

Social Network Characteristics and Heavy Episodic Drinking Among Women at Risk for HIV/Sexually Transmitted Infections*

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ABSTRACT. Objective: Social networks can either negatively or positively influence a variety of behaviors, including alcohol use. This study examined social network characteristics that are risk factors for and protective factors against heavy episodic drinking among a sample of women at risk for HIV/sexually transmitted infections. **Method:** This was a cross-sectional study using baseline data from 567 impoverished women participating in an HIV prevention study in Baltimore, MD. Data were collected through face-to-face interviews at a community-based research clinic. Heavy episodic drinking was defined as six or more drinks per drinking episode on at least a weekly basis. We examined network characteristics, including structure and function and their association with heavy episodic drinking. Multivariate logistic regression was used, adjusting for individual-level factors, such as drug use, demographics, and depression. **Results:** Approximately 21% of the sample engaged

in heavy episodic drinking at least weekly. Controlling for individual-level factors, women who engaged in heavy episodic drinking had fewer social network members (a) who were in drug treatment, adjusted odds ratio (AOR) = 0.65, 95% CI [0.49, 0.88]; (b) who were employed, AOR = 0.89, 95% CI [0.79, 0.99]; and (c) with whom the participant socialized, AOR = 0.74, 95% CI [0.63, 0.96]. Women who engaged in heavy episodic drinking had a significantly higher number of social network members with whom they drank alcohol, AOR = 1.71, 95% CI [1.43, 2.03]. **Conclusions:** Social network characteristics are both protective and risk factors for heavy episodic drinking among women. Interpersonal interventions, such as peer education, may be a useful strategy to decrease heavy episodic drinking and its subsequent outcomes among women. (*J. Stud. Alcohol Drugs*, 72, 1041–1047, 2011)

HHEAVY EPISODIC DRINKING (HED) frequency in the United States has increased over the past decade and is increasingly a problem for women (Blazer and Wu, 2009; Mokdad et al., 2007; Naimi et al., 2003). Although adult men in the United States have consistently reported greater HED rates than adult women (Naimi et al., 2003; Tsai et al., 2010), data show that the gender gap has narrowed in the past 30 years (Keyes et al., 2008; Wallace et al., 2002).

Multiple individual-level demographic and psychosocial factors are linked to a higher risk of HED among women. The average number of HED occasions is greatest among women who are unemployed, without a college education, or with a family income less than \$25,000, suggesting that socioeconomic disadvantage plays a role in HED (Centers for Disease Control and Prevention, 2008; Tsai et al., 2007a,

2007b; Wenzel et al., 2009). Although HED prevalence is greatest among non-Hispanic White women, non-Whites and Hispanics are more likely to have a higher average number of HED episodes per month (Tsai et al., 2007a, 2007b). Depression has been found to be a risk factor and consequence of HED among women (Blazer and Wu, 2009; Wenzel et al., 2009).

Women who report HED often engage in other risky behaviors. In a study of 2,672 women ages 18–44 with low incomes, HED was significantly more frequent among women who reported ever using two or more illicit drugs (Sharpe and Velasquez, 2008). HED is also associated with sexually transmitted infections (STIs) and risky sexual practices, such as multiple sex partners (Hutton et al., 2008; Raj et al., 2009).

Despite insight into the individual-level factors linked to HED, little is known about the role that social networks play in encouraging or preventing this behavior. Social networks refer to the web of social ties that exist among individuals. Examination of social networks has focused on structural or functional characteristics of the networks (House et al., 1985). Structural characteristics focus on who is in the network and include the number of network members, stability (i.e., turnover rate of members), and density (i.e., interconnectedness among network members). Functional character-

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istics refer to the roles that network members play, such as sex partners or drug partners, as well as providing tangible (e.g., money, housing) or intangible (i.e., emotional) support. Social network members have been shown to influence health behaviors such as HIV risk practices (Latkin et al., 2010), tobacco and alcohol use among youth (Wenzel et al., 2010), and entry into treatment for substance use disorders (Davey et al., 2007).

