Published in final edited form as:

Alcohol. 2011 February ; 45(1): 89–97. doi:10.1016/j.alcohol.2010.08.006.

Cultural and Social Network Predictors of Drinking among Korean American Women

John W. Ayers, M.A.^{1,4}, Christina D. Chambers, Ph.D., M.P.H.², C. Richard Hofstetter, Ph.D.^{3,4}, Suzanne C. Hughes, Ph.D., M.P.H.⁴, Washington Reyes, B.S.⁴, Sunny W. Kang, B.S.⁴, Veronica Irvin, M.P.H.⁴, and Melbourne F. Hovell, Ph.D, M.P.H.⁴

¹ Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, 21205, United States of America

² Departments of Pediatrics and Family and Preventive Medicine, University of California San Diego, San Diego, California, 92093, United States of America

³ Department of Political Science, San Diego State University, San Diego, California, 92182, United States of America

⁴ Center for Behavioral Epidemiology and Community Health (CBEACH), Graduate School of Public Health, San Diego State University, San Diego, California, 92123, United States of America

Abstract

This study estimated the association of cultural and social mechanisms with Korean American women's drinking behaviors. Data were drawn from telephone interviews with 591 Korean women selected from a random sample of households in California with Korean surnames during 2007. About 62% of eligible respondents completed the interview. Respondents reported any lifetime drinking (yes/no), drinking volume (typical number of drinks consumed on drinking days), level of acculturation, and described their social network by assessing who encouraged or discouraged drinking (drinking support) or drank (drinking models). Multivariable regressions were used for analyses. About 70% (95% confidence interval [95%CI], 67 to 74) of Korean American women reported any lifetime drinking and current drinkers drank 1.18 (95%CI, 1.07 to 1.28) drinks on drinking days. Acculturation was not significantly associated with any lifetime drinking or drinking volume, while models and support for drinking were statistically significantly associated with a higher probability of any lifetime drinking and drinking more on drinking days. Each additional encourager, or one fewer discourager, for drinking in women's social networks was associated with a 2% (95%CI, 1 to 3) higher probability of any lifetime drinking and drinking 0.25 (95%CI, -0.53 to 1.18) more drinks on drinking days. Each additional drinker in women's networks was associated with a 4% (95%CI, 1 to 8) higher probability of any lifetime drinking and drinking 0.26 (95%CI, -0.05 to 0.60) more drinks on drinking days. Korean American women's drinking appears to be strongly related to their social networks, though how women take on traits of their new environment was not.

Address all correspondence to the principal investigator C. Richard Hofstetter 9245 Sky Park Court, Suite 230, San Diego, CA 92123. Phone: (858) 505-4770 x146; Fax: (858) 505 8614; rhofstet@mail.sdsu.edu. John W. Ayers may be reached at jayers@jhsph.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Keywords

Korean American Women; Social Networks; Acculturation; Ecological Models of Health Behavior

Introduction

This study examined the association of cultural and social mechanisms with drinking behaviors among Korean women in California. Little is known about the correlates of alcohol use among Korean American women and most knowledge does not consider mechanisms that might be intervened on (Chi et al., 1989; Lubben, Chi and Kitano, 1989; Nakashima and Wong, 2000; Weatherspoon et al., 2001). Epidemiological studies suggest non-Protestant status, not participating in sports, and frequenting bars, taverns, or nightclubs increases drinking among Korean women (Lubben et al., 1989; Weatherspoon et al., 1994). Based on small non-probability community samples with limited measures, 280 Koreans in Southern California (Lubben et al. 1989) and 72 Koreans in Hawaii (Weatherspoon et al. 1994), these findings suggest the need for additional studies concerning alcohol consumption. Estimates of Korean American women's drinking behaviors are also limited. One population based study of 2,830 Korean Americans in California by Song and colleagues (2004) reported 50.7% of women were current drinkers, though they did not consider other drinking concepts. Moreover, we are unaware of studies that focus exclusively on the drinking behaviors of Korean American women.

Ecologic Deductions for Drinking

Plausible explanations for Korean American women's drinking may be guided by ecological models (Glass and McAtee, 2006; Hovell et al., 2002; 2009; McLeroy et al., 1988), that direct attention to individual, social, and environmental determinants. The Behavioral Ecological Model (BEM) differs from other approaches, using contingency concepts by borrowing from operant principles of behavior, among the most empirically validated theories for behavior change (DeGrandpre, 2000; Glenn et al., 1992). According to the BEM, learning is a function of both proximal, those occurring closer to the individual in terms of social aggregation, and distal, those occurring further from the individual, reinforcers (Hovell et al., 2002; 2009).

Distal reinforcers include cultural contingencies, such as public policies and practices in the larger society. Often implicit characteristics distal reinforcers include sanctioned behavior for acquisition and adherence to national cultures on immigration. According to Landrine and Klonoff (2004) acculturation is the extent to which immigrants retain their indigenous culture or adopt the host culture as a result of operant learning, *e.g.* rewards for English skills. Korean women often initiate risk behaviors, *e.g.* smoking, after acculturating to the U.S. (Hofstetter et al., 2004) and drinking may follow a similar pattern becoming more acceptable among acculturated versus traditional women. Many social situations in Western contexts involve drinking and there are near uniform cultural norms supporting drinking among non-pregnant women (Bloomfield et al., 2001). Drinking is portrayed as pleasurable, including a means of socialization, sexual relationships, and a sign of high social status (Beccaria, 2001; DuRant, 1997). Since drinking may be less supported by distal reinforces among Korean women than American women, acculturation should increase drinking. The plausibility of this association is, weakly, supported by evidence that later generation Asian women perceive more relaxed cultural norms and drink more than their parents (Li and Rosenblood, 1994). Among Korean Americans in California, current drinking prevalence was highest among those more acculturated to U.S. lifestyles in comparisons to those who were bi-cultural or traditional, though the association was unadjusted for possible confounds

(Song et al., 2004). We hypothesize (H₁) acculturation increases the likelihood of any lifetime drinking and volume drunk on drinking days.

