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### Science News

## More Alcohol Sales Sites Mean More Neighborhood Violence, New Research Finds

**ScienceDaily (Feb. 22, 2010)** — More alcohol sales sites in a neighborhood equates to more violence, and the highest assault rates are associated with carry-out sites selling alcohol for off-premise consumption, according to new research released Feb. 21 by two Indiana University professors.

**See Also:** Using crime statistics and alcohol outlet licensing data from Cincinnati, Ohio, to examine the spatial relationship between alcohol outlet density and assault density.

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The findings were released at a press briefing entitled "Using Geographic Information Systems and Spatial Analysis to Better Understand Patterns and Causes of Violence" and presented as part of the Feb. 18-22 annual meeting of the American Association for the Advancement of Science in San Diego, Calif.

"A higher density of alcohol sales outlets in an area means closer proximity and easier availability to an intoxicating substance," Pridemore said. "Perhaps just as importantly, alcohol outlets provide a greater number of potentially deviant places. Convenience stores licensed to sell alcohol may be especially troublesome in this regard, as they often serve not only as sources of alcohol but also as local gathering places with little formal social control."

Using different suites of spatial regression models, the researchers found that adding one off-premise alcohol sales site per square mile would create 2.3 more simple assaults and 0.6 more aggravated assaults per square mile. Increases in violence associated with restaurants and bars were smaller but still statistically significant, with 1.15 more simple assaults created when adding one restaurant per square mile, and 1.35 more simple assaults per square mile by adding one bar.

"We could expect a reduction of about one-quarter in simple assaults and nearly one-third in aggravated assaults in our sample of Cincinnati block groups were alcohol outlets removed entirely," Grubesic noted. "These represent substantial reductions and clearly reveal the impact of alcohol outlet density on assault density in our sample."

The study examined 302 geographic block groups that encompassed all of Cincinnati, with each block group containing about 1,000 residents. Block groups are subdivisions of census tracts and represent the smallest unit available for socioeconomic analysis using data from the Census Bureau.

Crime statistics from January through June 2008 provided by the Cincinnati Police Department found 2,298 simple assaults and another 479 serious assaults had occurred in the study area during that time. The location of each of these criminal events was geocoded to show the precise location where they occurred. The researchers, using data from the Ohio Division of Liquor Control for Hamilton County, Ohio, then used the same geocoding techniques to spatially aggregate the city's 683 unique alcohol sales outlets into those block groups. The arithmetic mean, or average, density of assaults was 69 per



**Aggravated Assault and Alcohol Density in Cincinnati, Ohio: Jan.-June 2008.** Indiana University professors Tony Grubesic and William Pridemore generated a geospatial display of districts denoting alcohol outlet density for aggravated assaults co-mingled with color-coded Cincinnati, Ohio. (Credit: Pridemore, G. A. and T. H. Grubesic (2010))

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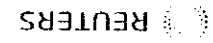
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square mile, while the average density of alcohol outlets per

The researchers pointed to possible implications from the research on both public policy and on future research within the field of criminology. Pridemore said ecological studies of alcohol and violence similar to this one, while appearing more and more over the past 20 years in journals of disciplines like public health, geography and epidemiology, have been rare in criminology journals.

"We believe that alcohol outlets, as a source of community-level variation in levels of interpersonal violence, deserve greater attention in the criminological literature," he said. "The nature of our findings should encourage further investigation of the nature of the ecological association between alcohol, violence and other negative outcomes within communities."

Griskevic said explanations for crime ecological theories like collective efficacy, social disorganization and social cohesion rely on elements like poverty, ethnic heterogeneity, residential mobility, anonymity of community members and willingness to intervene on another's behalf, are difficult to remedy through public policy. That is not the case with alcohol outlet density, he said.

"Alcohol outlet density, on the other hand, is much more amenable to policy changes," Grisbevic pointed out. "Unlike other negative neighborhood characteristics that often seem intractable, regulating the density of outlets, and to some extent their management, can be readily addressed with a mixture of policies by liquor licensing boards, the police and government agencies that regulate land use."

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# A Longitudinal Analysis of Alcohol Outlet Density and Assault

Michael Livingston

**Background:** The majority of studies that have examined the local-level relationship between alcohol outlet density and violence have utilized cross-sectional data. These studies have consistently demonstrated that there is a spatial link between outlets and violence, but because of their design they have not been able to determine whether changes in outlet density result in changes in rates of violence. The few studies that have examined this question over time have found that the violence rates are related to changes in outlet density. This study provides further evidence of this link and examines the characteristics of regions in which changes in outlet density are most strongly associated with changes in violence rates.

**Methods:** The study examined 9 years of data measuring alcohol outlet density (using liquor licensing records) and alcohol-related violence (using police recorded night-time assaults) from 186 postcodes in the metropolitan area of Melbourne, Australia. The relationships between 3 types of alcohol outlet density and alcohol-related violence were assessed using fixed-effects models. The postcodes were then grouped into 5 clusters based on their socio-demographic profile and separate fixed-effects models were fitted to assess whether the relationships between outlets and violence differed based on the type of region being examined.

