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Alcohol Availability and Neighborhood Characteristics in Los Angeles, California and Southern Louisiana

Ricky N. Bluthenthal, Deborah A. Cohen, Thomas A. Farley, Richard Scribner, Christopher Beighley, Matthias Schonlau, and Paul L. Robinson

ABSTRACT *The objective of this study was to examine the associations between alcohol availability types and community characteristics in randomly selected census tracts in Southern California and Southeastern Louisiana. Outlet shelf space and price by beverage type was collected from all off-sale alcohol outlets in 189 census tracts by trained research personnel. Three aspects of alcohol availability at the census tract level were considered—outlets per roadway mile, shelf space, and least price by beverage type. Using multivariate analyses, we examined the associations between census tract socioeconomic and demographic characteristics and alcohol availability types. Fifteen measures of alcohol availability were calculated—total shelf space and shelf space by beverage types (beer, malt liquor, and distilled spirits); outlets per roadway mile, per tract, and per capita; and least price by beverage type (including wine). In multivariate analyses controlling for state, male unemployment rate was inversely associated with total shelf space ($p=0.03$) and distilled spirit shelf space ($p=0.05$). Malt liquor shelf space was inversely associated with percent White ($p=0.02$). Outlets per roadway mile was positively associated with household poverty ($p<0.0001$), whereas percent African American was inversely associated with outlets per roadway mile ($p=0.03$). Beverage-specific least prices were not associated with any socioeconomic or demographic community characteristics. Alcohol availability types, but not least price, were associated with some community characteristics. More research exploring how alcohol availability types vary by community and their relationship to alcohol-related harms should be conducted.*

KEYWORDS *Off-sale alcohol outlets, Community characteristics, Beverage-specific availability, Alcohol price, Shelf space measurements, Alcohol outlet types, Liquor stores, Supermarkets.*

Bluthenthal, Cohen, Beighley, and Schonlau are with the Health Program and Drug Policy Research Center, RAND Corporation, Santa Monica, CA, USA; Bluthenthal is with the Urban Community Research Center, Sociology Department, California State University, Dominguez Hills, Carson, CA, USA; Farley is with the Department of Community Health Sciences, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA, USA; Scribner is with the School of Public Health, Louisiana State University Health Sciences Center, New Orleans, LA, USA; Robinson is with the Research Centers in Minority Institutions (RCMI), Charles R. Drew University of Medicine and Science, Los Angeles, CA, USA.

Correspondence: Ricky N. Bluthenthal, Health Program and Drug Policy Research Center, RAND Corporation, 1776 Main Street P.O. Box 2138 Santa Monica, CA 90407-2138, USA. (E-mail: rickyb@rand.org)

INTRODUCTION

Alcohol use and abuse causes significant health and social problems in the United States. According to the 2006 National Survey on Drug Use and Health, an estimated 125 million Americans consumed at least one alcoholic beverage in the last 30 days. An estimated 30.5 million Americans self-reported drinking and driving in this same survey and nearly 8% of Americans reported behaviors consistent with alcohol abuse and dependence.[1] Alcohol-related mortality was the third leading cause of death in the US in 2003,[2] and the leading cause of mortality among people because of intentional and unintentional injury.[3] Understanding the range of factors that influence alcohol consumption and related health outcomes is, therefore, a pressing public health concern.

Both alcohol consumption and alcohol-related harms have been associated with alcohol availability in some studies but not others. For instance, alcohol outlet density has been associated with neighborhood/community alcohol consumption levels.[4,5] On the other hand, perceived or subjective availability has been found to be a better predictor of alcohol consumption than physical availability in some studies.[6,7] Alcohol outlet density has also been associated with a variety of social problems including violent assault,[8–12] alcohol-related motor vehicle accidents and fatalities,[12,13] and sexually transmitted disease rates.[14,15] Yet, other studies have found that drug-related crime is a stronger predictor of violence than alcohol outlets.[16,17]

A separate consideration is that alcohol outlets are not randomly distributed in communities. The limited amount of research in this area has consistently documented that alcohol outlets tend to be concentrated in minority and lower-income neighborhoods.[18–20] Because physical availability (measured as outlet density) has been found to vary by sociodemographic and economic characteristics of communities, more careful consideration of how physical availability is measured is warranted.

