



Identification of trajectories of social network composition change and the relationship to alcohol consumption and norms

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ABSTRACT

Background: College drinking is embedded in a social context, drawing attention to the effects of social network composition on consumption. The presence of heavy drinking friends in social networks predicts later alcohol misuse, but little is known about how the composition of one's social network composition changes over time. This study identified changes in social network composition in a sample of at-risk students and examined the relationship among network trajectories, alcohol consumption, and descriptive norms.

Methods: Participants were 503 students (64% male) mandated to participate in an alcohol prevention intervention for residence hall alcohol policy violations. At baseline, students provided self-report data about alcohol consumption, perceived peer drinking norms, and peer alcohol involvement. Parallel assessments were completed at 6- and 12-months post-baseline.

Results: Growth-mixture models identified four groups of individuals with similar levels of heavy drinkers in their social networks. The majority of students had stable or decreasing numbers of heavy drinkers in their networks across the study, whereas two groups reported relatively stable densities of heavy drinkers from baseline to 6-months and increasing densities from 6- to 12-months. At baseline, the four groups were generally equivalent on consumption and normative perceptions. At 6- and 12-months, however, the groups differed significantly on consumption and norms.

Conclusions: These results suggest that changes in the number of heavy drinkers in college students' social networks may have significant implications for at-risk drinking.

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1. Introduction

Excessive rates of college alcohol consumption continue to pose a public health challenge. Despite the development of efficacious interventions (Carey et al., 2007), the rate of students who reported at least one heavy drinking episode (i.e., consuming five or more drinks on an occasion) in past month rose from 41.7% in 1999 to 44.7% in 2005 (Hingson et al., 2009). Heavy drinking episodes are related to academic, relational, and legal problems (Park, 2004), as well as injury, driving under the influence, and unprotected sex (Hingson et al., 2009).

The persistence of heavy drinking suggests the need to understand better the social context of college drinking. The peer network is a key factor in the initiation, escalation, and de-escalation of alcohol use among adolescents (Musher-Eizenman

et al., 2003). The college environment, characterized by prevalent alcohol use and permissive attitudes about drinking acceptability, is unlike any environment emerging adults have previously encountered (Schulenberg et al., 1994). Adolescents entering college may be particularly vulnerable to peer influence because of their need to make new friendships in a context with reduced conventional social controls (Arnett, 2005). College students may increase drinking to facilitate peer interactions (White and Jackson, 2004).

Peer drinking is a strong predictor of how young adults consume alcohol. A prospective study of young adults (19–25 years old) found that peer alcohol use predicted binge drinking but not total drinks per week (Andrews et al., 2002). Among young adults who met problem drinking criteria, a larger social network of heavy drinkers was associated with higher levels of binge drinking (Delucchi et al., 2008). Level of close friends' drinking predicts increased drinking in the first semester of college (Talbot et al., 2012). Peer alcohol use is an important contributor to young adult heavy drinking.

Research from adult and treatment samples indicates that it is not merely the presence of peer drinking in a social network

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(i.e., exposure to peers drinking at a party) that influences consumption. Alcohol-specific social support (i.e., heavy drinking close friends) may have a more direct impact (Longabaugh et al., 2010). Friends who are supportive of drinking can encourage alcohol misuse (Beattie and Longabaugh, 1997). Findings from the Combining Medications and Behavioral Interventions (COMBINE; Anton et al., 2006) trial provide further evidence of the specific impact of having heavy drinkers in-network. Alcohol-specific support, measured by network drinking and level of opposition to patient drinking, was predictive of percent days abstinent (PDA; Longabaugh et al., 2010). Though the percentage of heavy drinkers in network did not predict the PDA latent growth trajectory, the number of daily and frequent drinkers in-network did (Longabaugh et al., 2010). The number of frequent drinkers was negatively related to PDA for within treatment and post-treatment outcomes (Longabaugh et al., 2010). Therefore, whereas the proportion of heavy drinkers was unrelated to outcome, the total number of heavy drinkers in-network may have a unique impact on personal alcohol consumption.