**Results:** The initial models found overall positive relationships between all 3 types of alcohol outlets and violence. When separate models were developed for postcode clusters, they demonstrated that the link between outlet density and violence was significant in all neighborhood types, but the specific relationships varied substantially.

**Conclusions:** Changes in the number of alcohol outlets in a community are linked to changes in the amount of violence the community experiences. This relationship varies across the clusters of suburbs examined, with packaged liquor outlets consistently associated with violence in suburban areas and general (hotel) and on-premise (nightclubs, restaurants, and bars) licenses associated with violence in inner-city and inner-suburban areas.

**Key Words:** Alcohol Availability, Outlet Density, Violence, Panel Model.

**THE SPATIAL DENSITY** of alcohol outlets has been linked to a wide range of alcohol-related harms (Livingston et al., 2007). In particular, spatial studies linking alcohol outlet density and rates of violence are increasingly common (Alaniz et al., 1998; Britz et al., 2005; Costanza et al., 2001; Gorman et al., 2001; Gruenewald et al., 2006; Lipton and et al., 2000; Reid et al., 2005; Scribner et al., 1999; Zhu et al., 2004). Work in a range of settings, at a range of spatial scales and using a variety of measures of violence has consistently found that areas with higher outlet densities experience higher rates of violence. Predominantly, these studies have involved analyses at a particular point in time of local-area rates of violence and outlet density.

Only one other recent study has examined the longitudinal relationships between outlet density and violence. Gruenewald et al. (2007) investigated assaults per year. The results of this study suggested that, on average, an increase in 1 outlet corresponded to an increase in approximately 0.9 investigated assaults per year.

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# The relationship of alcohol outlet density to heavy and frequent drinking and drinking-related problems among college students at eight universities

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## Abstract

To determine whether alcohol outlet density was correlated with heavy and frequent drinking and drinking-related problems, we compared ecological measures of outlet density with survey measures of drinking using a geographic information system and the Harvard School of Public Health College Alcohol Study ( $n = 3,421$ , site  $n = 8$ ). We identified 966 outlets within 8-mile study areas. Densities/site ranged from 32 to 185. Density was correlated with heavy drinking ( $r = 0.82$ ,  $p = 0.01$ ), frequent drinking ( $r = 0.73$ ,  $p = 0.04$ ) and drinking-related problems ( $r = 0.79$ ,  $p = 0.02$ ). Women, underage students and students who picked up binge drinking in college were affected. Implications for prevention and research are discussed. © 2002 Elsevier Science Ltd. All rights reserved.

**Keywords:** Alcohol use; Drinking problems; Alcohol outlet density; Prevention; Environment; College

## Introduction

Features of local alcohol economies, in addition to characteristics of drinkers, may influence drinking behavior among college students. Discount pricing of alcoholic drinks and promotion of alcoholic beverages have been linked to consumption among college students (Chaloupka et al., 1998; Wechsler et al., 2000a). Lower rates of binge drinking exist among students at schools whose administrators report an absence of alcohol outlets within a mile of campus (Wechsler et al., 1994). Outlet density may impact drinking by making low cost, or volume discounted alcohol available to persons predisposed to drink heavily (Grunewald et al., 1996), for example young adults. High outlet density may reflect heavy drinking norms and preferences (Scribner et al., 2000), or underlying

## Methods

community features, such as social disorganization or social capital linked to frequent heavy drinking in college (Weitzman and Kawachi, 2000). The purpose of this study was to: (a) pilot the collection of secondary data about local alcohol licenses and assess their availability and quality; and, (b) determine whether levels of heavy and frequent drinking and drinking-related problems varied systematically with alcohol outlet density among students at colleges participating in the "A Matter of Degree" (AMOD) program to reduce binge drinking and related harms.

Data collection for geographic information systems (GIS)

Outlet information was collected for venues within a 2-mile radius of a central location point (CLP) on or near eight of ten AMOD campuses. CLPs were

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# ALCOHOL OUTLET DENSITY AND VIOLENCE: A GEOSPATIAL ANALYSIS

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(Received 10 February 2004; first review notified 2 March 2004; in revised form 6 March 2004; accepted 7 March 2004)

**Abstract** — Aims: To examine the relationship between alcohol outlet density and violent crime controlling for neighbourhood sociostructural characteristics and the effects of spatially autocorrelated error. Design: The sample for this ecologic study comprised 188 census tracts from the City of Austin, Texas and 263 tracts from the City of San Antonio, Texas. Data pertaining to neighbourhood social structure, alcohol density and violent crime were collected from archival sources, and analysed using bivariate, multivariate and geospatial analyses. Results: Using ordinary least squares analysis, the neighbourhood sociostructural covariates explained close to 59% of the variability in violent crime rates in Austin and close to 39% in San Antonio. Adding alcohol outlet density in the target and adjacent census tracts improved the explanatory power of both models. Alcohol outlet density in the larger census tract remained a significant predictor of violent crime rates in both cities when the effects of autocorrelated error were controlled for. In Austin, the effects of alcohol outlet density in the adjacent census tracts also remained significant. The final model explains 71% of the variance in violent crime in Austin and 56% in San Antonio. Conclusions: The findings show a clear association between alcohol outlet density and violence, and suggest that the issues of alcohol availability and access are fundamental to the prevention of alcohol-related problems within communities.

