Alcohol and Environmental Justice: The Density of Liquor Stores and Bars in Urban Neighborhoods in the United States*

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ABSTRACT. Objective: This study had two purposes: (1) to characterize the density of liquor stores and bars that individuals face according to race, economic status, and age in the urban United States and (2) to assess alternative measures of retailer density based on the road network and population. **Method:** We used census data on business counts and sociodemographic characteristics to compute the densities facing individuals in 9,361 urban zip codes. **Results:** Blacks face higher densities of liquor stores than do whites. The density of liquor stores is greater among nonwhites in lower-income areas than among whites in lower- and higher-income areas and nonwhites in higher-income areas. Nonwhite youths face higher densities of liquor stores than white youths. The density of liquor stores and bars is lower in higher-income areas, especially for nonwhites. **Conclusions:** Mismatches between alcohol demand and the supply of liquor stores within urban neighborhoods constitute an environmental injustice for minorities and lower-income persons, with potential adverse consequences for drinking behavior and other social ills. Our results for bars are sensitive to the measure of outlet density as well as population density. Although neither measure is clearly superior, a measure that accounts for roadway miles may reflect proximity to alcohol retailers and thus serve as a useful refinement to the per-capita measure. If so, alcohol policy might also focus on density per roadway mile. Further research on the existence, causes, and consequences of environmental injustice in alcohol retailing is warranted. (*J. Stud. Alcohol Drugs* **68:** 48-55, 2007)

DISPARITIES IN HEALTH RISKS across racial/ethnic and income groups have been documented for toxic waste sites, air pollution, and industrial sites (Brown, 1995; Environmental Protection Agency, 1992). In response, a 1994 Presidential Order requires every federal agency to make " . . . achieving environmental justice part of its mission . . . " and to reduce disproportionate impacts on minority low-income populations (Federal Register, 1994, p. 1). Most of the research and policy efforts have focused on toxic substances near residences, but environmental justice advocates argue that a wider range needs to be considered. The Institute of Medicine (1999) report expands the focus to all places where people live, work, and play; others include in the definition of a "toxic environment" (Horgen and Brownell, 2002) factors that compromise healthy lifestyles, such as barriers to physical activity/healthy eating or environmental factors that encourage tobacco use or excess alcohol consumption.

This broader view may be particularly relevant for reducing sociodemographic health disparities, because health behaviors are the main causes of premature mortality (McGinnis, 1993; Mokdad, 2004, 2005). Yet whereas national data show that there are sociodemographic disparities in unhealthy lifestyles, data on environmental influences are almost all of limited geographic scope. This is true for alcohol or tobacco availability, food outlets, or environments conducive to physical activity.

In this article, we study the association between residential sociodemographic characteristics and alcohol outlet density. There are several local studies that have found higher alcohol outlet density (Gorman and Speer, 1997; LaVeist and Wallace, 2000) or more outdoor advertising of alcohol or tobacco (Altman et al., 1991; Hackbarth et al., 1995) in minority neighborhoods. Although the studies cover very different cities, including Baltimore, Chicago, San Francisco, and a city in New Jersey, it is not clear whether these studies reflect a general pattern. In New Jersey, the neighborhood with the highest alcohol outlet density was also one of the wealthiest (Gorman and Speer, 1997). There may also be a selection bias from those case studies, because they are most likely to be conducted in sites where there appear to be noticeable inequities. For example, the Chicago study is often cited, but it is also the same site where the city council passed one of the nation's toughest anti-alcohol and tobacco billboard ordinances because of perceived disparities (Hackbarth et al., 2001). There are no data on a national scale showing that alcohol retailer presence is greater in high-minority and lower-income minority neighborhoods. This article tries to fill this gap.

