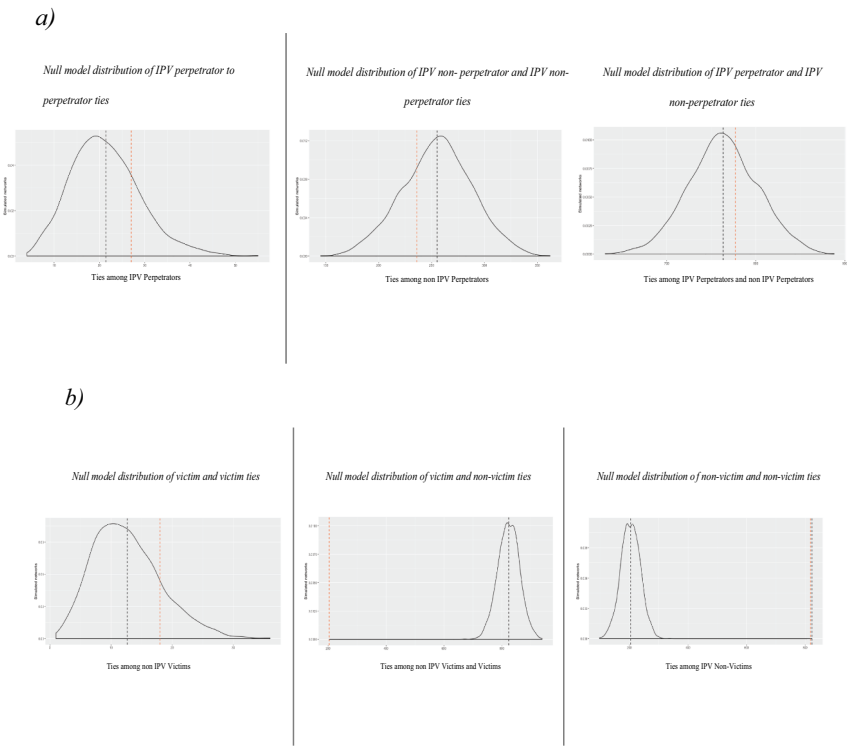

Figure 3. a) Observed ties by IPV perpetration status in the school network and mean constrained null model realizations. b) Observed Ties by IPV Victimization Status in The School Network and Mean Constrained Null Model Realizations.
Note. a) The *Y* axis represents the distribution of the mean constrained realizations of the null model. Red dashed line indicates the observed ties in the school social network. The black dashed line indicates the mean of the mean constrained model. For references to color, please see online version. (b) The Y axis represents the distribution of the mean constrained realizations of the null model. Red dashed line indicates the observed ties in the school social network. The black dashed line indicates the mean of themean constrained model. For references to color, please see online version.

Statistical social network analyses results

The school peers' social network included 242 adolescents and 1.329 ties in two connected components. The largest connected component of the social network had 241 nodes (adolescents), and the second one was a disconnected isolate (an adolescent with no reported social ties). The graph density was 0.05, and the diameter was 7. The average undirected degree for adolescents in the school network was 13.69. The assortativity coefficients by perpetration (0.09) and victimization status (0.07) were positive and small.

The degree-constrained null model statistical analysis showed that perpetrators did not have more ties among them or with non-perpetrators than expected by chance (Figure 3). Observed connections among perpetrators (p= 0.89), perpetrators, and non-perpetrators (p=0.66), and among non-perpetrators (p=0.78) were no different than expected by chance. The second mean-constrained null model results showed that victims had fewer ties with non-victims than expected by chance (p<0.01). Likewise, non-victims had more connections among them than expected by chance (p<0.01). No difference was observed for matched victim ties (p=0.90). A graphic representation of the mean-constrained models is available in Figure 3.

Discussion

This study centers on the IPV experiences of adolescents that live in rural areas in the Bolivar region of Colombia. Historically, LMIC countries are underrepresented in science (WHO, 2015), thus our focus was in an LMIC area. Our results highlight the importance of contextualizing IPV outcomes among adolescents residing LMIC contexts, especially as it relates to gendered dynamics. Our findings from a rural Colombian setting provided distinctive insights into the role of peers on physical IPV: IPV engaged adolescents are not nominating similar status peers more than expected by chance. However, the proportion of friends who are victims or perpetrators affects their individual probability of reporting IPV engagemenet. Furthermore, by including boys in our study, we found that they were highly victimized. This is not often the case in IPV adolescent studies. Gender is a factor that can inform social network and individual dynamics.

