

# They Drink How Much and Where? Normative Perceptions by Drinking Contexts and Their Association to College Students' Alcohol Consumption\*

MELISSA A. LEWIS, PH.D.,<sup>†</sup> DANA M. LITT, PH.D., JESSICA A. BLAYNEY, B.A., TY W. LOSTUTTER, PH.D.,  
HOLLIE GRANATO, M.A.,<sup>†</sup> JASON R. KILMER, PH.D.,<sup>†</sup> AND CHRISTINE M. LEE, PH.D.

*Department of Psychiatry and Behavioral Sciences, University of Washington, Box 354944, Seattle, Washington 98195*

**ABSTRACT. Objective:** Prior research has shown that normative perceptions of others' drinking behavior strongly relates to one's own drinking behavior. Most research examining the perceived drinking of others has generally focused on specificity of the normative referent (i.e., gender, ethnicity). The present study expands the research literature on social norms by examining normative perceptions by various drinking contexts. Specifically, this research aimed to determine if college students overestimate peer drinking by several drinking contexts (i.e., bar, fraternity/sorority party, non-fraternity/sorority party, sporting event) and to examine whether normative perceptions for drinking by contexts relate to one's own drinking behavior specific to these contexts. **Method:** Students ( $N = 1,468$ ; 56.4% female) participated in a web-based survey

by completing measures assessing drinking behavior and perceived descriptive drinking norms for various contexts. **Results:** Findings demonstrated that students consistently overestimated the drinking behavior for the typical same-sex student in various drinking contexts, with the most prominent being fraternity/sorority parties. In addition, results indicated that same-sex normative perceptions for drinking by contexts were associated with personal drinking behavior within these contexts. **Conclusions:** Results stress the importance of specificity of social norms beyond those related to the normative referent. Clinical implications are discussed in terms of preventions and intervention efforts as well as risks associated with drinking in a novel context. (*J. Stud. Alcohol Drugs*, 72, 844–853, 2011)

*"Everybody in the club gettin' tipsy." J-Kwon*

AS PREVIOUS RESEARCH and the above quote suggest, individuals vary their drinking behavior by location and may have the sense that everybody does the same. However, research has yet to examine if individuals' perceptions of what others drink varies by location and if these perceptions relate to one's own drinking within these contexts. Prior research has established that social norms are associated with alcohol consumption (Borsari and Carey, 2001, 2003) such that perceiving others to drink heavier and more frequently is positively associated with one's own drinking behavior. Perceived descriptive drinking norms, a type of social norm, are the perceived prevalence of drinking behavior. Research conducted over more than 2 decades indicates perceived descriptive drinking norms are often discrepant from actual drinking norms with perceived descriptive drinking norms being overestimated when compared with

actual drinking norms (Borsari and Carey, 2003). Although much research examining the perceived drinking of others has focused on the specificity of the normative referent (e.g., gender, ethnicity; Larimer et al., 2009; Lewis and Neighbors, 2004), previous research examining perceived descriptive drinking norms has primarily focused on drinking quantity more generally rather than examining drinking quantity for specific drinking contexts. The present study expands social norms literature by examining descriptive normative perceptions by various drinking contexts. Examining perceived descriptive drinking norms by drinking contexts is important because research has shown several drinking contexts to be high risk. Moreover, as found when examining the specificity of the normative referent (Lewis and Neighbors, 2007), the present study may determine that it is important to target descriptive normative perceptions specific to drinking contexts in preventive interventions.

## *Drinking contexts*

Previous research has conceptualized drinking contexts as where one drinks, with whom one is drinking, and when one drinks (Cahalan et al., 1969). In the present study, drinking context was conceptualized as where one drinks so that the normative perceptions would focus on location rather than on the normative referent (with whom one is drinking). Understanding factors that are associated with drinking in these contexts can improve methods of prevention. Prior research

Received: March 17, 2011. Revision: May 5, 2011.

\*This research was supported by National Institute on Alcohol Abuse and Alcoholism Grant K01AA016966 (to Melissa A. Lewis).

<sup>†</sup>Correspondence may be sent to Melissa A. Lewis at the above address or via email at: lewisma@uw.edu. Hollie Granato is with the Department of Psychology, University of Washington, Seattle, WA. Jason R. Kilmer is also with Health and Wellness, Division of Student Life, University of Washington, Seattle, WA.

has shown that college student drinking events are almost evenly distributed between public (i.e., bars, restaurants) and private (i.e., homes) contexts (Clapp et al., 2000). Moreover, prior investigations of drinking locations have found that the context in which drinking occurs often contributes to the amount of alcohol consumed (Clapp et al., 2006) and is related to a variety of negative consequences (Nyaronga et al., 2009; Wells et al., 2005). Several variables have been examined as to why context influences alcohol consumption. Factors such as ethnicity (Nyaronga et al., 2009), gender (Herd and Grube, 1993), lack of supervision (Wells et al., 2005), and living arrangement (Gfroerer et al., 1997; Valliant and Scanlan, 1996; Ward and Gryczynski, 2009) are associated with different contexts of heavier drinking in college. A number of contexts have been examined in relation to alcohol consumption and negative consequences, including home, non-fraternity/sorority parties, fraternity/sorority parties, bars, and sporting events.

*Home.* In a national survey on alcohol consumption and related consequences, it was found that 60% of students who live on campus reported drinking in their residence in the last 30 days (Liang and Huang, 2008). Further research by Nyaronga et al. (2009) found three basic clusters within their study on ethnicity and drinking context, with home being one of the three most popular locations. However, home was encapsulated into “mostly drink at home but do a fair amount of drinking elsewhere,” making it difficult to zero in on the consequences associated with this drinking context. Clapp et al. (2000) focused on drinking contexts as public (bars and restaurants) and private (homes). According to their findings, one factor that increased alcohol-related consequences in private settings is the availability of illegal drugs (Clapp et al., 2000). To our knowledge, no studies have examined normative perceptions for this context.

