Violence in the Social Networks of Homeless Youths: Implications for Network-Based Prevention Programming

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Abstract
This study examined social network processes related to interpersonal violence using a sample of 360 homeless youths from Los Angeles. Results indicated that violence is pervasive among homeless youths. Consistent with previous findings, hard drug use and childhood maltreatment experiences were closely related to violence experiences. Social network analyses revealed that having a higher proportion of violence-engaged peers in a youth's network is associated with increased risk of personal violent behavior as well as having a high k-core number within the larger overall homeless youth network. The findings have important implications for the development of violence prevention programs for homeless youths, particularly the potential for network-based programs.

Keywords
homeless youths, violence, social networks, prevention

Between 1.6 and 2.8 million individuals between the ages of 13 and 21 were homeless in the United States in 2009 (Terry, Bedi, & Patel, 2010). Homeless

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youths (HY) are typically defined as unaccompanied individuals aged 12 and older (up to age 17, 21, or 25) who live in shelters, on the streets, or in other unstable living conditions without family support (National Resource Center on Domestic Violence, 2013; Rice, Winetrobe, & Rhoades, 2013). Although violence in the United States has steadily decreased during the past decade, youths in general and HY in particular remain disproportionately susceptible to violent victimization and perpetration (Office of Victims of Crime, 2013).

HY often experience more interpersonal violence—defined as the intentional use of physical force or power between two or more individuals resulting in injury, death, or psychological harm (Dahlberg & Krug, 2002)—during life on the streets, in shelters, or in unstable housing compared with their housed counterparts. A systematic literature review of studies investigating violence between HY found rates of perpetration varied from 10% to 45% (Heerde, Hemphill, & Scholes-Balog, 2014). Victimization, typically measured in terms of being physically assaulted, ranged from 27% to 56%. Despite this variation, interpersonal violence perpetration and victimization are common occurrences for HY, largely occurring at rates similar to or greater than rates seen among housed youths; approximately 33% of students report recent interpersonal violence (Eaton et al., 2012).

Violence among HY results in several consequences, the most obvious being serious physical injury, a primary health concern of HY (Ensign & Gittelsohn, 1998; Ensign & Panke, 2002; Forst, Harry, & Goddard, 1993). This is of particular concern because many HY only seek health services when peer advice and self-care no longer work (Ensign & Panke, 2002), and minor, treatable injuries often escalate into more severe health problems (Ensign & Gittelsohn, 1998; Hwang, 2001; Vanderleest, 2010). This problem is compounded by limited access to health care among HY, who most frequently use drop-in centers that provide free, instant health care and emergency rooms that often fail to provide the necessary level of care and cost much more than the services of a primary care physician (Busen & Engebretson, 2008; Deisher & Rogers, 1991; Ensign & Panke, 2002; Terry et al., 2010). Exposure to violence can lead to increased instances of nonphysical ailments such as posttraumatic stress disorder (Bender, Ferguson, Thompson, & Langenderfer, 2014; Fitzpatrick & Boldizar, 1993; Overstreet & Braun, 2000), depression (Latzman & Swisher, 2005; Mazza & Overstreet, 2000), and externalizing behaviors such as antisocial behavior, delinquency, and aggression (Overstreet, 2000).

Interpersonal violence limits HY’s ability to safely and successfully exit street life. Participation in delinquent and violent subsistence strategies increases the risk of interaction with law enforcement, arrest, and imprisonment (Chen, Thrane, Whitbeck, & Johnson, 2006; Miles & Okamoto, 2008; Schwartz, Sorensen, Ammerman, & Bard, 2008; Yoder, Bender, Thompson,
Criminal records may limit the employment and housing opportunities of HY, ultimately restricting their ability to transition off the street (Ferguson et al., 2011; Miles & Okamoto, 2008). In addition, engaging in violent behavior could result in the temporary or permanent termination of services at agencies designed to support and assist HY in meeting subsistence needs or securing housing. If services are terminated, a youth is more likely to resort to illegal or deviant strategies to meet daily survival needs (Ferguson et al., 2011), in turn increasing the risk of exposure to violence (Gaetz, 2009).

Several factors contribute to the high rates of violence among HY. Many HY experience violence during their childhood and are more likely to have been physically abused or neglected than their housed peers (Wolfe, Toro, & McCaskill, 1999). Escaping violent family environments is also a common reason for becoming homeless (Milburn, Rotheram-Borus, Rice, Mallet, & Rosenthal, 2006; Robertson & Toro, 1999; Whitbeck & Hoyt, 1999; Whitbeck, Hoyt, & Ackley, 1997; Zide & Cherry, 1992). HY may possess a propensity toward violence due to prior victimization and may reenact violent behaviors modeled on previous perpetrators of abuse (Herrenkohl, Sousa, Tajima, Herrenkohl, & Moylan, 2008).

