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Original Contribution

''Culture of Drinking'' and Individual Problems with Alcohol Use

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Binge drinking is a substantial and growing health problem. Community norms about drinking and drunkenness may influence individual drinking problems. Using data from the New York Social Environment Study ($n = 4{,}000$) conducted in 2005, the authors examined the relation between aspects of the neighborhood drinking culture and individual alcohol use. They applied methods to address social stratification and social selection, both of which are challenges to interpreting neighborhood research. In adjusted models, permissive neighborhood drinking norms were associated with moderate drinking (odds ratio (OR) = 1.28, 95% confidence interval (CI): 1.05, 1.55) but not binge drinking; however, social network and individual drinking norms accounted for this association. By contrast, permissive neighborhood drunkenness norms were associated with more moderate drinking (OR = 1.20, 95% CI: 1.03, 1.39) and binge drinking (OR = 1.92, 95% CI: 1.44, 2.56); the binge drinking association remained after adjustment for social network and individual drunkenness norms (OR = 1.58, 95% CI: 1.20, 2.08). Drunkenness norms were more strongly associated with binge drinking for women than for men ($p_{\text{interaction}} = 0.006$). Propensity distributions and adjustment for drinking history suggested that social stratification and social selection, respectively, were not plausible explanations for the observed results. Analyses that consider social and structural factors that shape harmful drinking may inform efforts targeting the problematic aspects of alcohol consumption.

alcohol drinking; alcoholic intoxication; culture; residence characteristics; sex

Abbreviations: CI, confidence interval; NIAAA, National Institute for Alcohol Abuse and Alcoholism; OR, odds ratio.

Excessive alcohol consumption is a substantial and growing health problem in the United States (1, 2). Alcohol use is the third leading cause of mortality in the United States, and over half of alcohol-related deaths are attributable to binge drinking (1). Binge drinking is associated with many other negative social and health consequences, such as violence, child neglect, accidents, and reduced productivity (2). Although it is more common among younger adults, binge drinking has been rising across all age groups (2). There have been recent calls for increased attention to this major health problem (2–4).

A substantial body of research has identified risk factors for binge drinking including young age, male gender, being unmarried, lower education, lower income, and unemployment (5, 6). However, recently, interest has increased in understanding the larger societal forces that shape individual behaviors such as binge drinking, since intervening on these environmental characteristics may foster lasting and

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wide-reaching changes in behavior (7, 8). A small but growing body of research has examined aspects of the environment that may be associated with the risk of alcohol-related problems. These include the availability of alcohol (9–14), alcohol advertising (15, 16), policies related to alcohol availability (14), and norms around drinking (17, 18).

Group norms may be particularly important in relation to binge drinking, because theories suggest that there are norms or aspects of the ''culture of drinking'' that separately determine levels of any drinking, as distinct from levels of binge (or other problem) drinking (19–22). Drinking norms of a group are classified as either descriptive norms, defined as the actual drinking behaviors of others within a group, or injunctive norms, defined as the group approval or disapproval of drinking behaviors (18). Descriptive and injunctive group norms provide each individual with information on what behavior is acceptable or unacceptable in a particular social context (18). Group norms can be measured as perceptions of group norms or objective group norms. There is substantial research on perceived descriptive and injunctive group norms in relation to binge drinking, conducted mainly with young adults (18). In the college setting, the individual perception that others in the peer network are binge drinking and that they approve of binge drinking has been associated with the same drinking behavior in individuals (18, 23, 24).

However, two important issues remain understudied to date. First, we know little about the effects of group drinking norms on people across different ages, because most extant research has focused on the college setting; this is understandable given that the highest levels of binge drinking are found in this population (2, 18). Yet, it is also important to understand how group norms may affect the general population, given a growing interest in intervening on drinking at the community level (25) and a recent call by the National Institute for Alcohol Abuse and Alcoholism (NIAAA) to focus on alcohol use throughout the life span (26). Second, we know far less about objective group drinking norms and how they affect individual behavior than we do about perceived group drinking norms. We are aware of only one study that has examined objective group norms of drinking in relation to drinking behavior (17). This workplace-based analysis found that norms against drinking were associated with lower levels of problematic drinking behavior. However, this study did not adjust for each individual's norm and did not examine norms specific to heavy drinking. We are not aware of any research that has examined objective group norms of heavy drinking in an adult population in association with individual drinking behaviors.