Proximal reinforcers include models that may be imitated and positive or critical feedback from network members. Social models of drinking are one of the most influential predictors of drinking uptake (Barnes et al., 1994; Borsari and Carey, 2001) and drinking volume (Rosenquist et al. 2010). Drinkers typically expect alcohol consumption to be a pleasurable social experience (Cooper et al., 1995). Interventions to decrease alcohol use are more effective when they operate at the level of peer relations (McKnight and McPherson, 1986). For the purposes at hand, social contingencies include social support for drinking and models of drinking. Discriminating between encouragement or discouragement and passive exposure to drinking may capture the gradient of drinking's social mechanisms; where the later is most often studied at the exclusion of the former (Andrews, Tildesley et al., 2002; Urberg et al., 1997; Rosenquist et al., 2010). The BEM suggests that more immediate proximal contingencies are more influential for behavior change. We hypothesize (H₂) the more models of drinking and support for drinking will increase the likelihood of any lifetime drinking and volume drunk on drinking occasion.

Materials and Methods

Data were drawn from a 2007, probability based, telephone survey of California female adults (18 years of age and older, N=591) of Korean descent and was conducted by closely supervised, bilingual professional interviewers. California has the largest concentration of Korean immigrants in the nation, over 350,000 or one-third of the total U.S. Korean population (Yu, Choe & Han, 2002).

The survey instrument was first developed in English and translated into Korean with the assistance of co-investigators in Seoul, South Korea, and in the U.S. The English-Korean translation process was repeated to optimize isomorphism between concepts in each language. Focus groups, lead by the interview supervisor, who had extensive experience in working with prior Korean study participants, were used to ensure that the meanings of terminology were accurately rendered in the English and Korean translations. The final instrument was pilot tested and interviews were continuously monitored by the interview supervisor to make repairs if problems arose. The San Diego State University Institutional Review Board approved all procedures. All participants consented prior to beginning the survey.

The sample was randomly drawn from telephone numbers associated with residences of persons with Korean surnames purchased from a commercial firm and included both listed and unlisted numbers derived from a variety of sources, *e.g.*, subscriptions. Numbers with surnames that are common in other cultures (*e.g.*, Cho, Ho, etc.) that also had non-Korean but other Asian first names were deleted from the list, while Korean surnames that had Anglicized first names were retained in the list. Study participants were screened to insure they were of Korean descent.

Interviews were conducted with the female of Korean descent aged 18 and over who had the most recent birthday. Up to seven callbacks were made to each number, and 62% of eligible respondents contacted completed interviews; meaning 953 Korean women were contacted and 591 agreed to complete the interview. Since no data were collected on persons who did not complete the interview we estimated generalizability of the sample by comparing it with population estimates for Korean women in California. The sample closely approximated census demographics for women of Korean descent in California but slightly overrepresented older and underrepresented younger populations.

Drinking Characteristics

Any lifetime drinking was measured by responses to “Have you ever had more than a few sips of any kind of alcohol, beer, wine, spirits, to drink?” coded 0 = abstainer, 1 = drinker. *Drinking volume* indicates the volume of alcohol consumption per drinking occasion among current drinkers, measured by responses to “About how many drinks containing alcohol do you have on a typical day when you have something to drink? A drink of alcohol was defined as “a 12 ounce glass, can or bottle of beer, a 4–5 ounce glass of wine, a 12 ounce can or bottle of wine cooler, or a shot or mixed drink with 1 shot of liquor (*i.e.*, vodka, rum, whiskey or soju).” Four additional measures allow us to make stronger descriptive inferences about Korean American women’s drinking behaviors. Respondents reporting they had ever had any kind of alcohol but reported not currently drinking were classified as *former drinkers*. Current drinkers estimated their *alcohol tolerance* by responses to “How many drinks can you hold, that is until you feel sick or pass out?” and their *binge drinking* habits by responses to “About how often during an average month do you have 4 or more drinks on a single occasion?”. To capture women’s drinking histories, respondents were asked when they “started drinking alcohol...once a week or more?”

The survey instrument included questions to collect egocentric social network data to identify social influences of drinking (Smith and Christakis, 2008). These network data treat the individual as the wheel hub where respondents are asked about persons with whom they have a relationship, and how these persons encouraged, discouraged, or modeled drinking using a pre-generated list of possible social relationships. Using these data, two scales of social contingencies for drinking were formed.