One mechanism by which social networks influence behavior is by establishing norms about what actions are appropriate. In addition, network members provide both tangible (e.g., alcohol) and intangible resources (i.e., emotional or financial support; Berkman and Glass, 2000), which may increase or protect against HED among women. Research has shown that not all network members have an equal influence on health behaviors, including alcohol use. Among college students, drinking partners' level of alcohol use influences college students' drinking behaviors. Other network members had little influence on this behavior (Reifman et al., 2006). These findings highlight the need to examine different types of network members and their role on behavior.

Only recently have researchers started examining HED among adults from a social network perspective. Some social network research has focused on how the alcohol drinkers in one's network influence individual drinking behaviors. Among both men and women, larger social networks of heavy drinkers are associated with a greater frequency of individual HED (Homish and Leonard, 2008; Manuel et al., 2007). Similarly, Wenzel et al. (2009) found that the odds of HED were greater for homeless women who had a larger proportion of heavy drinkers in their social network. Having alcohol drinkers in one's social network may normalize this risky behavior.

In addition to drinkers affecting each other's drinking behaviors, other social network members may affect this behavior and possibly have protective characteristics (McCrary, 2004). Yet, little attention has been given to the protective influence of social network members regarding HED among women. The goal of the present study was to assess the relationships between social networks and HED among a sample of women at risk for HIV/STIs and living in an urban neighborhood. Specifically, we sought to determine which social network characteristics are protective factors and which would be risk factors for HED. The findings from this study may be used to develop interventions to reduce HED among women.

Method

Study protocols were reviewed and approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board before commencement of the study.

Procedures and study participants

This study was conducted in Baltimore, Maryland. Participants in this study were enrolled in the CHAT program, an HIV prevention intervention for women and their social network members. Women (i.e., index participants) were recruited through street outreach and posted advertisements. Inclusion criteria for women included age 18–55 years; did not inject drugs in the past 6 months; self-reported sex with at least one male partner in the past 6 months; and sexual risk behavior in the past 6 months, which included any of the following: (a) more than two sex partners, (b) recent STI diagnosis, and (c) having a high-risk sex partner (i.e., one who injected heroin or cocaine, smoked crack, was HIV seropositive, or was a man who has sex with men).

During the baseline visit, participants completed a social network inventory. From this inventory, network members who were eligible to be referred to the study by the index participant were identified. Eligibility for social network members included being an injector of heroin or cocaine, being a sex partner of the index participant, or being people the index participant felt comfortable talking to about HIV or STIs. Index participants were allowed to refer up to five network members to the study.

The present study included both index (74%) and network (26%) participants. Both index and network participants completed the same baseline visit, including the network inventory. However, network members did not refer other individuals to the study. Data were collected during a baseline visit at a community-based research center. After providing written consent, participants took part in an interview. Part of the interview was administered by a trained interviewer and part was administered through Audio-Computer-Assisted Self-Interview. Participants were compensated \$35 for completion of the interview. Baseline data were collected from September 2005 through July 2007.

Although male network members may have been referred to the parent intervention study, the present study focuses solely on women. The baseline data set included 746 individuals who completed a baseline visit. Of this sample, 76% ($n = 567$) were retained for this analysis because they were women.

Measures

Heavy episodic drinking. HED was assessed using an item from the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993). The AUDIT has been shown to be appropriate for identifying heavy episodic drinkers (Aalto et al., 2009). Participants were asked, "How often do you have six or more drinks on one occasion?" Response options included *never, less than monthly, weekly, and daily*

or almost daily. Individuals who reported having six or more drinks on one occasion at least once a week or more frequently were classified as heavy episodic drinkers.

