Neighborhood Disadvantage and Adult Alcohol Outcomes: Differential Risk by Race and Gender

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ABSTRACT. Objective: We examined whether relationships of neighborhood disadvantage with drinker status, heavy drinking, alcohol-related consequences, and dependence differed by race and/or gender. We hypothesized that neighborhood disadvantage would be negatively associated with drinker status but positively associated with heavy and problem drinking, with more pronounced relationships among African American and Hispanic men than other groups. **Method:** Data consisted of nationally representative, randomly selected, cross-sectional samples of White, African American, and Hispanic adults (N = 13,864, of which 52% were female; with 7,493 drinkers, of which 48% were female) from the 2000 and 2005 National Alcohol Surveys merged with 2000 Census data. Analyses included logistic and linear regression using weights to adjust for sampling and nonresponse. **Results:** Hypotheses were partly supported. Bivariate relationships were in the expected direction. Multivariate main effect models showed that neighborhood disadvantage was significantly associated with increased abstinence and marginally associated with increased negative consequences experienced by drinkers, but race/ethnicity and gender modified these associations. Disadvantage was significantly associated with increased abstinence for all groups except African American and Hispanic men. Among drinkers, disadvantage was significantly negatively associated with heavy drinking by Whites but significantly positively associated with heavy drinking by African Americans. Disadvantage also was associated with elevated alcohol-related consequences for White women and African American men. **Conclusions:** The findings have implications for the development of targeted interventions to reduce the unequal impacts of neighborhood disadvantage on alcohol outcomes. Future research should examine the contribution of multiple types of disadvantage to heavy drinking and alcohol problems. (*J. Stud. Alcohol Drugs, 73,* 865–873, 2012)

RECENT STUDIES UNDERSCORE the importance of environmental influences on health (Diez Roux and Mair, 2010; Robert, 1999) and risk behaviors, including substance use (Karriker-Jaffe, 2011). Neighborhoods provide basic infrastructure and resources and are important social contexts. The socioeconomic status of an area affects the development of legal, educational, and employment institutions (Kramer, 2000) and housing, shopping, and recreational resources (Kramer, 2000) that can affect health and behavior both directly and indirectly (Lynch and Kaplan, 2000). Many aspects of socioeconomically disadvantaged neighborhoods place residents at risk for developing alcohol problems, including generally stressful living conditions (Elliott, 2000), lack of resources to sanction risky behaviors and maintain social order (Sampson and Groves, 1989), proliferation of alcohol outlets (Romley et al., 2007), and targeted marketing of high-alcohol-content beverages (Jones-Webb et al., 2008).

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Currently, there is conflicting evidence of associations between neighborhood disadvantage and adults' alcohol use (Karriker-Jaffe, 2011). A few studies of neighborhood socioeconomic status and alcohol outcomes, all conducted in the United States with national samples of adults, have shown associations between area-level disadvantage and higher daily alcohol consumption (Waitzman and Smith, 1998), heavy drinking (Stimpson et al., 2007), and alcohol problems (Jones-Webb et al., 1997). A study of British men found similar results for heavy drinking (Shaper et al., 1981), and a study of adult men in the U.S. state of Michigan found that neighborhood disadvantage predicted alcohol use disorders up to 12 years after exposure (Buu et al., 2007). Neighborhood disadvantage also has been associated, conversely, with abstinence from alcohol in both national (Chuang et al., 2005) and local (Galea et al., 2007) U.S. samples, as well as with reduced rates of heavy drinking (Pollack et al., 2005) and lower drinking frequency (Galea et al., 2007) in local samples of American adults. The current study addresses the lack of recent national U.S. data on associations between neighborhood disadvantage and alcohol outcomes.

Heterogeneous results for associations between neighborhood disadvantage and alcohol outcomes suggest that a number of variables may moderate these associations. Unfortunately, almost no studies have directly explored potential moderators (Karriker-Jaffe, 2011), despite the importance of this area for prevention. One variable likely to moderate neighborhood effects on health outcomes is race/ethnicity.

In the United States, race/ethnicity is a major determinant of an individual's access to opportunities and resources, with some groups, such as African Americans and Latinos, being particularly disadvantaged relative to Whites. Theories about the compounding of multiple types of disadvantage (Robert, 1999) suggest that there may be added stress from being a member of a stigmatized minority group in a disadvantaged neighborhood. Consequently, people in these minority racial/ethnic groups may be more likely to show negative health outcomes in response to neighborhood disadvantage because psychological, social, and institutional resources may be severely limited by geographic context. African American and Hispanic drinkers in disadvantaged areas may experience more alcohol-related problems than Whites, even at the same level of consumption, because of discrimination (Mulia et al., 2009). Partially supporting these ideas, Jones-Webb et al. (1997) found that neighborhood poverty was associated with alcohol problems among African American men but not White or Hispanic men. However, this seminal study excluded women and examined only alcohol problems; thus, moderator effects for race/ethnicity deserve further study.

Gender also may moderate associations between neighborhood disadvantage and alcohol, but it too has received little attention. Gender is a strong predictor of drinking: Men generally drink more (and more often) than women (Wilsnack et al., 2000), and they are more likely than women to report drinking-related consequences (Wilsnack et al., 2000). Evidence for interactions between gender and neighborhood disadvantage when predicting alcohol use and alcohol problems is limited and conflicting, however. Two Finnish studies reported positive associations between neighborhood disadvantage and alcohol use among male youth but negative associations for female youth (Karvonen and Rimpelä, 1996, 1997). A recent Canadian study also reported a positive association between neighborhood disadvantage and weekly volume for adult men but no significant association for women (Matheson et al., 2012). In contrast, a Scottish study found no interactions of gender and neighborhood disadvantage when predicting heavy drinking or weekly volume (Ecob and Macintyre, 2000). In the United States, men tend to have more permissive drinking norms than women (Caetano and Clark, 1999), which may promote heavy drinking in stressful neighborhood situations. On the other hand, in disadvantaged neighborhoods, women may have even fewer economic resources and thus be more "place-bound" than men (Bernard et al., 2007), which may increase the salience of the neighborhood context for women. In sum, further research is needed to establish overall associations between disadvantage and alcohol outcomes as well as to explore potential moderators of these associations, with race/ethnicity and gender being prime candidates.