Drinking Support

Support for drinking in respondents’ social networks was estimated by the degree to which respondents were discouraged or encouraged to drink by spouse, parents, siblings, friends, and sons or daughters (Cronbach’s $\alpha = .92$). Respondents were provided a list of persons and asked if these persons ever encouraged, discouraged drinking, neither, or both. Less than one percent of respondents reported both encouragement and discouragement for any one source and these were treated as neither. The items were recoded, discourage (–1), neither (0), and encourage (1) and responses were summed. The range of possible values was –5 to 5. A 0 score indicates no net encouragement or discouragement to drink, positive scores indicate more encouragement for drinking than discouragement, and negative scores indicate more discouragement for drinking than encouragement. Each unit change is an additional net encourager or discourager for drinking.

Drinking Models

Drinking models were measured by counting the number of persons (spouse, parents, siblings, children, and friends) that respondents report “...regularly drinks alcohol.” The range of possible values was 0 to 5, with each unit change being an additional person who modeled drinking.

Acculturation

The acculturation scale used in this study was adapted from the Suinn-Lew Asian self-identity acculturation to U.S. society scale (Suinn et al., 1995; Suinn et al., 1987). Eleven items were designed to measure aspects of cultural preferences involving language, music, food, and self-identification including how persons identified with the U.S. and Korea, father’s identification, and social linkages including ethnicity of peers and preferred associations. After conversion to a common metric (*z*-scores), a principal components analysis was computed. Although two components emerged from the analysis using the

customary eigenvalue of 1 as a cutoff, a single general dimension explained 82% of the common and 50% of the total variance among items. For purposes of analysis, a general acculturation scale was formed by computing the mean of standardized items (Mean=-.02, standard deviation [SD]=.63, Cronbach's α =.88) after permitting up to four scores to be missing. Analyses demonstrated that the missing data treatment made no significant difference in findings.

Covariates

Education was measured as total years of formal education completed after subtracting overlapping years of education in South Korea and the U.S. Work status indicated work outside the home (1) or not (0). Age was measured in years.

Analysis Plan—First, descriptive characteristics of the sample were appraised. In steps two and three, predictors for any lifetime drinking (using logistic regression) and drinking volume (using least squares regression) were evaluated for the drinking support and models scales and components of the scales separately. Right-skewness in drinking volume was constrained by computing models for the natural logarithm (Carroll and Ruppert, 1988). Analysis of other drinking characteristics was not appropriate, *e.g.* associating contemporary measures of the environment and social network with age women began drinking regularly, or was not feasible due to limited variances for rare outcomes, *e.g.* binge drinking. To assess the relative association of drinking support and drinking models by relationship, without considering the larger network context, equations were specified for spouses, siblings, parents, sons/daughters, and friends separately with dummy variables for encouragement and discouragement for drinking (both relative to neither), and drinker (relative to abstainer) including adjustment for acculturation, education, working outside the home, marital status, and age to predict any lifetime drinking and drinking volume.

To ease interpretation, predicted quantities of interest, predicted probability of any lifetime drinking or expected value on the drinking volume scale, were calculated using the estimates from the multivariable analysis by simulation using 1000 randomly drawn sets of estimates from a sampling distribution with mean equal to the maximum likelihood point estimates and variance equal to the variance covariance matrix of the estimates, with all other predictors held at their mean values (King et al., 2000). All tests were two-tailed $p < .05$.

Results

About 70% (95% confidence interval [95%CI], 67 to 74) of Korean American women reported any lifetime drinking, with 10% (95%CI, 8 to 12) reporting they had drank but did not presently drink, former drinkers (Table 1). Current drinkers, typically, drank about 1.18 (95%CI, 1.07 to 1.28) drinks on drinking days ranging from “a sip” (coded .01) to 10 drinks. Current drinkers also reported a typical tolerance of 2.02 (95%CI, 1.75 to 2.30) drinks before “feel[ing] sick or pass[ing] out,” ranging from a sip (.01) to 12.50 drinks. Drinking four or more drinks on any one occasion was rare among current drinkers, occurring less than one day per month (.65, 95%CI, .33 to .97), though the range, 0 to 28 days, indicate binge drinking may be common among some women. Regular drinkers, drank at least once per week, began drinking regularly at 22.07 (95%CI, 21.31, 22.82) years, with some beginning much earlier or later as indicated by the range from 15 to 53 years old.

Women typically had two more discouragers than encouragers in their network as indicated by the mean, -2.50 (95%CI, -2.70 to -2.31), of the drinking support indicator. Some reported all their observed social ties encouraged or discouraged drinking as indicated by the -5 to +5 range. By relationships, drinking encouragement was more common in spousal (9%; 95%CI, 6 to 11) or friendship (7%; 95%CI, 5 to 9) ties and discouragement was more

common in parental (66%; 95%CI, 62 to 71), son/daughter (70%; 95%CI, 66 to 74) and sibling (62%; 95%CI, 58 to 66) ties. The typical woman had one social tie that drank, as indicated by the mean for the drinking models indicator, .95 (95%CI, .86 to 1.05), ranging from no (0) to all of their ties (5) drinking. By relationships, spouses (33%; 95%CI, 29 to 37) were statistically significantly more likely to drink than all other social ties.

Any Lifetime Drinking

Consistent with hypothesized expectations any lifetime drinking was more likely when women had more encouragement, or less discouragement, and drinking was more common in their social networks. Each encourager, or one fewer discourager, of drinking was associated with a 18% higher odds (AOR=1.18; 95%CI, 1.08 to 1.28) of any lifetime drinking (Table 2). Similarly, each additional drinker in their network was associated with a 23% higher odds (AOR=1.23; 95%CI, 1.02 to 1.48) of any lifetime drinking among women. Regardless of whether a network member drank or encouraged drinking the odds of drinking similarly increased, suggesting an additive impact for modeling and encouraging drinking.