Social network characteristics. Social network data were collected through a network inventory. Participants were asked the first name and initial of the last name for individuals who played different roles (i.e., friends, sex partners) and functions, such as provided social support. The maximum number of individuals that could be listed was 20. After naming individuals, follow-up questions about each person listed—including demographics, drug use, and relationship type—were asked. Continuous variables were created based on the total number of social network members who fell into a specific category. The categories are not mutually exclusive; an individual could hold multiple roles and play several functions. The following specific items were used in the current study:

- Total network size: Total number of individuals in the social network
- Family members: Number of family members in the social network
- Friends: Number of friends in the social network
- Sex partners: Number of people individual had sex with in the past 90 days
- Heroin/cocaine users: Number of social network members who have used heroin or cocaine in the past 6 months
- Employed full time: Number of social network members who had a full-time job
- Emotional support: Number of social network members who individual talked to about personal or private topics in the past 6 months
- Financial support: Number of social network members who lent or gave money to the individual in the past 6 months
- Conflict: Number of social network members who individual is not on good terms with or often fights or argues with
- Socialized with: Number of social network members who individual got together with to socialize with or have fun with doing things, such as shopping, going to the movies or clubs, or just hanging out
- Drank alcohol with: Number of social network members the individuals drank alcohol with in the past 6 months

We also asked participants to rate their level of trust of each network member on a scale from 1 to 10. Finally, participants were asked the amount of time that they have known each network member. These data were reported as the number of months.

Individual-level characteristics. We also assessed several individual-level characteristics. Age was recorded as a continuous variable. Because of skewness in the data, several items were dichotomized. Employment was cat-

egorized as employed at least part time or unemployed, and income was assessed as less than \$500/month or \$500 or more/month. Education was dichotomized as a high school diploma or lower, and race was coded as African American or Other. Participants reported whether they had been homeless in the past 6 months. Depressive symptoms were assessed as a continuous score measured through the Centers for Epidemiological Studies Depression (CES-D) scale (Radloff, 1977). Participants also reported their use of heroin and cocaine in the past 6 months. Finally, we used participants' self-reported HIV serostatus, rather than antibody test, because self-reported status may influence their health behaviors.

Data analysis

Exploratory analyses—including frequencies, *t* tests, and chi-square tests—were conducted to examine the distribution and unadjusted relationships among variables. Individual-level factors that have been shown to be associated with HED among women in previous studies were included in the multivariate model. Social network variables that were significant at the bivariate level were entered into a multivariate logistic model. Generalized estimating equation was used to adjust for clustering of responses among social network members (Zeger et al., 1988).

Results

Individual-level characteristics

Of the 567 participants, 115 (20%) engaged in HED (six or more drinks) at least once a week, whereas 452 (80%) did not. About 49% of the women who were classified as heavy episodic drinkers reported having seven or more drinks on a typical drinking day. Among non-heavy episodic drinkers, 58% had one to two drinks per drinking occasion.

As shown in Table 1, approximately 97% of women who engaged in HED reported drinking alcohol at least two to three times per week. On the contrary, 17% of women who did not engage in HED drank alcohol as often. Heavy episodic drinkers had significantly higher levels of hazardous alcohol use as shown by the AUDIT score ($p < .001$).

The majority of participants were African American with an average age of 41 years. Women who engaged in HED were less likely to have a high school diploma (40.4% vs. 52.0%, $p < .05$) and less likely to have an income of \$500/month or more (40.4% vs. 51.0%, $p < .05$). In addition, women who engaged in HED were more likely to have used heroin or cocaine in the past 30 days ($p < .001$). Although both groups had high levels of depressive symptoms, heavy episodic drinkers had significantly higher scores ($p < .01$) on the CES-D scale.

TABLE 1. Individual-level characteristics of heavy episodic drinkers and non-heavy episodic drinkers among women in the CHAT study, Baltimore, Maryland, 2005–2007