The current study examined overall effects for neighborhood disadvantage on abstinence, heavy drinking, and alcohol problems as well as potential simultaneous moderating effects for race/ethnicity and gender. We hypothesized that neighborhood disadvantage would be negatively associated with drinker status but positively associated with heavy drinking and alcohol problems (Hypothesis 1) and that, among drinkers, associations between neighborhood disadvantage and heavy drinking and alcohol problems would be stronger for African American and Hispanic men than for other race-gender groups (Hypothesis 2).

Because we expect neighborhood disadvantage to be associated with decreased prevalence of drinking but also increased heavy drinking and problems for those who do drink, we limited all analyses except those on drinker status to past-year drinkers. The current study constitutes an important extension of prior research on neighborhood context and alcohol outcomes by explicitly testing for moderation by race and gender using a very large, national sample; a variety of precise, well-validated outcome measures; and a well-validated, composite measure of neighborhood disadvantage.

Method

Data set

Survey data come from the 2000 and 2005 National Alcohol Surveys (NAS). Both cross-sectional surveys used computer-assisted telephone interviews with randomly selected adults ages 18 and older, including oversamples from sparsely populated U.S. states and of African Americans and Hispanics. For more details on NAS methodology, see Midanik and Greenfield (2003a). Both NAS and the current study were approved by the institutional review board of the Public Health Institute, Oakland, CA.

The 2000 NAS included 7,613 respondents (58% response rate); the 2005 NAS included 6,919 respondents (56% response rate). These response rates, although lower than those of many face-to-face surveys, are typical of recent U.S. telephone surveys in a time of increasing barriers to random-digit-dial studies (Midanik and Greenfield, 2003b). Despite higher response rates for in-person surveys, methodological studies comparing identical questions from telephone and in-person surveys have found comparable estimates across modality for alcohol consumption (Midanik and Greenfield, 2003b) and only modest and inconsistent mode effects for alcohol harms (Midanik et al., 2001). The current study's analysis sample consisted of all 2000 and 2005 NAS respondents whose self-reported race/ethnicity was White/Caucasian, Black/African American, or Hispanic/Latino. Because of small sample sizes, Asian Americans/Pacific Islanders, Native Americans, and other racial/ethnic groups were not included.

Survey data were matched with indicators of neighborhood disadvantage from the 2000 Census (U.S. Census Bureau, 2002). Respondent addresses were commercially geocoded; we found the geocoding to be highly accurate

(97% accuracy rate based on recommended testing procedures; Krieger et al., 2001). Neighborhoods were defined by census tracts, which effectively delineate social and structural determinants of health and substance use (Karriker-Jaffe, 2011). Approximately two thirds (60%) of the sample had street address geocodes; the remainder had geocodes assigned based on ZIP code centroids. A sensitivity analysis determined that results did not differ substantially by geocoding precision (data available on request), but all analyses adjusted for geocode precision.

Measures

Neighborhood disadvantage. Neighborhood disadvantage included indicators of three primary dimensions of socioeconomic status (education, employment, and income/financial assets), including proportions of adults without a high school diploma, men who were unemployed or not in the labor force, people with incomes below the poverty level, families with incomes below 50% of the U.S. median, and households without access to a car. These indicators represent important markers of extremes in socioeconomic status that are easily interpretable and socially relevant (Krieger et al., 2002; Wagle, 2002). An average score was calculated (M = 19.9%, SD = 10.8; Cronbach's α = .89 overall, .87 Whites, .92 African Americans, .90 Hispanics). The composite was validated in a preliminary study (Karriker-Jaffe and Kaskutas, 2009); disadvantage was highly correlated with the percentage receiving public assistance (r = .73, $p < .01$) and the proportion of working class (r = .60, $p < .01$). The score was square root transformed to obtain a normal distribution and multiplied by 10 (regression coefficients show change for 10% increments).

Drinking outcomes. Drinker status indicated whether the respondent had consumed at least one alcoholic drink in the past 12 months. The 12-month volume from heavy drinking was calculated from sessions where drinking 5–7, 8–11, or 12 or more drinks was reported. This graduated quantity-frequency approach is very effective for measuring consumption among individuals who occasionally drink heavily (Greenfield, 2000). Because of skewness, volume was log transformed. Negative alcohol-related consequences indicated whether the respondent had experienced 2 or more of 15 social, legal, workplace, or health consequences while or because of drinking in the past 12 months (reliability measured by Kuder-Richardson Formula 20 [KR20] = .73). These negative consequences of drinking are similar to diagnostic criteria commonly used to assess alcohol abuse, and the dichotomous variable has been successfully used in prior studies of alcohol problems in general population samples (Cherpitel, 2002). A second indicator of alcohol problems, alcohol dependence (Midanik and Greenfield, 2000), was measured by 17 items based on the American Psychiatric Association's (1994) *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV), that have been validated in prior NAS data sets (Caetano and Tam, 1995). Following the DSM-IV, a dichotomous variable indicated whether respondents reported at least one symptom in three or more of seven domains in the past 12 months: withdrawal, tolerance, drinking despite consequences, unsuccessful efforts to reduce drinking, drinking more than intended, time spent drinking/recovering, and giving up activities because of drinking.