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Higher alcohol availability in minority neighborhoods is unlikely to be a result of higher demand. To the contrary, national individual-level data show lower consumption by blacks, Hispanics, and Asians than non-Hispanic whites (Native Americans have higher consumption). This is true for both any alcohol consumption (55% for non-Hispanic whites compared with 39.9% for blacks and 42.3% for Hispanics) and heavy alcohol use (7.5% for non-Hispanic whites compared with 4.4% for blacks or 5.9% for Hispanics) (National Center for Health Statistics, 2004). Lower-income groups do have higher alcohol consumption; therefore, demand factors may lead to higher alcohol availability in lower-income neighborhoods. However, the most recent study based on four cities in California concludes that, although alcohol availability is concentrated in the most-deprived neighborhoods, more women and men in the least-deprived neighborhoods are heavier drinkers (Pollack et al., 2005). This mismatch between supply and demand may cause people in the most-deprived neighborhoods to disproportionately suffer the negative health consequences of living near alcohol outlets (Pollack et al., 2005). Such mismatches are at the heart of the environmental justice movement.

There are several pathways through which differential availability of alcohol can contribute to sociodemographic disparities. In California, type and number of outlets predict arrest rates for public drunkenness, misdemeanor, and felony drunken-driving arrest rates and cirrhosis mortality rate (Rabow and Watts, 1982). Spatial analysis suggests that alcohol outlets elevate the rate of violent crime within the neighborhood context (Gorman et al., 2001; Scribner et al., 1995, 1999; Speer et al., 1998; Zhu et al., 2004), and alcohol availability seems to be related to self-reported injury rates (Treno et al., 2001), both health problems that are greater in more-deprived neighborhoods. Data from some cities suggest that the physical availability of alcohol is a contextual factor that may increase alcohol consumption and alcohol-related problems over what individuals in those communities would otherwise consume (Scribner et al., 1994, 2000), although data from other cities find no evidence for this (Pollack et al., 2005). Discrepancies in findings may be a consequence of the level of geographic units analyzed, and it is desirable to examine the relationship between alcohol availability and consequences at geographic units of analysis that are smaller than cities (Gorman et al., 2001; Scribner et al., 1999).

The ideal measure of exposure to alcohol outlets depends on the scale of the processes through which alcohol outlets are thought to affect social outcomes. For drunk driving accidents, the scale is obviously much larger than for barroom brawls, but heavy drinking, alcoholism, crime, and assaults fall somewhere in the middle ground. Empirical evidence is sparse because data are generally available only at a fixed resolution, which does not permit testing different spatial definitions. Some studies have measured outlet density at the city level (Scribner et al., 1994, 1995), some at the zip code level (Gruenewald et al., 2000, 2002), and some at the census tract level (Cohen et al., 2006; LaVeist and Wallace, 2000, Reid et al., 2003; Scribner et al., 1999; Zhu et al., 2004). All found adverse effects of alcohol at their level of analysis, whether city, zip code, or tract level. In an initial analysis of the California Health Interview Survey, heavy drinking had the strongest association with outlet density within 0.5 miles for men and between 0.5 miles and 1 mile for women, suggesting that, for this outcome, a census tract would be too small and a city too large a unit (Sturm, 2006).

Different types of alcohol retail outlets have different consequences. Restaurants and grocery stores are thought to be more desirable types of businesses, with liquor stores and bars less desirable. Most research distinguishes on-site retail (restaurants, bars) from off-site retail (liquor stores, grocery stores), although that distinction is not useful in all areas. In New Jersey, for example, most licenses are for combined on- and off-site sales (Gorman et al., 2001). In California, license data do not distinguish liquor stores from grocery stores. When on- and off-site sales can be distinguished, off-site retail outlets seem to be more strongly associated with increased crime and violence rates (Scribner et al., 1999), and bars with binge drinking (Sturm, 2006).

This article matches data on businesses to demographic information from the 2000 census to investigate the association between the density of liquor stores and bars and sociodemographic characteristics at the zip code level within urban areas in the United States. We use codes from the North American Industry Classification System (NAICS; Bureau of the Census, 1998) to identify categories of outlets, because differences in data quality and definition across states in licensing data make it impossible to create comparable categories nationwide. The NAICS codes also allow us to focus on liquor stores and bars.

Our main research question is to what extent the perception that minorities and low-income individuals face higher densities of these two less desirable types of alcohol outlets in their neighborhoods is confirmed across the urban United States. Particularly important is whether outlet density differs for youth across racial/ethnic groups.