Probabilities of any lifetime drinking by levels of drinking support and drinking models were calculated holding other predictors in the logistic equation at their means (Figure 1A). Each additional encourager, or a decrease of one discourager, for drinking was associated with a 2% (95%CI, 1 to 3) higher probability of any lifetime drinking. Consider, women who encountered only drinking discouragement (-5) had a 63% (95%CI, 58 to 68) probability of any lifetime drinking versus 90% (95%CI, 83 to 94) when encountering only drinking encouragement (+5). Women who had equal discouragement and encouragement for drinking (0) had a 80% (95%CI, 75 to 83) probability of any lifetime drinking. Each additional drinker in women's networks was associated with a 2% (95%CI, <1 to 5) higher probability of any lifetime drinking. Women who reported none of their network members drank had a 68% (95%CI, 63 to 72) probability of any lifetime drinking versus 85% (95%CI, 75 to 92) when all their social ties drank.

Contrary to hypothesized expectations greater acculturation was not statistically significantly associated with a higher odds of drinking (AOR=.943, 95% CI .667, 1.336), with the practical effect size being close to zero (Table 1). Each additional year of education was associated with a 10% higher odds (AOR=1.10; 95%CI, 1.03 to 1.18) of any lifetime drinking. Working outside the home, marital status, and age were not statistically significantly associated with differences in the odds of any lifetime drinking.

Drinking Volume

Drinking support was positively associated with drinking more drinks on drinking days (B=0.06; 95%CI, 0.01 to 0.12) among Korean American women (Table 2). For the logged dependent variable, each unit change in the predictor variable may be interpreted as the percent difference in drinking volume (Wooldridge 2003). This interpretation strategy suggests that for each additional encourager, or fewer discourager, in their social network women drinkers drank 6% (95%CI, 1 to 12) fewer drinks on drinking days. Each additional drinker in women's social networks was associated with women drinking 17% more drinks on drinking occasion (B=0.17; 95%CI, 0.06 to 0.28).

Expected values of drinking volume by levels of drinking support and drinking models were calculated holding other predictors in the regression at their means (Figure 1B). Women who encountered only discouragement for drinking (-5) drank 1.41 (95%CI, 1.14 to 1.81) drinks on drinking days versus 2.68 (95%CI, 1.87 to 3.93) when encountering only encouragement (+5). A woman with equal discouragement and encouragement (0) was expected to drink 1.94 (95%CI, 1.60 to 2.40) drinks on drinking days. Women who had no

drinkers in their social network were expected to drink 1.40 (95%CI, 1.12 to 1.74) drinks on drinking days versus 3.36 (95%CI, 2.15 to 5.00) with all drinkers in their social network.

Consistent with the results for any lifetime drinking, although contrary to hypothesized expectations, acculturation was not statistically significantly associated with a higher drinking volume (Table 2). Drinking volume, among current drinkers, was similar among single and married, less and more educated, working and non-working, women. It is possible that the adjusted analysis controlled away the association between acculturation and the drinking indicators. The bivariable associations, however, were consistent with the adjusted associations for any lifetime drinking (OR=1.23; 95%CI, 0.92 to 1.64) and drinking volume (B=0.02; 95%CI, -0.19 to 0.22).

Social Reinforcers by Relationship Type

Consistent with the high reliability of the drinking support and model scales, the association of encouragement, discouragement, or models were similar across relationship types. The association of encouragement on any lifetime drinking or drinking volume, however, did not differ from zero for any relationship, likely because encouragement was rare in any one relationship, and are not discussed in detail.

Discouragement from all relationships was significantly associated with a lower probability of any lifetime drinking (Figure 2A). Discouragement from spouses, on average, was associated with a 11% (95%CI, 2 to 20) lower probability of any lifetime drinking, about half-as-much of that for other relationships, including friends, parents, siblings and sons/daughters. On the other hand, in isolation of each other, drinking in any relationship was not statistically significantly associated with a higher probability of any lifetime drinking, though all were in the predicted direction.

The patterns for drinking volume were similar for drinking discouragement (Figure 2B). Again, spousal discouragement had the weakest association, with the difference in drinking volume not significantly varying across any or no spousal discouragement. Discouragement from friends, parents, siblings and sons/daughters was associated with a lower drinking volume, ranging from drinking 0.59 (95%CI, 0.02 to 1.21) to 0.89 (95%CI, 0.25 to 1.64) fewer drinks on drinking days for siblings and friends respectively. Drinking models, unlike any lifetime drinking, were associated with increases in drinking volume when the modelers were likely similar in demographic traits, *e.g.* siblings and friends. If their sibling drank, women drank 0.80 (95%CI, 0.08 to 1.59) more drinks on drinking days. If their friend drank, women drank 0.70 (95%CI, 0.01 to 1.58) more drinks on drinking days.