| Characteristic | Heavy episodic drinkers (<i>n</i> = 115) <i>M</i> (<i>SD</i>) or <i>n</i> (%) | Non-heavy episodic drinkers (<i>n</i> = 452) <i>M</i> (<i>SD</i>) or <i>n</i> (%) | Test statistic | <i>df</i> |
|---|--|--|----------------|-----------|
| Age in years | 41.9 (7.43) | 41.2 (8.46) | -0.89 | 565 |
| African American | 113 (98.3%) | 435 (96.2%) | 1.16 | 1 |
| Education: high school diploma or higher* | 46 (40.4%) | 235 (52.0%) | 5.27 | 1 |
| Homeless in past 6 months | 37 (32.2%) | 134 (29.6%) | 0.28 | 1 |
| Income in past month: ≥\$500* | 46 (40.4%) | 230 (51.0%) | 4.13 | 1 |
| Employed at least part time | 15 (13.0%) | 70 (15.5%) | 0.43 | 1 |
| Has main sexual partner | 91 (79.1%) | 325 (71.9%) | 2.45 | 1 |
| HIV+, self-report | 11 (9.6%) | 53 (11.7%) | 0.43 | 1 |
| Depressive symptoms** | 28.0 (11.7) | 24.2 (10.6) | -3.3 | 565 |
| Snorted/smoked heroin or cocaine in past 30 days*** | 85 (73.9%) | 23 (49.3%) | 22.3 | 1 |
| AUDIT score*** | 20.5 (8.02) | 3.51 (5.22) | -27.6 | 565 |
| Frequency of drinking alcohol | | | 310.4 | 4 |
| Never | 0 (0%) | 176 (38.9%) | | |
| Monthly or less | 0 (0%) | 116 (26.6%) | | |
| 2–4 times per month | 4 (3.5%) | 81 (17.9%) | | |
| 2–3 times per week | 42 (36.5%) | 64 (14.1%) | | |
| ≥4 times a week | 69 (60.0%) | 15 (3.3%) | | |

Note: AUDIT = Alcohol Use Disorders Identification Test.

p* < .05; *p* < .01; ****p* < .001.

Social network characteristics

Table 2 displays data on social network characteristics between women who engaged in HED and women who did not. Women who were heavy episodic drinkers had a higher

number of network members who used heroin or cocaine (2.69 vs. 1.90) and whom they drank alcohol with (2.10 vs. 0.93). Approximately 9% of heavy episodic drinkers had no network members whom they drank alcohol with, whereas 55% of women who did not engage in HED had no drinking

TABLE 2. Comparison of social network characteristics of heavy episodic drinkers and non-heavy episodic drinkers among women in the CHAT study, Baltimore, Maryland, 2005–2007

| Characteristic | Heavy episodic drinkers (<i>n</i> = 115) <i>M</i> (<i>SD</i>) | Non-heavy episodic drinkers (<i>n</i> = 452) <i>M</i> (<i>SD</i>) | Test statistic | <i>df</i> |
|---|--|--|----------------|-----------|
| Total network size | 8.79 (3.88) | 8.67 (3.88) | -0.31 | 565 |
| No. of family members | 3.93 (2.78) | 3.87 (2.62) | -0.24 | 565 |
| No. of friends | 3.25 (2.81) | 3.28 (2.62) | | |
| No. of sex partners† | 1.67 (0.12) | 1.43 (0.54) | -1.86 | 565 |
| No. of heroin/cocaine users** | 2.69 (2.34) | 1.90 (1.96) | -3.72 | 565 |
| No. of network members who were employed full time* | 3.21 (2.67) | 3.83 (2.61) | 2.33 | 565 |
| No. of network members who are in drug treatment** | 0.33 (0.07) | 0.90 (0.07) | 3.85 | 565 |
| No. of network members who provided emotional support | 1.55 (0.98) | 1.67 (1.22) | 0.98 | 565 |
| No. of network members who provided financial support | 1.47 (0.88) | 1.43 (1.13) | -0.36 | 565 |
| No. of network members with whom participant was in conflict | 1.53 (2.21) | 1.20 (1.94) | -1.59 | 565 |
| No. of network members with whom participant socialized* | 1.56 (1.03) | 1.86 (1.47) | 2.09 | 565 |
| No. of network members with whom participant drank alcohol*** | 2.10 (1.54) | 0.93 (1.41) | -7.78 | 565 |
| Mean trust of network members ^a | 7.92 (1.80) | 8.16 (1.59) | 1.39 | 565 |
| Length of time participant has known network member, months | 212.12 (92.8) | 202 (96.8) | -0.94 | 564 |

Notes: No. = number. ^aRated on a scale of 1–10, where 1 = do not trust at all and 10 = trust with my life.

