An event- and network-level analysis of college students' maximum drinking day☆

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HIGHLIGHTS

- 55% of participants' friends were present on their maximum drinking day.
- 81% of the peers who were present self-reported drinking in the past month.
- The proportion of peers who were drinkers was associated with greater drinking.
- Being present at peer heaviest drinking occasions is associated with greater drinking.

ARTICLE INFO

ABSTRACT

Background: Heavy episodic drinking is common among college students and remains a serious public health issue. Previous event-level research among college students has examined behaviors and individual-level characteristics that drive consumption and related consequences but often ignores the social network of people with whom these heavy drinking episodes occur. The main aim of the current study was to investigate the network of social connections between drinkers on their heaviest drinking occasions.
Methods: Sociocentric network methods were used to collect information from individuals in the first-year class (N = 1342) at one university. Past-month drinkers (N = 972) reported on the characteristics of their heaviest drinking occasion in the past month and indicated who else among their network connections was present during this occasion.
Results: Average max drinking day indegree, or the total number of times a participant was nominated as being present on another students' heaviest drinking occasion, was 2.50 (SD = 2.05). Network autocorrelation models indicated that max drinking day indegree (e.g., popularity on heaviest drinking occassions) and peers' number of drinks on their own maximum drinking occasions were significantly associated with participant maximum number of drinks, after controlling for demographic variables, pregaming, and global network indegree (e.g., popularity in the entire first-year class).
Conclusion: Being present at other peers' heaviest drinking occasions is associated with greater drinking quantities on one's own heaviest drinking occasion. These findings suggest the potential for interventions that target peer influences within close social networks of drinkers.

1. Introduction

College student drinking tends to be highly variable over the course of the school year, as a function of day of the week, academic requirements, holidays, and school-based events (Del Boca, Darkes, Greenbaum, & Goldman, 2004; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005; Hoeppner et al., 2012). Although there are known periods of risk that promote heavy drinking, such as Spring Break, sporting events, and 21st birthday celebrations (Brister, Sher, & Fromme, 2011; Glassman, Werch, Jobli, & Bian, 2007; Neighbors et al.,

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2011), college students also frequently drink heavily outside of these specific events (Johnston, O', Bachman, & Schulenberg, 2013). Identifying influences associated with maximum drinking occasions is important. Volume of alcohol consumption is positively associated with various negative consequences such as hangovers, harming oneself or others, and blacking out (Hingson, Heeren, Winter, & Wechsler, 2005; Hingson, Zha, & Weitzman, 2009; White & Hingson, 2014). Similarly, at the event-level, peak alcohol consumption is associated with greater risk, relative to average alcohol consumption (Neal & Carey, 2007; Neal & Fromme, 2007).

Previous event-level research among college students has examined behaviors and individual-level characteristics that drive consumption and related consequences, but has often ignored the characteristics of individuals with whom these heavy drinking episodes occur (Grant, LaBrie, Hummer, & Lac, 2012; Mallett et al., 2017; Merrill, Vermont, Bachrach, & Read, 2013; Montes, LaBrie, & Froidevaux, 2016). For example, among males, drinking with other males is related to greater consumption compared to drinking with a mixed-sex group (Miller, Borsari, Fernandez, Yurasek, & Hustad, 2016). However, the paucity of literature in this area does not consider the characteristics of the social network members with whom the individual is drinking. For example, some network members with specific characteristics, such as those who are more popular, may exert a stronger influence on others' drinking behavior than other network members. Identifying the characteristics of network members who are present at risky drinking events may provide information about the optimal ways to intervene to prevent negative outcomes.

Broadly speaking, social networks are defined as the connections among units or entities (Wasserman & Faust, 1994). Social network theory posits that the pattern of relationships an individual has to other members of the network has implications for behavioral influence. In sociocentric network research, every member of a network is observed, and social connections (also referred to as ties) between individuals in the network are recorded; this allows for the examination of important associations, and ultimately influence, in the network. Using these social network connections, researchers can better understand how behavior is transmitted across a network (Valente, 2010).