Discussion

This analysis points toward an emerging avenue of investigation that attempts to develop explanations for disease and morbidity from proximal and distal mechanisms using ecological frameworks. Our analysis suggests Korean American women's drinking was associated with their micro-social context but not necessarily conformity to the larger cultural context. Contrary to expectations acculturation was not statistically significantly associated with either any lifetime drinking or drinking volume. This relationship contradicted our hypotheses derived from prior investigations that posit acculturation should promote risky behaviors (Song et al., 2004; Hofstetter et al., 2004). Consistent with expectations, Korean American women were more likely to have drunk alcohol and current drinkers drank more on drinking occasions as a function of drinking encouragement, or lack of discouragement, and drinkers in their social network. Relationships characterized by similarities, siblings and friends, typically had a stronger association with women's drinking

behaviors. Spouses may be the closest relationships, however, their drinking traits typically had the weakest associations with women's drinking.

Strengths and Weaknesses

This is likely the only population-based sample of Korean American women that documents acculturation, social network traits and drinking patterns. Another strength is the reliable multi-faceted acculturation index. This measure is preferred to surrogate measures such as language traits that in isolation of other acculturative traits may produce large inferential biases making or null conclusions regarding acculturation robust (Ayers 2010). However, the measures of social contingencies used a pre-generated list of family and friends and excluded other possible social influences of drinking behaviors. Other relationships like mother-in-laws, cousins, and the closeness of friendship ties may be important but could not be explored in this study. The alcohol questions were embedded in a long health surveillance study, by necessity they were brief and were not clinical measures. However the six items used assessed very concisely the critical variables – any lifetime drinking, drinking quantity (binging), drinking frequency (number of binges per month), alcohol tolerance, and signs of alcohol abuse. The rarity of some drinking behaviors restricted our multivariable analysis to any lifetime drinking and drinks consumed per drinking day. The influence of social contingencies and acculturation on other drinking measures, *e.g.* addiction, may be different from that observed in this study.

Relationship with Prior Work

A number of factors justified the need to investigate drinking behaviors among Korean American women. Women who consume similar amounts of alcohol as men, after adjusting for body weight, are more susceptible to poor health outcomes (Rahav et al., 2006; Wilsnack et al., 2000). For example, moderate alcohol consumption may be associated with breast cancer (Smith-Warner et al., 1998), though some evidence suggests otherwise positive effects for cardiovascular disease (Fuchs et al., 1995). Women are also more socially vulnerable to alcohol, such as increased risk of intimate partner violence (Rahav et al., 2006; Wilsnack et al., 2000), than men. Korean American women may have greater social risks for drinking than other women given their dual immigrant-minority status and a traditional culture that supports male hegemony (Min, 2001). Korean American women also differ from other Asian women by genetic differences in alcohol response. Some have a physical “flushing response” to alcohol mediated by a genetically determined inability to rapidly eliminate the alcohol metabolite, acetaldehyde. In contrast, Koreans demonstrate “low response” to alcohol and therefore present fewer physiologically noxious symptoms that might otherwise deter drinking (Duranceaux et al., 2008). At the time of this report very little was known of drinking behaviors among Korean American women, since their minority status precludes their inclusion in most health surveillance. This study provided the first, though limited, population based estimate of drinking patterns among Korean American women.

Consistent with several recent studies of Koreans and Korean Americans (Ayers et al., 2010; Hofstetter et al., 2004; 2010) social contingencies via network mechanisms were fundamental to the social contagion of drinking among Korean American women. This in combination with the high reliability of the drinking support and model scales suggest Korean American women drinkers are embedded in more supportive drinking clusters similar to that found for drinking in the Framingham study (Rosenquist et al., 2010). When we considered the association of specific drinking encouragements, or discouragement, and drinking models outside of their general network scales their leverage reduced dramatically. This pattern suggests there may be a collective network mechanism greater than the sum of its individual parts.

We distinguished between the associations for drinking models and explicit drinking support and found additive effects for each. These findings imply that social contingencies for drinking are not solely communicated by modeling a behavior, but also by how persons are motivated by explicit encouragement or discouragement for drinking. Studies that only observe the associations for drinking models may potentially underestimate network effects by as much as half, as would have been the case in this study. It is possible that social contingencies interact so that a drinking model may be more efficacious when it follows drinking encouragement and less efficacious when it follows drinking discouragement. Testing of this hypothesis yielded insignificant results for all sources but such analysis should not be neglected in future studies.

Implications

The advantage of using theories and analysis strategies focused on reinforcers, like the BEM, is they can be manipulated using interventions for behavior change. Interventions focused on social contingencies that reduce drinking support and drinking models may reduce the likelihood of drinking onset and decrease the volume of alcohol consumed when drinking. Specifically programs that focus on social influence and the willingness to reproach persons may be most appropriate given the present findings. Such programs may wish to use health educators within the Korean American community to design workshops which encourage social support for healthy drinking, directing interventions to the peers or social network members of all Korean immigrants irrespective of their own drinking behaviors. This is a marked departure from the bio-medical model, where the person at risk or already over-drinking will be provided education or counseling to change in isolation of factors outside the individual. Indeed, Alcoholics Anonymous serves as one such example for individuals suffering from alcohol dependence and addiction, where individuals are embedded in new social networks and follow a schedule to change the dynamics of their preexisting network. Social network interventions among Korean American women may be more effective than among other populations, since Asian cultures view individuals as part of a collective rather than as purely autonomous actors (Markus and Kitayama, 1991). In these cases women are more likely to choose behaviors that are consistent with the desires of others than in a culture where rugged individualism predominates as may be the case in the U.S.