*Non-fraternity/sorority parties.* Harford et al. (2002) found that the prevalence of heavy drinking among college students was highest for off-campus parties (31%), followed by off-campus bars (22%), fraternity/sorority parties (15%), and dormitory parties (10%). This is particularly concerning because off-campus parties offer less access to social controls from the campus and community, thus making this a difficult context in which to successfully intervene. When examining themed parties (e.g., lingerie-themed party), Clapp et al. (2008) found that heavier drinkers attended themed parties more, engaged in more drinking games, and had more alcohol-related consequences when compared with drinkers at parties that were not themed. In another study, it was found that heavier drinking at parties was associated with a combination of groups of intoxicated people, bringing your own beverages, drinking games, and illicit drugs (Clapp et al., 2006). Further examination of drinking context and drunk driving found that those who drank at parties had higher blood alcohol concentrations (BACs) than in any other context (Usdan et al., 2005). These previous studies,

however, did not examine drinking norms and misperceptions within parties.

*Fraternity/sorority parties.* Research examining drinking in fraternity/sorority contexts has found that fraternity/sorority houses were associated with the highest frequency of risky drinking (Park et al., 2009) and highest BACs (Glindemann and Geller, 2003). Findings indicate that students consume more alcohol at fraternity/sorority parties than all other contexts, with the exception of off-campus parties (Paschall and Saltz, 2007). Moreover, attendees of fraternity/sorority parties also reported the highest number of drinks consumed before the event in comparison with attendees of house parties, campus events, off-campus parties, bars/restaurants, and outdoor events (Paschall and Saltz, 2007). In addition, both fraternity/sorority and non-fraternity/sorority students exhibit higher BACs at fraternity/sorority parties than non-fraternity/sorority parties (Glindemann and Geller, 2003). Research examining normative perceptions specific to the normative referent, not drinking context, has found that fraternity/sorority members perceive fellow fraternity/sorority members as consuming heavy amounts of alcohol and approving of alcohol use (Carey et al., 2006). However, normative perceptions may also exist based on drinking context, not just for the normative referent. Although social norms have been associated with drinking among fraternity/sorority members (Carey et al., 2006), normative perceptions have not been evaluated specific to the fraternity/sorority party context.

*Bars.* Prior research has shown bars to be a drinking context associated with risk. A recent analysis of three U.S. National Alcohol Surveys found that bars are consistently a preferred drinking context, and people who drink at bars are more likely to engage in arguments, fighting, and drunk driving than those who drink the equivalent amount of alcohol at home (Nyaronga et al., 2009). Research has also shown that college students who have taken advantage of drink specials in bars reached higher BACs than students who did not take advantage of drink specials (Thombs et al., 2008). Research has yet to examine the relationship between perceived descriptive drinking norms and their relation to one's drinking in bars.

*Sporting events.* Previous research has found that alcohol is not only a quintessential component for attendees of sporting events (Glassman et al., 2010) but is often readily available at larger schools with sports teams (Nelson et al., 2010). According to Nelson et al. (2010), availability can include alcohol sold within the stadium but also accessed with tailgate parties or fans bringing their own. With alcohol being highly common at sporting events, fans tend to consume drinks at extremely high levels (Glassman et al., 2007, 2010; Neal and Fromme, 2007; Neal et al., 2005; Neighbors et al., 2006b). Neal and Fromme (2007) found that football games considered to be high profile were often the heaviest drinking occasions, even when compared with celebrating

alcohol-centered holidays like New Year's Eve or Halloween. With heavy alcohol use comes consequences, with the most commonly reported alcohol-related problem at sporting events being fights inside and outside games (Lenk et al., 2009). Conversely, other studies have found no significant differences between sports fans and non-sports fans reporting of alcohol-related problems (End et al., 2009). Research has examined normative perceptions related to drinking contexts specific to tailgating. Neighbors et al. (2006b) examined normative perceptions and tailgating. They found that students underestimated the percentage of tailgaters who drank but overestimated typical consumption, which was associated with heavier drinking during tailgating. Whereas normative perceptions have been examined by drinking context for tailgating, the present study extends this context to sporting events in general and examines these normative perceptions in relation to other context-specific norms and context-specific drinking.

### *Present study*

The current study seeks to add to the drinking context and social norms literature by providing further examination of alcohol consumption and perceived same-sex student alcohol use in multiple drinking contexts. Because research has shown that individuals will seek out environments that are consistent with their expectancies, motivations, and goals (Gaines, 1982; Lange and Voas, 2000), we expected that students would perceive the typical same-sex student as consuming more drinks in various drinking contexts than one's own drinking in the same contexts, and that perceiving the typical same-sex student as consuming higher amounts of alcohol in various contexts would be associated with heavier alcohol consumption in those contexts when controlling for gender and age.

## **Method**

### *Participants and procedures*

A random sample ( $N = 3,224$ ) of 18- to 25-year-old undergraduate students were mailed and e-mailed an invitation to participate in a 20-minute web-based screening survey for a larger study on sexual behavior and alcohol use. A total of 1,468 (45.5%) participated in the study, and of those, 1,387 (94.5%) completed the survey. Recruitment rates were comparable to other large-scale studies in this population (e.g., Marlatt et al., 1998; McCabe et al., 2002). Participants received \$10 for completing the survey. The ethnicity of the sample was 61.0% White, 23.2% Asian, 9.4% multiracial, and 6.4% other. A small proportion of the sample identified as Hispanic (5.6%). The mean age for participants was 19.90 years old ( $SD = 1.52$ ). Those who completed screening were younger than those who did not complete the screening sur-

vey,  $t(3,223) = 2.23, p < .05$ . There were significant differences in ethnic representation (i.e., White, Asian, and other) based on whether students decided to participate,  $\chi^2(2, n = 4,106) = 14.96, p = .001$ , Cramer's  $V = .060, p < .001$ . The sample included 61.0% Whites and 23.2% Asians, whereas those who did not participate were 54.7% White and 27.6% Asian. Thus, Whites were more likely to participate and Asians were less likely to participate in the screening survey. There were no differences in other ethnic representation. The sample included 56.4% women and 43.6% men, whereas the invited sample was 49.8% women and 50.2% men. Thus, women were more likely to participate in the screening survey than men,  $\chi^2(1, n = 4,659) = 17.66, p < .001$ , Cramer's  $V = .062, p < .001$ . All study procedures were approved by the university's institutional review board, and a Federal Certificate of Confidentiality was obtained for this research.

