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## Social network perspective on alcohol consumption among African American women: a longitudinal analysis

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### Abstract

**Objective**—The aim of the study was to examine alcohol use in African American women's social networks.

**Design**—This was a longitudinal study of African American women and their social networks in Baltimore, MD. Data were collected through face-to-face interviews at a community-based research clinic. Alcohol consumption frequency was assessed by a single question “How often do you drink alcohol?” with a four-point ordinal rating scale “never,” “monthly or less,” “2-4 times a month” and “>2 times a week.” A longitudinal ordinal logistic model was conducted to use 317 African American women's alcohol consumption frequency as a predictor of their social networks' alcohol consumption frequency.

**Results**—Results show that African American women's alcohol consumption frequency was a statistically significant predictor of their social network members' alcohol consumption frequency.

**Conclusion**—Findings suggest the merit of social network-based approaches to address alcohol use among urban minority populations.

### Keywords

alcohol consumption; social network; African American; longitudinal data analysis

## Introduction

With higher rates of liver cirrhosis and rates of overall alcohol-related mortality, minority populations bear a disproportionately greater burden of alcohol-related health problems compared to non-Hispanic whites (Greenfield, 2001). In addition, the consequences of drinking appear to be more profound among racial minorities. For example, research suggests that African American adult drinkers are more likely than non-Hispanic white drinkers to report negative social consequences, such as violence as result of drinking (Mulia, Ye, Greenfield, & Zemore, 2009). Research is needed to better understand the complexities of factors that influence alcohol consumption and negative consequences of alcohol consumption, as well as to develop risk reduction programs, among African Americans.

Social network may be a risk or protective factor for alcohol consumption. Social network members have been shown to be associated with individuals' health behaviors such as HIV risk practices (Yang, Tobin, & Latkin, 2011), tobacco and alcohol use among youth (Wenzel, Tucker, Golinelli, Green, & Zhou, 2010), and depressive symptoms (Yang, Latkin, Tobin, Patterson, & Spikes, 2013). Examination of social networks can focus on compositional (i.e. number of members) and functional (i.e. roles played) characteristics of the networks (House, Kahn, McLeod, & Williams, 1985). Framingham Heart Study, which was a population-based, longitudinal and observational cohort study, reported data on the association between alcohol use and social network factors among adults (Rosenquist, Murabito, Fowler, & Christakis, 2010). Framingham study investigators concluded that alcohol use can be attributed in part to the influence of close social network members.

Despite substantial evidence that social networks are strongly linked to health behaviors and conditions, most large-scale studies of social networks have only focused on Caucasian middleclass populations, which may miss unique network dynamics or processes that contribute to the concentration of disease burden and associated costs among impoverished minority populations. Minority individuals rely more on their social networks than the more affluent. Consequently, their networks are expected to have a greater impact on their behaviors. Research among African Americans, especially impoverished African American living in the urban setting is needed to determine how social network members influence alcohol use and alcohol use disorders. In a cross-sectional study of African American women, we found that the perception of having a greater number of social network members to drink with (i.e., the totally number of drinking buddies) was associated with an increased likelihood of binge drinking (Davey-Rothwell, Chander, Hester, & Latkin, 2011).

Using a longitudinal data of 317 African American women and their social network members, the current analyses examined whether individuals' alcohol consumption frequency predicted the network members' alcohol consumption frequency over time. Cancer mortality in women was significantly associated with alcohol frequency.

## Material and Methods

### Study Population

Data were collected longitudinally from the CHAT study, a social-network based intervention for heterosexual women who were trained to be peer mentors to encourage HIV and sexual transmitted infections (STIs) risk reduction within their social networks. CHAT was the intervention's acronym and represented the first letters of four communication skills: (1) Choose the right time and place; (2) Hear what the person is saying; (3) Ask questions; and (4) Talk with respect. Women (i.e., index participants) were recruited through street outreach as well as at health clinics, and other local community agencies in Baltimore, MD, USA. Inclusion criteria for index participants included 1) female; 2) did not inject drugs in the past 6 months, 3) self-reported sex with at least 1 male partner in the past 6 months, and 4) had at least one sexual risk factor including any of the following: a) more than 2 sex partners in the past 6 months; b) STD diagnosis in the past 6 months, and c) having a high risk sex partner in the past 90 days (i.e., injected heroin or cocaine, smoked crack, HIV seropositive, or man who has sex with men).