However, there are several weaknesses in the current literature on alcohol availability, alcohol consumption patterns, and alcohol consequences. First, many alcohol availability studies only measure the densities of outlets. One weakness of this approach is it cannot account for systematic differences in the availability of alcohol by outlet types (e.g., liquor stores versus supermarkets) or the impact of differences in alcohol promotion within and near outlets. Yet, we know that supermarkets carry more and a larger variety of alcoholic beverages than the typical "mom and pop" convenience store. We also know that point-of-purchase marketing also varies by store type.[21] However, relatively little research has been conducted on how in-store availability and differences among alcohol outlets might influence the overall physical availability of alcohol.

Second, alcohol pricing and community characteristics have been understudied. To our knowledge, only two studies have examined the factors associated with alcohol pricing and community context.[22,23] Yet, we know from the laboratory and observational studies that there is a strong association between price and alcohol consumption.[24,25] For instance, reduced pricing of distilled spirits in Switzerland lead to increase consumption of this beverage type at the same time that overall alcohol consumption was declining in this country.[26,27] Whereas in Sweden, changes in the 1990s in alcohol tax policies that tended to increase price lead to declines in alcohol sales, although brand substitution patterns suggest that alcohol consumption might not have declined.[28,29] More research examining whether alcohol least price varies by community characteristics is needed.

Lastly, insufficient attention has been paid to the causal mechanism involved in the associations among alcohol availability, consumption and drinking patterns, and adverse consequences. Recently Gruenewald summarized the ecological theoretical literature in this area.[30] He identified four theoretical explanations—"flow models,"[10,12] "gravity models," "social contextual models,"[18] and "niche marketing and assortative drinking"—for the association between alcohol outlets and alcohol-related consequences. In each of these models, alcohol outlets influence adverse consequences by concentrating problematic drinkers (flow and gravity) or by locating in areas with residents who are more likely to have adverse consequences (social contextual and niche marketing). One perspective that is not addressed by these approaches is that of the alcohol outlet as a "trigger." There is a substantial literature that documents how food and alcohol availability directly relate to consumption patterns.[31–33] One way to assess whether alcohol availability operates as a marketing and assortative mixing mechanism or as a trigger is to consider other measurements of availability that might better capture domains of alcohol availability.

To address both theoretical and methodological gaps in the existing literature on alcohol availability, we examined alcohol availability at three levels—outlets per roadway mile (or outlet density), total and beverage type (regular beer, malt liquor, and distilled spirits) shelf space in a census tract, and average least price by alcohol beverage type (regular beer, malt liquor beer, distilled spirits, and wine) in a census tract. From a theoretical perspective, these measures will allow us to consider the relative contributions of alcohol availability as a trigger (measured by shelf space and price) and as niche or assortative mixing mechanisms (e.g., the relative absence of supermarkets and other big box retailers in lower income minority communities on one hand, and the disproportionate availability of liquor stores and other outlets in these same communities on the other hand) to negative alcohol consequences.[18–20] In addition, we will be able to better describe the association between alcohol outlets and niche marketing by considering both the price and type of beverages that are sold in different socioeconomic and sociodemographic settings. Price and beverage-specific shelf space as niche marketing measures can directly contribute to assortative mixing by attracting drinkers with preferences for lower-cost, higher alcohol content beverages such as malt liquors and fortified wines.[34,35] To accomplish this, we examine whether these levels of alcohol availability vary significantly by community demographic and socioeconomic characteristics at the census tract level.

METHODS

Data for these analyses come from a study of alcohol availability, marketing, promotion, and consumption conducted in Los Angeles County and Southern Louisiana. The aim of the study was to consider more fully the contribution of off-sale alcohol outlet availability, in-store promotion and marketing, and community marketing (measured through billboards) on alcohol consumption and consequences. We conducted this study in Los Angeles County and Southern Louisiana to increase the numbers of African American and Hispanic areas and individuals in the study. By including both we assured ourselves of having sufficient numbers of African American and Hispanic areas for our analytic purposes (see Table 1 for sociodemographic and economic information on the areas selected).