In this analysis, we examine two distinct objective group injunctive drinking norms, acceptability of drinking and acceptability of drunkenness (21, 22), in relation to drinking patterns in urban neighborhoods. This research aims to contribute to the literature by 1) providing a quantitative examination of aspects of the adult drinking culture in relation to individual alcohol use patterns that is not available to date, and 2) applying methods that address the problems of social stratification and social selection that are challenges to interpreting neighborhood research (27).

MATERIALS AND METHODS

The New York Social Environment Study is a multilevel study designed to examine neighborhood-level exposures, including economic, social, and structural characteristics of communities, and substance use in New York City. This study was conducted between June and December of 2005. We used random digit dialing methods to contact and interview 4,000 New York City residents. One adult aged 18 years or older was interviewed by telephone in each household; the respondent was the person who either most recently or would next celebrate his/her birthday (randomly selected). Interviews were conducted in English or Spanish. Respondents were offered $10 in compensation for their participation. The study protocol was approved by the institutional review boards of the New York Academy of Medicine, the University of Michigan, and the University of California, Berkeley.

Measures

Respondents were interviewed with a structured questionnaire that included questions on demographic and socioeconomic characteristics, including age, race and ethnicity, gender, marital status, place of birth, education, income, employment, years lived in the current neighborhood, and interview language. Drinking behavior was assessed by use of the World Mental Health Comprehensive International Diagnostic Interview alcohol module (28, 29) and the NIAAA-recommended questions on binge drinking (30). The Comprehensive International Diagnostic Interview alcohol measures that were used in the present analysis include drinking in the past 12 months and a retrospectively recalled history of alcohol use, including age when first had an alcoholic drink and age when first drank monthly. The NIAAA binge drinking questions assessed the number of occasions in the past 12 months when four (for women) or five (for men) or more drinks were consumed within a 2-hour period. This is drinking behavior that will raise the blood alcohol content beyond 0.08 percent in most people, which is considered legally drunk (30). For the analysis, drinking was coded into three categories including abstinent in the past 12 months (abstinent), drinking but not binge drinking in the past 12 months (moderate drinking), and binge drinking in the past 12 months (binge drinking). This approach allows us to conduct an analysis that distinguishes between exposures associated with the decision to drink at all from those associated with problem drinking.

History of drinking, in conjunction with number of years lived in the current neighborhood, was used to assess drinking prior to residence in the current neighborhood. Respondents were classified as those who never had a drink, those who tried drinking but did not drink regularly, and those who drank at least monthly prior to residence in the current neighborhood.

Respondents provided their residential address or nearest cross-streets so that their locations could be geocoded and linked to their neighborhoods of residence. Of the 4,000 respondents, 93.1 percent ($n = 3,725$) were geocoded by address ($n = 2,859$) or cross-streets ($n = 866$). For the

remaining 275 respondents, we had insufficient address or cross-street information or had only zip code information. These participants were linked to the neighborhood that had the largest percentage of overlap with their zip code (98.5 percent had more than 50 percent overlap between the zip code and the neighborhood, and 68.7 percent had more than 75 percent overlap between the zip code and the neighborhood). An indicator for linkage to the neighborhood by zip code instead of by geocoding was considered in all analyses as a potential confounder. The neighborhood units for this analysis were the 59 community districts in New York City, well-defined units, each headed by an administrative community board, that as such have political and social relevance for their residents. Community districts were initially defined by a resident consultative process organized by the Office of City Planning to reflect residents' own descriptions of neighborhoods in the 1970s. Characteristics of community districts have been shown to have a relation with resident behavior and health (31–35).