Future Research

This analysis sets the stage for continued investigation of Korean American, men and women, drinking behaviors. Within this aim the relevance of this work is a bequest to do so using ecological models that focus on factors outside the individual such as individuals interaction with the larger culture and their social networks. Future research may find it useful to model our strategy across populations but investigations of Korean American women need to be improved by identifying additional network mechanisms and apply these to models with clinical measures of alcohol misuse.

Acknowledgments

The project described was supported by award number R01CA105199 from the National Cancer Institute to C. Richard Hofstetter. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Cancer Institute or the National Institutes of Health. Intramural support was received from the Center for Behavioral Epidemiology and Community Health, Graduate School of Public Health, San Diego State University, San Diego, California, USA. We thank James Fowler, David Jernigan, Hee-Soon Juon, Carl Latkin, Keith Schnakenberg, and Larry Wissow for helpful criticisms. Any omissions are purely accidental.

References

- Andrews JA, Tildesley E, Hops H, Li F. The influence of peers on young adult substance use. *Health Psychol.* 2002; 21:349–357. [PubMed: 12090677]
- Ayers JW. Measuring English proficiency and language preference: Are self-reports valid? *Am J Public Health.* 2010; 100:1364–1366. [PubMed: 20558784]
- Ayers JW, Hofstetter CR, Hughes SC, Park HR, Paik HY, Song YJ, et al. Gender modifies the relationship between social networks and smoking among adults in seoul, south korea. *Int J Public Health.* 2010 Online Edition. 10.1007/s00038-010-0126-7
- Bandura A. Social cognitive theory. *Ann Child Dev.* 1989; 6:60.
- Barnes GM, Farrell MP, Banerjee S. Family influences on alcohol abuse and other problem behaviors among black and white adolescents in a general population sample. *J Res Adolescence.* 1994; 4:183–201.
- Beccaria F. Italian alcohol advertising: A qualitative content analysis. *Contemp Drug Probl.* 2001; 28:391–414.
- Bloomfield K, Gmel G, Neve R, Mustonen H. Investigating gender convergence in alcohol consumption in Finland, Germany, the Netherlands, and Switzerland: A repeated survey analysis. *Subst Abuse.* 2001; 22:39–53.
- Borsari B, Carey KB. Peer influences on college drinking: A review of the research. *J Subst Abuse.* 2001; 13:391–424. [PubMed: 11775073]
- Caetano R, Clark CL, Tam T. Alcohol consumption among racial/ethnic minorities. *Alcohol Health Res W.* 1998; 22:233–238.
- Carroll, RJ.; Ruppert, D. Transformation and weighting in regression. New York: Chapman and Hall; 1988.
- Chi I, Lubben JE, Kitano HHL. Differences in drinking behavior among three Asian-American groups. *J Stud Alcohol.* 1989; 50:15–23. [PubMed: 2927118]
- Cooper ML, Frone MR, Russell M, Mudar P. Drinking to regulate positive and negative emotions: A motivational model of alcohol use. *J Pers Soc Psychol.* 1995; 69:990–990. [PubMed: 7473043]
- DeGrandpre RJ. A science of meaning. Can behaviorism bring meaning to psychological science? *Am Psychol.* 2000; 55:721–379. [PubMed: 10916862]
- Duranceaux NC, Schuckit MA, Luczak SE, Eng MY, Carr LG, Wall TL. Ethnic differences in level of response to alcohol between Chinese Americans and Korean Americans. *J Stud Alcohol Drugs.* 2008; 69:227–234. [PubMed: 18299763]
- DuRant RH, Rome ES, Rich M, Allred E, Emans J, Woods ER. Tobacco and alcohol use behaviors portrayed in music videos: A content analysis. *Am J Public Health.* 1997; 87:1131–1135. [PubMed: 9240102]
- Fuchs CS, Stampfer MJ, Colditz GA, Giovannucci EL, Manson JAE, Kawachi I, Hunter DJ, Hankinson SE, Hennekens CH, Rosner B. Alcohol consumption and mortality among women. *N Engl J Med.* 1995; 332:1245–1250. [PubMed: 7708067]
- Glass TA, McAtee MJ. Behavioral science at the crossroads in public health: Extending horizons, envisioning the future. *Soc Sci Med.* 2006; 62:1650–1671. [PubMed: 16198467]
- Glenn SS, Ellis J, Greenspoon J. On the revolutionary nature of the operant as a unit of behavioral selection. *Am Psychol.* 1992; 47:1329–1329.
- Helzer JE, Canino GJ, Yeh EK, Bland RC, Lee CK, Hwu HG, et al. Alcoholism--North America and Asia: A comparison of population surveys with the diagnostic interview schedule. *Arch Gen Psychiatry.* 1990; 47:313–319. [PubMed: 2322082]
- Hofstetter CR, Hovell MF, Lee J, Zakarian J, Park H, Paik HY, Irvin VL. Tobacco use and acculturation among Californians of Korean descent: A behavioral epidemiological analysis. *Nicotine Tob Res.* 2004; 6:481–489. [PubMed: 15203782]
- Hofstetter CR, Ayers JW, Irvin VL, Kang Sim DE, Hughes SC, Reighard F, Hovell MF. Does church participation facilitate tobacco control? A report on Korean immigrants. *J Imm Min Health.* 2010; 12:187–197.