TABLE 1 Demographic and socioeconomic characteristics of sampled tracts, New Orleans SMSA tracts, and Los Angeles County tracts based on the 2000 US census ($n = 187$)

Characteristics	Sample mean (SD)	New Orleans and Baton Rouge combined MSA mean	Los Angeles County mean
Percent African American	29% (32%)	37%	10%
Percent Hispanic	28% (31%)	4%	45%
Percent White	33% (32%)	61%	31%
Male unemployment rate	6% (4%)	7%	9%
Family poverty rate	21% (13%)	14%	14%
Households receiving public assistance	7% (6%)	3%	6%
Median household income	$35,632 (7,019)	$36,285	$42,189

Source: Tables DP-1 and DP-3 for Baton Rouge and New Orleans, LA MSA, U.S. Census Bureau, Census 2000.
SD: standard deviation, *MSA*: Metropolitan Statistical Area

In these analyses, we use three types of data: (1) tract level demographic and socioeconomic information from the 2000 United States census, (2) alcohol outlet data (address and license type) that was purchased from the alcohol control agencies of California and Louisiana, and (3) linear shelf space measures and least price of alcohol by beverage type from physical observations of all off-premise alcohol outlets (alcohol for purchase but consumption must occur off premise) in the selected census tracts.

Census tracts (county subdivisions that are relatively homogenous in terms of population characteristics, economic status, and living conditions) were selected in the following manner.[36] Twenty-six contiguous parishes in southeastern Louisiana were identified and 114 tracts with 2,000 persons per square mile or more were then randomly selected from a candidate list of census tracts. In Los Angeles, 114 tracts with 2,000 persons per square mile or more within 20 miles of Charles R. Drew University of Medicine and Science were randomly selected from a list of candidate tracts. The 2,000 or more persons per square mile inclusion criteria was used to ensure that all census tracts were urban (the U.S. census bureau considers census block groups urbanized if they have a population density of at least 1,000 persons per square mile and are adjacent to another census block group with a population density of at least 500).[37,38]

In each census tract, off-premise alcohol outlets were identified through state alcohol beverage control agencies files and systematic physical observation of each street in the census tract. Data was collected in 217 census tracts—114 from Los Angeles County, California and 103 from Southeastern Louisiana and environs (11 census tracts in New Orleans were excluded because of Hurricane Katrina which forced the suspension of data collection activities). Those 11 census tracts differed only in population size (they included on average 2,000 fewer people per tract) from the other census tracts selected in Louisiana.

Second, at each outlet, trained personnel from either Charles R. Drew University of Medicine and Science in Los Angeles or Tulane University School of Public Health in Louisiana conducted systematic observation of store characteristics. The following data were collected on a four-page pencil and paper form: (1) purchase price of a standard brand and container of beer (Budweiser or Miller), and a standard brand and container of malt liquor (Olde English or Colt 45); (2)

placement of beer and malt liquor (on shelf, in refrigerator, open ice bucket, floor display, within 1 meter of cash register, whether self service or clerk-assisted); (3) the minimum purchase price of any single-serving container of beer, malt liquor, and distilled spirits; (4) availability of other alcoholic beverages: flavored beers, coolers, premium malt beverages, regular table wine, "expensive" fortified wine; (5) length of shelf space for alcoholic beverages: self-service (refrigerated and nonrefrigerated) and clerk-assisted; (6) extent of alcohol advertising inside the store and number of alcohol ads on the exterior of the store; and (7) total floor space. Intercoder reliability was found to range from acceptable to high for shelf space measurement (κ=0.98) and lowest price for beer (0.79) and malt liquor (0.76).[39]

Measurement

From these data, the following 15 dependent variables of alcohol availability were constructed at the census tract level: (1) total shelf space, (2) total beer shelf space, (3) total malt liquor shelf space, (4) total distilled spirit shelf space, (5) total shelf space in feet per capita, (6) beer shelf space per capita, (7) malt liquor shelf space per capita, (8) distilled spirits shelf space per capita, (9) outlets per roadway mile, (10) outlets per capita, (11) total outlets, (12) least price per ounce for beer (where higher price equals higher rank), (13) least price per ounce for malt liquor, (14) least price per ounce for wine, and (15) least price per ounce for distilled spirits.

