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Neighborhood socioeconomic characteristics, the retail environment, and alcohol consumption: A multilevel analysis

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ABSTRACT

Background: The neighborhoods where people live can influence their drinking behavior. We hypothesized that living in a neighborhood with lower median income, higher alcohol outlet density, and only liquor stores and no grocery stores would be associated with higher alcohol consumption after adjusting for individual demographic and lifestyle factors.
Methods: We used two self-report measures to assess alcohol consumption in a sample of 9959 adults living in a large Midwestern county: volume of alcohol consumed (count) and binge drinking (5 or more drinks vs. < 5 drinks). We measured census tract median annual household income based on U.S. Census data. Alcohol outlet density was measured using the number of liquor stores divided by the census tract roadway miles. The mix of liquor and food stores in census tracts was assessed using a categorical variable based on the number of liquor and number of food stores using data from InfoUSA. Weighted hierarchical linear and Poisson regression were used to test our study hypothesis.
Results: Retail mix was associated with binge drinking. Individuals living in census tracts with only liquor stores had a 46% higher risk of binge drinking than individuals living in census tracts with food stores only after controlling for demographic and lifestyle factors.
Conclusion: Census tract characteristics such as retail mix may partly explain variability in drinking behavior. Future research should explore the mix of stores, not just the over-concentration of liquor stores in census tracts.

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1. Introduction

Alcohol consumption is a significant public health problem in the U.S. Approximately two-thirds of adults in the U.S. consume some alcohol (Center for Disease Control (CDC), 2007). Studies suggest that about 15 percent of Americans engage in excessive drinking, defined as a pattern of alcohol consumption of 5 or more drinks on a single occasion for men or 4 or more drinks on a single occasion for women (CDC, 2007). Excessive drinking contributes to 79,000 excess deaths annually (CDC, 2004) and is associated with cardiovascular disease, several cancers, and liver cirrhosis (Alaniz, 1998; Corrao et al., 2004; Scribner et al., 1999).

The neighborhoods where people live can influence their drinking behavior. Two neighborhood characteristics in particular are important in understanding alcohol outcomes: neighborhood median income, and the retail environment. Social systems theory, which examines how individuals interact with their environment, suggests that alcohol problems are ultimately linked to larger social and economic systems such as the neighborhood and retail environment (Holder and Wallack, 1986).

Some studies have found that living in a poor neighborhood is associated with increased alcohol consumption (Cerda et al., 2010; Galea et al., 2007; Jones-Webb et al., 1997; Pollack et al., 2005; Stimpson et al., 2007). In a recent prospective study, Cerda et al. (2010) found that a 1% increase in the number of adults living in poverty was associated with an 86% increase in odds of binge drinking. They also found that a 1% increase in mean neighborhood cumulative poverty was associated with a 53% increase in number of drinks per week after controlling for individual socioeconomic status. Similarly, Stimpson et al. (2007) reported that higher neighborhood deprivation was positively associated with a higher odds of excessive drinking after controlling for demographic variables (Stimpson et al., 2007). Some studies have also found no association between low neighborhood SES and increased alcohol consumption (Ecob and Macintyre, 2000; Mulia et al., 2008).

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Higher alcohol consumption may be greater in poor neighborhoods, because liquor stores are often over concentrated in them (Bluthenthal et al., 2008; Gorman and Speer, 1997; Pollack et al., 2005; Romley et al., 2007), and some studies have shown that higher alcohol outlet density is associated with higher alcohol consumption (Gruenewald et al., 2002; Schonlau et al., 2008; Scribner et al., 2008, 2000; Truong and Sturm, 2007). However, results from studies examining the relationship between alcohol outlet density and alcohol consumption suggest the relationship may be more complex. Schonlau et al. (2008) examined the relationship between the density of off-premise alcohol outlets (e.g., liquor stores, convenience stores) and alcohol consumption in Los Angeles County and Southern Louisiana and found that the density of off-premise alcohol outlets within census tracts and within 1 mile buffers was positively associated with alcohol consumption in Louisiana (Schonlau et al., 2008). Truong and Sturm (2007) in the largest study to date examined the relationship between alcohol availability and heavy drinking among 36,953 adults within 1600 census tracts and found that only the number of on-sale establishments (e.g., bars, taverns) was associated with heavy drinking episodes.