Life on the street increases exposure to violence and demonstrates to youths that physical aggression is necessary to guarantee safety from future victimization (Baron, 2004; Baron, Kennedy, & Forde, 2001; Gaetz, 2009). When HY establish relationships with street peers, they often use violence as a favored method of resolving disputes (Baron, 2003; Tyler & Beal, 2010). HY associating with peers who engage in violence are more likely to use force to settle disputes, which is associated with increased instances of experiencing violence both as perpetrator and as victim (Baron, Forde, & Kennedy, 2007). Additionally, frequent involvement in delinquent activities such as stealing, burglary, prostitution, and dealing drugs to obtain money, food, or shelter (Baron et al., 2007; Crawford, Whitbeck, & Hoyt, 2011; Martin et al., 2009; Toro, Dworsky, & Fowler, 2007) increases the likelihood of experiencing violence (Stewart et al., 2004; Tyler, Hoyt, & Whitbeck, 2000; Whitbeck & Hoyt, 1999; Yates, MacKenzie, Pennbridge, & Cohen, 1988). Other situational variables that may have a direct effect on violent encounters are daily alcohol use, marijuana use, sleeping on the street during the previous week, and longer episodes of homelessness (Tyler, Gervais, & Davidson, 2013). HY who are transient—frequently moving from city to city—are at an increased risk of being victimized in dangerous and unfamiliar environments (Bender, Ferguson, Thompson, Komlo, & Pollio, 2010). This experience of transience exacerbates victimization risk by disrupting the formation and maintenance of a network of resources and support.
Interpersonal violence, including both perpetration and victimization, is a critical issue in HY populations, yet more comprehensive knowledge of this complex issue is necessary to develop adequate prevention strategies. Violence is frequently a social issue that most often occurs as an exchange between individuals. Baron and colleagues (2007) stated that criminology research has primarily focused on the characteristics and lifestyles of victims while ignoring the dynamic interaction between victims and perpetrators that leads to physical violence. Social network analysis can provide the tools necessary to explore violence as it relates to individual characteristics, peer interaction, and the overall structure of the social network, and understanding violence in the context of HY social networks will inform the development of innovative and effective prevention techniques.

Theoretical Framework

Homophily theory is often used to understand behaviors related to an individual’s personal social network. Homophily refers to the tendency of people to associate with similar individuals (Valente, 2010); a person’s social network tends to consist of people of similar sex, ethnicity, socioeconomic status, religion, beliefs, attitudes, and behaviors (McPherson, Smith-Lovin, & Cook, 2001). Network researchers have confirmed that patterns of homophily encompass the propensity for delinquency, including violence; therefore, delinquent and violent individuals are more likely to associate with other delinquent and violent individuals (Espelage, Green, & Wasserman, 2007).

Although homophily illuminates HY’s personal network (or egocentric network) processes, the risk amplification model (Whitbeck, Hoyt, & Yoder, 1999) explains phenomena within the larger HY population-level network processes, that is, the connections within and between well-defined groups of people. This model considers HY’s background and posits that behavioral outcomes of HY are influenced differentially by their engagement in negative socialization experiences across various levels of social organizations, including family, peers, social service agencies, and formal institutions (Milburn et al., 2009). These negative experiences may lead to increased time spent on the street, affiliation with violent peers, and participation in survival strategies (Whitbeck et al., 1999).

Antisocial outcomes explained by the risk amplification model are directly related to network structure. Prior work has shown that HY networks can manifest a core-periphery structure (Rice, Barman-Adhikari, Milburn, & Monro, 2012). What is crucial to this structure is the way in which network embeddedness is associated with high-risk behaviors. HY who occupy embedded positions within these densely interconnected subgroups tend to
have been homeless longer and be connected to more homeless peers (Rice et al., 2012). They also exhibit more antisocial behaviors, such as drug use and HIV risk-taking behaviors. Conversely, HY who are less embedded in the network generally are less likely to engage in antisocial behaviors. To our knowledge, no research has specifically examined the distribution of violence in a HY network. Based on the risk amplification model, this study explored whether a youth highly interconnected within the HY network is more likely to engage in violence than a youth loosely connected to the network.

The current study used sociometric network data collected from Los Angeles–based HY to explore how individual, street-related, and social network characteristics promote or prevent the experience of interpersonal violence. We developed the following specific research questions regarding violence in a network of HY:

**Research Question 1:** Are HY who report violence more likely to be connected to HY who also report violence?

**Research Question 2:** Is the violence perpetrated and experienced by HY associated with their structural position in the network? For example, are youths who report violence more likely than youths who do not report violence to occupy a certain position in the overall network?

**Method**

**Sample and Procedure**

A sample of 481 HY from the ages of 18 to 25 years accessing services from 2-day-service drop-in centers for HY in Hollywood and Santa Monica, California, were approached for study inclusion in October 2011 and February 2012. The research team approached all youths who entered the service agencies during the data collection period and invited them to participate in the study. The selected agencies provided weekday services to eligible HY, including basic needs, medical and mental health services, case management, and referrals and connections to other programs such as housing services. Each youth signed a voluntary consent form, and a consistent pair of research staff members was responsible for all recruitment to prevent youths from completing the survey multiple times during each data collection period per site. The overall response rate was 80.1%; 19.9% of HY approached declined to participate, 6.2% did not complete the full survey, and 2.6% completed the surveys at both sites 3 months apart. Four participants were excluded because they were younger than 18 to limit the sample to late adolescence and early adulthood.
The final sample consisted of 360 participants. The institutional review board of University of Southern California approved all procedures and waived parental consent for minors without parents or guardians.