Using the US Census Bureau tract level data, we examined how these levels of alcohol availability varied by neighborhood demographic (i.e., percent African American, White, and Hispanic) and socioeconomic characteristics (i.e., male unemployment rate, percent of families in poverty, percent of households receiving public assistance, and median household income). These measures were selected based on previous research indicating that they are strongly related to negative health outcomes and substance abuse.[40,41] In the following analyses, we examine the associations between these levels of alcohol availability and sociodemographic and socioeconomic variables.

Statistical Analyses

The analytic sample includes 188 of 217 tracts (86%) where data was collected. We removed all tracts that did not have any alcohol outlets (n=29). We also removed one tract with unusually large shelf space measures to satisfy goodness of fit tests. The regressions for shelf space included 187 tracts. Missing data were more common for prices (beer 35.3% of 642 stores, malt 53.7%, wine 40.3%, hard liquor 43.6%). The price regressions were conducted on 166 tracts for beer, 151 tracts for malt liquor, 123 tracts for wines, and 136 tracts for distilled spirits.

We also had missing data for some shelf space (31.8%) measures as documented elsewhere.[39] Missing data for shelf space from the store observation data were multiply imputed (five times). The choice of five imputations is common. Rubin gives a formula for computing the efficiency relative to an infinite number of imputations.[42] Assuming a rate of 10% of missing values, five imputations are 98% efficient.[43] We imputed the data in two steps. First, we used a Markov Chain Monte Carlo algorithm to attain a monotone missing value pattern. We then used predictive mean matching for the imputation. The imputations rely on the usual missing at random assumption (MAR). This assumption is unverifiable.[44]

Next, socioeconomic and demographic data were merged with store observation data. Store level measures were aggregated to census tracts by either an average (for price) or the sum (for shelf space). Census tract characteristics and availability

measures were summarized by calculating the means and standard deviations. We computed the Pearson's correlations between census tract characteristics and tract level measures of shelf space, outlets, and price and adjusted for multiple testing using the Benjamini and Hochberg method.[44]

We used Gaussian linear regression to investigate the correlates between alcohol availability measures and tract level community characteristics. To account for population size and density, we include population per thousand as a covariate in all linear regression analyses. To improve the model fit, we log transformed all alcohol availability measures. Regression models were examined for outliers. Regression models should not be sensitive to any one data point and to the extent that such outliers were flagged and investigated. Three census tracts were removed from the price regressions because their prices were unreasonably high. To capture the between-imputation variation, analyses performed on multiply imputed data are conducted separately for each imputation. Estimates then have to be combined using Rubin's formula.[42] We used the implementation of Rubin's formula in Proc MiAnalyze in SAS version 8 (SAS Institute, Cary, NC, USA).

RESULTS

The demographics of the census tracts included in this study (Table 1) resulted in near identical averages for African Americans (29%; standard deviation [SD]=32), Hispanics (28%; SD=31), and White residents (33%; SD=32). The socioeconomic characteristics of the tracts were as follows: male unemployment rate of 6%, household poverty rate of 21%, households receiving public assistance of 7%, and median household income of $35,632. These rates differ from the average demographic characteristics of census tracts in Los Angeles County and New Orleans Metropolitan Statistical Areas (MSA) substantially. More modest differences were observed between sample census tract averages and socioeconomic characteristics of the populations in Los Angeles County and the New Orleans MSA.

Descriptive statistics on alcohol shelf space, outlet, and price availability and community characteristics are reported in Table 2. Total shelf space availability varied substantially by census tract with a low of 5 ft in one tract and to a high of 397 ft. On average, a plurality of shelf space availability was accounted for by regular beer, followed by distilled spirits, and malt liquor. For outlet availability, on average, there was one outlet for every 2 roadway miles.