### *Measures*

*Drinking at settings/events.* Students were asked to report the amount of alcohol they typically consume at five contexts (i.e., home, non-fraternity/sorority party, fraternity/sorority party, bar, and sporting event). The 5-item scale instructions read, "Consider the contexts listed below. How much alcohol, on average (measured in the number of drinks), do you drink in each of these contexts?"

*Perceived drinking at settings/events.* Perceived descriptive drinking norms were assessed for the same five settings/events that were used to assess drinking in these contexts. The instructions read, "Consider the contexts listed below. How much alcohol, on average (measured in the number of drinks), do you think the typical male/female [University Name] student drinks in each of these contexts?"

## **Results**

### *Data analysis*

Preliminary analyses revealed nonnormal distributions for all drinking outcomes. For all variables the distributions were positively skewed, approximating a negative binomial distribution with the exception of a disproportionately large number of zero values. Thus, zero-inflated negative binomial (ZINB) regression was selected as the primary analysis strategy (Atkins and Gallop, 2007; Heilbron, 1994; Hilbe, 2007; Simons et al., 2006). ZINB regression is a type of mixture model in which a negative binomial regression is fit and excess zeros (i.e., over and above what is predicted by the negative binomial regression) are modeled using a logistic regression. The logistic portion of the model examines the likelihood of the observation being a zero value, such that it predicts the excess zeros (i.e., zero scores that exceed what would be expected in a negative binomial distribution). The second set of tests focuses on the count portion of the

TABLE 1. Correlations of perceived drinking norms and drinking behavior

	1	2	3	4	5	6	7	8	9	10
1. Perceived home	–									
2. Perceived non–fraternity/sorority parties	.33**	–								
3. Perceived fraternity/sorority parties	.46**	.71**	–							
4. Perceived bar	.30**	.58**	.58**	–						
5. Perceived sporting event	.48**	.50**	.64**	.50**	–					
6. Actual home	.42**	.28**	.21**	.27**	.22**	–				
7. Actual non–fraternity/sorority parties	.17**	.49**	.34**	.35**	.32**	.46**	–			
8. Actual fraternity/sorority parties	.05	.27**	.27**	.28**	.30**	.27**	.56**	–		
9. Actual bar	.13**	.23**	.16**	.35**	.20**	.36**	.36**	.27**	–	
10. Actual sporting event	.11**	.24**	.21**	.31**	.43**	.36**	.52**	.61**	.40**	–

Note: ns range from 1,332 to 1,390 because of missing data.

\*\* $p < .01$ .

model, in this case the negative binomial distribution. In these data, this corresponds to evaluating predictors of the number of drinks or negative consequences and includes positive integers and zero. Five ZINB regression analyses were performed. Dependent variables were drinks consumed at a bar, fraternity/sorority party, non–fraternity/sorority party, home, sporting event, and the number of drinks consumed per typical drinking occasion. Gender and age were included in all analyses as covariates based on their previous associations with alcohol consumption and drinking contexts (Neighbors et al., 2007; O’Malley and Johnston, 2002; Read et al., 2002; Wechsler et al., 2000). However, because these variables were not a primary focus of this study, we did not test interactions with these variables.

### Descriptive information

Zero-order correlations are presented in Table 1. Results indicate that normative perceptions for each context were positively and significantly correlated with their respective drinking context.

### Perceived descriptive normative perceptions by context

To determine if students perceived that others engaged in more alcohol use in various contexts than they actually do, a series of repeated measures multivariate analysis of covariances (MANCOVAs) were conducted. The actual number of drinks consumed at home, non–fraternity/sorority party, fraternity/sorority party, bar, and sporting events were the dependent variables. Personal behavior and perceived behavior (i.e., perceived male and perceived female student drinking behavior) were entered as within-subject factors. The gender and age of perceiver were entered as covariates. For MANCOVA results, partial eta squared ( $\eta_p^2$ ) describes the proportion of total variability of the dependent variable(s) attributable to an effect, with values of .01 for a small effect, .06 for a medium effect, and .14 for a large effect (Cohen, 1988).

Multivariate findings indicated that there was a main effect for perceived and personal behavior (i.e., repeated measures), such that men and women perceived others as engaging in more alcohol use than they actually did in each of the contexts (home, non–fraternity/sorority, fraternity/sorority, bars, and sporting events; all  $F$ s  $> 7.59$ , all  $p$ s  $> .01$ ). Estimated marginal means, standard errors, and univariate and multivariate statistics can be found in Table 2.

### Zero-inflated binomial regression results evaluating home

Results of the ZINB regression evaluating drinks consumed at home as the dependent variable are presented in Table 3. Results for the logistic portion of the model represent unique associations between each predictor and expected zero scores. Results for the counts portion of the model represent unique associations between each predictor and the number of drinks (count) typically consumed at home. The likelihood ratio for the full ZINB model was  $\chi^2(6) = 395.71$ ,  $p < .001$ , maximum likelihood  $R^2 = .25$ , which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count mod-

TABLE 2. Estimated marginal means and standard errors

Variable	<i>M</i>	<i>SE</i>	<i>F</i> (1, 1363)	Wilks’s $\Lambda$	$\eta_p^2$
Drinking at home			7.59**	.99	.01
Actual	1.50	.04			
Perceived	1.91	.05			
Drinking at non–fraternity/sorority parties			46.86**	.96	.03
Actual	2.92	.04			
Perceived	4.36	.04			
Drinking at fraternity/sorority parties			184.65***	.88	.12
Actual	2.03	.05			
Perceived	5.41	.06			
Drinking at bars			96.51***	.93	.07
Actual	1.20	.03			
Perceived	3.17	.03			
Drinking at sporting events			69.46***	.95	.05
Actual	1.31	.04			
Perceived	3.15	.04			

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

els. The Vuong test for nonnested models supported the use of a zero-inflated model over a standard negative binomial model,  $Z = 5.88, p < .001$ .