The study consisted of two parts: a computerized self-administered survey and a social network interview. The computerized survey included an audio-assisted version for participants with low literacy and was available in English or Spanish. The computerized survey included approximately 200 questions and took an average of 1 hour to complete. The social network interview was interactive, conducted by a trained research staff member, as in University of Southern California study. Social network interviews took between 15 and 30 minutes to complete depending on each participant’s personal network size.

There are a large number of methods for collecting social network data. One of the most common field techniques is to utilize name generators: A question or a series of questions designed to elicit the naming of relevant social connections along some specified criterion (Campbell-Barrett & Karen, 1991; Marsden, 2005). Typically, name generators are free recall name generators. Respondents are given a prompt that defines some criterion, for instance, a category of persons such as “family,” “friends,” or types of social exchange relationships (e.g., “Who do you turn to for advice or support?”). Then, respondents are asked to list as many people as they can. In some cases, an upper limit is given to the number of names that can be elicited. Most solutions to network recall begin with the understanding that a single item free recall name generator will be most subject to recall bias. Brewer (2000; Brewer, Garrett, & Rinaldi, 2002) has extensively reviewed the topic and suggested and tested several viable solutions to the problem, including nonspecific prompting, reading back lists, semantic cues, multiple elicitation questions, and reinterviewing.

The current study chose to follow the solution of multiple elicitation questions. The following was read: “Think about the last month. Who have you interacted with? These can be people you interacted with in person, on the phone, or through the internet.” After youth stopped nominating social connections, an additional 15 prompts to solicit nominees were used as follows: “These might be friends; family; people you hang out with/chill with/kick it with/have conversations with; people you party with—use drugs or alcohol; boyfriend/girlfriend; people you are having sex with; baby mama/baby daddy; case worker; people from school; people from work; old friends from home; people you talk to (on the phone, by email); people from where you are staying (squatting with); people you see at this agency; other people you know from the street.” Interviewers paused between each prompt to allow youth to nominate additional social connections before proceeding to the next prompt.
At the Santa Monica site, interviewers used a large sheet of paper and colored markers to create a network map for each participant. Individuals who participants nominated to include in their social network were referred to as their social connections and were written in an arc around each participant’s name, which was written in the center of the paper. At the second site in Hollywood, the research team used an iPad application to create the network map. Research assistants later coded all data from hand-drawn network maps into the corresponding database.

After youth finished nominating persons, attributes of each social connection were then collected, including first and last names, aliases, age, gender, race/ethnicity, visible tattoos, and whether the nominee was a client of the agency. In the paper-and-pencil version, attributes were entered into a spreadsheet on a laptop by the interviewer; in the app version, responses were entered directly into the app by the interviewer.

A sociomatrix was created linking participants in the sample. A directed tie from participant i to participant j was recorded if participant i nominated participant j in his or her personal network. Although directed network information was collected, the network information is intrinsically undirected (a person who interacts with another) and was treated in this fashion for the current analysis. The initial matrix creation, however, depended upon the information provided by each youth about their personal network alters, and subsequent “matches” were made with other youth in the sample. Matches were based on name, alias, race/ethnicity, gender, approximate age, tattoos, and agency attendance. Two independent reviewers made match decisions for all alters who were between the ages of 13 to 39 years and not identified as agency staff. A series of decision rules was derived from information that was available; decisions were based on a series of algorithms that included (a) interviewer and recruiter field knowledge (through the compilation of field notes following each data collection period), (b) how well the ego knew the alter (i.e., relative, romantic partner, needle sharer, known for at least 1 year) and whether the alter was identified as a client, or (c) via an Access database and form that formulaically paired possible matches based on names, visible tattoos, and demographic characteristics. If two distinct youths were similar on all information, they are considered for the purposes of this research to be the same individuals. We use a union rule to assign adjacency, such that social relationships exist if either party involved reports the interaction took place. For example, suppose Youth A nominated Youth B during their interview. Youth B and Youth C are similar given identifying characteristics then B and C are considered to be the same youth and a tie from A to B is added to both the personal network of A and the personal network of B. For all matches, two independent reviewers who were part of the team collecting
the field data assigned matches. The independent reviewers’ decisions were compared for agreement. Discrepant matches were discussed as a group with the independent reviewers and a third reviewer who also served as an interviewer and recruiter during the data collection. Group consensus led to final match decisions. Three questionable matches were left uncoded (hence, a conservative matrix of ties). All participants received US$20 in cash or gift cards as compensation for their time.