In bivariate analyses that examined the associations between community characteristics and various alcohol availability levels, a large number of statistically significant associations were observed (Table 3). Total shelf space availability was inversely associated with socioeconomic measures (percentages of families in poverty, households receiving public assistance, and male unemployment rates). On the other hand, as percent White and median household income increased, so did shelf space. Reflecting in part that shelf space is dominated by beer beverages, the associations between beer shelf space and socioeconomic and sociodemographic measures were the same as those observed for total shelf space with the exception that percent Hispanic was also inversely associated with beer shelf space. In contrast, malt liquor shelf space tended to increase as socioeconomic conditions worsened. Demographically, as malt liquor shelf space increased, so too did the percent African American whereas percent White was inversely associated with malt

TABLE 2 Shelf space and outlets per tract alcohol availability for study census tracts ($n=187$)

Characteristics	Mean	SD	Minimum	Maximum
Shelf space availability				
Total shelf space in feet	69.91	60.94	5.30	397.32
Beer shelf space	31.66	25.33	0	154.30
Malt liquor shelf space	3.52	2.19	0	14.36
Distilled spirits shelf space	16.87	16.43	0	83.35
Per capita shelf space availability				
Total shelf space in feet	20.44	23.57	1.82	155.89
Beer shelf space	9.31	9.96	0	79.01
Malt liquor shelf space	1.11	1.46	0	16.51
Distilled spirits shelf space	4.96	6.08	0	32.91
Outlet availability				
Outlets per roadway mile	0.49	0.63	0	6.31
Per capita				
Outlets per capita	1.02	1.06	0	10.34
Total number of outlets	3.46	2.75	0	17
Price per ounce availability				
Beer	0.072	0.040	0.041	0.449
Malt liquor	0.065	0.040	0.035	0.343
Wine	0.145	0.068	0.075	0.787
Distilled spirits	0.385	0.247	0.088	2.071

liquor shelf space. For distilled spirit shelf space, only one community variable, percent African American, was associated with this measure.

We also examined per capita shelf space. We found that per capita (per thousand) shelf space was associated only with percent household receiving public assistance. Differences in beverage type shelf space availability were also found with per capita beer shelf space being inversely associated with percent of households receiving public assistance and percent Hispanic, but being positively associated with percent White. In contrast, malt liquor shelf space was positively associated with percent of families in poverty and percent African American, and inversely associated with median income and percent White. No community characteristics predicted distilled spirit availability.

In bivariate analyses of outlet availability, we found that outlets per roadway mile were positively associated with percent of families in poverty, male unemployment rate, households receiving public assistance, and Hispanic population. Outlets per roadway mile declined as median household income and percent White increased. For outlets per capita, percent of families in poverty and percent African American were positively associated with per capita outlets, whereas median household income and percent Hispanic were inversely associated with per capita outlets. For the total number of outlets, percent of families in poverty and percent African American were positively associated with number of outlets, and median household income was inversely associated with this measure.

In terms of least price, we found that beer prices were inversely associated with percent African American only. Malt liquor prices were also inversely associated with percent African American, but positively associated with percent White. For wine price, percent Hispanic was positively associated with wine price whereas percent African American were inversely associated with wine price. No community

TABLE 3 Pearson's correlations coefficients of alcohol availability measures by census tract level community sociodemographic and socioeconomic characteristics ($n=187$)