*Logistic results.* Results of the logistic portion of the model indicated that gender was not significantly associated with zero inflation. The perceived number of typical drinks at home and age were significantly and negatively associated with zero inflation, indicating that those reporting not

drinking at home were more likely to perceive other students as typically consuming less alcohol at home and were more likely to be younger.

*Count results.* Results from the counts portion of the model indicated that gender and age were not associated with the number of drinks consumed at home. However, the perceived number of drinks at a home was positively associated with the number of drinks typically consumed at

TABLE 3. ZINB regression results

Variable	<i>B</i>	<i>SE B</i>	<i>Z</i>	Ratio	[95% CI]
Actual drinks at home					
Logistic portion of the model					
Gender	0.329	0.179	1.83	1.390	[0.977, 1.977]
Age	-0.687	0.088	-7.76***	0.503	[0.423, 0.598]
Perceived drinks at home	-0.417	0.064	-6.49***	0.659	[0.581, 0.747]
Counts portion of the model					
Gender	0.093	0.069	1.34	1.097	[0.958, 1.258]
Age	-0.027	0.022	-1.26	0.972	[0.933, 1.016]
Perceived drinks at home	0.148	0.017	8.91***	1.160	[1.123, 1.198]
Actual drinks at a non-fraternity/sorority party					
Logistic portion of the model					
Gender	0.381	0.130	2.92**	1.463	[1.133, 1.889]
Age	-0.287	0.046	-6.21***	0.750	[0.685, 0.821]
Perceived drinks at a non-fraternity/sorority party	-0.282	0.032	-8.77***	0.754	[0.708, 0.803]
Counts portion of the model					
Gender	0.145	0.035	4.16***	1.116	[1.080, 1.237]
Age	-0.027	0.011	-2.50**	0.973	[0.952, 0.994]
Perceived drinks at a non-fraternity/sorority party	0.111	0.007	17.41***	1.117	[1.103, 1.131]
Actual drinks at a fraternity/sorority party					
Logistic portion of the model					
Gender	0.224	0.121	1.85	1.251	[0.987, 1.586]
Age	0.058	0.038	1.50	1.059	[0.983, 1.142]
Perceived drinks at a fraternity/sorority party	-0.059	0.021	-3.34***	1.251	[0.896, 0.972]
Counts portion of the model					
Gender	0.249	0.043	5.74***	1.282	[1.178, 1.395]
Age	-0.025	0.015	-1.70	0.975	[0.947, 1.004]
Perceived drinks at a fraternity/sorority party	0.094	0.007	13.50***	1.099	[1.084, 1.115]
Actual drinks at a bar					
Logistic portion of the model					
Gender	0.257	0.182	1.42	1.294	[0.906, 1.848]
Age	-1.557	0.096	-16.24***	0.209	[0.173, 0.252]
Perceived drinks at a bar	-0.112	0.045	-2.55*	0.891	[0.815, 0.974]
Counts portion of the model					
Gender	-0.073	0.055	-1.32	0.929	[0.834, 1.036]
Age	-0.008	0.020	-0.39	0.992	[0.955, 1.032]
Perceived drinks at a bar	0.186	0.013	14.54***	1.204	[1.175, 1.245]
Actual drinks at sporting events					
Logistic portion of the model					
Gender	0.347	0.141	3.17**	1.564	[1.186, 2.062]
Age	-0.462	0.051	-9.09***	0.630	[0.578, 0.696]
Perceived drinks at sporting events	-0.272	0.029	-9.37***	0.762	[0.719, 0.806]
Counts portion of the model					
Gender	0.214	0.064	3.37***	1.239	[1.093, 1.403]
Age	-0.073	0.020	-3.58***	0.929	[0.893, 0.967]
Perceived drinks at sporting events	0.132	0.011	11.76***	1.141	[1.116, 1.166]

Notes: ZINB = zero-inflated negative binomial; ratio = zero-inflated odds ratios are presented for the logistic portion of the model and negative binomial incidence rate ratios are presented for the counts portion of the model.

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

home, such that those reporting consuming more drinks at home perceived other students as consuming more alcohol at home.

*Zero-inflated binomial regression results evaluating non-fraternity/sorority parties*

Results of the ZINB regression evaluating drinks consumed at non-fraternity/sorority parties as the dependent variable are presented in Table 3. The likelihood ratio for the full ZINB model was  $\chi^2(6) = 479.88$ ,  $p < .001$ , maximum likelihood  $R^2 = .30$ , which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for nonnested models supported the use of a zero-inflated model over a standard negative binomial model,  $Z = 38.61$ ,  $p < .001$ .

*Logistic results.* Results of the logistic portion of the model indicated that gender was significantly and positively associated with zero inflation, indicating that those reporting not drinking at non-fraternity/sorority parties were more likely to be male. In addition, the perceived number of typical drinks at non-fraternity/sorority parties and age were negatively associated with zero inflation, indicating that those reporting not drinking at non-fraternity/sorority parties were more likely to perceive other students as typically consuming less alcohol at non-fraternity/sorority parties and to be younger.

*Count results.* Results from the counts portion of the model indicated that the perceived number of drinks at a non-fraternity/sorority party, gender, and age were all associated with the number of drinks typically consumed at non-fraternity/sorority parties, such that those reporting consuming more drinks at fraternity/sorority parties perceived other students as typically consuming more alcohol at non-fraternity/sorority parties, were likely to be younger, and were male.

*Zero-inflated binomial regression results evaluating fraternity/sorority parties*

Results of the ZINB regression evaluating drinks consumed at fraternity/sorority parties as the dependent variable are presented in Table 3. The likelihood ratio for the full ZINB model was  $\chi^2(8) = 243.90$ ,  $p < .001$ , maximum likelihood  $R^2 = .17$ , which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for nonnested models supported the use of a zero-inflated model over a standard negative binomial model,  $Z = 13.35$ ,  $p < .001$ .