Demographics and control variables. Demographic moderators included gender (female as reference) and race/ethnicity (mutually exclusive dummy variables for African Americans and Hispanics; White as reference). Multivariate analyses adjusted for age; marital status (married/partnered vs. single); household socioeconomic status, including total income before taxes ($20,000 increments from less than $20,000 to more than $80,000); education (from less than high school to college graduate or more); work situation (dummy variables for unemployed, retired, and homemaker status; employed as reference); geocoding precision (street-level match vs. ZIP code match); and survey year. (All dollar amounts are in U.S. dollars.)

Analysis strategy

Analyses involved logistic and linear regression. We used Stata Version 10 (Stata Corp LP, College Station, TX) to accommodate sampling and nonresponse weights. Because the national samples were selected through random digit dialing, neighborhood clustering was low: Only 3% of tracts contained five or more respondents. Thus, multilevel modeling strategies were not required (Snijders and Bosker, 1999).

All predictors were centered to reduce multicollinearity in moderation models (Aiken and West, 1991). Multivariate models contained three-way interactions between neighborhood disadvantage, gender, and minority race/ethnicity and all lower-order two-way interactions and main effect terms. To facilitate interpretation, models were simplified by removing blocks of interactions that were not statistically significant. Significant moderation effects were assessed using plots of predicted values at high (one standard deviation above mean), medium (at mean), and low (one standard deviation below mean) levels of disadvantage, with all other predictors set to zero, as well as tests of simple slopes to generate estimates of the association of neighborhood disadvantage and the outcome for each race/sex group of interest (Aiken and West, 1991).

Results

Table 1 shows respondent demographics and their relationships with a dichotomous indicator of neighborhood disadvantage (top quartile on neighborhood socioeconomic disadvantage measure vs. all other neighborhoods). Neigh-

TABLE 1. Respondent characteristics (N = 13,864)

Variable	Demographics of full sample[a]	Demographics of sample in most disadvantaged neighborhoods[b]
Gender		$\chi^2 = 3.88$*
Male	48%	46%
Female	52%	54%
Race/ethnicity		$\chi^2 = 1{,}797.18$**
White	64%	34%
Black/African American	17%	35%
Hispanic	19%	31%
Marital status		$\chi^2 = 302.41$**
Married/partnered	56%	44%
Single	43%	56%
Age, in years		$\chi^2 = 100.38$**
18–29	22%	28%
30–39	21%	21%
40–49	20%	18%
50–59	17%	15%
≥60	19%	18%
Individual income		$\chi^2 = 903.29$**
≤$20,000	23%	45%
$20,000–40,000	23%	30%
$40,000–60,000	15%	12%
$60,000–80,000	11%	6%
≥$80,000	15%	7%
Education		$\chi^2 = 702.37$**
Less than high school	14%	26%
High school diploma	30%	34%
Some college	26%	23%
College graduate (or more)	29%	17%
Employment		$\chi^2 = 218.74$**
Employed full or part time	65%	59%
Unemployed	13%	21%
Homemaker	6%	13%
Retired	15%	7%

[a]Percentages do not total 100% because of missing data for some demographic variables; [b]top quartile on neighborhood socioeconomic disadvantage measure.
*$p < .05$; **$p < .01$.

borhood disadvantage was significantly associated with gender, race/ethnicity, marital status, age, and individual-level socioeconomic status. Women (vs. men), African Americans and Hispanics (vs. Whites), single people (vs. married/partnered), and young adults (vs. respondents older than age 29 years) were more likely to live in the most disadvantaged neighborhoods in the sample. Additionally, these neighborhoods included an overrepresentation of low-income (<$40,000 per year), low-education (high school diploma or less), and unemployed (including homemakers) respondents.

Table 2 shows the prevalence of each dichotomous outcome and the average volume from heavy drinking by race/ethnicity and sex for the full sample and for the subsample living in the most disadvantaged neighborhoods (top quartile, as in Table 1). Each outcome varied significantly across the different race/ethnicity and sex subgroups (Table 2), with significant differences in average volume from heavy drinking by race/ethnicity for both men, $F(2, 13809) = 9.77$, $p < .01$, and women, $F(2, 13809) = 3.15$, $p < .05$, in the full sample; and for men, $F(2, 13809) = 3.39$, $p < .05$, but not women, $F(2, 13837) = 2.27$, $p = .10$, in the subsample living in the most disadvantaged neighborhoods.

Table 3 shows bivariate and multivariate associations of the continuous measure of neighborhood disadvantage with the alcohol outcomes. In bivariate models, neighborhood disadvantage was significantly negatively associated with drinker status. Among past-year drinkers, neighborhood disadvantage was significantly positively associated with heavy drinking, negative consequences, and alcohol dependence. Consistent with bivariate analyses, adjusted multivariate main effect models showed a significant negative association of neighborhood disadvantage with drinker status and a marginally significant positive association with negative consequences experienced by drinkers. Inclusion of individual-level control variables attenuated the main effects

TABLE 2. Alcohol outcomes by race/ethnicity and sex

Variable	White men	African American men	Hispanic men	White women	African American women	Hispanic women	Design-based χ^2
Full sample							
n	4,229	1,074	1,335	4,642	1,341	1,269	
Current drinker	70.9%	55.8%	66.7%	65.2%	44.6%	43.9%	76.30**
Mean volume from heavy drinking[a,b]	240 drinks	237 drinks	282 drinks	55 drinks	60 drinks	78 drinks	–[c]
≥2 consequences[a]	6.5%	10.8%	8.6%	2.7%	2.7%	3.2%	15.75**
Dependence[a]	4.1%	9.2%	10.1%	2.1%	3.1%	4.8%	18.68**
Sample in most disadvantaged neighborhoods[d]							
n	558	496	552	630	696	535	
Current drinker	60.7%	51.7%	64.5%	53.3%	40.8%	39.8%	17.08**
Mean volume from heavy drinking[a,b]	279 drinks	321 drinks	284 drinks	94 drinks	84 drinks	126 drinks	–[c]
≥2 consequences[a]	8.6%	14.6%	9.3%	6.3%	3.4%	2.7%	5.25**
Dependence[a]	5.0%	10.2%	12.0%	5.7%	3.7%	4.1%	4.16**

Notes: *n* = weighted sample size. [a]Drinkers only; [b]heavy drinking volume calculated from days in past year consuming five or more drinks; [c]see text for tests of group differences; [d]top quartile on neighborhood socioeconomic disadvantage measure.
**$p < .01$.