**Dependent Variable**

The primary dependent variable was violent behavior assessed by recent participation in a physical fight. Participants were asked, “During the past 12 months, how many times were you in a physical fight?” Eight ordinal responses ranged from “zero times” to “over 12 times.” Due to skewness of the original variable, responses were dichotomized similar to the previous literature on youth violence (Duong & Bradshaw 2014; Eaton et al., 2012) to distinguish between participants who had been in no physical fights and participants who had been in at least one physical fight during the previous year. This question was adopted from the Youth Risk Behavior Survey (Centers for Disease Control and Prevention, 2014) and did not distinguish between victims and perpetrators of violence.

**Sociodemographic Variables**

Sociodemographic variables included gender, age, race and ethnicity, sexual orientation, and field site. The six participants who identified as transgender were coded based on the gender with which they currently identified (e.g., transgender male to female was coded as female), resulting in a binary category for gender. Age ranged from 18 to 26. Participants were coded for the field site where baseline data were collected, either Santa Monica or Hollywood.

**Street-Risk Variables**

Youths experiencing literal homelessness were defined as those who reported currently staying in a shelter (emergency or temporary), a stranger’s home, hotel, motel, street, beach, tent or campsite, abandoned building, car, or bus. Youths who were not experiencing literal homelessness reported staying elsewhere, such as at a relative’s home, transitional living program, group home, or sober living facility. This definition of literal homelessness is derived from the work done by Tsemberis, McHugo, Williams, Hanrahan, and Stefancic (2007).
Participants were also asked if they have ever self-identified as a “traveler.” The survey defined a traveler as someone who moves alone or with friends from city to city after a short period of time. Recent research has found that self-identification as a traveler reflects a risky subgroup within HY populations (Martino et al., 2011). To be consistent with previous research by Bender and colleagues (2010, 2014), the term transient is used to describe individuals who self-identified as travelers. Participants who indicated that they had used cocaine, methamphetamine, ecstasy, or heroin during the previous 30 days were coded as recent hard drug users, as were participants who reported recent prescription drug abuse or injection of any type of drug. Prescription drug abuse was assessed by asking how many times a participant had taken a prescription drug without a doctor’s prescription or used more of the drug or took the drug more often than prescribed. Participants who reported binge drinking (having five or more drinks of alcohol in a row within a couple of hours) on 6 or more days during the previous month were coded as high-risk alcohol users.

Participants were asked various questions to assess childhood trauma, including physical abuse (having been hit, punched, or kicked very hard at home, excluding ordinary fights between brothers and sisters), witnessing family violence (seeing a family member being hit, punched, or kicked very hard at home, excluding ordinary fights between brothers and sisters), and sexual abuse (having an adult or someone much older touch their private sexual body parts in an unwanted way). Participants who responded affirmatively to any of these questions were coded as having experienced childhood abuse.

**Social Network Variables**

K-core number was used to determine an individual’s position in the network. A K-core is a maximal group of actors, where each actor is connected to at least K other members of the group (Wasserman & Faust, 1994). Having a high K-core number therefore represents youths who occupy positions in a densely interconnected subgroup of the overall network. A variable, high K-core number, was created to distinguish actors who scored a k-core number 3 or higher, indicating that these actors were in a group of actors all of whom have a minimum of three connections to other members of that group. Additionally, the authors examined other social network structural metrics assessing centrality, including degree (the number of undirected ties associated with the actor; Wasserman & Faust, 1994), betweenness (a measure reflecting the number of shortest paths from all vertices to all others that pass through that actor; Wasserman & Faust, 1994), Bonacich power (a measure calculated based on the centrality of the actors an individual is connected to;
Scott, 2012), and eigenvector (a measure that calculates centrality for each actor based on the location of the actor in the overall network; Hanneman & Riddle, 2005). Basic correlation analyses revealed structural measures K-core and eigenvector were significantly related to the outcome variable at the $p < .001$ level with very similar correlation values. The authors made a decision to only include K-core number as the structural measure for several reasons, particularly because the eigenvector was heavily skewed and led to problems with large confidence intervals in the final multivariable statistical models. Although degree was significantly related to violence, it was left out of final models because the measure does not fully capture an actor’s embedded structural network position (only the local egocentric connectivity) and could not be included in addition to K-core number due to multicollinearity issues.

To measure the tendency of an individual to be connected with other youths who had self-reported violent behavior (homophily), a variable was created to indicate the proportion of violence-engaged peers to whom an individual was connected. Proportion variables were derived by dividing the number of connections to violence-engaged peers by the participant’s total number of connections to individuals in the surveyed network.