Neighborhood drinking norms were measured by questions modified from the National Survey on Drug Use and Health (36). Respondents were asked their opinion about adults drinking alcoholic beverages and about adults getting drunk at least once a week. For both questions, respondents were given the options of "acceptable," "unacceptable," and "don't care." The neighborhood measures were the proportions of residents who believed it was "unacceptable" for adults to drink alcoholic beverages and "unacceptable" for adults to get drunk at least once a week in each neighborhood.

Analysis

All analyses were weighted by the ratio of the persons in the household to phone lines in the household to account for the probability of selection for interview. In addition, all analyses were replicated with additional weighting to adjust the respondents to the joint age, race/ethnicity, and gender distribution within each neighborhood as determined from the 2000 US Census data. This was done to assess the potential impact of nonresponse of particular population groups and to examine whether nonresponse was a plausible explanation for the analysis findings. Because none of the results changed appreciably after this additional weighting, analyses with only the selection probability weights are presented here.

To assess the extent of social stratification, we examined the probabilities or propensities for living in neighborhoods with 1) high versus low drinking norms (median split) and 2) high versus low drunkenness norms (median split), modeled as a function of individual characteristics (37). Individual characteristics in the propensity model included history of drinking, individual drinking norm, age, race/ethnicity, gender, marital status, place of birth, education, income, employment, years lived in the neighborhood, and survey language. Through this process, we were able to examine whether there was overlap between the "types" of people, defined by covariate combinations, who lived in permissive drinking norm neighborhoods and those who lived in neighborhoods with strong norms against drinking. If the people who actually lived in the two kinds of neighborhoods had similar and predominantly overlapping distributions of propensities, then we would know that there was little social stratification in terms of the variables in the propensity model. This would imply that people of all "types" lived in both permissive and strong norm neighborhoods and that the analysis did not rely on extrapolation; for example, if all White men aged 18–24 years lived in permissive drinking norm neighborhoods, extrapolation would be required to assess the effect of strong norms against drinking on this "type" of person.

To account for social selection, drinking prior to residence in the current neighborhood was controlled as a confounder in all analyses (38, 39); by controlling for history of drinking, we ensured that the associations observed were not due to the fact that drinkers were likely to move to certain types of neighborhoods.

To model the three-category drinking outcome, two logistic regression models were used in each analysis, one comparing moderate drinkers with abstainers and one comparing binge drinkers with abstainers. In a supplemental analysis, we used logistic regression models to compare binge drinkers with moderate drinkers and with all others (abstainers and moderate drinkers), because abstainers alone may not be the best comparison group for binge drinkers. Generalized estimating equation logistic regression models were used in all analyses to account for potential clustering by neighborhood and to estimate population-averaged parameter estimates with robust standard errors (40–42). Individual demographic and socioeconomic characteristics that were conceptually considered confounders on the basis of the literature were considered as confounders in the multivariable analysis. In addition, age, race/ethnicity, and gender were considered potential effect modifiers on the basis of previous findings (43); years lived in the neighborhood and history of drinking were also considered, as they were logical potential effect modifiers that had not been examined in previous analyses. Missingness indicator variables were included for all covariates where some respondents declined to answer.

Each neighborhood exposure was examined separately in association with current drinking categories, adjusted for demographic and socioeconomic confounders, and finally adjusted for friend and family drinking norms, as well as individual drinking norm. All odds ratios presented are for a 2-standard deviation change in the neighborhood exposure.

RESULTS

The survey respondents were demographically similar to the overall population of New York City according to the most recent census (table 1). Overall, 27.2 percent of respondents were moderate drinkers, and 11.0 percent were binge drinkers. The cooperation percentage was 54 percent, representing the percentage of those contacted who agreed to participate in the study ((completed + screened out)/(completed + screened out + refused)).