Partnered adolescents in our study reported higher rates of physical intimate partner victimization and perpetration as compared to other Latin American and LMIC studies, where both range between 5% and 30%, respectively (Devries et al., 2019; Kidman & Kohler, 2020; Peitzmeier et al., 2016; Rey-Anacona, 2013; Rodríguez-Franco, 2010); 32% of adolescents in our study reported physical perpetration of IPV (76% boys) and 26% reported being victims (93% boys). This is an important finding, given that most research centers on the experiences of urban or national samples of adolescents.

However, participants of this study reside in complex vulnerabilities in a rural village with limited services, sustained government absenteeism, poverty, and crime (Basso, 2015; CNMH Centro Nacional de Memoria Histórica Colombia, 2017; Jiménez Bautista, 2018). Research on IPV has noted that these social factors are linked to increased adolescent physical IPV and shifts in gender norms simultaneously (Cuevas et al., 2014; Gressard et al., 2015; Johnson et al., 2015).

Therefore, findings of this study also underline the importance of expanding research that examines gender influences on IPV engagement, as boys were at an increased risk for victimization. We discuss this finding in light of three angles. First, most literature on adolescent IPV centers on girls only (Kamndaya et al., 2017); therefore, studies including boys and girls in a socio-centric context are rare. Therefore, there is little evidence available that is similar to this specific high-risk context. Second, analyses reported in this study did not include other forms of violence (such as sexual violence; SV), which were only qualitatively addressed in the (IsBaru) mixed methods study; In this work, SV was a prevalent form of victimization for girls and physical violence was justified as a form of defense, including participating in defending same gender kins (friends that are also relatives) or friends (Rodriguez de la Rosa et al., Under Review). These cultural specificities complement the understanding of these adolescents' IPV norms and could partially explain why these boys would be more willing to report victimization. In the same line, a plausible explanation could be that girls would underreport any form of IPV, as the cited qualitative results also showed that they would center more on severe forms of street and family mistreatment, such as rape or murder (Rodriguez de la Rosa et al., Under Review). Third, gender disparities in IPV victimization benefiting boys are not common; and when these are found, studies often highlight an increased willingness to report as a possible explanation.

Disparities in research on IPV by gender are also common in Latin American studies, where most are centering on adolescent girls' victimization (e.g., Kamndaya et al., 2017) and boys' perpetration (e.g., Peitzmeier et al., 2016). Addressing girls as victims is also common in the Colombian context, where a recent study on IPV victimization did not consider boys (Rozo-Sánchez et al., 2019). However, our results align with the few previous efforts in the Latin American region that have included both boys and girls in young adult samples (in Mexico, Cortes-Ayala, 2015; Chile, Pinto-Cortez et al., 2021). These studies found that when IPV victimization was reported high in boys, the rates of poly-victimization also increased. In the same body of research, bidirectional physical aggression in romantic relationships was also concurrent with higher reports of IPV for boys. Given the mixed results with the broader body of adolescent physical IPV in LMIC research, we suggest that

future studies consider all genders when studying adolescent IPV, instead of skipping the questions by gender. This is especially relevant in the context of LMIC, given that in these understudied populations there is an increased need of accounting for social dynamics. Societal gender inequality and norms (e.g., Gressard et al., 2015; Nivette et al., 2019) inform adolescent's social networks (Hébert et al., 2019) which in turn have been shown to modify gender disparities in physical IPV engagement. In light of a social complexity approach, all of these webbed connections must be considered when contextualizing adolescent IPV and social networks.

Our results show that victim and perpetrator status were associated. Both logistic regression models showed that victimization and perpetration were correlated with each other, consistent with the literature on dyadic adolescent IPV (the same adolescent reporting both statuses). Research suggests that retaliation in conflicted relationship is a reliable predictor of physical IPV among adolescents (Bookwala et al., 1992; Bradley, 2015; Cortés-Ayala et al., 2015; Jennings et al., 2017; K. O'Leary & Smith Slep, 2003) with robust across genders (K. D. O'Leary et al., 2008).

Victimization by peers and status in the school social network was unrelated to the risk of IPV victimization and perpetration in the context of this study. Both social network position (Faris & Felmlee, 2011; Foshee et al., 2013) and peer victimization have been associated with adolescent IPV engagement in the literature (Hébert et al., 2019 for a review). It is important to note that our study utilized socio-centric network data (each respondent reported their information and that of their friends for physical IPV) instead of perceived peer engagement; thus, IPV was self-reported by both friends (alter and ego). This is important to consider, given that Foshee and colleagues (2013) pointed out that ego's indication of their social network victimization could inflate the effects of peer social networks over IPV engagement. Our findings could be associated with the added methodological approach to measuring peers' IPV engagement using census, socio-centric data.