*Logistic results.* Results of the logistic portion of the model indicated that gender and age were not significantly associated with zero inflation (i.e., zeros in excess of what

is predicted by the negative binomial regression). However, the perceived number of typical drinks at a fraternity/sorority party was negatively associated with zero inflation, indicating that those reporting not drinking at fraternity/sorority parties were more likely to perceive other students as typically consuming less alcohol at fraternity/sorority parties.

*Count results.* Results from the counts portion of the model indicated that age was not associated with a greater number of drinks consumed at a fraternity/sorority party. Gender was associated with the number of drinks at a fraternity/sorority party, such that men reported consuming more drinks than women. Complimentary to the logistic portion of the results, the perceived number of drinks at a fraternity/sorority party was positively associated with the number of drinks typically consumed at fraternity/sorority parties, such that those reporting consuming more drinks at fraternity/sorority parties perceived other students as typically consuming more alcohol at fraternity/sorority parties.

*Zero-inflated binomial regression results evaluating bars*

Results of the ZINB regression evaluating the typical number of drinks consumed at a bar as the dependent variable are presented in Table 3. The likelihood ratio for the full ZINB model was  $\chi^2(6) = 864.89$ ,  $p < .001$ , maximum likelihood  $R^2 = .47$ , which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for nonnested models supported the use of a zero-inflated model over a standard negative binomial model,  $Z = 14.14$ ,  $p < .001$ .

*Logistic results.* Results of the logistic portion of the model indicated that gender was not significantly associated with zero inflation (i.e., zeros in excess of what is predicted by the negative binomial regression). Age and the perceived number of typical drinks in a bar were each negatively associated with zero inflation, indicating that those reporting not drinking in a bar were more likely be younger and to perceive other students as typically consuming less alcohol in a bar.

*Count results.* Results from the counts portion of the model indicated that gender and age were not associated with the number of drinks consumed in a bar. Complimentary to the logistic portion of the results, the perceived number of drinks in a bar was positively associated with the number of drinks typically consumed in a bar, such that those reporting consuming more drinks in a bar perceived other students as typically consuming a greater number of drinks in a bar.

*Zero-inflated binomial regression results evaluating sporting events*

Results of the ZINB regression evaluating drinks consumed at sporting events as the dependent variable are

presented in Table 3. The likelihood ratio for the full ZINB model was  $\chi^2(6) = 414.48, p < .001$ , maximum likelihood  $R^2 = .26$ , which indicated that the overall model was significant. Findings indicated strong support for the ZINB model over other possible count models. The Vuong test for nonnested models supported the use of a zero-inflated model over a standard negative binomial model,  $Z = 9.33, p < .001$ .

*Logistic results.* Results of the logistic portion of the model indicated that age, gender, and perceived number of typical drinks at sporting events were all significantly associated with zero inflation. Findings suggest that those reporting not drinking at sporting events were more likely to perceive other students as typically consuming less alcohol at sporting events, were more likely to be male, and were more likely to be younger.

*Count results.* Results from the counts portion of the model indicated that the perceived number of drinks at sporting events, age, and gender were associated with the number of drinks typically consumed at sporting events, such that those reporting consuming more drinks at sporting events perceived other students as typically consuming more alcohol at sporting events, were male, and were younger.

## Discussion

Hypotheses for the present study were supported. Findings indicated that students perceived the typical same-sex student as consuming more drinks in each of the drinking contexts than their own drinking in the same contexts. Moreover, the logistic results demonstrated that not drinking in each of these contexts was related to perceiving other students as typically consuming less alcohol in each of these contexts. The count findings were consistent such that perceiving the typical same-sex student as consuming greater amounts of alcohol in these contexts was associated with heavier alcohol consumption in those contexts, even when controlling for gender and age. Thus, these findings expand the current social norms literature by suggesting that specificity of drinking location when estimating peer drinking behavior may be important to consider when preventing high-risk drinking, and in particular, high-risk contexts.

Whereas the present study showed that students overestimated the drinking of their same-sex peers in all contexts, overestimations were largest for drinking at fraternity/sorority parties. There are a number of reasons students are likely to overestimate the high-risk drinking of their peers within these contexts. Overestimations of perceived peer behavior have been explained in terms of pluralistic ignorance (Miller and Prentice, 1996; Prentice and Miller, 1993), which occurs when people believe that their private behaviors vary from the behaviors of others, regardless that they behave the same way others do. Suls and Martin (2001) explained that maintaining behavior consistent with perceived norms may serve as a self-protection function. People do not want to stand out

in a negative way or be different; thus, they desire to behave in accord with the drinking norms of college students at their campus within these various drinking contexts. From this perspective, normative perceptions influence one's drinking behavior.

Overestimating peer behavior is also consistent with false consensus (Marks and Miller, 1987; Neighbors et al., 2006a; Ross et al., 1977). The false consensus effect is the tendency for people to overestimate the population prevalence of their behavior or to perceive themselves as similar to others. In terms of risk-related behaviors, students who drink heavily in these contexts tend to overestimate that their peers behave similarly to themselves. Under the false consensus effect, one's drinking behavior influences their normative perceptions.

Finally, overestimating drinking behavior may result from the fact that drinking is observable and salient in these contexts. For example, students are more likely to notice and to discuss their peers who drink excessively in larger, more public locations (e.g., sporting events) rather than smaller, private locations (e.g., home). According to the availability heuristic (Tversky and Kahneman, 1974), examples of heavy drinking are more likely to be recalled than moderate drinking; thus, students are more likely to overestimate these behaviors, which may explain why overestimations are higher for certain contexts. For example, overestimations were smallest for drinking at home, the majority of which may occur alone or with a small group of peers. Thus, heavy drinking that occurs at home may be less observable if one is drinking alone or within a small group. However, drinking within certain contexts is much more observable as well as more noticeable because of representations of drinking within certain contexts. For example, overestimations were largest for drinking at fraternity/sorority parties, the majority of which would be happening within a large group of individuals and thus presenting greater opportunity to observe heavy drinking. Furthermore, the large overestimation for fraternity/sorority parties may also result indirectly via the general perception of heavy alcohol use at fraternity/sorority parties and by fraternity/sorority members (e.g., Ashmore et al., 2002; Larimer et al., 2009), regardless of whether one directly observes drinking within this context. For example, portrayals of alcohol use at fraternity/sorority parties are often represented in the media. Furthermore, Hines et al. (2002) found that students overestimated the typical student's comfort level more for media portrayals of health-related risk behaviors (i.e., drinking, smoking, illegal drug use, and sexual behavior) than for campus health-related behaviors.