During the baseline visit, index participants completed a social network inventory and were asked to recruit up to 5 eligible network members to participate in this study. Eligibility for social network members included: 1) being an injector of heroin or cocaine, 2) sex partners of the index participant; or 3) people the index participants felt comfortable talking to about HIV or STIs. Index and network participants were linked and interviewed at baseline, 6, 12 and 18-months. During each visit, index and network participants completed the same study survey administrated by a trained interviewer at a community-based research clinic.

The present study included longitudinal data of African American index and network participants at the baseline, 6-, 12-, and 18-month assessments. A total of 746 participants completed the baseline visit and 634 participants with at least follow up visit (317 African American index participants and their corresponding 317 network participants) contributed to the present analyses. Study protocols were reviewed and approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board prior to commencement of the study.

### Measurement

**Alcohol consumption frequency**—Alcohol consumption frequency was assessed by one question from Alcohol Use Disorders Identification Test (AUDIT) (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) “How often do you drink alcohol?” with response option “never,” “monthly or less,” “2-4 times a month”, “2-3 times a week: and “4 or more times a week.” Based on the distribution, a four-point ordinal rating scale were constructed for the current analyses, which included “never,” “monthly or less,” “2-4 times a month”, “twice or more times a week.” The primary outcome of interest in the current study was the network members' alcohol consumption frequency.

**Participants' background**—Index and network participants' age, gender, current employment status, and depressive symptoms were assessed. Depressive symptoms were

assessed by the Centers for Epidemiological Studies Depression (CES-D) Scale, a 20-item, 4-point response scale, using 16 as cut-off point (Radloff, 1977). Participants' current smoking status was assessed by one question "Do you currently smoke cigarettes?" Injection drug use was evaluated by one question "At any time during the past six months, have you injected drugs?"

### Statistical Analysis

Associations between baseline characteristics of index and network participants and the alcohol consumption frequency were assessed using *t* tests for normally distributed continuous variables and chi-square tests for categorical data. A four-point ordinal rating scale was used for alcohol consumption frequency. Longitudinal ordinal logistic regression, with an unstructured working correlation matrix, was performed to estimate the network participants' relative risk of alcohol consumption frequency using index participants' alcohol consumption frequency as a predictor. Index participants' age, employment status, depression, current smoking status and injection drug use were added as time-varying covariates. Time effect was also taken into consideration as an interaction with alcohol consumption frequency of index participants, but it was removed from final model for statistical non-significance findings. All the analyses were conducted in Stata 11.0 (StataCorp, 2009).

## Results

### Individual characteristics

A total of 634 participants contributed to the present study, including 317 index participants and their corresponding 317 network participants interviewed at the baseline visit. All index participants were females due to eligibility, while network members included 144 females (45%) and 173 males (55%). For the 6-month assessment, 275 index participants and 270 network members were interviewed, with retention rates of 87% and 85% for index and network participants, respectively. For the 12-month assessment, 280 index participants and 259 network members completed the survey, with retention rates of 88% and 82% for index and network participants, respectively. A total of 302 index participants and 295 network members finished the 18-month assessment, with retention rates of 95% and 93% for index and network participants, respectively.

At baseline, about one-third (30%) of the index participants reported no alcohol use, 21% reported drinking monthly or less, 17% reported drinking 2 to 4 times a month and 31% reported drinking twice or more times a week. Over one-third (35%) of network participants reported no alcohol use, 16% reported drinking monthly or less, 15% reported drinking 2 to 4 times a month and 34% reported drinking twice or more times a week.

Table 1 showed the baseline demographic characteristics of index and network participants stratified by their alcohol consumption frequency. Among index participants, the proportion of smokers were statistically significantly higher among those with a higher frequency of alcohol consumption ( $p < .01$ ). There was no association between alcohol consumption frequency and age, employment status and depressive symptoms among index participants.

For network participants, there was a statistically significant difference in age across the four alcohol consumption frequency groups ( $p < 0.001$ ). There was no statistically significant difference in alcohol consumption frequency with regard to gender, employment status, smoking, depressive symptoms, and injection drug use status among network participants.