Method

Alcohol outlets

We obtained outlet counts within zip codes from the U.S. Bureau of the Census's 2001 release of ZIP Code Business Patterns. The zip code is the finest geographic level at which census outlet data are provided. Because of their potentially large size and arbitrary shape, zip codes correspond imperfectly to important features of the alcohol-

retailing environment, such as how far from home people purchase alcohol. On the other hand, our focus on urban zip codes may mitigate the problem of too-large zip codes, and environmental impacts have been found at scales larger than the zip code, such as cities.

We focused on NAICS industries 445310 and 722410, whose formal definitions are "Beer, wine and liquor stores" and "Drinking places (alcoholic beverages)." The former includes government-operated liquor stores. For simplicity, we refer to these two kinds of outlets as liquor stores and bars, respectively. The Bureau of the Census does not release information about the number outlets with no employees at the level of the zip code. In 2001, 74.2% of liquor stores and 68.9% of bars in the United States had employees (Bureau of the Census, 2001). Nonemployers are typically small operations. Although their distribution across zip codes may not be random, they account for small shares of industry sales in the aggregate (for example, nonemployers earned 9.2% of bar revenues in 2002).

Density measures

We used two measures of outlet density within zip codes. The first is the number of outlets per 100 roadway miles; the second is the number of outlets per 1,000 persons. The per-capita measure has been widely used in alcohol studies (LaVeist and Wallace, 2000; Watts and Rabow, 1983). The roadway-miles measure is more recent and may be a more natural measure than density per square mile, because alcohol is typically obtained through the road system. Cohen et al. (2006) found that a unit decrease in alcohol outlets per roadway mile is associated with 21 fewer gonorrhea cases per 100,000 persons in areas affected by the civil unrest in Los Angeles in 1991 than in unaffected areas (for another example, see Gruenewald et al., 2000).

The roadway-miles measure may also provide a better characterization of exposure when comparing areas that differ in urban design. Figure 1 compares a sprawling suburban environment with a denser design, such as a center city with apartment buildings. Although there are the same number of residents and alcohol outlets (and therefore the same population-adjusted outlet density), twice as many residents in the center-city environment are exposed to the alcohol outlet in their immediate neighborhood (as defined by the dashed circle). In this case, the per-capita measure underestimates the differences between neighborhoods. We therefore compare the per-capita and roadway-miles measures.

To obtain roadway length, we identified and summed the lengths of roads within zip codes using ArcGIS 9.0 (Environmental Systems Research Institute, 2004) and GDT Dynamap/ZIP Code Boundary & Inventory Files version 12.0 (Geographic Data Technology, 2004). Our counts of roadway miles excluded freeways and parkways, because these roads do not provide direct access to alcohol outlets. Some zip codes include only post office boxes at a particular mail facility. We exclude such zip codes, because the physical locations of alcohol retailers using post office boxes are unclear. Our geodatabase includes streets and zip codes as of 2003. Hence, our roadway-miles counts do not correspond exactly in time to our data on alcohol outlets.

Population sociodemographics

We obtain data on population counts for the per-capita outlet measure and on race, age, neighborhood economic status, and urbanicity from the 2000 Census of Population and Housing. We distinguished among non-Hispanic whites, Hispanics, blacks, Asian/Pacific Islanders, and Native Americans, leaving 2.2% of the population with ambiguous or multiple races unclassified. The census reports population by age classes for all persons and for non-Hispanic whites and Hispanics. We distinguished between those who are younger than 18 years old and those who are 18 and older. We used median household income within zip codes as a measure of neighborhood economic status. In our main analyses, we distinguished "lower-income" from "higher-income" neighborhoods according to whether income lies below or above the sample median of $42,970. Finally, the 2000 census reports the number of respondents residing within urban areas within each zip code.

The geography of these sociodemographic data is the five-digit ZIP Code Tabulation Area (ZCTA; Bureau of the Census, 2000). Although ZCTAs are meant to correspond to zip codes, the correspondence is imperfect (Bureau of the Census, 2000). In addition, between the Census 2000 and the 2001 Economic Census, new zip codes may have been introduced or old zip codes redefined or retired. Thus, the matching is less than perfect and constitutes a limitation of our analysis (Krieger et al., 2002).