- Hofstetter CR, Hovell MF, Irvin VL, Ayers JW, Hughes S, Kang S. It's others, not the police: Smoking, reprimand, and fines among adults of Korean descent in California. *Health Psychol.* 2010; 29:255–261. [PubMed: 20496979]
- Hovell, MF.; Wahlgren, DR.; Gehrman, CA. The behavioral ecological model: Integrating public health and behavioral science. In: DiClemente, RJ.; Crosby, RA.; Kegler, M., editors. *Emerging theories in health promotion practice and research: Strategies for improving public health.* San Francisco, CA: Jossey-Bass; 2002. p. 347-385.
- Hovell, MF.; Wahlgren, DR.; Adams, MA. The logical and empirical basis for the behavioral ecological model. In: DiClemente, RJ.; Crosby, RA.; Kegler, M., editors. *Emerging theories in health promotion practice and research: Strategies for improving public health.* 2. San Francisco, CA: Jossey-Bass; 2009. p. 347-385.
- Jeffery RW. How can health behavior theory be made more useful for intervention research? *Int J Behav Nutr Phy.* 2004; 1:1–15.
- King G, Tomz M, Wittenberg J. Making the most of statistical analyses: Improving interpretation and presentation. *Am J Pol Sci.* 2000; 44:341–355.
- Landrine H, Klonoff EA. Culture change and ethnic-minority health behavior: An operant theory of acculturation. *J Beh Med.* 2004; 27:527–555.
- Legge C, Sherlock L. Perception of alcohol use and misuse in three ethnic communities: Implications for prevention programming. *Subst Use Misuse.* 1991; 25:629–653.
- Li HZ, Rosenblood L. Exploring factors influencing alcohol consumption patterns among Chinese and Caucasians. *J Stud Alcohol.* 1994; 55:427–433. [PubMed: 7934050]
- Lubben JE, Chi I, Kitano HH. The relative influence of selected social factors on Korean drinking behavior in Los Angeles. *Adv Alcohol Subst Abuse.* 1989; 8:1–17. [PubMed: 2711913]
- Markus HR, Kitayama S. Culture and the self: Implications for cognition, emotion, and motivation. *Psychol Rev.* 1991; 98:224–253.
- McKnight AJ, McPherson K. Evaluation of peer intervention training for high school alcohol safety education. *Accid Anal Prev.* 1986; 18:339–47. [PubMed: 3741584]
- McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educ Behav.* 1988; 15:351–377.
- Min PG. Changes in Korean immigrants' gender role and social status, and their marital conflicts. *Soc Forum.* 2001; 16:301–320.
- Nakashima J, Wong MM. Characteristics of alcohol consumption, correlates of alcohol misuse among Korean American adolescents. *J Drug Educ.* 2000; 30:343–359. [PubMed: 11092153]
- Park JT, Kim BG, Jhun HJ. Alcohol consumption and the CAGE questionnaire in Korean adults: Results from the second Korea national health and nutrition examination survey. *J Korean Med Sci.* 2008; 23:199–206. [PubMed: 18437000]
- Parrish, KM. Alcohol abuse prevention research in Asian American and Pacific Islander communities. In: Langton, PA.; Epstein, LG.; Orlandi, MA., editors. *Challenge of Participatory Research: Preventing Alcohol-Related Problems in Ethnic Communities.* Center for Substance Abuse Prevention Cultural Competence Series 3. Rockville, MD: Center for Substance Abuse Prevention; 1995. p. 411-428.
- Rahav G, Wilsnack R, Bloomfield K, Gmel G, Kuntsche S. The influence of societal level factors on men's and women's alcohol consumption and alcohol problems. *Alcohol Suppl.* 2006; 41:i47–i55.
- Rosenquist JN, Murabito J, Fowler JH, Christakis NA. The spread of alcohol consumption behavior in a large social network. *Ann Int Med.* 2010; 152:426–433. [PubMed: 20368648]
- Smith KP, Christakis NA. Health and social networks. *Ann Rev Soc.* 2008; 34:405–429.
- Smith-Warner SA, Spiegelman D, Yaun SS, Van den Brandt PA, Folsom AR, Goldbohm RA, Graham S, Holmberg L, Howe GR, Marshall JR, et al. Alcohol and breast cancer in women a pooled analysis of cohort studies. *J Am Med Assoc.* 1998; 279:535–540.
- Song YJ, Hofstetter CR, Hovell MF, Paik HY, Park HR, Lee J, Irvin VL. Acculturation and health risk behaviors among Californians of Korean descent. *Prev Med.* 2004; 39:147–56. [PubMed: 15207996]
- Suinn RM, Khoo G, Ahuna C. The Suinn-Lew Asian self-identity acculturation scale: Cross-Cultural information. *J Multicult Couns D.* 1995; 23:139–139.

- Suinn RM, Rickard-Figueroa K, Lew S, Vigil P. The Suinn-Lew Asian self-identity acculturation scale: An initial report. *Educ Psychol Meas.* 1987; 47:401.
- Urberg KA, Degirmencioglu SM, Pilgrim C. Close friend and group influence on adolescent cigarette smoking and alcohol use. *Dev Psychol.* 1997; 33:834–844. [PubMed: 9300216]
- Varma SC, Siris SG. Alcohol abuse in Asian Americans: Epidemiological and treatment issues. *Am J Addict.* 1996; 5:136–143.
- Watson JB. Psychology as the behaviorist views it. *Psychol Rev.* 1994; 101:248–253.
- Weatherspoon AJ, Danko GP, Johnson RC. Alcohol consumption and use norms among Chinese Americans and Korean Americans. *J Stud Alcohol.* 1994; 55:203–206. [PubMed: 8189740]
- Weatherspoon AJ, Park JY, Johnson RC. A family study of homeland Korean alcohol use. *Addict Behav.* 2001; 26:101–113. [PubMed: 11196283]
- Wilsnack RW, Vogeltanz ND, Wilsnack SC, Harris TR. Gender differences in alcohol consumption and adverse drinking consequences: Cross-Cultural patterns. *Addict.* 2000; 95:251–265.
- Wooldridge, JM. *Introductory econometrics: a modern approach.* 2. Mason, OH: Thomson South-Western; 2003.
- Yu EY, Choe P, Han SI. Korean population in the United States, 2000: Demographic characteristics and socio-economic status. *Int J Korean Studies.* 2002; 6:71–107.