TABLE 1. Respondent characteristics, New York Social Environment Study, 2005

	New York Social Environment Study population		2000 US Census, New York, NY (%)
	No.	%	
Total	4,000	100.00	100.00
Age (years)			
18–24	350	11.78	13.23
25–34	685	18.05	22.54
35–44	815	19.50	20.82
45–54	808	21.42	16.68
55–64	612	14.85	11.26
≥65	690	14.39	15.46
Race/ethnicity			
White	1,616	38.18	38.65
African American	1,055	27.03	22.97
Asian	164	5.08	10.08
Hispanic	958	27.19	24.71
Other	95	2.52	3.59
Gender			
Male	1,880	48.89	46.20
Female	2,120	51.11	53.80
Marital status			
Married	1,632	47.33	
Divorced	479	9.56	
Separated	208	4.70	
Widowed	354	6.68	
Never married	1,270	31.73	
Birthplace			
New York, NY	1,810	44.65	
Other US location	731	16.13	
Different country	1,406	39.22	
Education			
Less than high school	508	13.89	
High school/general equivalency diploma	923	24.69	
Some college	879	23.23	
College graduate	883	21.63	
Graduate work	730	16.57	
Income ($)			
≤40,000	1,605	46.45	
40,001–80,000	1,093	31.97	
>80,000	722	21.58	
Unemployed			
Yes	321	8.56	
No	3,658	91.43	
Drinking before moved to neighborhood			
Ever drank/tried drinking	706	17.39	
Monthly drinker	1,948	45.84	
Never drank	1,346	36.78	
Current drinking			
Abstinent	2,416	61.80	
Moderate drinking	1,125	27.23	
Binge drinking	438	10.97	

A descriptive examination of neighborhood norms around drinking and drunkenness suggested that there were no outlying neighborhoods. The mean percentage believing it was unacceptable for an adult to drink was 32 percent (range: 3–60 percent), and the mean percentage believing it was unacceptable to get drunk weekly was 78 percent (range: 53–89 percent). Neighborhood drinking norms and norms around getting drunk were positively correlated (correlation: 0.48; $p = 0.06$), suggesting that they are related, as would be expected, but are sufficiently distinct to be considered measuring different constructs.

Examining the propensities for living in neighborhoods with permissive versus restrictive drinking and drunkenness norms, we found that there was little suggestion of social stratification. People of all ''types,'' based on individual covariates, lived in neighborhoods with different values of the neighborhood exposures. In both cases, fewer than 0.5 percent of respondents had propensity values that were more extreme (higher or lower) than the propensity values among respondents living in neighborhoods with a different exposure (tables and plots of the propensity values are available from the corresponding author).

To adjust for confounders and account for clustering, the relations between neighborhood norms and drinking patterns were examined in generalized estimating equation logistic regression models. Twenty-one respondents did not provide data on current drinking and were thus excluded from all models. In the first series of models, we examined the relation between neighborhood norms about drinking and the drinking categories. In the unadjusted models, those living in neighborhoods with weaker norms against drinking had greater odds of moderate drinking (odds ratio (OR) = 2.66, 95 percent confidence interval (CI): 2.18, 3.25) and binge drinking (OR = 2.42, 95 percent CI: 1.54, 3.80) compared with abstaining (table 2). After adjustment for individual confounders including demographic and socioeconomic characteristics, the relations between norms about drinking and the drinking categories were dramatically reduced, with greater odds of moderate drinking remaining significant (OR = 1.28, 95 percent CI: 1.05, 1.55) but no remaining increase in the odds of binge drinking (OR = 1.12, 95 percent CI: 0.69, 1.82). In the final analysis, we considered whether these associations were robust to further adjustment for the norms of the closer social network and of the individuals themselves; after this additional adjustment, there were no remaining associations between neighborhood drinking norms and either type of drinking (moderate drinking OR = 1.03, 95 percent CI: 0.86, 1.25; binge drinking OR = 0.98, 95 percent CI: 0.62, 1.54). To assess the sensitivity of the analysis of binge drinking to the choice of comparison group, final models were run with moderate drinking as the comparison (OR = 1.16, 95 percent CI: 0.80, 1.66) and with all others (moderate drinking and abstaining) as the comparison (OR = 1.05, 95 percent CI: 0.71, 1.56), and no substantial differences were found.