Sample

We were able to match 31,428 of the 40,426 (77.7%) five-digit zip codes/ZCTAs in our two data sources (including zip codes with no alcohol outlets); 20.8% appear only as zip codes, probably because the algorithm by which ZCTAs are constructed excludes some zip codes (Bureau of the Census, 2000); 1.5% appear only as ZCTAs. The match rate for ZCTAs that are entirely urban is especially high (99.8%).

Our focus is on urban zip codes, paralleling the policy debate. Typical local alcohol-control policies, such as zoning, do not apply to rural areas, and it would not be meaningful to include rural areas in our analysis. Although it may be interesting to conduct a separate analysis for rural areas, our data are of high quality for urban areas (the match rate between zip codes and ZCTAs reaches 99.8% among zip codes whose population is entirely urban) but not for rural areas.

We defined a zip code as urban if the urban share of its population exceeded the median value (73.1%) among zip codes with both urban and rural residents. Our sample includes 205.2 million persons in 2000 (72.9% of the total population).

Analysis

We assessed the outlet densities that average individuals with particular socioeconomic characteristics encounter within their zip codes. Because the data are at the level of the zip code, the two measures of zip-code density were weighted by the populations of interest. Although zip-code density could have been regressed on sociodemographic composition, our approach is more direct and potentially less sensitive to misspecification.

With respect to race/ethnicity, we distinguished among whites, nonwhites, Hispanics, blacks, Asian/Pacific Islanders, and Native Americans. For whites and nonwhites, we further distinguished the following: (1) those residing in lower-income neighborhoods and those residing in higher-income neighborhoods and (2) those younger than 18 years old and those 18 or older. For the analyses of economic status, ideally the status of particular individuals would be used, rather than median household income within the zip code. However, the census does not report information at this level of detail.

We also performed sensitivity analyses. First, the threshold defining lower-income neighborhoods was set at the bottom one third of the income distribution (≤$33,300). Second, we replicated our main analyses for the subsample of zip codes whose population density was in the top one third of the distribution (≥3,000 persons/square mile).