Figure 1. Social support and models for drinking are associated with more drinking

Panel A shows the predicted probability of any lifetime drinking and Panel B the expected value of drinking volume by drinking support and models. These patterns were derived from the statistical models reported in Table 2.

Figure 2. Specific drinking social influences by relationship type

Panel A and B displays the mean effect sizes and 95% confidence intervals. Each source represents a separate multiple regression adjusting for the acculturation, education, work status, marital status, and age. All models significantly reduced variation $P < .001$. Drinking encouragement was omitted from the model to improve presentation, since individually the confidence intervals for these indicators were large and none were statistically significant.

Table 1

Sample Characteristics.^a

	<u>Mean</u>	<u>95% CI</u>	<u>Min</u>	<u>Max</u>	<u>N</u>
Any Lifetime Drinking	0.70	0.67, 0.74	0.00	1.00	591
Drinking volume	1.18	1.07, 1.28	0.00	10.00	352
Former Drinker	0.10	0.08, 0.12	0.00	1.00	591
Drinking Tolerance	22.07	21.31, 22.82	15.00	53.00	184
Binge Drinking	2.02	1.75, 2.30	0.00	12.50	201
Age Began Drinking	0.65	0.33, 0.97	0.00	28.00	255
Drinking Support	-2.50	-2.70, -2.31	-5.00	5.00	591
Spouse Encourage	0.09	0.06, 0.11	0.00	1.00	487
Spouse Discourage	0.58	0.54, 0.63	0.00	1.00	487
Sibling Encourage	0.05	0.03, 0.06	0.00	1.00	574
Sibling Discourage	0.62	0.58, 0.66	0.00	1.00	574
Parent Encourage	0.03	0.02, 0.05	0.00	1.00	466
Parent Discourage	0.66	0.62, 0.71	0.00	1.00	466
Son/Daughter Encourage	0.04	0.02, 0.05	0.00	1.00	447
Son/Daughter Discourage	0.70	0.66, 0.74	0.00	1.00	447
Friend Encourage	0.07	0.05, 0.09	0.00	1.00	586
Friend Discourage	0.61	0.57, 0.65	0.00	1.00	586
Drinking Models	0.95	0.86, 1.05	0.00	5.00	591
Spouse	0.33	0.29, 0.37	0.00	1.00	489
Sibling	0.22	0.18, 0.25	0.00	1.00	581
Parent	0.21	0.17, 0.25	0.00	1.00	467
Child	0.14	0.11, 0.18	0.00	1.00	442
Friend	0.19	0.16, 0.23	0.00	1.00	587
Acculturation	-0.00	-0.05, 0.05	-0.84	3.02	591
Years Education	15.24	15.01, 15.47	0.00	20.00	591
Married	0.38	0.34, 0.41	0.00	1.00	591
Work Outside the Home	0.78	0.74, 0.81	0.00	1.00	591
Age	46.06	44.90, 47.23	18.00	94.00	591

^aNumbers in cells are means (indicative of percent for a 0–1 variable) and associated 95% confidence intervals, range, and useful sample size for each concept. Useful sample size includes respondents who refused to answer or were ineligible, e.g. non-drinkers for drinking questions. Drinking volume is the mean number of drinks per drinking occasion among persons who reported any lifetime drinking.

Table 2Any Lifetime Drinking and Drinking Volume Regressed on Cultural and Social Reinforcers, 2007.^a

	<u>Any lifetime drinking</u>	<u>Drinking volume</u>
Drinking Support	1.18 *** [1.08,1.28]	0.06 * [0.01,0.12]
Drinking Models	1.23 * [1.02,1.48]	0.17 ** [0.06,0.28]
Acculturation	0.96 [0.68,1.36]	-0.08 [-0.32,0.16]
Education	1.10 ** [1.03,1.18]	-0.01 [-0.06,0.04]
Work outside the home	1.42 [0.96,2.11]	-0.06 [-0.34,0.21]
Married	1.30 [0.81,2.08]	-0.14 [-0.51,0.23]
Age	0.99 [0.97,1.00]	-0.01 [-0.02,0.00]
Constant	--	0.45 [-0.60,1.50]
Nagelkerke or Adjusted R ²	.11	.05
N	591	352

^aNumbers in cells are adjusted odds ratios or regression coefficients, 95% confidence intervals, and two tailed probabilities*
p<.05,**
p<.01,***
p<.001.

Any lifetime drinking was coded 1 drinker and 0 abstainer. Drinking volume was the mean number of drinks per drinking occasion among persons who reported current drinking after taking the natural. Listwise deletion was used for analysis.