Statistical Analysis

To examine any statistically significant differences between the Hollywood and Santa Monica survey sites, chi-square tests were conducted for violence and social network variables. No notable significant differences were found between sites. Interaction variables for site with high k-core number, proportion of violence-engaged peers, age, gender, hard drug use, binge drinking, and child abuse were tested. No interaction variable was significantly related to each respondent’s report of violence. Prior to the regression analyses, a correlation matrix of all independent variables showed that no two variables were significantly correlated at a value greater than .4 or less than −.4, indicating little risk of multicollinearity. A correlation matrix was also used to determine the relationship of the various social network measures with the outcome variable. Univariable logistic regression was performed to test each independent variable’s direct effect on violence. A three-step hierarchical multivariable logistic regression was conducted with violent behavior as the dependent variable. The first step included individual-level variables (age, gender, sexual orientation, race and ethnicity, and field site). Street-risk variables (literal homelessness, transience, alcohol bingeing, hard drug use, and childhood abuse) were entered in the second step. The third step included social network variables (proportion of violence-engaged peers and high k-core number). All analyses were performed using SAS 9.3.
Results

Descriptive statistics for all variables are presented in Table 1. The average age of participants was 21.47 years ($SD = 1.98$), and approximately three quarters of the sample (71%) was male. Approximately one quarter of participants identified as lesbian, gay, bisexual, or queer. The sample was predominately White (36%) and Black or African American (29%), followed by mixed or other (19%), and Hispanic or Latino (15%). Thirty-seven percent of the sample was currently experiencing literal homelessness and 30% of youths self-identified as transient. The rate of hard drug use was 45%; high-risk alcohol use was reported to be 17%. Thirty-nine percent of participants reported

Table 1. Descriptive Statistics for Independent and Dependent Variables ($N = 360$).

<table>
<thead>
<tr>
<th>Variable</th>
<th>$n$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent violent behavior (fight during previous year)</td>
<td>203</td>
<td>56.70</td>
</tr>
<tr>
<td>Injured during fight in previous year</td>
<td>77</td>
<td>21.63</td>
</tr>
<tr>
<td>Individual variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>21.47</td>
<td>1.98</td>
</tr>
<tr>
<td>Male</td>
<td>256</td>
<td>71.11</td>
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<tr>
<td>Lesbian, gay, bisexual, or queer</td>
<td>90</td>
<td>24.39</td>
</tr>
<tr>
<td>White</td>
<td>132</td>
<td>36.67</td>
</tr>
<tr>
<td>Black</td>
<td>106</td>
<td>29.44</td>
</tr>
<tr>
<td>Latino</td>
<td>54</td>
<td>15.00</td>
</tr>
<tr>
<td>Mixed or Other race</td>
<td>67</td>
<td>18.61</td>
</tr>
<tr>
<td>Street-risk variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literal homelessness</td>
<td>133</td>
<td>36.94</td>
</tr>
<tr>
<td>Transience</td>
<td>108</td>
<td>30.00</td>
</tr>
<tr>
<td>Hard drug use</td>
<td>161</td>
<td>44.72</td>
</tr>
<tr>
<td>Binge drinking</td>
<td>61</td>
<td>16.94</td>
</tr>
<tr>
<td>Child abuse</td>
<td>140</td>
<td>38.89</td>
</tr>
<tr>
<td>Social network variables</td>
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<td></td>
</tr>
<tr>
<td>Personal network size</td>
<td>11.40</td>
<td>8.33</td>
</tr>
<tr>
<td>Degree</td>
<td>2.21</td>
<td>2.32</td>
</tr>
<tr>
<td>Betweenness</td>
<td>121.39</td>
<td>297.91</td>
</tr>
<tr>
<td>Eigenvector</td>
<td>0.028</td>
<td>0.068</td>
</tr>
<tr>
<td>Bonacich power</td>
<td>65.70</td>
<td>223.41</td>
</tr>
<tr>
<td>Proportion of violence-engaged peers</td>
<td>0.45</td>
<td>0.41</td>
</tr>
<tr>
<td>High k-core number</td>
<td>68</td>
<td>17.80</td>
</tr>
</tbody>
</table>

*Values represent $M$ and $SD$.  

Results

Descriptive statistics for all variables are presented in Table 1. The average age of participants was 21.47 years ($SD = 1.98$), and approximately three quarters of the sample (71%) was male. Approximately one quarter of participants identified as lesbian, gay, bisexual, or queer. The sample was predominately White (36%) and Black or African American (29%), followed by mixed or other (19%), and Hispanic or Latino (15%). Thirty-seven percent of the sample was currently experiencing literal homelessness and 30% of youths self-identified as transient. The rate of hard drug use was 45%; high-risk alcohol use was reported to be 17%. Thirty-nine percent of participants reported
having experienced child abuse. More than half of the HY in this sample had been in at least one fight during the previous year and one fifth had sustained an injury during a fight that necessitated medical attention. On average, youths named 11.40 social connections ($SD = 8.33$) during the social network interview, with the size of their personal networks ranging from 1 to 63 people. Participants’ degree ranged from 0 to 14, with an average of 2.21 ($SD = 2.32$). Participants had an average betweenness value of 121.39 ($SD = 297.910$), eigenvector centrality of 0.028 (0.068), and Bonacich Power of 65.70 ($SD = 223.41$). On average, 42% of each participant’s network consisted of violence-engaged peers, and 18% of participants had a k-core value of 3 or higher.