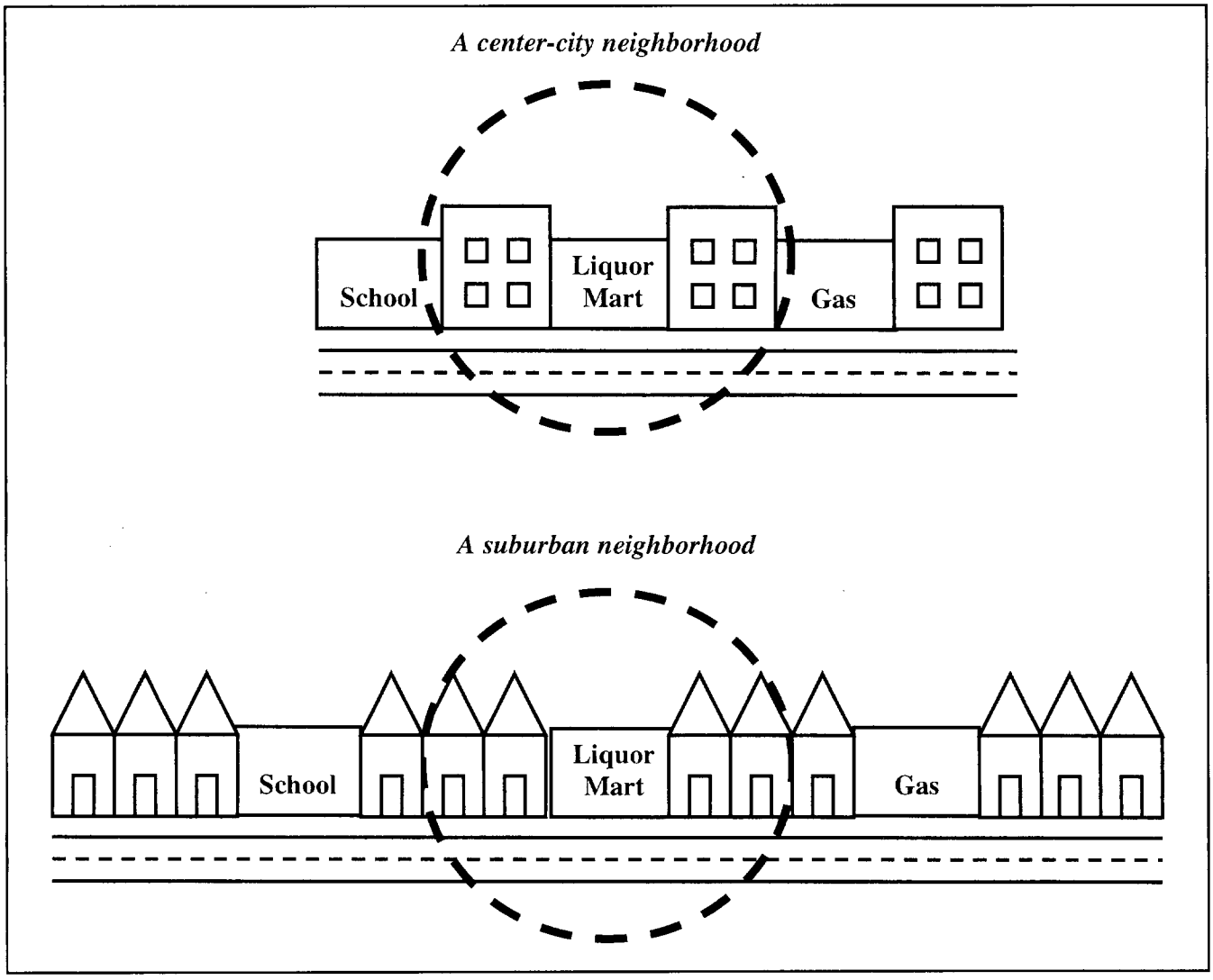

FIGURE 1. Two neighborhoods with equal numbers of residents and alcohol outlets

Results

Table 1 presents some descriptive statistics for our sample. The mean (SD) land area of the 9,361 urban zip codes is 40.1 (128.1) square miles. (The mean area of rural zip codes is 107.1 miles.) The mean population is 21,920 (16,232) persons, and the mean roadway miles is 173.9 (288.8). For the individuals residing in these zip codes, Hispanics are the largest group, with a share of 15.5%, followed by blacks at 13.5%, and Asian/Pacific Islanders at 4.8%. Roughly 25% of the population is younger than age 18; for nonwhites, this statistic is 32.2%. Table 1 indicates that about 50% of the population resides in lower-income zip codes; for nonwhites, this statistic is 64.5%.

Liquor stores by race, economic status, and age

Table 2 reports the mean density of liquor stores facing individuals. All minorities, except for Native Americans, live in zip codes with a significantly higher density of liquor stores per mile than do whites. Across all minority groups, the density is 71% higher ($z = 11.27$, $p < .001$). On a per-capita basis, the differences are much smaller in percentage terms. The density of liquor stores, across all minority groups, is only about 1% higher than among whites, a statistically insignificant difference ($z = 0.58$, $p = .36$). Blacks continue to live in areas with a higher density (12.5%; $z = 3.55$, $p < .001$), whereas other minorities face a lower density of liquor stores than whites.

The next set of results in Table 2 stratifies by median income in a zip code. Minorities in lower-income zip codes face the highest densities of liquor stores under both measures. Under the roadway-miles measure, the mean density (5.22 per roadway mile) is about 98% higher than that for whites in lower-income (2.64) and higher-income zip codes (2.62). Liquor store density is lower in higher-income areas, especially for minorities. The results for the per-capita liquor-store measure are fairly similar. Density is lowest for minorities in higher-income zip codes under the per-capita measure. The difference between the density facing nonwhites in lower-income zip codes and that facing whites in lower-income zip codes, although still positive, is no longer significantly different at the 10% level.