In addition to examining overestimations of drinking in these contexts, the present study demonstrated that normative perceptions were associated with drinking in each context. Logistic findings were consistent across contexts, such that higher perceived drinks in each context were associated with not drinking in the context. Count findings are

also consistent across models, with higher perceived drinks in each context being positively associated with the number of drinks consumed in the context. Thus, normative perceptions were associated with actual behavior in a manner that is consistent with the social norms literature (Borsari and Carey, 2001, 2003).

Findings for age demonstrated that older students were more likely to report drinking in the various contexts (with the exception of fraternity/sorority parties), and that age was negatively associated with consuming more drinks at non-fraternity/sorority parties and sporting events. Thus, students who were younger were less likely to have drunk in these contexts, but when they did drink at non-fraternity/sorority parties or sporting events, they consumed more alcohol. These findings may be largely because of age restrictions preventing students younger than age 21 from having access to drinking in several of these contexts (i.e., bar).

The results related to gender suggested that there were no significant gender differences in terms of whether one drank at home or a bar, as well as how much one drank when drinking at home or at a bar. When examining gender differences for non-fraternity/sorority parties, fraternity/sorority parties, and sporting events, men were more likely to not be drinking at non-fraternity/sorority parties and sporting events and consumed more alcohol when drinking at non-fraternity/sorority parties, fraternity/sorority parties, and sporting events. It is interesting that men were less likely to drink at non-fraternity/sorority parties and sporting events than women, but that when they did drink, they consumed more than women did within these contexts. Future studies could further explore the context of drinking in each of the settings to better understand the behaviors observed as well as any differences in drinking related to gender. These efforts could include an assessment of the context surrounding drinking in these settings to determine with whom students are attending the parties/events, any differences in alcohol consumption within each of these settings (e.g., type of sporting event attended could likely affect drinking behavior), actual attendance at or familiarity with each of the settings assessed, and what contributes to drinking in each setting (e.g., drinking motives).

### *Clinical implications*

Because normative perceptions are associated with actual drinking, the high perceptions of drinking at fraternity/sorority parties have risk-management implications and practical relevance to prevention and intervention efforts on college campuses. Because it is clear that fraternity/sorority parties are not exclusively attended by fraternity/sorority members, and because both fraternity/sorority members and non-fraternity/sorority members exhibit higher BACs at fraternity/sorority parties than at non-fraternity/sorority parties (Glin-demann and Geller, 2003), attendance at parties in these

contexts by non-fraternity/sorority members could represent safety concerns related to returning to their own residences after an event. These concerns could include decisions to drive, walking back to a home or residence hall (in which students could be at risk for injury or crime), and legal consequences. In fact, in our work with mandated students in the residence halls (i.e., students referred following a violation of campus alcohol policies), there are several instances in which students got the attention of those enforcing policy on returning to their residence hall following attendance at a fraternity/sorority party.

Related to prevention and intervention efforts, the risks associated with a novel context or environment could be of concern for heavier drinkers. Research on the role of environment in the development of tolerance (e.g., Siegel, 2005; Siegel and Ramos, 2002) suggests that drinking in familiar contexts can result in drinking-related cues eliciting compensatory responses. Similar research highlights the risks of drinking in a new environment, such that tolerance will literally “fail” to follow someone to a novel environment if the cues normally associated with drinking are not present and this conditioned compensatory response is not made (Siegel, 2001). This would mean that the amounts of alcohol a student has consumed in the past without incident could affect him or her much more significantly in a new environment, which would increase the risk of negative consequences. As brief interventions continue to emphasize personally relevant reasons to change, this information could be included when working with students who report tolerance and who report drinking in various settings. Future research could examine protective behavioral strategies related to drinking in novel settings.

Finally, prevention and intervention efforts could focus on reduced normative perceptions for high-risk contexts. Prior research has shown that brief, live, interactive normative information reduces overestimated norms for high-risk groups, such as first-year students, fraternity/sorority-affiliated students, and student athletes (LaBrie et al., 2008, 2010). Future research could consider examining the efficacy of this type of intervention within these contexts. For example, research could examine if an interactive preventive intervention based on normative information could reduce normative perceptions for drinking at a fraternity/sorority party if that intervention occurred within that context, as well as determine if reductions in norms led to reductions in drinking over time.

### *Limitations and future directions*

Because of the cross-sectional nature of the present study, the ability to make casual inferences is limited. Future research examining the relationship between drinking behavior and perceived drinking behavior for these contexts over time would be useful in evaluating causal precedence and further examining pluralistic ignorance and false consensus perspec-



tives. Although data were collected on how much people drank in each of five contexts, we did not measure if they actually were at these contexts. This could have affected some reports of not drinking in certain contexts (e.g., not drinking at a bar could indicate that the person had been to a bar and did not drink, but it could also be a function of not going to bars). Lack of familiarity with a particular setting also could have affected students' estimates for certain contexts (e.g., students who have not attended a sporting event may have had a different sense of what happens in such contexts). Future research should examine familiarity with or experience in various settings. Finally, although participants were asked to report the number of drinks typically consumed in a given context, it is possible that participants were thinking of the prototypical person who drinks in these contexts when determining their responses. Thus, it is unknown if perceptions of the actual environment were driving our findings or if the findings were being driven by perceptions of the typical person who drinks in these contexts.

### Conclusion

The present study extends previous research on social norms literature by demonstrating that college students have gender-specific normative misperceptions of drinking in various contexts. Moreover, these results demonstrated that same-sex perceptions of drinking by context were related to actual drinking in these same contexts, even when taking relevant demographics into account. Future research is needed to empirically evaluate the use of social norms interventions in efforts to decrease drinking in high-risk contexts among college students.