	% Family poverty	% Male UR	% HHs on public assistance	Median HH income	% African American	% White	% Hispanic
Total shelf space in feet	−0.261* $p<0.001$	−0.215* $p=0.004$	−0.228* $p=0.005$	0.262* $p<0.001$	ns	0.238* $p=0.003$	ns
Beer shelf space	−0.230* $p=0.003$	−0.212* $p=0.006$	−0.249* $p=0.002$	0.181*$p=0.016$	ns	0.261* $p=0.001$	−0.188* $p=0.02$
Malt liquor shelf pace	0.398* $p<0.001$	0.234* $p=0.015$	0.310* $p=0.001$	−0.352* $p<0.001$	0.302* $p<0.001$	−0.452* $p<0.001$	ns
Hard liquor shelf space	ns	ns	ns	ns	−0.187* $p=0.011$	ns	ns
Per capita shelf space availability							
Total shelf space in feet	ns	ns	−0.177* $p=0.02$	ns	ns	ns	ns
Beer shelf space	ns	ns	−0.200* $p=0.009$	ns	ns	0.192* $p=0.013$	−0.202* $p=0.008$
Malt liquor shelf space	0.337* $p<0.001$	ns	ns	−0.275* $p<0.001$	0.338* $p<0.001$	−0.228* $p=0.002$	ns
Distilled spirits shelf space	ns	ns	ns	ns	ns	ns	ns
Roadway miles							
Outlets per roadway mile	0.371* $p<0.001$	0.191* $p=0.004$	0.347* $p<0.001$	−0.311* $p<0.001$	ns	−0.342* $p<0.001$	0.420* $p<0.001$
Per capita							
Outlets per capita	0.326* $p<0.001$	ns	ns	−0.289* $p<0.001$	0.346* $p<0.001$	ns	−0.188* $p=0.004$
Total number of outlets	0.225* $p=0.001$	ns	ns	−0.238* $p<0.001$	0.162* $p=0.015$	ns	ns
Price per ounce							
Beer price ($n=167$)	ns	ns	ns	ns	−0.182* $p=0.019$	ns	ns
Malt liquor price ($n=152$)	ns	ns	ns	ns	−0.190* $p=0.020$	0.276* $p=0.001$	ns
Wine price ($n=124$)	ns	ns	ns	ns	−0.253* $p=0.005$	ns	0.265* $p=0.003$
Distilled spirits price ($n=137$)	ns	ns	ns	ns	ns	ns	ns

The asterisk indicates that the correlation is significant at 2% adjusted for multiple testing.[44]
UR: unemployment rate, *HHs*: households

characteristics were associated with distilled spirit prices. We next constructed multivariate models for the dependent variables that seemed most promising—total shelf space measures, beverage-specific shelf space, outlets per roadway mile, and beverage-specific least prices. In models that controlled for state and considered community characteristics (excluding household receiving public assistance and median household income because of collinearity), relatively few significant associations were found (Table 4). For instance, male unemployment rate was inversely associated with total shelf space ($b=-3.41$; $p=0.03$) and distilled spirit shelf space ($b=-4.02$; $p=0.05$). For malt liquor, percent White was inversely associated with malt liquor shelf space ($b=-0.89$; $p=0.02$). For outlets per roadway mile, we found that percent of families in poverty was positively associated with more outlets ($b=1.06$; $p<0.0001$), whereas African American percent was inversely associated with outlets ($b=-0.35$; $p=0.03$). Figures 1 and 2 show the plots for male unemployment rate by total shelf space (Figure 1) and percent households in poverty by outlets per roadway mile with regression lines (Figure 2) to better illustrate these key associations.

In terms of price, no community characteristics were associated with least price, although California was associated with lower beer shelf space ($b=-0.44$; $p=0.02$) and higher wine prices ($b=0.46$; $p<0.01$). In separate analyses by state, beer price in California was found to have a significant association with any community characteristic (percent White, $b=0.37$; $p=0.05$; data not shown). In Louisiana, distilled spirit least price was positively associated with male unemployment rate ($b=2.93$; $p=0.02$; data not shown).

DISCUSSION

We found important differences in community characteristics associated with different levels of alcohol availability. Total shelf space availability was inversely associated with male unemployment rates, and distilled spirit shelf space was inversely associated with male unemployment rate. This likely reflects the availability of supermarkets and other larger retail stores that sell alcohol beverages (i.e., Beverages and More, Costco) and tend to be located in areas of greater relative economic affluence.[45–48] We also observed an inverse relationship between percent White and malt liquor shelf space. Taken together, these findings highlight the role of socioeconomic conditions on the availability of types of alcoholic beverages. Previous studies have primarily examined demographic characteristics (e.g., race) and, therefore, may be missing an essential component of alcohol availability. On the other hand, the inverse association between percent White and malt liquor shelf space, whereas not confirming other studies that have claimed that minority groups are targeted for malt liquor sales,[49] does indicate that all racial and ethnic groups do not have the same malt liquor availability. Recent studies have noted differences in drinking patterns by beverage type.[34,35] Therefore, further studies examining whether such differences in beverage type availability are associated with drinking patterns and drinking consequences are warranted.