From a policy perspective, arguably the most important group is youths, who are not even legally allowed to be customers. Here we see a fairly consistent picture across all measures. Minority youths are exposed to more liquor stores than white youths. Again, the difference is larger in percentage terms for the roadway measure (92% higher for minority youth; $z = 13.00$, $p < .001$) than for the per-capita measure (3% higher for minority youth; $z = 1.61$, $p = .107$).

Bars by race, economic status, and age

Table 3 reports the same results for bars, which are slightly different. Again, on the roadway measure of bar density, blacks, Hispanics, and especially Asian/Pacific Islanders face statistically significantly higher densities of bars than do whites (5.44, 6.55, 9.00, and 4.99, respectively). However, when density is measured on a per-capita basis, members of these minority groups face lower densities than do whites (1.60, 1.50, 1.60, and 1.91, respectively).

Turning to race and economic status, the measures again differ with respect to the density facing minorities relative to whites. On a roadway-miles basis, the density of bars facing minorities in lower-income zip codes (7.52) is 21% higher than that facing whites in such zip codes (6.20). Under the per-capita density measure, this disparity changes

TABLE 1. Descriptive statistics for sampled zip codes

Characteristic	Mean (SD) or %
Zip codes (9,361 sampled)	
Mean land area of sampled zip codes, square miles	40.1 (128.1)
Mean population of sampled zip codes	21,921 (16,232)
Mean roadway miles	173.9 (288.8)
Total census within sampled zip codes (205,200,841 persons included)	
White	63.4%
Nonwhite	36.6%
Hispanic alone	15.5%
Black alone	13.5%
Asian or Pacific Islander alone	4.8%
Native American alone	0.5%
>18 years old	25.5%
>18 years old and nonwhite	32.2%
Resident of lower-income neighborhood	49.9%
Resident of lower-income neighborhood and nonwhite	64.5%

TABLE 2. Mean number of liquor stores per 100 roadway miles and per 1,000 capita, by race, age, and income

	Per 100 roadway miles		Per 1,000 capita	
Variable	Mean (SD)		Mean (SD)	
All	3.31 (6.00)		1.04 (1.20)	
White	2.63 (5.30)		1.04 (1.21)	
Nonwhite	4.50[a] (6.89)		1.05 (1.17)	
Black	4.42[a] (6.13)		1.17[a] (1.31)	
Hispanic	4.66[a] (7.32)		0.98[a] (1.09)	
Asian/Pacific Islander	4.68[a] (7.74)		0.96[a] (1.00)	
Native American	2.27[a] (4.02)		1.01 (1.39)	
	Lower income	Higher income	Lower income	Higher income
White	2.64 (4.31)	2.62 (5.90)	1.10 (1.32)	0.99[c] (1.13)
Nonwhite	5.22[b] (7.19)	3.18[b,c] (6.10)	1.13 (1.25)	0.91[b,c] (0.99)
	Younger than 18	18 and older	Younger than 18	18 and older
White	2.16 (3.82)	2.76[c] (5.63)	0.98 (1.06)	1.05[c] (1.25)
Nonwhite	4.15[b] (6.12)	4.67[b,c] (7.23)	1.02 (1.04)	1.06[c] (1.23)

[a]Mean is statistically significantly different from that for whites at $p = .10$; [b]mean is statistically significantly different from the mean in the row above at $p = .10$; [c]mean is statistically significantly different from the mean in the column to the left at $p = .10$.

TABLE 3. Mean number of bars per 100 roadway miles and per 1,000 capita, by race, age, and income

Variable	Per 100 roadway miles Mean (SD)	Per 1,000 capita Mean (SD)
All	5.52 (13.92)	1.79 (2.69)
White	4.99 (3.58)	1.91 (2.72)
Nonwhite	6.45[a] (14.45)	1.58[a] (2.63)
Black	5.44[a] (10.58)	1.60[a] (2.91)
Hispanic	6.55[a] (13.67)	1.50[a] (2.29)
Asian/Pacific Islander	9.00[a] (22.91)	1.60[a] (2.70)
Native American	4.42[a] (8.85)	2.12[a] (3.35)