In the second series of models, we examined the relations between neighborhood norms about getting drunk regularly and drinking patterns (table 3). In bivariable generalized estimating equation logistic regression models, more permissive neighborhood norms about getting drunk were

TABLE 2. Generalized estimating equation logistic regression models of neighborhood drinking norms and drinking pattern, comparing moderate drinkers and binge drinkers with abstainers, New York Social Environment Study ($n = 3,979$), 2005

	Model 1				Model 2*				Model 3*			
	Moderate drinking†		Binge drinking‡		Moderate drinking†		Binge drinking‡		Moderate drinking†		Binge drinking‡	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Neighborhood drinking norms§	2.66	2.18, 3.25	2.42	1.54, 3.8	1.28	1.05, 1.55	1.12	0.69, 1.82	1.03	0.86, 1.25	0.98	0.62, 1.54
Drinking before moved to neighborhood												
Never drank					1.00		1.00		1.00		1.00	
Ever drank/tried drinking					0.81	0.57, 1.13	0.44	0.24, 0.81	0.71	0.5, 0.99	0.41	0.21, 0.81
Monthly drinker					5.50	4.32, 7.02	6.39	3.93, 10.39	4.56	3.46, 6	5.48	3.25, 9.26
Friends/family norms about drinking												
No opinion									1.00		1.00	
Acceptable									1.30	1.01, 1.68	1.14	0.77, 1.68
Unacceptable									0.68	0.47, 1	0.75	0.45, 1.23
Missing									0.68	0.36, 1.29	0.23	0.07, 0.76
Individual norm about drinking												
No opinion									1.00		1.00	
Acceptable									1.50	1.21, 1.86	1.47	1.06, 2.06
Unacceptable									0.34	0.25, 0.46	0.28	0.17, 0.45
Missing									0.98	0.47, 2.07	0.30	0.08, 1.09

* Models additionally adjusted for age, race/ethnicity, sex, marital status, place of birth, education, income, employment, years lived in the neighborhood, and survey language.

† Moderate drinking analysis: $n = 3,541$.

‡ Binge drinking analysis: $n = 2,854$.

§ Odds ratios for a 2-standard deviation increase in permissiveness of drinking norms.

associated with greater odds of moderate drinking (OR = 1.66, 95 percent CI: 1.24, 2.22) and strongly associated with greater odds of binge drinking (OR = 2.74, 95 percent CI: 2.19, 3.42) compared with abstaining. After adjustment for individual confounders, these associations were reduced but remained significant; more permissive neighborhood norms about getting drunk were associated with a greater odds of moderate drinking (OR = 1.20, 95 percent CI: 1.03, 1.39) and binge drinking (OR = 1.92, 95 percent CI: 1.44, 2.56) compared with abstaining. After additional adjustment for friend and family norms and for individual norms about drunkenness, associations were further reduced but remained significant in association with binge drinking (for moderate drinking: OR = 1.14, 95 percent CI: 0.99, 1.30; for binge drinking: OR = 1.58, 95 percent CI: 1.20, 2.08). To assess the sensitivity of the analysis of binge drinking to the choice of comparison group, final models were run with moderate drinking as the comparison (OR = 1.40, 95 percent CI: 1.06, 1.85) and with all others (moderate drinking and abstaining) as the comparison (OR = 1.43, 95 percent CI: 1.12, 1.84), and associations were somewhat weaker but remained significant.

In the final model for binge drinking, we found an interaction between gender and drunkenness norms in association with binge drinking ($p = 0.006$) such that norms around drunkenness were more strongly associated with binge drinking for women than for men. This interaction is depicted in figure 1. None of the other hypothesized interactions was found.