†*p* < .010; **p* < .05; ***p* < .01; ****p* < .001.

TABLE 3. Multivariate model of the associations between heavy episodic drinking and social network characteristics among women in the CHAT study, Baltimore, Maryland, 2005–2007

| Characteristic ^a | AOR | 95% CI |
|---|------|--------------|
| No. of sex partners | 1.13 | [0.91, 1.42] |
| No. of heroin/cocaine users | 1.04 | [0.91, 1.20] |
| No. of network members who have a 9-to-5 job* | 0.89 | [0.79, 0.99] |
| No. of network members who are in drug treatment** | 0.65 | [0.49, 0.88] |
| No. of network members with whom participant socialized* | 0.78 | [0.64, 0.97] |
| No. of network members with whom participant drank alcohol*** | 1.71 | [1.43, 2.03] |

Notes: AOR = adjusted odds ratio; CI = 95% confidence interval; No. = number. ^aAdjusted for education, income, drug use in past 30 days, depressive symptoms, age, and homelessness.

* $p < .05$; ** $p < .01$; *** $p < .001$.

partners. Heavy episodic drinkers had a lower number of social network members who had 9-to-5 jobs ($p < .05$), were currently in drug treatment ($p < .01$), and with whom they socialized ($p < .05$). There was a marginally significant difference in total number of sex partners between each group.

Multivariate results

The results of the multivariate model are shown in Table 3. After controlling for individual-level factors that were significant at the bivariate level, HED was associated with decreased odds of number of social network members who were in drug treatment ($p < .01$), employed full time ($p < .05$), and with whom the participant socialized ($p < .05$). Women who engaged in HED had a significantly greater number of social network members with whom they drank alcohol (AOR = 1.71, 95% CI [1.41, 2.03]). The relationship between HED and the number of sex partners and social network members who used drugs was attenuated in the multivariate model.

Discussion

In this sample of women in Baltimore, Maryland, we found that social network characteristics are both protective and risk factors for HED. Women who had a higher number of network members who they drank alcohol with were more likely to be heavy episodic drinkers. Protective factors included having more network members to socialize with, who were employed full time, and who were in drug treatment.

It is not surprising that having more social network members to drink alcohol with was associated with HED. Only 8% of heavy episodic drinkers did not have drinking partners. This finding is consistent with earlier research that showed that having a larger number of drinkers in one's network is associated with increased drinking among women (Manuel et al., 2007; Wenzel et al., 2009). In their study of

social networks of women seeking alcohol treatment, Manuel et al. (2007) proposed that linkages among heavy drinkers persist because they seek out individuals who "support the drinker in her drinking pattern" (p. 877). In an environment wherein norms promote or accept excessive drinking, increased HED may occur (Ahern et al., 2008). A recent study from Rosenquist and colleagues (2010) suggests that female network members are important in the spread of alcohol consumption in a social network. As a woman's drinking behaviors increase, the norms about drinking patterns are altered. As a result, other social network members may increase their own alcohol use to align their behavior with the new norms.

Just as the composition of one's social network may increase their risk for HED, our study suggests that there are potential avenues to lower the risk for HED. One strategy is for women to associate with social network members who they can hang out with and do fun or productive activities that do not involve drinking. Our study found that having a greater number of network members to socialize with (i.e., hang out with and do activities, such as shopping or going to the movies) was associated with a decrease in HED. Also, because having a greater number of people who drink alcohol was associated with increased women's risk for HED, women should be encouraged to seek out network members who do not drink alcohol.

Another element that was shown to be protective against HED was having network members who were in drug treatment. Individuals in drug treatment may have lower levels of alcohol use given that any substance use is generally discouraged in these settings. In addition, individuals in treatment may avoid people who use alcohol or drugs as a way to control their own use. Data from the Framingham study indicate that having network members who abstain from alcohol use is associated with decreased alcohol consumption (Rosenquist et al., 2010). Previous research has suggested that having network members who are supportive of treatment increases the likelihood of women entering treatment for alcohol use (Manuel et al., 2007).