### References

- Ashmore, R. D., Del Boca, F. K., & Beebe, M. (2002). "Alkie," "Frat Brother," and "Jock": Perceived types of college students and stereotypes about drinking. *Journal of Applied Social Psychology, 32*, 885–907.
- Atkins, D. C., & Gallop, R. J. (2007). Rethinking how family researchers model infrequent outcomes: A tutorial on count regression and zero-inflated models. *Journal of Family Psychology, 21*, 726–735.
- Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse, 13*, 391–424.
- Borsari, B., & Carey, K. B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol, 64*, 331–341.
- Cahalan, D., Cisin, I. H., & Crossley, H. M. (1969). American drinking practices: A national study of drinking behavior and attitudes. In *Monographs of the Rutgers Center of Alcohol Studies, 6*. New Brunswick, NJ: Rutgers Center of Alcohol Studies.
- Carey, K. B., Borsari, B., Carey, M. P., & Maisto, S. A. (2006). Patterns and importance of self-other differences in college drinking norms. *Psychology of Addictive Behaviors, 20*, 385–393.
- Clapp, J. D., Ketchie, J. M., Reed, M. B., Shillington, A. M., Lange, J. E., & Holmes, M. R. (2008). Three exploratory studies of college theme parties. *Drug and Alcohol Review, 27*, 509–518.
- Clapp, J. D., Reed, M. B., Holmes, M. R., Lange, J. E., & Voas, R. B. (2006). Drunk in public, drunk in private: The relationship between college students, drinking environments and alcohol consumption. *The American Journal of Drug and Alcohol Abuse, 32*, 275–285.
- Clapp, J. D., Shillington, A. M., & Segars, L. B. (2000). Deconstructing contexts of binge drinking among college students. *American Journal of Drug and Alcohol Abuse, 26*, 139–154.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- End, C. M., Davis, M. C., Kretschmar, J. M., Campbell, J., Mueller, D. G., & Worthman, S. S. (2009). Missed call? A reexamination of sport fans' and nonfans' alcohol usage and alcohol-related experiences. *Sociological Spectrum: Mid-South Sociological Association, 29*, 649–658.
- Gaines, L. S. (1982). Developmental theories of alcohol use. *Bulletin of the Society of Psychologists in Substance Abuse, 1*, 46–48.
- Gfroerer, J. C., Greenblatt, J. C., & Wright, D. A. (1997). Substance use in the US college-age population: Differences according to educational status and living arrangement. *American Journal of Public Health, 87*, 62–65.
- Glassman, T. J., Dodd, V. J., Sheu, J. J., Rienzo, B. A., & Wagenaar, A. C. (2010). Extreme ritualistic alcohol consumption among college students on game day. *Journal of American College Health, 58*, 413–423.
- Glassman, T., Werch, C. E., Jobli, E., & Bian, H. (2007). Alcohol-related fan behavior on college football game day. *Journal of American College Health, 56*, 255–260.
- Glindemann, K. E., & Geller, E. S. (2003). A systematic assessment of intoxication at university parties: Effects of the environmental context. *Environment and Behavior, 35*, 655–664.
- Harford, T. C., Wechsler, H., & Seibring, M. (2002). Attendance and alcohol use at parties and bars in college: A national survey of current drinkers. *Journal of Studies on Alcohol, 63*, 726–733.
- Heilbron, D. C. (1994). Zero-altered and other regression models for count data with added zeros. *Biometrical Journal, 36*, 531–547.
- Herd, D., & Grube, J. (1993). Drinking contexts and drinking problems among black and white women. *Addiction, 88*, 1101–1110.
- Hilbe, J. (2007). *Negative binomial regression*. Cambridge, MA: Cambridge University Press.
- Hines, D., Saris, R. N., & Throckmorton-Belzer, L. (2002). Pluralistic ignorance and health risk behaviors: Do college students misperceive social approval for risky behaviors on campus and in media? *Journal of Applied Social Psychology, 32*, 2621–2640.
- LaBrie, J. W., Hummer, J. F., Grant, S., & Lac, A. (2010). Immediate reductions in misperceived social norms among high-risk college student groups. *Addictive Behaviors, 35*, 1094–1101.
- LaBrie, J. W., Hummer, J. F., Neighbors, C., & Pedersen, E. R. (2008). Live interactive group-specific normative feedback reduces misperceptions and drinking in college students: A randomized cluster trial. *Psychology of Addictive Behaviors, 22*, 141–148.
- Lange, J. E., & Voas, R. B. (2000). Youth escaping limits on drinking: Binging in Mexico. *Addiction, 95*, 521–528.
- Larimer, M. E., Kaysen, D. L., Lee, C. M., Kilmer, J. R., Lewis, M. A., Dillworth, T., . . . Neighbors, C. (2009). Evaluating level of specificity of normative referents in relation to personal drinking behavior. *Journal of Studies on Alcohol and Drugs, Supplement 16*, 115–121.
- Lenk, K. M., Toomey, T. L., & Erickson, D. J. (2009). Alcohol-related problems and enforcement at professional sports stadiums. *Drugs: Education, Prevention, and Policy, 16*, 451–462.
- Lewis, M. A., & Neighbors, C. (2004). Gender-specific misperceptions of college student drinking norms. *Psychology of Addictive Behaviors, 18*, 334–339.
- Lewis, M. A., & Neighbors, C. (2007). Optimizing personalized normative feedback: The use of gender-specific referents. *Journal of Studies on Alcohol and Drugs, 68*, 228–237.