### **Index alcohol consumption frequency as a predictor of network alcohol consumption frequency**

Table 2 presents the adjusted analysis for social network alcohol consumption frequency using index's alcohol consumption frequency as a primary predictor. Results demonstrate that for those index participants who drink monthly or less when compared to never drinkers, the odds of alcohol consumption frequency of their corresponding network members in a higher frequency drinking group was 1.88 (95% CI: 1.12-3.14). When comparing to those who were never drinkers, index participants who drink 2-4 times per month, the odds of alcohol consumption frequency of their corresponding network members in a higher drinking frequency group was 3.09 (95% CI: 1.68-5.67). For those index participants who drink more than 2 times a week, when comparing to those who never drank, the odds of alcohol consumption frequency of their network members in a higher drinking frequency group was 2.68 (95% CI: 1.41-5.08).

We also observed a trend effect. As time went on, the odds of the network members being in a higher drinking frequency group went down. However, the trend was not statistically significant. Specifically, for index participants who were in the 6 month visit, as compared to baseline, the odds of their corresponding network members in a higher drinking group reduced by 30% ( $p = .09$ ). This association held when compared index participants who were in the 12 month visit and 18 month visit comparing to baseline, the odds of their corresponding network members in a higher drinking group decreased by 26% ( $p = .17$ ) and 31% ( $p = .07$ ), respectively.

Index participant's age was not a statistically significant predictor of the network member's alcohol consumption frequency (AOR=1.02, 95% CI: 0.95-1.08). We also did not find index participants' employment status, depressive symptoms and smoking status as statistically significant predictors of the alcohol consumption of their corresponding network members. We observed that for index participants who were injection drug users at the follow-up, the odds of their corresponding network members to be more frequent alcohol drinkers increased by 17% ( $p = .025$ ).

The relationship of change in the alcohol consumption between index participants and network members within a specific point in time was also considered in the present analyses. We compared 6-month visit to baseline, 12-month visit to baseline and 18-month visit to baseline. Although there was a trend, none of the above associations were statistically significant at 0.05 level.

## **Discussion**

Consistent with extant social network literature on health behaviors, African American women's alcohol consumption frequency was a statistical significant predictor of their social

network members' alcohol consumption frequency over time. Induction of these effects may occur through social norms, modeling and rewarding the behavior, and access to alcohol. (Coleman, 1990) However, the current longitudinal data include no measures of these social network mechanisms. Nevertheless, findings from this study suggest the potential value of social network-based public health interventions approaches to address alcohol use and its associated problems among impoverished, urban minority populations.

A critical element to improve effectiveness of social-network based interventions is selection of the referent group. Prior research suggests that not all network members have an equal influence on health behaviors, including alcohol use. Individuals' behaviors are often shaped and influenced by referent groups, who are often peers, with whom individuals feel some degree of similarity (Festinger, 1954). Research suggested that women's alcohol consumption is often more solitary, while men's alcohol consumption is convivial with a more socially favorable acceptance (Limosin, 2002). It remains unclear if the referent groups can vary by gender due to different drinking patterns. Limited research on adults has shown that alcohol use, especially among women, is often influenced by their sex partners drinking patterns (Grant et al., 2007). Little research has been conducted with impoverished, urban minority populations to determine the most influential referent groups on drinking behavior. In our previous cross-sectional study of African American men and women, male participants' alcohol dependence symptoms were associated with having drinking buddies who were sex partners or who were female. Among female participants, association between the presence of drinking buddy and alcohol dependence symptoms did not depend on the types of relationship or the gender of the drinking buddy (Yang, Davey-Rothwell, & Latkin, 2013). However, these associations may be a result of homophily (i.e. similar individuals in the same network) and shared environment, rather than social influence from network members (Lyons, 2010). Future social network research with similar populations is needed to longitudinally assess specificity of relevant referent groups for alcohol use and its associated problems.

The results of this study must be interpreted within the context of its limitations. Alcohol use was assessed using self-report, and thus alcohol use may have been under-reported due to social desirability bias. We only used one question of alcohol use frequency and a more comprehensive measurement of alcohol consumption may be appropriate. Despite the limitation, research has found alcohol use frequency was highly associated with cancer mortality among women (Breslow & Graubard, 2008), and a high correlation between the drinking frequency and the drinking quality (Paradis, Demers, Picard, & Graham, 2009). The inclusion criteria for index and network participants limit the generalizability of the findings. However, the research design tended to recruit high risk populations with whom intervention is much needed. Despite these limitations, this study highlights the role of social network on alcohol consumption frequency among urban minority populations.