On the other hand, in terms of outlet availability, we found that areas with high proportions of family poverty had more outlets per roadway mile. We suspect that this reflects the differences in retail markets. As has been demonstrated in several studies, lower income and racial and ethnic minority areas tend to have fewer supermarkets or other large retailers and instead have many smaller food and beverage retailers, many of whom also sell alcohol.[19,20,45,46] This can result in a

TABLE 4 Coefficients and p value of community characteristics by alcohol availability types at the census tract level using linear regression with multiple imputation

	State	% Family poverty	% Male UR	% African American	% White	% Hispanic	Population size (in thousands)	R^2
Total shelf space	0.30	−0.38	−3.41 $p=0.03$	0.00	0.39	−0.45	0.01	0.14
Beer shelf space	−0.44 $p=0.02$	−0.64	−1.19	−0.30	0.00	−0.05	0.03	0.17
Malt liquor shelf space	0.17	0.68	0.28	−0.09	−0.89 $p=0.02$	−0.54	0.00	0.33
Distilled spirits shelf space	0.55	0.17	−4.02 $p=0.05$	−0.20	−0.17	−0.78	0.00	0.06
Outlets per roadway mile	0.00	1.06 $p<0.001$	0.21	−0.35 $p=0.03$	−0.23	0.01	0.01	0.37
Beer price	0.10	0.16	0.83	0.00	0.38	0.28	0.00	0.10
Malt liquor price	−0.08	−0.07	0.83	−0.53	−0.10	−0.22	−0.02	0.10
Distilled spirit price	0.26	0.65	1.05	−0.34	−0.10	−0.53	0.02	0.06
Wine price	0.46 $p<0.001$	0.20	1.42	0.14	0.30	0.00	0.00	0.38

Logged values.

State: residing in California, *% Family poverty*: percentage of families below the federal poverty line, *% Male UR*: percentage of males who are unemployed, *% African American*: percentage of total population that identifies as African American, *% White*: percentage of total population that identifies as White or European American, *% Hispanic*: percentage of total population that identifies as Hispanic

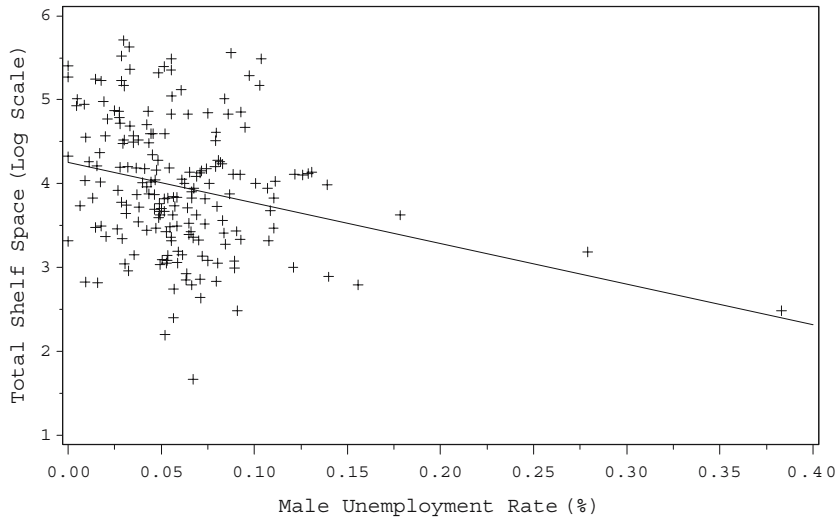

FIGURE 1. Scatter plot of total shelf by male unemployment rate with regression line displayed.

pattern of greater alcohol outlet availability even whereas overall shelf space availability is lower. Harder to interpret is our finding that the African American population was inversely associated with outlet availability. We suspect that this particular finding was influenced by changing demographics in Los Angeles County where in-migration of Hispanic populations into formerly African American neighborhoods (e.g., South Central Los Angeles) has lead to African American out-migration to increasingly better off neighborhoods (see the following website for graphic illustration of how African American majority census tracts in Los Angeles county have became majority Hispanic census tracts between 1970 and 2000, http://lewis.sppsr.ucla.edu/special/metroamerica/ladiversity.htm).[50]