Social network theory and research extends traditional studies on individual drinking by: 1) obtaining actual self-report data from an individual's peers instead of relying on participant perceptions of peers' drinking (i.e., social norms approach), 2) using network ties to investigate the importance of the quality of relationships (e.g., best friend versus peer), 3) considering the connections between other peers in one's own network (i.e., friends of friends), and 4) allowing for the examination of individual-level characteristics (i.e., network position) that are based on connections to other network members. Characteristics derived from the nominations to and from members in a network (by asking for example, "who are your friends?") include indegree, outdegree, betweenness centrality, mutuality, and ego density.

Indegree, a measure of popularity, is defined as the number of times an individual is nominated by other network members, while outdegree, a measure of expansiveness, is defined as the number of network members the individual nominates. Betweenness centrality, a measure of bridging, is defined as the number of times an individual falls on the shortest path between two other people in the network. Individuals who are high in betweenness centrality connect others who are not connected; these individuals are considered important because by linking parts of a network they may transmit or prevent transmission of information or influence. Mutuality is the extent to which a person's ties are reciprocated by others so could be considered a measure of relationship stability, in that both members agree that they share the relationship. Lastly, ego density, defined as the extent to which a person's ties are connected to each other as well, is considered a measure of personal network cohesion. Most of these network measures have been investigated as to their relationship with specific behaviors, for example among adolescents the measures of centrality (i.e., degree centrality

and betweenness centrality) are positively related to alcohol use, with the most consistent relationship found with indegree (Ennett et al., 2006; Fujimoto & Valente, 2012; Moody, Brynildsen, Osgood, Feinberg, & Gest, 2011; Mundt, 2011; Pearson et al., 2006). Despite the potential for using social network methods to understand behaviors that have a strong peer influence component such as alcohol use, very few sociocentric network studies have been conducted with college students (see Rinker, Krieger, & Neighbors, 2016 for a review).

The main aim of the current study was to utilize social network theory and methods to investigate the social connections between drinkers on their heaviest drinking occasion. We sought to: 1) describe the network of members who are present in the drinking occasions of their peers, and 2) examine the relationship between participants' position in the network of heavy drinking day ties and the total number of drinks consumed on their maximum drinking day. Describing the network ties that link together high-risk drinking occasions can help inform interventions that account for the social influence of peers.

2. Method

2.1. Participants

Incoming first-year students at a private university in the northeast were invited to participate in a longitudinal social network study. Eligibility criteria for the study were: residing on-campus, and full-time enrollment status. All first-year students are required to live on campus at the university. A small number of returning undergraduates who were participating in a program for nontraditional age students (ages 23 to 43) and who did not live in first-year residences were excluded. Using these criteria, 1660 students were eligible and 33 were ineligible. Of the 1660, 1342 participants completed the baseline survey (80.8% completion rate). Of the 1342, 972 participants (55.0% female based on sex assigned at birth) consumed at least one drink of alcohol in the past month and were included in the present analysis. Gender identity was as follows: 44.8% male, 54.3% female, 0.9% different gender identity. This subsample of participants was on average 18.7 years old (SD = 0.53). Hispanic ethnicity was reported by 15.0%, and self-reported racial identification was as follows: 62.0% White, 20.0% Asian, 10.1% Multi-racial, 6.1% Black, 1.8% other or did not answer. 5.8% lived in a substance-free dorm.

2.2. Procedure

During the summer prior to the beginning of the students' first-year at college, mailer postcards were sent to the home addresses of incoming students explaining the nature of the study and emails were sent to the students' university e-mail address, which included a web link to participate in the study. In the invitation email, students were informed that in the survey they would be asked to review a list of all of the names of first-year students to designate who in the first year class was important to them (i.e., a member of their social network). Students who did not want to have their names on the list were able to "opt out" of the study (n = 42). All other student names were shown on the list, regardless of their participation status. This "opt out" method is a recommended strategy for protecting nonparticipants in sociocentric network studies (Borgatti & Molina, 2005) and has been used in other work with underage participants (Laurens et al., 2017) and college students (Barnett et al., 2014). Students under the age of 18 provided their assent as well as contact information (postal mail or e-mail) for a guardian who could provide consent.

Approximately six weeks into the fall semester, participants were emailed a web link containing a battery of assessments about their social networks and health behaviors, including alcohol use. We expected that at about six weeks, peer friendships would be relatively established. Specifically, participants were asked whether they consumed any alcohol in the past month; those who reported any past-