- Liang, L., & Huang, J. (2008). Go out or stay in? The effects of zero tolerance laws on alcohol use and drinking and driving patterns among college students. *Health Economics*, *17*, 1261–1275.
- Marks, G., & Miller, N. (1987). Ten years of research on the false-consensus effect: An empirical and theoretical review. *Psychological Bulletin*, *102*, 72–90.
- Marlatt, G. A., Baer, J. S., Kivlahan, D. R., Dimeff, L. A., Larimer, M. E., Quigley, L. A., . . . Williams, E. (1998). Screening and brief intervention for high-risk college student drinkers: Results from a 2-year follow-up assessment. *Journal of Consulting and Clinical Psychology*, *66*, 604–615.
- McCabe, S. E., Boyd, C. J., Couper, M. P., Crawford, S., & D'Arcy, H. (2002). Mode effects for collecting alcohol and other drug use data: Web and U.S. mail. *Journal of Studies on Alcohol*, *63*, 755–761.
- Miller, D. T., & Prentice, D. A. (1996). The construction of social norms and standards. In E. Higgins and A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 799–829). New York, NY: Guilford Press.
- Neal, D. J., & Fromme, K. (2007). Hook 'em horns and heavy drinking: Alcohol use and collegiate sports. *Addictive Behaviors*, *32*, 2681–2693.
- Neal, D. J., Sugarman, D. E., Hustad, J. T. P., Caska, C. M., & Carey, K. B. (2005). It's all fun and games . . . or is it? Collegiate sporting events and celebratory drinking. *Journal of Studies on Alcohol*, *66*, 291–294.
- Neighbors, C., Lee, C. M., Lewis, M. A., Fossos, N., & Larimer, M. E. (2007). Are social norms the best predictor of outcomes among heavy-drinking college students? *Journal of Studies on Alcohol and Drugs*, *68*, 556–565.
- Neighbors, C., Lewis, M. A., Bergstrom, R. L., & Larimer, M. E. (2006a). Being controlled by normative influences: Self-determination as a moderator of a normative feedback alcohol intervention. *Health Psychology*, *25*, 571–579.
- Neighbors, C., Oster-Aaland, L., Bergstrom, R. L., & Lewis, M. A. (2006b). Event- and context-specific normative misperceptions and high-risk drinking: 21st birthday celebrations and football tailgating. *Journal of Studies on Alcohol*, *67*, 282–289.
- Nelson, T. F., Lenk, K. M., Xuan, Z., & Wechsler, H. (2010). Student drinking at U.S. college sports events. *Substance Use & Misuse*, *45*, 1861–1873.
- Nyaronga, D., Greenfield, T. K., & McDaniel, P. A. (2009). Drinking context and drinking problems among Black, White, and Hispanic men and women in the 1984, 1995, and 2005 U.S. National Alcohol Surveys. *Journal of Studies on Alcohol and Drugs*, *70*, 16–26.
- O'Malley, P. M., & Johnston, L. D. (2002). Epidemiology of alcohol and other drug use among American college students. *Journal of Studies on Alcohol, Supplement 14*, 23–39.
- Park, A., Sher, K. J., & Krull, J. L. (2009). Selection and socialization of risky drinking during the college transition: The importance of microenvironments associated with specific living units. *Psychology of Addictive Behaviors*, *23*, 404–414.
- Paschall, M. J., & Saltz, R. F. (2007). Relationships between college settings and student alcohol use before, during and after events: A multi-level study. *Drug and Alcohol Review*, *26*, 635–644.
- Prentice, D. A., & Miller, D. T. (1993). Pluralistic ignorance and alcohol use on campus: Some consequences of misperceiving the social norm. *Journal of Personality and Social Psychology*, *64*, 243–256.
- Read, J. P., Wood, M. D., Davidoff, O. J., McLacken, J., & Campbell, J. F. (2002). Making the transition from high school to college: The role of alcohol-related social influence factors in students' drinking. *Substance Abuse*, *23*, 53–65.
- Ross, L., Greene, D., & House, P. (1977). The "false consensus effect": An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, *13*, 279–301.
- Siegel, S. (2001). Pavlovian conditioning and drug overdose: When tolerance fails. *Addiction Research & Theory*, *9*, 503–513.
- Siegel, S. (2005). Drug tolerance, drug addiction, and drug anticipation. *Current Directions in Psychological Science*, *14*, 296–300.
- Siegel, S., & Ramos, B. M. (2002). Applying laboratory research: Drug anticipation and the treatment of drug addiction. *Experimental and Clinical Psychopharmacology*, *10*, 162–183.
- Simons, J. S., Neal, D. J., & Gaher, R. M. (2006). Risk for marijuana-related problems among college students: An application of zero-inflated negative binomial regression. *The American Journal of Drug and Alcohol Abuse*, *32*, 41–53.
- Suls, J., & Martin, R. (2001). Social comparison processes in the physical health domain. In A. Baum, T. Revenson, & J. Singer (Eds.), *Handbook of health psychology* (pp. 195–208). Mahwah, NJ: Lawrence Erlbaum.
- Thombs, D. L., Dodd, V., Pokorny, S. B., Omli, M. R., O'Mara, R., Webb, M. C., . . . Werch, C. (2008). Drink specials and the intoxication levels of patrons exiting college bars. *American Journal of Health Behavior*, *32*, 411–419.
- Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*, 1124–1131.
- Usdan, S. L., Moore, C. G., Schumacher, J. E., & Talbott, L. L. (2005). Drinking locations prior to impaired driving among college students: Implications for prevention. *Journal of American College Health*, *54*, 69–75.
- Valliant, P. M., & Scanlan, P. (1996). Personality, living arrangements, and alcohol use by first year university students. *Social Behavior and Personality: An International Journal*, *24*, 151–156.
- Ward, B. W., & Gryczynski, J. (2009). Social learning theory and the effects of living arrangement on heavy alcohol use: Results from a national study of college students. *Journal of Studies on Alcohol and Drugs*, *70*, 364–372.
- Wechsler, H., Kuo, M., Lee, H., & Dowdall, G. W. (2000). Environmental correlates of underage alcohol use and related problems of college students. *American Journal of Preventive Medicine*, *19*, 24–29.
- Wells, S., Graham, K., Speechley, M., & Koval, J. J. (2005). Drinking patterns, drinking contexts and alcohol-related aggression among late adolescent and young adult drinkers. *Addiction*, *100*, 933–944.