Personal consumption is also related network composition. In a cross-sectional study of 471 couples prior to marriage, heavy drinkers' social networks had a different composition than the networks of regular and lighter drinkers (Leonard et al., 2000). Heavy drinkers' networks contained more "drinking buddies," defined as a person who "you got together with on a regular basis to do activities centered around drinking" (Leonard et al., 2000). These "drinking buddies" are comparable to the heavy drinkers identified in COMBINE and further highlight the importance of the number of heavy drinkers in-network. In contrast, Reifman et al. (2006) used percentage of heavy drinkers in-network to recursively predict alcohol misuse. Higher percentages of "drinking buddies" in-network were associated with college students' drinking longitudinally. The authors note, however, that other literature (e.g., Leonard and Mudar, 2003) has demonstrated that key individuals in a network, rather than the entire network, are most influential. Overall, most research has identified the number of heavy/frequent drinkers as the most important predictor of an individual's alcohol use trajectory. The proportion of heavy drinkers is a useful predictor specifically of autoregressive associations between network composition and alcohol misuse but was unrelated to COMBINE treatment outcome (Reifman et al., 2006; Longabaugh et al., 2010). Heavy drinkers in-network may be uniquely predictive of personal alcohol consumption.

Despite the clear association between network composition and alcohol consumption, little is known about the evolution of social networks over time. One study examined whether changes in college students' drinking were the result of fluctuations in current members' drinking or of participants dropping and adding network members with different drinking levels (Reifman et al., 2006). Changes in network drinking resulted from adding new members and dropping others (Reifman et al., 2006). Thus, it is important to consider *how many* heavy drinkers are in-network and to consider *whether* members are being incorporated over time.

This study sought to determine whether different trajectories could be identified that represent how college students include heavy drinkers in their social networks. Trajectory analysis using social network data has not been used to explain the longitudinal impact of peers on alcohol consumption. Given the significant temporal variability in drinking over the academic year (Del Boca et al., 2004), it is important to consider how students' network composition and alcohol consumption concurrently change. First, we sought to explore patterns in the composition of college students' social networks over one year. Specifically, we examined whether different trajectories could be identified by how many heavy drinkers were included in networks.

If different trajectories could be identified, we sought to determine whether they were associated with different levels of alcohol consumption and drinking norms. Descriptive drinking norms are a key factor in understanding how social context influences personal alcohol consumption. Norms are defined as "self-instructions to do what is perceived to be correct by members of a culture" (Solomon and Harford, 1984, p. 460); descriptive norms are perceptions of what others do, including estimates of others' alcohol consumption. College students often overestimate drinking norms (Borsari and Carey, 2003); this overestimation predicts current and future drinking (Carey et al., 2006; Neighbors et al., 2007). Descriptive norms, therefore, are important to consider when examining network composition and network effects. Students who incorporate more heavy drinkers are likely to concurrently increase their descriptive norms. Research has not investigated the relationship between network composition and drinking norms. Second, we sought to determine whether trajectory classes had different levels of alcohol consumption and norms over one year.

To accomplish these goals, we measured alcohol consumption, norms, and social network composition during the baseline, 6-month (6M), and 12-month (12M) follow-up appointments of a randomized controlled trial of alcohol prevention interventions for mandated college student drinkers (Carey et al., 2011). After identifying trajectory groups, we compared groups on alcohol consumption and descriptive norms at baseline, 6M, and 12M.

2. Method

2.1. Participants

Participants were students enrolled in a private university who had violated campus alcohol policy and were required to complete an alcohol intervention program. Participants were eligible if the violation was a first, on-campus disciplinary, alcohol-related violation. A total of 677 students consented and were randomized into one of four conditions: two computer-based interventions, one face-to-face motivational feedback-based intervention, and one wait-list control condition. The Consolidated Standards of Reporting Trials (CONSORT) diagram is available in the published main outcomes report (Carey et al., 2011). Of the 677 participants who completed baseline, 96% completed 1-month assessments, 58% at 6-months, and 68% at 12-months. Demographics and condition were unrelated to attrition. To control for any differential effects an intervention delay may have had, participants in the delay condition ($n = 174$) were excluded from these analyses. A total of 503 participants were included in this study. The current sample was primarily white (85%), male (64%), and freshman (64%).

2.2. Measures

2.2.1. Demographics. Participants provided information about age, gender, year in college, and racial and ethnic background.

2.2.2. Brief important people interview. (BIPI; Adapted from Zywiak et al., 2002). The BIPI is a shortened form of the Important People and Activities Interview (Clifford and Longabaugh, 1991), which was administered in Project MATCH (Project Match Research Group, 1997) and the COMBINE trial (Anton et al., 2006), and measured social support for drinking. The BIPI retained the components of the original interview that best predicted treatment response in COMBINE. Administration followed the BIPI manual (Zywiak and Longabaugh, 2002), with slight adaptations to tailor the assessment to college drinkers. As in COMBINE, participants identified up to 10 network members. At baseline, 6M, and 12M, participants listed up to 10 important friends, defined in the current study as "friends on-campus that have been important to you and with whom you

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