Table 3. Relationship between neighborhood disadvantage and alcohol outcomes for U.S. adults

	Current drinker		Volume from heavy drinking[a]	≥2 consequences[a]		Dependence[a]	
Variable	OR	[95% CI]	*B* (*SE*)	OR	[95% CI]	OR	[95% CI]
Unadjusted main effect							
Neighborhood disadvantage	0.73**	[0.71, 0.76]	0.09 (0.03)**	1.27**	[1.15, 1.41]	1.26**	[1.13, 1.41]
Adjusted main effect[b]							
Neighborhood disadvantage	0.88**	[0.84, 0.93]	0.01 (0.03)	1.13†	[0.99, 1.29]	1.03	[0.89, 1.18]
Adjusted moderated effect							
African American (vs. White)	0.52**	[0.45, 0.60]	-0.83 (0.10)**	0.83	[0.55, 1.25]	1.38	[0.92, 2.06]
Hispanic (vs. White)	0.69**	[0.60, 0.80]	-0.30 (0.10)**	0.73†	[0.51, 1.05]	1.59**	[1.11, 2.26]
Male (vs. female)	1.25**	[1.13, 1.39]	1.31 (0.06)**	2.61**	[1.89, 3.61]	2.35**	[1.67, 3.31]
Household income	1.24**	[1.18, 1.29]	-0.03 (0.03)	1.02	[0.91, 1.15]	1.02	[0.89, 1.16]
Education	1.27**	[1.20, 1.34]	-0.15 (0.04)**	0.70**	[0.61, 0.81]	0.78**	[0.67, 0.91]
Neighborhood disadvantage	0.86**	[0.82, 0.90]	-0.01 (0.03)	1.16*	[1.00, 1.35]	1.10	[0.91, 1.31]
Disadvantage × Af. American	1.14*	[1.03, 1.27]	0.22 (0.08)**	0.88	[0.64, 1.22]	0.75†	[0.53, 1.05]
Disadvantage × Hispanic	1.14*	[1.02, 1.27]	0.17 (0.08)*	0.67*	[0.46, 0.98]	0.71†	[0.48, 1.05]
Disadvantage × Male	1.12**	[1.03, 1.22]	–[c]	0.93	[0.70, 1.22]	0.89	[0.63, 1.25]
Disadvantage × Af. Amer. × Male		–	–	1.74†	[0.97, 3.11]	1.70	[0.87, 3.25]
Disadvantage × Hispanic × Male		–	–	1.82†	[0.90, 3.67]	1.96†	[0.94, 4.09]
Obs. (wtd. *n*)	11,839 (11,881)		7,493 (7,567)	7,493 (7,631)		7,493 (7,632)	

Notes: OR = odds ratio; CI = confidence interval; S.E. = linearized standard error; Af. Amer. = African American; obs. = number of observations in unweighted sample; wtd. *n* = weighted sample size. [a]Drinkers only; [b]adjusted models controlled for age, gender, marital status, race/ethnicity, household income, education, employment status, survey year, and precision of geocode; [c]not statistically significant, dropped from model.
†$p < .10$; *$p < .05$; **$p < .01$.

of neighborhood disadvantage on heavy drinking and alcohol dependence to nonsignificance.

Adjusted interaction models revealed that neighborhood main effects were specific to certain subgroups, and they suggested partial support for our second hypothesis. There were significant two-way interactions of neighborhood disadvantage with both race/ethnicity and gender for drinker status and significant two-way interactions of neighborhood disadvantage with race/ethnicity for volume from heavy drinking. There also were marginally significant ($p < .10$) three-way interactions between neighborhood disadvantage, race/ethnicity, and gender for negative consequences and alcohol dependence.

The simple slopes analysis revealed that neighborhood disadvantage had opposing effects on drinking outcomes in different subgroups. Neighborhood disadvantage was negatively associated with drinker status for White women (odds ratio [OR] = 0.78, $p < .01$), White men (OR = 0.87, $p < .01$), African American women (OR = 0.89, $p < .01$), and Hispanic/Latina women (OR = 0.88, $p < .05$), but it was not significant for African American men (OR = 1.00, $p > .10$) or Hispanic men (OR = 0.99, $p > .10$). Neighborhood disadvantage was negatively associated with heavy drinking by Whites ($B = -0.08$, $p < .05$) but positively associated with heavy drinking by African Americans ($B = 0.14$, $p < .05$) and not significant for Hispanics ($B = 0.09$, $p > .10$). Neighborhood disadvantage was significantly positively associated with negative consequences for White women (OR = 1.47, $p < .05$) and marginally significant for African American men (OR = 1.30, $p < .10$), but it was not significant for other groups (White men: OR = 1.10, $p > .10$; African American women: OR = 1.00, $p > .10$; Hispanic men: OR = 1.01, $p > .10$; Hispanic women: OR = 0.74, $p > .10$). Finally, despite elevated odds of dependence for White women, neighborhood disadvantage was not significantly associated with alcohol dependence for any group (White women: OR = 1.44, $p > .10$; White men: OR = 1.03, $p > .10$; African American women: OR = 0.84, $p > .10$; African American men: OR = 1.02, $p > .10$; Hispanic women: OR = 0.74, $p > .10$; Hispanic men: OR = 1.04, $p > .10$). To supplement these group-specific estimates, Figure 1 shows the predicted volume from heavy drinking by race at three levels of neighborhood disadvantage, and Figure 2 depicts the predicted probabilities of two or more negative consequences by race/ethnicity and sex at three levels of neighborhood disadvantage.