The association between peers' engagement in IPV and individual IPV status differed by victimization or perpetration. Having a higher proportion of IPV perpetrators in the adolescent immediate social network increased the probability of reporting IPV perpetration, consistent with cross-cultural findings on peer effects of adolescent IPV perpetration (for a recent review see Hébert et al., 2019). Furthermore, given that the mean-constrained null model findings indicated no preferential tie formation among perpetrators, it would be reasonable to assume this effect did not result from selection or contagion mechanisms in the social network (adolescents befriending same-status peers or being influenced by them and modifying the social structure). Second, victimization results operated in the opposite direction, meaning that an adolescent were less likely to be victims of IPV at the individual level, with higher proportions of IPV victims friends. Furthermore, victims were less

likely to be socially connected to non-victims than expected by chance, suggesting an avoidance mechanism could exist in this social network. Other studies addressing adolescent social networks on other forms of violence have registered the deselection of victimized peers in the school context (Moouttapa et al., 2004; Sentse et al., 2013). Utilizing a longitudinal design, Turanovic and Young (2016) found that adolescent victims tended to be avoided by friends and eventually befriended other adolescent victims. Even when not explicitly referring to IPV, these studies' findings could partially explain our results. Finally, a decreased individual probability of victimization with a higher proportion of observed relationships with victims could result from adolescent peers' reactions to this social consequence of victimization that they observe in their friends.

Limitations and future directions

Although this study provides innovative evidence about LMIC rural adolescents' IPV violence and social networks, several limitations must be addressed. First, IPV reports were based only on the reporting partner, and we could not discern if our study participants were dating each other. Studies utilizing dyadic reports could assess mismatch or congruence among partners. Second, a cross-sectional, correlational, and observational design cannot distinguish causality, selection, homophily, or influence processes in adolescent social networks. Modeling these mechanisms requires longitudinal data. This is a common limitation of socio-centric studies, where balancing resources and social network scope can be challenging. Despite these limitations, this study adds to the scarce literature studying social networks and adolescent IPV in an understudied population of Afro-Colombian rural, LMIC, and resource-limited settings.

Our findings suggest that the role of gender needs to be explored when studying adolescent physical IPV, including boys as potential victims. Future research must also expand on the association between school peers' social network and IPV. We recommend including perpetration and victimization status to account for retaliation in the same partnership.

Interventions for adolescent IPV prevention need to be informed by gendered norms and include boys and girls. This is in contrast to assigning the role of victim to girls without exploring the distribution of victimization and perpetration. Our findings highlight the importance of leveraging peer relationships as points for intervention seeking to prevent physical IPV. Specifically, practitioners could create gender-specific spaces in which the challenges of victimization and perpetration are both addressed in groups of peers in the school context.

Conclusion

Our study responds to calls for more global health research to study adolescent IPV in understudied contexts and innovative methods (Bukowski et al., 2018; Rubin et al., 2006). Given the unique contextual factors that adolescents negotiate in high-risk communities in LMIC settings, it is critical to minimize the scarcity in social network studies among these populations (Bedoya et al., 2019; Blum et al., 2019; Browne et al., 2017). Physical IPV can have life-threatening and long-lasting effects, and its incidence in globally vulnerable contexts is higher (World Health Organization, 2017). Our findings also underscore the importance of considering boys' victimization and the influence of peer relationships in the school setting in future adolescent research.

Utilizing a non-comparative approach to adolescents' IPV, the results from our study highlight the significance of connecting social network analyses with the cultural specificities of the context being studied. In other words, assuming a social complexity approach to assessing adolescent IPV (multi-leveled analysis: individual, dyad, social network, cultural levels). Our individual (e.g., both genders), dyadic (IPV bi-directionally), social networks, and cultural levels of analyses allowed a research design that revealed differences from previous work including a gender disparity in victimization where boys were the majority of victims and perpetrators. We highlight the importance of not leaving behind the social niche beyond the dyad to address experiences of IPV among understudied adolescent populations (LMIC, rural, post-conflict villages; Bonilla-Escobar et al., 2017, Butti, 2018; Melesse et al., 2020).

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Conflicting interests

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