Our findings suggest the potential application of social network-based alcohol risk reduction programs treatment. Future interventions efforts should be social network specific and identify important referent groups in the social network to promote norms that discourage excessive alcohol use.

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**Table 1**  
Association of baseline characteristics of index participants and their network members with alcohol consumption frequency

Frequency of alcohol consumption	Index participants				Network participants				P-value
	Never (n=96)	Monthly or less (n=68)	2-4 times a month (n=54)	>= 2 times a week (n=99)	Never (n=111)	Monthly or less (n=51)	2-4 times a month (n=48)	>= 2 times a week (n=107)	
Age: Mean (SD)	42 (6.14)	42 (8.27)	41 (6.99)	43 (5.75)	46 (10.59)	42 (7.62)	40 (10.02)	43 (9.46)	0.013
Gender									
<i>male</i>	0	0	0	0	55 (49.6%)	26 (51.0%)	28 (58.3%)	64 (59.8%)	
<i>female</i>	96 (100%)	68 (100%)	54 (100%)	99 (100%)	56 (50.4%)	25 (49.0%)	20 (41.7%)	43 (40.2%)	0.415
Employment									
<i>yes</i>	85 (88.5%)	64 (94.1%)	48 (88.9%)	89 (89.9%)	96 (86.5%)	41 (80.4%)	39 (81.2%)	83 (77.6%)	
<i>no</i>	11 (11.5%)	4 (5.9%)	6 (11.1%)	10 (10.1%)	15 (13.5%)	10 (19.6%)	9 (18.8%)	24 (22.4%)	0.394
Smoking									
<i>yes</i>	76 (79.2%)	56 (82.3%)	49 (90.7%)	93 (93.9%)	89 (80.2%)	36 (70.6%)	38 (79.2%)	86 (80.4%)	
<i>no</i>	20 (20.8%)	12 (17.7%)	5 (9.3%)	6 (6.1%)	22 (19.8%)	15 (29.4%)	10 (20.8%)	21 (19.6%)	0.510
Depressive symptoms									
<i>yes</i>	58 (60.4%)	39 (57.4%)	28 (51.8%)	61 (61.6%)	52 (46.8%)	24 (47.1%)	21 (43.7%)	51 (47.7%)	
<i>no</i>	38 (39.6%)	29 (42.6%)	26 (48.2%)	38 (38.4%)	59 (53.2%)	27 (52.9%)	27 (56.3%)	56 (52.3%)	0.976
Injection drug use									
<i>yes</i>	0	0	0	0	7 (6.3%)	8 (15.7%)	4 (8.3%)	10 (9.4%)	
<i>no</i>	96 (100%)	68 (100%)	54 (100%)	99 (100%)	104 (93.7%)	43 (84.3%)	44 (91.7%)	97 (90.6%)	0.290

**Table 2**

Association of alcohol consumption between index participants and their corresponding network members over time

Index characteristics as predictor	AOR	95% CI	P-value
Alcohol consumption			
<i>Never</i>	1.00	-	-
<i>Monthly or less</i>	1.88	1.12-3.14	0.016
<i>2-4 times a month</i>	3.09	1.68-5.67	<0.001
<i>&gt;=2 times a week</i>	2.68	1.41-5.08	0.003
Time			
<i>Baseline</i>	1.00	-	-
<i>6 month</i>	0.70	0.47-1.05	0.09
<i>12 month</i>	0.74	0.49-1.13	0.17
<i>18 month</i>	0.69	0.46-1.03	0.07
Age	1.02	0.95-1.08	0.62
Employment status			
<i>No</i>	1.00	-	-
<i>Yes</i>	0.95	0.57-1.58	0.83
Injection drug use			
<i>No</i>	1.00	-	-
<i>Yes</i>	1.17	1.38-1.79	0.03
Smoking			
<i>No</i>	1.00	-	-
<i>Yes</i>	1.29	0.57-2.92	0.55
Depression			
<i>No</i>	1.00	-	-
<i>Yes</i>	0.91	0.62-1.34	0.63