Table 2 displays a correlation matrix of social network measures and the outcome variable. Proportion of violence-engaged peers, degree, eigenvector, and high k-core number were all significantly related to violence at the $p < .01$ level or higher with correlation values ranging from .12 to .21. The correlation matrix reveals that the network variables were all significantly related to other network variables at the $p < .001$ level.

Results from univariable logistic regression for each independent variable and violence are displayed in Table 3. Boys and young men were 1.59 ($p < .05$, 95% confidence interval [CI] = [1.00, 2.55]) times more likely to report violent behavior compared with females. Transient youths were 1.82 ($p < .05$, 95% CI = [1.14, 2.91]) times more likely to report violent behavior than youths who did not self-identify as transient. Youths who reported hard drug use had an increased likelihood of reporting violence (OR = 3.36, $p < .001$, 95% CI = [2.15, 5.26]), as did binge drinkers (OR = 2.66, $p < .01$, 95% CI = [1.42, 4.98]). The experience of child abuse increased the odds of reporting violent behavior by 2.51 ($p < .001$, 95% CI = [1.60, 3]). As the proportion of violence-engaged peers in a youth’s network increased, the odds of a youth
reporting violent behavior increased (OR = 2.94, \( p < .001 \), 95% CI = [1.73, 5.00]); having a k-core value of 3 or higher was also associated with increased odds of violent behavior (OR = 3.20, \( p < .001 \), 95% CI = [1.78, 6.12]).

Table 4 presents results from hierarchical multivariable logistic regressions. The effects of gender and transience on youths’ violent behavior dissipated when taking into account other variables. Binge drinking increased the risk of violent behavior in the second step (OR = 2.66, \( p < .05 \), 95% CI = [1.31, 5.33]), but was not significant when social network variables were added to the model. In the final step, hard drug use (OR = 3.36, \( p < .001 \), 95% CI = [2.15, 5.26]), experience of child abuse (OR = 2.51, \( p < .01 \), 95% CI = [1.60, 3.93]), the proportion of violence-engaged peers (OR = 2.94, \( p < .001 \), 95% CI = [1.73, 5.00]), and having a k-core value of 3 or higher (OR = 2.38, \( p < .05 \), 95% CI = [1.19, 4.79]) significantly increased the odds of violent behavior. The structural models were compared using the Akaike information criterion, which indicates the minimal Kullback-Leibler distance between the model and the truth (Burnham & Anderson, 2002). The value was lowest for

<p>| Table 3. Univariable Logistic Regression of Recent Violent Behavior Among Homeless Youths. |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual variables</td>
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</tr>
<tr>
<td>Age</td>
<td>0.97</td>
<td>[0.87, 1.07]</td>
</tr>
<tr>
<td>Male</td>
<td>1.59*</td>
<td>[1.00, 2.55]</td>
</tr>
<tr>
<td>Lesbian, gay, bisexual, or queer*</td>
<td>0.72</td>
<td>[0.44, 1.15]</td>
</tr>
<tr>
<td>White</td>
<td>1.29</td>
<td>[0.83, 1.99]</td>
</tr>
<tr>
<td>Black</td>
<td>0.70</td>
<td>[0.44, 1.11]</td>
</tr>
<tr>
<td>Latino</td>
<td>1.03</td>
<td>[0.58, 1.86]</td>
</tr>
<tr>
<td>Mixed or Other race</td>
<td>1.05</td>
<td>[0.61, 1.79]</td>
</tr>
<tr>
<td>Field site</td>
<td>0.78</td>
<td>[0.51, 1.19]</td>
</tr>
<tr>
<td>Street variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literal homelessness</td>
<td>0.83</td>
<td>[0.54, 1.28]</td>
</tr>
<tr>
<td>Transience</td>
<td>1.82*</td>
<td>[1.14, 2.91]</td>
</tr>
<tr>
<td>Hard drug use</td>
<td>3.36***</td>
<td>[2.15, 5.26]</td>
</tr>
<tr>
<td>Binge drinking*</td>
<td>2.66**</td>
<td>[1.42, 4.98]</td>
</tr>
<tr>
<td>Child abuse</td>
<td>2.51**</td>
<td>[1.60, 3.93]</td>
</tr>
<tr>
<td>Social network variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of violence-engaged peers</td>
<td>2.94***</td>
<td>[1.73, 5.00]</td>
</tr>
<tr>
<td>High k-core number</td>
<td>3.30***</td>
<td>[1.78, 6.12]</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval.
* \( n = 352 \). For all other variables, \( n = 358 \).
* * * \( p < .001 \).
* * \( p < .01 \).
* * * \( p < .05 \).
Table 4. Hierarchical Multivariable Logistic Regression of Recent Violent Behavior Among Homeless Youths (N = 352).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
<td>OR</td>
</tr>
<tr>
<td>Age</td>
<td>0.95</td>
<td>[0.85, 1.06]</td>
<td>0.93</td>
</tr>
<tr>
<td>Male</td>
<td>1.45</td>
<td>[0.90, 2.35]</td>
<td>1.32</td>
</tr>
<tr>
<td>Race and ethnicity&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>0.81</td>
<td>[0.41, 1.59]</td>
<td>0.73</td>
</tr>
<tr>
<td>Black</td>
<td>0.69</td>
<td>[0.36, 1.09]</td>
<td>0.98</td>
</tr>
<tr>
<td>Mixed or Other</td>
<td>0.94</td>
<td>[0.46, 1.93]</td>
<td>0.99</td>
</tr>
<tr>
<td>LGBQ&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.76</td>
<td>[0.46, 1.27]</td>
<td>0.66</td>
</tr>
<tr>
<td>Field site&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.79</td>
<td>[0.49, 1.30]</td>
<td>1.15</td>
</tr>
<tr>
<td>Literal homelessness</td>
<td></td>
<td></td>
<td>0.97</td>
</tr>
<tr>
<td>Transience</td>
<td>1.24</td>
<td>[0.95, 1.60]</td>
<td>1.21</td>
</tr>
<tr>
<td>Hard drug use</td>
<td>2.66***</td>
<td>[1.31, 5.38]</td>
<td>2.57***</td>
</tr>
<tr>
<td>Binge drinking</td>
<td>2.16*</td>
<td></td>
<td>2.03</td>
</tr>
<tr>
<td>Child abuse</td>
<td>2.15*</td>
<td></td>
<td>1.99**</td>
</tr>
<tr>
<td>Proportion of violence-engaged peers</td>
<td></td>
<td>1.88*</td>
<td>[1.05, 3.34]</td>
</tr>
<tr>
<td>High k-core number</td>
<td>2.38*</td>
<td>[1.19, 4.79]</td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>510.24</td>
<td></td>
<td>481.90</td>
</tr>
<tr>
<td>−2 log likelihood</td>
<td>494.24</td>
<td></td>
<td>455.90</td>
</tr>
<tr>
<td>Max rescaled R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>.03</td>
<td></td>
<td>.16</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval; LGBQ = lesbian, gay, bisexual, or queer; AIC = Akaike information criterion.