Discussion

Using data from two large national surveys of U.S. adults (analyzed together), we found partial support for the hypothesis that neighborhood disadvantage is negatively associated with drinker status but positively associated with heavy drinking and alcohol problems among drinkers. Although all bivariate associations were statistically significant as hypothesized, in models adjusting for individual-level socioeconomic status, associations remained only between neighborhood disadvantage with drinker status and consequences experienced by drinkers. Similar findings have been noted by others in terms of both reduced odds of drinking (Chuang et al., 2005; Galea et al., 2007) and increased nega-

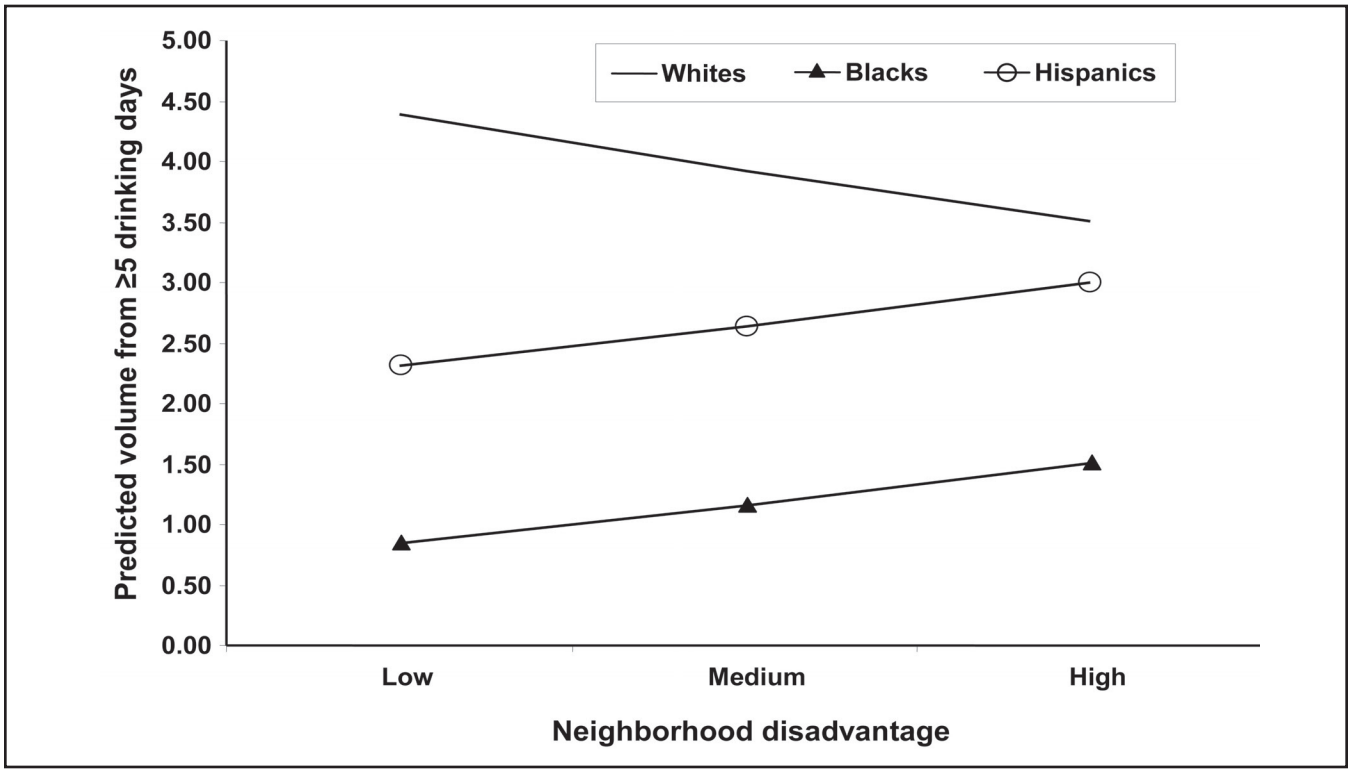

FIGURE 1. Moderated effects of neighborhood disadvantage and race on past-year volume from heavy drinking (drinkers only)