	Lower income	Higher income	Lower income	Higher income
White	6.20 (11.41)	4.14[c] (14.87)	2.69 (3.44)	1.35[c] (1.86)
Nonwhite	7.52[b] (14.04)	4.50[b,c] (14.97)	1.84[b] (3.07)	1.10[b,c] (1.42)
	Younger than 18	18 and older	Younger than 18	18 and older
White	3.76 (8.47)	5.33[c] (14.67)	1.73 (2.15)	1.96[c] (2.86)
Nonwhite	5.67[b] (11.35)	6.82[b,c] (15.69)	1.51[b] (2.08)	1.61[b,c] (2.85)

[a]Mean is statistically significantly different from that for whites at $p = .10$; [b]mean is statistically significantly different from the mean in the row above at $p = .10$; [c]mean is statistically significantly different from the mean in the column to the left at $p = .10$.

TABLE 5. Mean number of liquor stores among zip codes whose population density is in top third

Variable	Per 100 roadway miles Mean (SD)	Per 1,000 capita Mean (SD)
All	5.77 (8.27)	1.13 (1.03)
White	4.96 (8.28)	1.11 (1.02)
Nonwhite	6.59[a] (8.19)	1.14 (1.04)
Black	6.43[a] (7.22)	1.27[a] (1.14)
Hispanic	6.83[a] (8.59)	1.07 (0.96)
Asian/Pacific Islander	6.52[a] (9.23)	1.03[a] (0.98)
Native American	4.24[a] (5.81)	1.05 (1.02)

	Lower income	Higher income	Lower income	Higher income
White	5.01 (6.11)	4.92 (9.68)	1.16 (1.06)	1.07 (0.99)
Nonwhite	7.41[b] (8.10)	4.72[c] (8.08)	1.21 (1.08)	0.97[b,c] (0.92)
	Younger than 18	18 and older	Younger than 18	18 and older
White	4.06 (6.23)	5.17[c] (8.67)	1.04 (0.95)	1.13[c] (1.04)
Nonwhite	6.18[b] (7.31)	6.78[b,c] (8.56)	1.12[b] (1.00)	1.15[c] (1.06)

[a]Mean is statistically significantly different from that for whites at $p = .10$; [b]mean is statistically significantly different from the mean in the row above at $p = .10$; [c]mean is statistically significantly different from the mean in the column to the left at $p = .10$.

directions. Regardless of measure, minorities in higher-income zip codes face a lower density of bars than whites in lower-income zip codes.

The bottom of Table 3 shows the age group comparisons. The two density measures yield opposite results. Under the roadway-miles measure, minority youths face a 51% higher density of bars, whereas under the per-capita measure density is lower among minority youths (1.51) than white youths (1.73).

Sensitivity analyses

Table 4 reports the results when the threshold for lower-income zip codes was set at the bottom one third of the income distribution. The results are qualitatively similar. For liquor stores, the density is higher among nonwhites than among whites in lower-income zip codes under both measures. For nonwhites, density decreases with increased income. For bars, density also decreases with increased income. However, the two measures continue to disagree about the direction of the disparity among whites and nonwhites in higher-income zip codes.

The next two tables report the results for the subsample of zip codes whose population densities are in the highest

TABLE 4. Mean number of liquor stores and bars when lower income is bottom third of income distribution

Variable	Per 100 roadway miles: Lower income Mean (SD)	Per 100 roadway miles: Higher income Mean (SD)	Per 1,000 capita: Lower income Mean (SD)	Per 1,000 capita: Higher income Mean (SD)
Liquor stores				
White	2.65 (4.29)	2.62 (5.56)	1.14 (1.54)	1.01[c] (1.10)
Nonwhite	5.48[b] (7.39)	3.67[b,c] (6.34)	1.16 (1.35)	0.95[b,c] (0.98)
Bars				
White	6.50 (10.32)	4.54[c] (14.39)	2.98 (4.14)	1.58[c] (2.01)
Nonwhite	7.36[b] (12.38)	5.68[b,c] (15.94)	1.88[b] (3.38)	1.32[b,c] (1.71)

[b]Mean is statistically significantly different from the mean in the row above at $p = .10$; [c]mean is statistically significantly different from the mean in the column to the left at $p = .10$.