<sup>a</sup>Reference group is Hispanic or Latino.

<sup>b</sup>Reference group is heterosexual.

<sup>c</sup>Reference group is Santa Monica.

<sup>*</sup>p < .05, <sup>**</sup>p < .01, <sup>***</sup>p < .001.
the final model including all variables, suggesting best fit. This indicates that social network variables are important in explaining HY’s experience of violence. The likelihood-based pseudo $R^2$ (also known as the generalized $R^2$) indicated that each step of the model accounted for more variance in the sample.

**Discussion**

The purpose of this study was to develop a more extensive understanding of violent behavior among HY using social network analysis. This work is especially important because it advances previous literature, which has primarily focused on individual characteristics related to violence. The current study found that the experience of violent behavior, perpetrated or experienced, is pervasive among HY. Consistent with previous scholarly work, hard drug use (Baron et al., 2007; Crawford et al., 2011; Martin et al., 2009; Toro et al., 2007) and experiencing child abuse (Herrenkohl et al., 2008; Wolfe et al., 1999) were related to violent behavior among HY. Although hard drug use and experiencing child maltreatment had large effects related to current violent behavior, the addition of social network variables and current study results highlight the role of social context and suggest that future violence prevention programming that focuses on active and observable risk factors related to social networks would be effective.

The findings of the study provide preliminary support to the proposed theoretical framework, showing the utility of social network analysis to understand the experience of violence among HY. This study was able to identify two social network factors related to HY experience of violence: homophily and network position. The results confirm that a youth’s risk of violence increases as the proportion of violent peers in his or her network increases. The results suggest that HY who experience violence tend to associate with other HY who experience violence, indicating that violence is a homophilous behavior in a HY population. The results also expand on the previous literature base regarding the influence of delinquent peers. Previous research on violent behavior, HY, and peer influence used less sophisticated network indicators, including relying on self-reported perceptions of peer behavior (Baron et al., 2007). The current study is unique in that by using sociometric data, all measures of violent behavior were based on youths’ self-report.

Violence was also related to structural network patterns. HY who were densely interconnected to subgroups of other HY in the network were more likely to report violent behavior. Preliminary analyses revealed that violence is significantly related to the number of network connections. It is clear that
violence is associated with whether HY are in a densely connected portion of the overall network. HY who are connected to many other individuals who are also highly connected are more likely to experience violence. These findings expand on the risk amplification model, confirming that violent behavior in HY social networks is similar to other antisocial behaviors, such as drug use and HIV risk. HY who are embedded and interconnected in the HY network are more likely to be violent, a likely outcome of a chain of negative events and life experiences as proposed by Whitbeck and colleagues (1999). The results further support the idea that behavioral outcomes of HY are influenced differentially by their engagement in negative socialization experiences across various levels during their early life, such as family, formal institutions, and services, which results in increased time spent engaged in street life. This appears to lead to affiliation with violent peers and participation in violence.