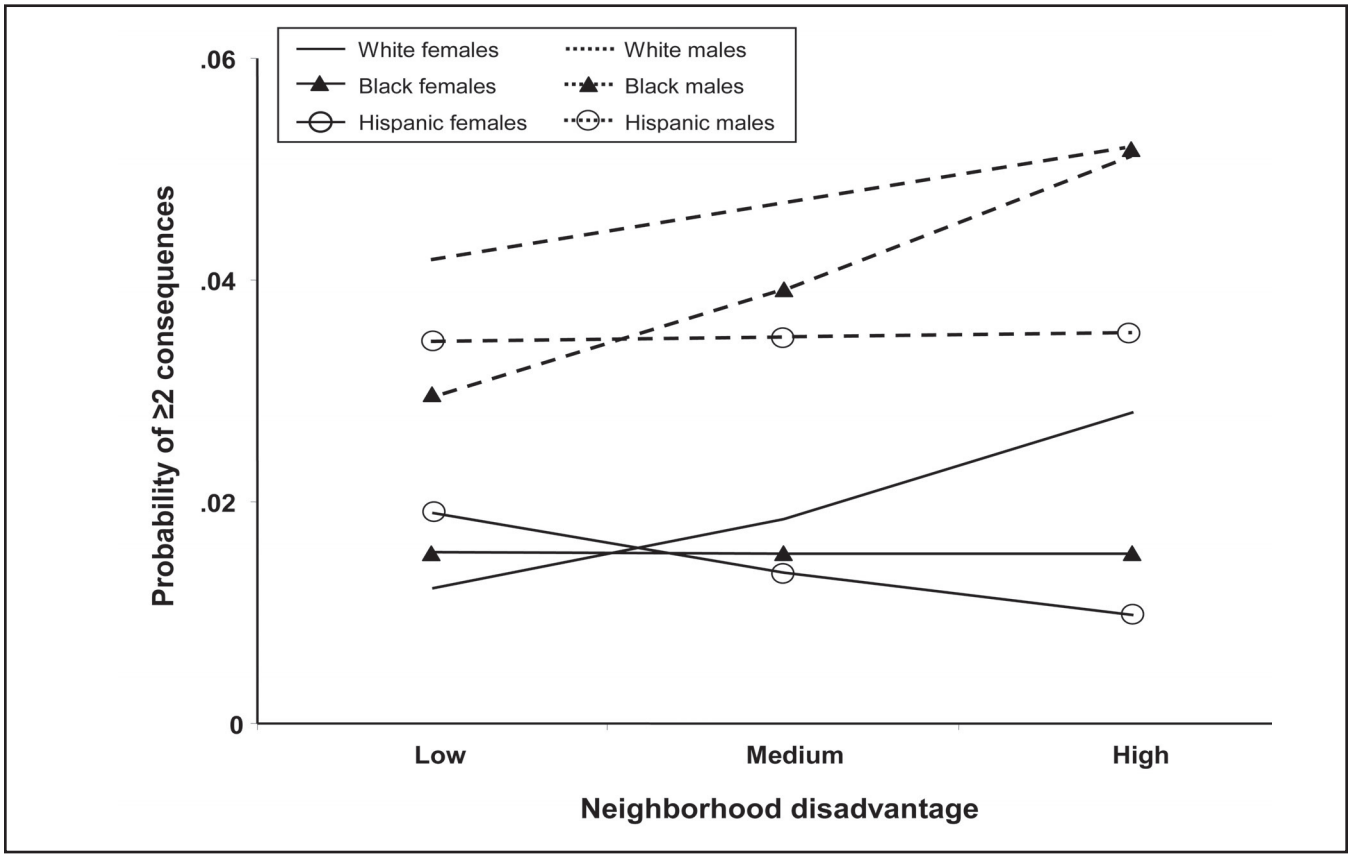

FIGURE 2. Moderated effects of neighborhood disadvantage, race, and gender on two or more negative consequences of drinking in the past year (drinkers only)

tive consequences of drinking (Jones-Webb et al., 1997) in more disadvantaged areas.

We further found that both race/ethnicity and gender modified relationships between neighborhood disadvantage and drinking outcomes, with some protective effects of neighborhood disadvantage on drinker status for all groups except African American and Hispanic men. There also were decreases in heavy drinking observed for Whites at higher levels of neighborhood disadvantage that were opposite significant increases in heavy drinking observed for African Americans. This association between neighborhood disadvantage and reduced heavy drinking among Whites is similar to results reported from a California sample (Pollack et al., 2005). However, these findings differ somewhat from those noted in earlier studies using data from the U.S. National Health and Nutrition Examination Surveys I and III, which documented overall higher daily volumes of alcohol consumed (Waitzman and Smith, 1998) and very heavy drinking (operationalized as consumption of five or more drinks "almost daily"; Stimpson et al., 2007) in disadvantaged neighborhoods. Given the large sample sizes in these data sets, further analysis of moderation effects by race and sex would be informative for validation of our differential findings. In our sample, the decreases in heavy drinking among Whites were offset by a higher prevalence of negative alcohol-related consequences and slightly elevated rates of alcohol dependence among White women in more disadvantaged neighborhoods. Additional elevations in negative consequences were observed for African American men that were marginally significant, and there was a small increase for Hispanic men that did not reach statistical significance. In fact, no significant relationships of problem drinking outcomes with neighborhood disadvantage emerged for Hispanic men. The overall pattern of findings partially supports our second hypothesis, but, counter to prior studies suggesting differential risk for men (Karvonen and Rimpelä, 1996, 1997; Matheson, et al., 2012), our results instead reveal deleterious effects of neighborhood disadvantage for White women who drink.

Stress from multiple types of disadvantage (Robert, 1999) experienced by men of color in disadvantaged neighborhoods may contribute to increased heavy drinking. We observed significantly higher volumes of alcohol consumed on heavy-drinking days for African American drinkers as neighborhood disadvantage increased. In stark contrast, White drinkers reported significantly lower heavy-drinking volumes at higher levels of neighborhood disadvantage. Unlike other outcomes, these effects were not qualified by gender. In bivariate post hoc analyses, we found that African Americans and Hispanics were significantly more likely than Whites to report unfair treatment and racial stigma in disadvantaged neighborhoods, which suggests that increased heavy drinking among African Americans may have been, in part, a reaction to increased stress from multiple sources of disadvantage. It is unclear why an effect on heavy drinking would differ for Hispanics, and it merits further study to identify protective factors that may buffer these accumulating stressors. It also is possible that a higher density of alcohol outlets in certain disadvantaged neighborhoods (LaVeist and Wallace, 2000; Romley et al., 2007) contributed to increases in heavy drinking by African Americans, but we were unable to test this hypothesis.

Increased heavy drinking likely contributed to negative alcohol consequences reported by African American men in disadvantaged neighborhoods, which also has been noted in other studies (Jones-Webb et al., 1997). Additional factors unique to disadvantaged neighborhood contexts can potentially contribute to alcohol-related problems as well. Increased police presence and low-wage, inflexible employment may contribute to elevated risk for alcohol problems reported by some drinkers residing in these areas. In bivariate post hoc analyses, all groups of drinkers except Hispanic women were significantly more likely to report alcohol-related work or legal problems in disadvantaged neighborhoods than in more affluent neighborhoods. Additional research should characterize the intersection of neighborhood context, unfair treatment, stigma, policing, and employment in relation to alcohol consumption and related problems by race/gender group.