DISCUSSION

In a population-based multilevel study of urban residents, we found associations between neighborhood norms about specific types of drinking and the corresponding drinking behaviors. Neighborhoods with norms that were permissive about drinking among adults had higher levels of moderate drinking but no difference in levels of binge drinking in adjusted models. This association was not robust to adjustment for the drinking norms of friends and family and of each individual. In contrast, neighborhoods with permissive norms about drunkenness had much higher levels of binge drinking and somewhat higher levels of moderate drinking. For binge drinking, this association was robust to adjustment for friend and family norms and for individual norms about the acceptability of getting drunk. In the final model, neighborhood norms about drunkenness were more strongly associated with binge drinking for women than for men.

TABLE 3. Generalized estimating equation logistic regression models of neighborhood norms around drunkenness and drinking pattern, comparing moderate drinkers and binge drinkers with abstainers, New York Social Environment Study ($n = 3,979$), 2005

	Model 1				Model 2*				Model 3*			
	Moderate drinking†		Binge drinking‡		Moderate drinking†		Binge drinking‡		Moderate drinking‡		Binge drinking‡	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Neighborhood drunkenness norms§	1.66	1.24, 2.22	2.74	2.19, 3.42	1.20	1.03, 1.39	1.92	1.44, 2.56	1.14	0.99, 1.30	1.58	1.20, 2.08
Drinking before moved to neighborhood												
Never drank					1.00		1.00		1.00		1.00	
Ever drank/tried drinking					0.80	0.57, 1.12	0.43	0.23, 0.82	0.75	0.53, 1.05	0.44	0.24, 0.82
Monthly drinker					5.48	4.32, 6.96	6.40	3.90, 10.50	4.81	3.75, 6.19	5.90	3.50, 9.94
Friends/family norms about drinking												
No opinion									1.00		1.00	
Acceptable									1.65	1.32, 2.06	1.44	1.02, 2.02
Unacceptable									0.50	0.36, 0.70	0.66	0.41, 1.08
Missing									0.68	0.38, 1.20	0.24	0.07, 0.84
Individual norm about drunkenness												
No opinion									1.00		1.00	
Acceptable									1.13	0.63, 2.04	1.04	0.64, 1.68
Unacceptable									0.59	0.42, 0.82	0.28	0.20, 0.39
Missing									0.58	0.23, 1.46	0.05	0.01, 0.38

* Models additionally adjusted for age, race/ethnicity, sex, marital status, place of birth, education, income, employment, years lived in the neighborhood, and survey language.

† Moderate drinking analysis: $n = 3,541$.

‡ Binge drinking analysis: $n = 2,854$.

§ Odds ratios for a 2-standard deviation increase in permissiveness of drunkenness norms.

Our analysis suggests that neighborhood norms about drinking and neighborhood norms about drunkenness are distinct aspects of the social environment that are associated with different types of drinking behaviors in the communities studied, consistent with previous theories (21, 22). In fact, the most robust and strongest association was between norms about drunkenness and binge drinking, an association that was independent of friend, family, and individual norms. Even when an individual believed that it was acceptable to get drunk regularly, if there were stronger norms against drunkenness in the neighborhood, that individual was less likely to binge drink.

We found that neighborhood drunkenness norms were more strongly associated with binge drinking among women than among men. Although this issue has not been examined in many studies, two analyses of college students found that perceptions of drinking among other students were more strongly associated with alcohol consumption for women than for men (44, 45). Research on gender differences in drinking suggests that overall drinking and heavy drinking