The mixed findings in the literature on alcohol outlet density and alcohol consumption are likely due to several factors. First, studies in this area do not taken into account the mix of retail stores in neighborhoods, e.g., the mix of liquor stores and food stores (Gruenewald and Remer, 2006; Treno et al., 2008). Studies have found that low SES neighborhoods have more liquor stores (Bluthenthal et al., 2008; Gorman and Speer, 1997; Pollack et al., 2005; Romley et al., 2007), and other studies have reported that low SES neighborhoods also have fewer chain grocery stores (Baker et al., 2006; Moore and Diez Roux, 2006; Powell et al., 2007). Powell et al. (2007) investigated the association between neighborhood median household income, racial/ethnic neighborhood composition, and density of food retail outlets in the U.S. (n = 28,050 zip code areas) and showed that low-income areas had significantly fewer chain supermarkets than middle-income and high-income zip codes after controlling for neighborhood racial/ethnic composition. Neighborhoods with many liquor stores and few grocery stores might limit healthy choices and encourage greater alcohol consumption (Shimotsu et al., 2012; Lipsey et al., 1997). Second, studies in this area do not control for lifestyle behaviors such as healthful diet, which have also been shown to be inversely related to alcohol consumption (Barefoot et al., 2002; Breslow et al., 2010, 2006; Kesse et al., 2001; La Vecchia et al., 1992; Mannisto et al., 1997; Schroder et al., 2002; Shimotsu et al., 2012; Veenstra et al., 1993).

We examined whether features of neighborhoods were associated with higher drinking volume and binge drinking in a large county in Minnesota. We hypothesized that living in a neighborhood with lower median income, higher alcohol outlet density, and only liquor stores and no grocery stores would be associated with higher increased alcohol consumption after adjusting for individual socioeconomic characteristics and other covariates. In Minnesota, off-sale outlets such as liquor stores primarily sell alcoholic beverages, whereas food stores sell a variety of food products and can sell alcoholic beverages with only an alcohol content of 3.2 percent or less (e.g., three-two- beer).

Our study builds on current research on neighborhood characteristics and drinking behavior. While previous studies have examined the relationship between neighborhood characteristics, alcohol outlet density, and drinking behavior (Cerda et al., 2010; Galea et al., 2007; Jones-Webb et al., 1997; Pollack et al., 2005; Stimpson et al., 2007), no studies have explored how the mix of liquor and food stores in neighborhoods might be related to drinking behavior. Results from our study will therefore further understanding of how the larger retail environment in neighborhoods affects drinking behavior.

2. Methods

2.1. Study design

A cross-sectional, multilevel study design was used to test our study hypothesis. Multilevel study designs permit the researcher to analyze characteristics at the level of the individuals (e.g., alcohol consumption) and at the level of the census tracts (e.g., retail environment) simultaneously, while also accounting for the correlation of individuals within census tracts.

2.2. Data collection

2.2.1. Individual level data. Individual data for this study were drawn from the 2002 Survey of the Health of Adults, the Population, and the Environment (SHAPE), which was designed to examine individual, social, and environmental factors that affect the health of Hennepin County residents in Minnesota. Hennepin County is comprised of 10 cities including the city of Minneapolis (Census, 2000). The SHAPE sample is unique in that it includes a large and racial/ethnically diverse sample of residents including some of the major immigrant groups in Minnesota (e.g., Hmong, Vietnamese, Somali).

The SHAPE study employed a stratified sampling design to recruit participants. Census tracts within Hennepin County with more racial and ethnic minority groups were oversampled. One adult per household was selected using the most recent birthday technique (Hennepin County Assessment Unit, 2004). A total of 15,231 persons were recruited and 9959 agreed to participate in the SHAPE survey. One hundred thirty-nine participants were removed from the sample due to incomplete interviews, yielding an overall response rate of 66.3% (Hennepin County Assessment Unit, 2004).

Respondents were interviewed by phone using a 30-minute structured questionnaire. In-person interviews (n = 178) also were conducted to increase participation among hard-to-reach populations (e.g., American Indians; African-Born Black groups). Ten percent of the completed surveys (n = 991) were conducted in a language other than English (i.e., Spanish, Hmong, Somali, and Vietnamese). The instrument was reviewed extensively by experts from several local and national health organizations (e.g., Centers for Disease Control and Prevention) and field-tested with staff from over 40 local health organizations serving minority and immigrant populations. The instrument covered a broad range of health topics including alcohol and tobacco use, and fruit and vegetable intake. This study was approved by the University of Minnesota Institutional Review Board (#0911E74635).

2.2.2. Census tract level data. Census tract level data on Hennepin County where SHAPE respondents resided were drawn from two main sources: the U.S. Census (2000) and InfoUSA Business Dataset (2002). Census Decennial data were acquired from the U.S. Census to assess census tract socioeconomic status (Summary Files 1 and 3; Census, 2000). Data from the InfoUSA business dataset were used to estimate GIS-derived counts of food (n = 345) and liquor stores (n = 152; Analyst Business, 2002). InfoUSA included geocoded information on food stores (chain supermarket and grocery stores) and liquor stores (Analyst Business, 2002). We linked the two sources by census tract codes in the Hennepin County metropolitan area, Minnesota (n = 298). The Hennepin County metropolitan area is 557 square miles and has a population of about 1,140,988 people or 456,129 households (Census, 2000). Typically, there were about 20–30 participants per tract. We used census tracts rather than census block groups as our unit of analysis. Smaller geographical units such as census block groups have been shown to be more strongly related to health outcomes (Gorman et al., 2001; Scribner et al., 1999). However, some studies have found associations between