Findings for White women are in surprising contrast to those of other subgroups. At all levels of neighborhood disadvantage, White men and women were more likely than their African American or Hispanic counterparts to be drinkers, which could contribute to more permissive drinking norms. Whites also had the highest volume from heavy drinking days across all levels of neighborhood disadvantage. Bivariate post hoc analyses revealed important comorbidities that may be associated with significant increases in alcohol-related consequences and somewhat higher odds of dependence in the absence of increased heavy drinking by White women. White women in the most disadvantaged neighborhoods in our sample were challenged by family histories of alcohol problems, concurrent illicit drug use, and an increased tendency to use alcohol to cope with tension and stress, all of which are important risk factors for alcohol problems. These factors also may be associated with migration to disadvantaged neighborhoods (Buu et al., 2007), which could have contributed to observed associations. This effect should not have been unique to White women, however, and replication with longitudinal data would be informative.

Limitations of this study should be noted. We are unable to account for the length of neighborhood residence. This is particularly relevant, given a longitudinal study demonstrating that men diagnosed as alcohol dependent were significantly more likely to move to disadvantaged neighborhoods over time (Buu et al., 2007). This "downward drift" may have been most pronounced for White women in our study.

Although a recent review revealed that relationships between neighborhood socioeconomic status and substance use do not differ markedly for cross-sectional and longitudinal studies (Karriker-Jaffe, 2011), longitudinal data on neighborhood effects on adults would contribute significantly to current knowledge. Another limitation pertains to the low survey response rate. In a time of increasing difficulty of random-digit-dial surveys, researchers should search for alternative methods for recruiting and engaging nationally representative samples for health studies.

Our study has strengths that enhance its contribution to the literature. Similarity in methods and questions allowed us to pool two data sets to obtain a large, nationally representative sample of U.S. adults that provided increased statistical power for examining subgroup differences in associations of neighborhood disadvantage with drinking outcomes. Despite this, we were unable to include many racial/ethnic groups in our analyses, and examination of differential neighborhood effects for Asians and Native Americans is warranted. Furthermore, as noted above, replication with even larger nationally representative samples of African American and Hispanic women who drink also would be valuable. Extensive alcohol measures allowed us to use an innovative approach to define the volume of alcohol consumed that incorporated the drinking pattern, which is an improvement over many national surveys that have only a few items to assess alcohol use. Future studies examining neighborhood effects on alcohol problems also may benefit from the inclusion of continuous measures that reflect the new guidelines for classifying alcohol use disorders outlined in the American Psychiatric Association's (2010) DSM-5.

The findings from this project have important implications for the prevention of alcohol problems. Targeted interventions should be developed to reduce unequal impacts of neighborhood disadvantage. In particular, specialized efforts to reach African Americans (both men and women) and White women in disadvantaged areas may decrease heavy drinking and lessen the burden of alcohol problems among these groups. Additional outreach programs to address comorbidities also may be beneficial, particularly for women.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

American Psychiatric Association. (2010). Alcohol-use disorder: Proposed revision for DSM-5, retrieved from http://www.dsm5.org/ProposedRevisions/Pages/proposedrevision.aspx?rid=452#

Bernard, P., Charafeddine, R., Frohlich, K. L., Daniel, M., Kestens, Y., & Potvin, L. (2007). Health inequalities and place: A theoretical conception of neighbourhood. *Social Science & Medicine, 65,* 1839–1852.

Buu, A., Mansour, M., Wang, J., Refior, S. K., Fitzgerald, H. E., & Zucker, R. A. (2007). Alcoholism effects on social migration and neighborhood effects on alcoholism over the course of 12 years. *Alcoholism: Clinical and Experimental Research, 31,* 1545–1551.

Caetano, R., & Clark, C. L. (1999). Trends in situational norms and attitudes toward drinking among whites, blacks, and Hispanics: 1984–1995. *Drug and Alcohol Dependence, 54,* 45–56.

Caetano, R., & Tam, T. W. (1995). Prevalence and correlates of DSM-IV and ICD-10 alcohol dependence: 1990 US National Alcohol Survey. *Alcohol and Alcoholism, 30,* 177–186.

Cherpitel, C. J. (2002). Screening for alcohol problems in the U.S. general population: Comparison of the CAGE, RAPS4, and RAPS4-QF by gender, ethnicity, and service utilization. *Alcoholism: Clinical and Experimental Research, 26,* 1686–1691.

Chuang, Y.-C., Ennett, S. T., Bauman, K. E., & Foshee, V. A. (2005). Neighborhood influences on adolescent cigarette and alcohol use: Mediating effects through parent and peer behaviors. *Journal of Health and Social Behavior, 46,* 187–204.

Diez Roux, A. V., & Mair, C. (2010). Neighborhoods and health. *Annals of the New York Academy of Sciences, 1186,* 125–145.

Ecob, R., & Macintyre, S. (2000). Small area variations in health related behaviours; do these depend on the behaviour itself, its measurement, or on personal characteristics? *Health & Place, 6,* 261–274.

Elliott, M. (2000). The stress process in neighborhood context. *Health & Place, 6,* 287–299.

Galea, S., Ahern, J., Tracy, M., & Vlahov, D. (2007). Neighborhood income and income distribution and the use of cigarettes, alcohol, and marijuana. *American Journal of Preventive Medicine, 32, Supplement 6,* S195–S202.

Greenfield, T. K. (2000). Ways of measuring drinking patterns and the difference they make: Experience with graduated frequencies. *Journal of Substance Abuse, 12,* 33–49.