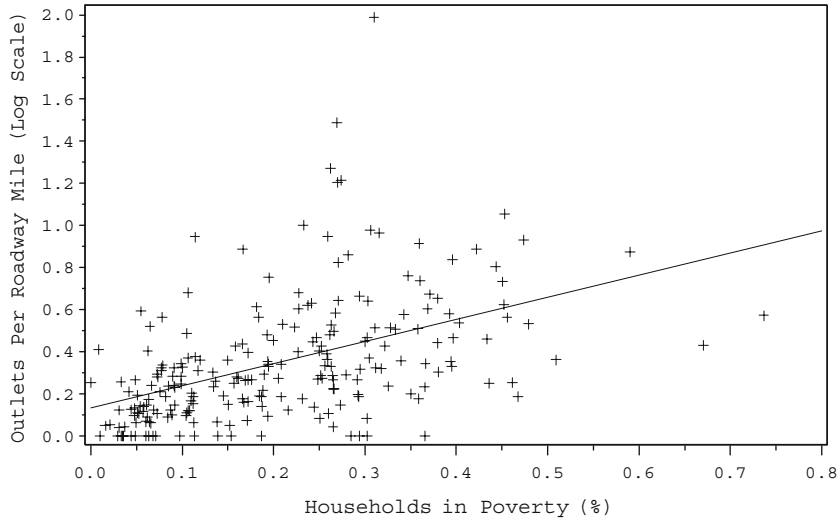

FIGURE 2. Scatter plot of outlets per roadway mile by percent of households in poverty with regression line displayed.

Whereas shelf space and outlet availability were more strongly associated with socioeconomic characteristics, we found that price availability was not associated with any community characteristics. This finding likely reflects uniform pricing of alcoholic beverages throughout regional markets as has been found in other studies.[23,51]

From a theoretical perspective, these findings demonstrate that the community characteristics associated with alcohol availability as a trigger (measured as total shelf space) differ from the outlet density measure associated with niche marketing and assortative mixing perspectives. Additional research considering whether the measures are inversely related seems warranted given that worsened economic conditions are associated with greater outlet density but less shelf space. Research is also needed to determine whether trigger measures are associated with alcohol consumption patterns and alcohol consequences. Lastly, the findings that beverage-specific shelf space was associated with socioeconomic (distilled spirits shelf space inversely related to male unemployment rate) and demographic characteristics (percent White inversely related to malt liquor shelf space) suggest that more detailed studies on beverage-specific availability and alcohol consumption patterns and consequences may be useful for understanding how niche marketing tactics impact alcohol-related outcomes.

These study findings should be considered in the light of the following limitations. First, this is a cross-sectional study and so we cannot establish the direction of the associations we have found between community characteristics and our various measures of alcohol availability. Second, observation and coding of alcohol outlets occurred between 2003 and 2005 whereas census data used to describe communities was collected in 1999. We are unable to determine the amount of changes in community characteristics during the intervening years. In terms of alcohol outlets, no catastrophic event occurred on the scale of the civil unrest in Los Angeles that would radically change the number and location of alcohol outlets.[15] We have modest confidence in our outlet measurements. A recent analysis of reliability found good to acceptable reliability for our measures of shelf space and pricing.[39] In addition, goodness of fit varied by model with low R^2 scores for distilled spirits shelf and distilled spirit price. In this case, other community variables for which we do not have data may be influencing shelf space availability and pricing for distilled spirits.

Nonetheless, we have used several novel measures of alcohol availability, thus enriching and complicating the prevalent notions of alcohol availability. In particular, our results suggest that socioeconomic characteristics are associated with shelf space and outlet availability. Furthermore, by examining beverage-specific availability as it regards shelf space and outlets per tract, we have identified additional policy levers for reducing alcohol-related harms. One obvious policy option is to reduce the number of alcohol outlets, particularly in lower income communities. However, there are few examples of this approach in the literature.[52] Evidence does suggest that dramatic reductions in outlet availability of alcohol outlets can have significant impacts on drinking behavior and negative alcohol-related consequences.[15,53] Another approach could be to reduce the availability of more problematic beverages such as malt liquors and fortified wines. Preliminary studies indicate some success using this approach,[54] although larger studies with more rigorous designs are required to establish the effectiveness of such an approach. In general, this study indicates that alcohol availability can profitably

be examined by considering shelf space and price availability in addition to outlet availability.

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