The results have important implications for violence prevention among HY. The use of social network data collection and analyses allowed for exploration and support of the network-based assumptions inherent in network-based violence prevention programs. Chicago’s Cure Violence program is an example of an effective violence prevention strategy that considers violence in the context of social networks (Bonner, McLean, & Worden, 2008; Deeney, 2012; National Gang Center, 2013). Created to reduce gang violence, the program is guided by social learning theory, which posits that a learned behavior such as violence is modeled and reinforced by peers (Bandura, 1977). According to this model, changing the behavior of the most high-risk and violent individuals in a social network will reduce violence throughout the network.

The underlying framework of Cure Violence operates on network-based assumptions of how violence disperses through a community. The program assumes that individual violent behavior is influenced by the violent behaviors of peers and that changing the behavior of key individuals will affect the behavior of the larger network. Results from the current study suggest that these assumptions are valid in HY networks and that these network patterns are true when accounting for other well-established risk factors. Future development of a network-based violence prevention program for HY similar to Cure Violence should be considered. An intervention designed to change the behavior of a small group of key youths, particularly those embedded in areas of a network where they are connected to many other violent peers, could affect the overall behavior of the community. A HY violence prevention program could employ workers to identify individuals who have a significant influence on their peers and apply intervention strategies to promote positive and nonviolent behavior.
There are several potential limitations that should be considered when interpreting the findings of this study. First, the survey relied on youths’ self-report on personally sensitive items. It is possible that youths, even after being informed of confidentiality, may not report truthfully regarding items assessing personally sensitive information and/or illegal activity. While our name generator uses the suggested method of multiple elicitations, any free recall name generator is subject to recall bias as youth may forget important social connections at the time of the interview. This can lead to missing network connections. Multiple elicitation, however, is the most viable solution to this problem, given that there is no roster or other registry in existence from which to elicit nominations for HY. The cross-sectional design limited assumptions of causal order. This is especially important when considering homophily. Homophily results from one of two processes: social influence or social selection (Kandel, 1978; McPherson et al., 2001). Social influence, based on Bandura’s (1977) social learning theory, posits that individual behaviors are modeled and learned through network interactions. According to social selection, individuals choose to interact with others who already engage in similar behaviors. Without longitudinal data, there is no way to distinguish between peer influence and peer selection. Longitudinal social network research is particularly difficult with an unbounded population, but would be necessary to determine the direction in which violence spreads through a network. Previous research on youth delinquency has suggested that selection may be the primary action, whereas peer influence reinforces preexisting tendencies (Baron & Tindall, 1993). Additionally, the measure of violent behavior did not distinguish between perpetration and victimization. The measure was also limited in that it only assessed a limited domain of interpersonal violence, physical fighting. Future studies would benefit from a more specific measure of interpersonal violence that measured severity of violent behavior and different types of violent behavior (i.e., assault with a weapon, robbery), and distinguishing between perpetration and victimization. Although more recent research has shown that violence is often a bidirectional phenomenon, perpetrators of violence are likely to be victims and vice versa. In one sample of adolescents, longitudinal data indicated that exposure to violence increased aggression and that individuals who engaged in violence had an increased risk of aggression (Farrell, Mehari, Kramer-Kuhn, & Goncy, 2014). In the current study, the measure likely captured bidirectional violence, that is, both perpetration and victimization.

Despite potential limitations, the current study represents one of the first efforts to explore social network concepts regarding violence and HY. Future research can build on the current findings by exploring the context of violence among HY using qualitative research methods. In addition, future research
that uses advanced network modeling known as the exponential random graph model (in which the global structure of a network can be accounted for and assessed; Hunter, Handcock, Butts, Goodreau, & Morris, 2008) would be useful to examine in detail how other structural features of the network (such as cliques, triad transitivity, and reciprocity) are associated with violence.

**Conclusion**

In conclusion, the current study has important implications for the development of violence prevention programs for HY. Peer-based network interventions are particularly important in high-risk youth populations considering their disconnection and lack of trust regarding formal systems and working with adults. The results support the theory that violence among HY is a network phenomenon. Adaptation and development of novel-network-based interventions can reduce many of the adverse effects of HY violence and in turn help youth safely and successfully exit street life.

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**Eric Rice,** PhD, is an assistant professor at the USC School of Social Work. He is a community-based researcher who works primarily on problems faced by homeless youth. He is an expert in social network theory, social network analysis, and the application of social network methods to HIV prevention research. His current projects focus on the social networks of homeless youth and how they impact HIV risk-taking behaviors. He is the primary investigator on a NIMH-funded longitudinal research project examining the social networks and risk behavior of homeless youth in Los Angeles. The project focuses on how homeless youth utilize the Internet, social-networking websites, and cell phone technologies to access home-based peers and family, and how such relationships promote healthy behaviors.

**Harmony Rhoades** holds a PhD in sociology and MS in epidemiology from the UCLA. She is currently a research assistant professor at the USC School of Social
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