We also found that having social network members who had full-time jobs was linked to a decreased likelihood of HED. Researchers have reported that heavy drinking is more common among unemployed people (Mossakowski, 2008). Network members who are employed may dissociate themselves from people who engage in heavy drinking or may not have time to engage in heavy drinking, which may explain the lower number of employed network members among women who engaged in HED.

Having individuals in one's social network who are in drug treatment or employed may also indicate a level of stability. The norm of maintaining social stability may militate against HED because this behavior may be disruptive to their lives. Women who interact with social network members who have alternative activities to drinking, such as jobs,

or who are actively avoiding substances may be persuaded against HED.

Our findings have shown that social network factors are associated with HED among women. Latkin and colleagues (2001) have demonstrated that individuals associate with people who practice similar behaviors through differential affiliation (i.e., birds of a feather flock together). Thus, the women in the sample who engaged in HED may seek out network members who also engage in HED.

Interpersonal interventions, such as peer education, may be a useful strategy to decrease HED and its subsequent outcomes among women. Peer educators can diffuse information and resources through their social network. By providing social support to peers, peer educators may create and sustain norms that favor responsible drinking. Peer education interventions have been demonstrated to be effective at changing several behaviors, including risky sexual and drug practices among women (Davey-Rothwell et al., 2011). It has been established that peers may have iatrogenic effects on behaviors, including substance use practices (Dishion and Dodge, 2005; Dishion et al. 2001). Thus, alcohol-related interventions that use peer education approaches should incorporate peers who model healthy behaviors, such as moderate alcohol use, so that peers may have a positive impact on behavior. Also, promoting norms about responsible alcohol use may sustain the effects of peer education. In this sample, women who used heroin or cocaine were twice as likely to be heavy episodic drinkers. Thus, interventions should target both alcohol and drug use.

Understanding the motives and expectancies influencing adult female HED is important for developing effective interventions. Research has shown that some alcohol expectancies among women may facilitate drinking. These include providing an avenue to be more intimate, to "survive" social situations and adversity, to feel more confident, to facilitate partner discussions about feelings or problems, and to feel less inhibited about sex or to feel more sexually attractive (Pirkle and Richter, 2006; Plant, 2008; Plant et al., 2002).

This study has limitations that should be noted. First, we used a single item from the AUDIT to assess HED, which is a conservative measure. The standard definition of HED among women is four drinks in about a 2-hour period (National Institute on Alcohol Abuse and Alcoholism, 2004). Thus, the prevalence of HED in this sample may have been underestimated. Also, we used self-reported data, which may be subject to recall bias. The cross-sectional design of the study does not allow us to make causal inferences about HED and social network factors. Longitudinal studies are needed to determine if social network composition predicts heavy drinking. In addition, the findings have limited generalizability to women who are at high risk for HIV/STIs living in impoverished urban environments. Because the conditions of at-risk women in inner-city Baltimore are similar to women in other impov-

erished urban environments, we anticipate similar results in other impoverished urban communities. However, it will be important to replicate the study in other geographic areas and with other populations so that we can definitively elucidate the parameters of generalizability. Next, we know very little about the context of the HED incidents. However, these data suggest that HED is a social activity and hence may be influenced through social networks. Finally, the study was unable to assess level of stress and satisfaction with social network members.

In summary, this study indicates that although having more drinking partners in one's social network is a risk factor for HED, social networks also have several protective elements. Understanding the social context that influences HED among urban women is important for multiple reasons. Foremost, HED is linked to multiple health and social problems that can negatively affect urban areas already struggling with violence, sexual assault, unwanted pregnancies, poor production, and poverty (Miller et al., 2004). There is a need for more research on substance use-related behaviors in women, especially in underserved populations, such as urban women in high-risk environments, to develop evidence-based interventions that can prevent unhealthy alcohol behaviors (Wenzel et al., 2009). By gaining a greater understanding of HED behaviors and social influences or deterrents of these behaviors in urban adult women, we will be able to develop appropriate interventions.

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