Jones-Webb, R., McKee, P., Hannan, P., Wall, M., Pham, L., Erickson, D., & Wagenaar, A. (2008). Alcohol and malt liquor availability and promotion and homicide in inner cities. *Substance Use & Misuse, 43,* 159–177.

Jones-Webb, R., Snowden, L. R., Herd, D., Short, B., & Hannan, P. (1997). Alcohol-related problems among black, Hispanic and white men: The contribution of neighborhood poverty. *Journal of Studies on Alcohol, 58,* 539–545.

Karriker-Jaffe, K. J. (2011). Areas of disadvantage: A systematic review of effects of area-level socioeconomic status on substance use outcomes. *Drug and Alcohol Review, 30,* 84–95.

Karriker-Jaffe, K. J., & Kaskutas, L. A. (2009). Neighborhood socioeconomic context of alcohol use: A measurement validation study [Abstract 720]. *Alcoholism: Clinical and Experimental Research, 33, Supplement S1,* 190A.

Karvonen, S., & Rimpelä, A. (1996). Socio-regional context as a determinant of adolescents' health behaviour in Finland. *Social Science & Medicine, 43,* 1467–1474.

Karvonen, S., & Rimpelä, A. H. (1997). Urban small area variation in adolescents' health behaviour. *Social Science & Medicine, 45,* 1089–1098.

Kramer, R. C. (2000). Poverty, inequality, and youth violence. *The Annals of the American Academy of Political and Social Science, 567,* 123–139.

Krieger, N., Chen, J. T., Waterman, P. D., Soobader, M.-J., Subramanian, S. V., & Carson, R. (2002). Geocoding and monitoring of US socioeconomic inequalities in mortality and cancer incidence: Does the choice of area-based measure and geographic level matter? The Public Health Disparities Geocoding Project. *American Journal of Epidemiology, 156,* 471–482.

Krieger, N., Waterman, P., Lemieux, K., Zierler, S., & Hogan, J. W. (2001). On the wrong side of the tracts? Evaluating the accuracy of geocoding in public health research. *American Journal of Public Health, 91,* 1114–1116.

LaVeist, T. A., & Wallace, J. M., Jr. (2000). Health risk and inequitable distribution of liquor stores in African American neighborhood. *Social Science & Medicine, 51,* 613–617.

Lynch, J., & Kaplan, G. (2000). Socioeconomic position. In L. F. Berkman & I. Kawachi (Eds.), *Social epidemiology* (pp. 13–35). New York, NY: Oxford University Press.

Matheson, F. I., White, H. L., Moineddin, R., Dunn, J. R., & Glazier, R. H. (2012). Drinking in context: The influence of gender and neighbourhood deprivation on alcohol consumption. *Journal of Epidemiology and Community Health, 66*(6), e4.

Midanik, L. T., & Greenfield, T. K. (2000). Trends in social consequences and dependence symptoms in the United States: The National Alcohol Surveys, 1984–1995. *American Journal of Public Health, 90,* 53–56.

Midanik, L. T., & Greenfield, T. K. (2003a). Defining 'current drinkers' in national surveys: Results of the 2000 National Alcohol Survey. *Addiction, 98,* 517–522.

Midanik, L. T., & Greenfield, T. K. (2003b). Telephone versus in-person interviews for alcohol use: Results of the 2000 National Alcohol Survey. *Drug and Alcohol Dependence, 72,* 209–214.

Midanik, L. T., Greenfield, T. K., & Rogers, J. D. (2001). Reports of alcohol-related harm: Telephone versus face-to-face interviews. *Journal of Studies on Alcohol, 62,* 74–78.

Mulia, N., Ye, Y., Greenfield, T. K., & Zemore, S. E. (2009). Disparities in alcohol-related problems among white, black, and Hispanic Americans. *Alcoholism: Clinical and Experimental Research, 33,* 654–662.

Pollack, C. E., Cubbin, C., Ahn, D., & Winkleby, M. (2005). Neighbourhood deprivation and alcohol consumption: Does the availability of alcohol play a role? *International Journal of Epidemiology, 34,* 772–780.

Robert, S. A. (1999). Socioeconomic position and health: The independent contribution of community socioeconomic context. *Annual Review of Sociology, 25,* 489–516.

Romley, J. A., Cohen, D., Ringel, J., & Sturm, R. (2007). Alcohol and environmental justice: The density of liquor stores and bars in urban neighborhoods in the United States. *Journal of Studies on Alcohol and Drugs, 68,* 48–55.

Sampson, R. J., & Groves, W. B. (1989). Community structure and crime: Testing social-disorganization theory. *American Journal of Sociology, 94,* 774–802.

Shaper, A. G., Pocock, S. J., Walker, M., Cohen, N. M., Wale, C. J., & Thomson, A. G. (1981). British Regional Heart Study: Cardiovascular risk factors in middle-aged men in 24 towns. *British Medical Journal, 283,* 179–186.

Snijders, T., & Bosker, R. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling.* London, England: Sage.

Stimpson, J. P., Ju, H., Raji, M. A., & Eschbach, K. (2007). Neighborhood deprivation and health risk behaviors in NHANES III. *American Journal of Health Behavior, 31,* 215–222.

U.S. Census Bureau. (2002). *Census 2000 Summary File 3—United States.* Washington, DC: Author. Retrieved from http://www.census.gov/census2000/sumfile3.html

Wagle, U. (2002). Rethinking poverty: Definition and measurement. *International Social Science Journal, 54,* 155–165.

Waitzman, N. J., & Smith, K. R. (1998). Phantom of the area: Poverty-area residence and mortality in the United States. *American Journal of Public Health, 88,* 973–976.

Wilsnack, R. W., Vogeltanz, N. D., Wilsnack, S. C., & Harris, T. R (2000). Gender differences in alcohol consumption and adverse drinking consequences: Cross-cultural patterns. *Addiction, 95,* 251–265.