TABLE 6. Mean number of bars among zip codes whose population density is in top third

Variable	Per 100 roadway miles Mean (SD)	Per 1,000 capita Mean (SD)
All	9.73 (20.00)	1.95 (2.51)
White	10.05 (21.85)	2.20 (2.63)
Nonwhite	9.41[a] (17.9)	1.69[a] (2.35)
Black	7.78[a] (13.07)	1.72[a] (2.56)
Hispanic	9.44[a] (16.68)	1.58[a] (2.03)
Asian/Pacific Islander	13.12[a] (28.05)	1.83[a] (2.59)
Native American	8.21[a] (13.02)	2.23[a] (2.70)

	Lower income	Higher income	Lower income	Higher income
White	11.58 (16.66)	8.80[c] (25.22)	2.93 (3.17)	1.89[c] (2.60)
Nonwhite	10.41[b] (16.60)	7.14[b,c] (20.52)	1.89[b] (2.60)	1.24[b,c] (1.58)
	Younger than 18	18 and older	Younger than 18	18 and older
White	7.45 (14.27)	10.65[c] (23.22)	1.92 (2.09)	2.26[c] (2.74)
Nonwhite	8.33[b] (14.19)	9.90[b,c] (19.40)	1.61[b] (2.08)	1.73[b,c] (2.47)

[a]Mean is statistically significantly different from that for whites at $p = .10$; [b]mean is statistically significantly different from the mean in the row above at $p = .10$; [c]mean is statistically significantly different from the mean in the column to the left at $p = .10$.

one third of the distribution. (Lower income is again defined by the median of the income distribution.) The results for liquor stores in Table 5 are similar to those in Table 2. For example, nonwhites living in dense zip codes with lower income face higher densities than do whites in these same zip codes, regardless of density measure. In contrast with Table 2, however, the two measures now agree that nonwhites in higher-income zip codes face lower densities than whites in lower- as well as higher-income zip codes.

The results for bars in Table 6 are quite different from those in Table 3. Whereas in Table 3 the two measures generally disagreed about the direction of white/nonwhite disparities, they now agree that nonwhites generally face lower densities than do whites, both in the aggregate and when compared by economic status.

Discussion

This article has examined disparities in the density of liquor stores and bars across racial groups nationwide. In some respects, the study confirms the perception that has emerged from localized case studies. First, blacks face higher densities of liquor stores than do whites. Second, minorities in lower-income neighborhoods have more liquor stores in their neighborhoods than whites in lower- and higher-income neighborhoods and minorities in higher-income neighborhoods. Third, minority youth have more liquor stores in their neighborhoods than do white youth. Fourth, the density of liquor stores and bars decreases with increased income, especially for minorities. These results, although subject to data limitations, suggest that there is a mismatch between alcohol demand and the supply of liquor stores in particular within urban neighborhoods. In view of alcohol retailing's adverse consequences, these disparities may represent an important kind of environmental injustice, and further research is warranted.

Yet, in other respects, the results are less clear. In particular, under the traditional measure of outlet density per capita, the results for bars are very sensitive to population density. In the full sample of zip codes, white/nonwhite disparities sometimes differ in direction in comparison with the roadway-miles measure. On the other hand, for zip codes in the top one third of the population-density distribution, the two measures generally agree that whites face higher densities of bars than do nonwhites (with the exception of nonwhite youths under the per-capita measure).

Recalling Figure 1, we have suggested that the number of outlets per roadway mile may be an important aspect of the alcohol environment distinct from per-capita density. Nevertheless, we do not believe we can draw clear conclusions when our measures disagree. Further research is warranted with respect to the consequences of alcohol retailing, and our methods may be useful in exploring these consequences. If indeed the number of outlets per roadway mile is its own pathway, existing policies intended to mitigate the localized impacts of alcohol retailing—such as restrictions on proximity to schools (Ashe et al., 2003) or per-capita restrictions—might be supplemented with restrictions on outlets per roadway mile.

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