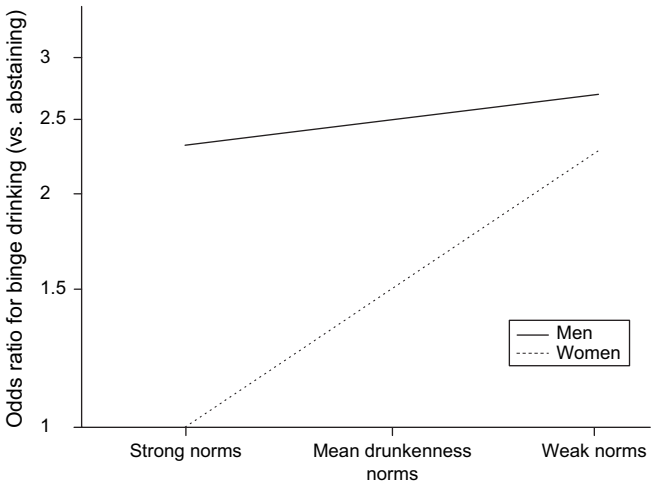

FIGURE 1. Odds ratios for the association between neighborhood drunkenness norms and binge drinking by gender ($p_{interaction} = 0.006$), New York Social Environment Study ($n = 3,979$), 2005.

are more socially stigmatized for women than for men (46), so it may be that, where there are norms against heavy drinking generally, those norms are felt more strongly by women or expressed more strongly towards women.

There are several limitations to this study. The cooperation percentage was 54 percent, which is consistent with recent telephone-based research (47). However, this raises the question of whether the study sample is representative. Participants were informed that they would be participating in a "survey about the neighborhoods where New Yorkers live and what people think about their neighborhoods," and thus they were not likely to refuse on the basis of their use or nonuse of alcohol. The findings were robust to additional weighting to adjust the respondents to the age, race/ethnicity, and gender distribution within each neighborhood as determined from the 2000 US Census data, suggesting that nonresponse did not distort the study findings. However, the participants may still differ from those in the City overall in ways that we were unable to capture. Self-report is standard practice in alcohol research, and telephone interviews are thought to elicit more accurate reports than in-person interviews (48). However, there may be differences between actual and reported alcohol use. The neighborhood drinking and drunkenness norm variables were based on questions originally designed to assess individual norms. These questions clearly assess injunctive norms, defined as approval or disapproval of drinking behaviors (18), but they represent only one of many ways these norms could have been assessed. A recent review of perceived injunctive norms noted the lack of consistency in how they are measured (18); validation of items to assess group-level drinking norm measures will be important for future work. Norms in a neighborhood are naturally only one of many factors that shape drinking behaviors. Structural aspects of neighborhoods and legal restrictions on alcohol certainly have reciprocal relations with neighborhood norms; for example, changing availability of alcohol may alter norms and, conversely, changes in norms may affect availability of alcohol. Teasing apart these complex interrelations would be a fruitful topic for future longitudinal work. Recent discussions of analyses that examine community characteristics and individual outcomes have raised the problem of contagion (27, 49). This problem arises when the prevalence of the outcome (in this case, drinking or binge drinking) affects the probability of the outcome for any individual (i.e., prevalence affects incidence). This dependence of the outcomes between individuals means that parameter estimates from a traditional analysis do not accurately reflect how much of a change in outcome would be expected from a change in exposure (50). A complementary analytical approach that merits consideration for future analyses of neighborhood characteristics and health would be one that can account for these dynamic processes, such as the systems modeling approaches that have been used to model infectious diseases (50, 51).

Among several strengths, this study includes a large population-based sample. We assessed the extent of social stratification by use of propensities and found that there was virtually no social stratification in this analysis. We also accounted for social selection by adjusting for history of drinking prior to each person's residence in his/her current neighborhood. Social selection has been considered one of the major barriers to determining whether the environment has an influence on people, or whether people who have worse health "drift" or select into worse types of environments (27, 52). Because we adjusted for history of drinking, social selection is not a likely explanation for these findings.

Overall, we found that two distinct aspects of norms around drinking in communities were associated with the corresponding drinking behaviors. In particular, neighborhood norms around drunkenness were strongly associated with binge drinking independent of friend, family, and individual norms. This analysis and other analyses that consider aspects of the social and structural environments that may affect harmful drinking behaviors in particular may provide insight for intervention strategies. If future analyses of neighborhood drinking and drunkenness norms in other settings support the results of this study, norm-changing campaigns may be an important addition to community interventions that target the problematic aspects of alcohol consumption (25, 53, 54).

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