## INTRODUCTION

With the dramatic increase in violent crime that occurred in the USA during the past four decades and the apparent inability of traditional criminal justice approaches to deal with this, the problem has increasingly come to be considered as one that is amenable to epidemiological understanding and public health interventions (Koop and Lundberg, 1992; Farrington and Loeber, 2000). At the same time, criminological research has broadened its perspective from a primary focus on punishment of individuals by rediscovering the scholarship of sociologists from the 1940s and 1950s on the ways in which the physical and structural characteristics of local environments encourage and facilitate violent crime (Skogan, 1990; Brantingham and Brantingham, 1993). This dual movement away from considering violence as entirely the result of individual characteristics has led to an increased emphasis on how aspects of the built environment influence its occurrence (Bottoms and Wiles, 1997). One aspect of the built environment that has received increased attention in recent years has been the location and concentration of alcohol outlets, especially in urban neighbourhoods (Lipton *et al.*, 2003). Much of the early research in this area was limited by statistical weaknesses and a reliance on aggregated datasets pertaining to large units of analysis such as states and counties (Gruenewald, 1993; Stockwell and Gruenewald, 2001). The statistical weaknesses arose from the failure of ordinary least squares analyses to account for spatial autocorrelations that can bias statistical estimates of effects and lead to either Type I (in the case of positive spatial autocorrelation) or Type II (in the case of negative spatial autocorrelation) errors (Gruenewald *et al.*, 2000). Generalized least squares regression models that estimate and correct for residual spatial autocorrelation

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The present study is intended to build on previous research, and specifically to address the following three issues. First, does the observed relationship between alcohol outlet density and violent crime exist within cities that are both larger than, and in a different part of the US, from those that have previously been studied? The foci of our study are the cities of Austin and San Antonio in the State of Texas, which had populations of 656 562 and 1 144 646, respectively, in 2000. Previous city-level studies have focused on places with populations (at the time that the studies were conducted) under 600 000, such as Camden, Cleveland and Newark (Roncek and Maier, 1991; Speer *et al.*, 1998; Gorman *et al.*, 2001). Only Scribner *et al.* (1999) and Costanza *et al.* (2001) have assessed the relationship between alcohol outlet density and violent crime in cities in the southern US. Second, what are the implications of using generalized least-squares analysis in assessing the relationship between alcohol outlet density and violent crime? Gruenewald and colleagues (1996, 2000) have described in detail the potential problems that emanate from the use of ordinary least square analysis in geospatial studies of the effects of alcohol availability. However, Scribner *et al.* (1999) have argued that the extent of the problems emanating from spatial autocorrelation have yet to be empirically demonstrated in this field of research. Our study will add to the small body of research that has addressed this issue. Third, is the relationship between alcohol availability and violence contingent upon specific neighbourhood context? For example, might the effect of alcohol outlet density be limited to relatively small geographic areas in some cities but be more

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J Stud Alcohol. 1986 Jan;47(1):1-10.

# Alcohol availability, alcohol consumption and alcohol-related damage. I. The distribution of consumption model.

Rush BR, Gilksman L, Brook R.

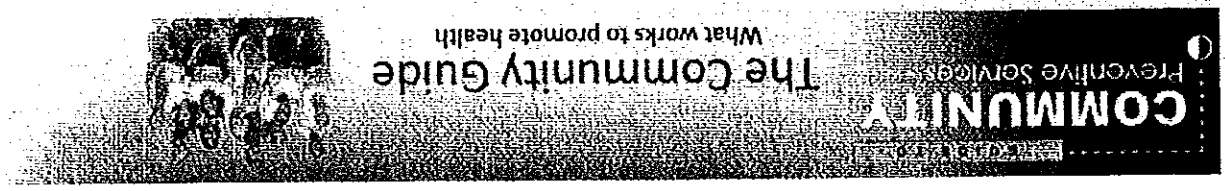
Abstract

One of the major approaches to alcoholism prevention is referred to as the distribution of consumption model. This prevention model can be summarized as a causal model whereby the availability of alcoholic beverages has a direct causal effect on the aggregate level of alcohol consumption in the population and, in turn, an indirect effect on the incidence and prevalence of alcohol-related damage. This article summarizes an application of a statistical technique known as the analysis of linear structural relations (LSREL) to a set of Ontario data concerning alcohol availability, alcohol consumption and alcohol-related damage. Results substantiated the existence of specific causal paths consistent with the model. Several procedures for assessing the overall goodness-of-fit of the model suggested that it adequately fit the data. The results provide reasonable statistical evidence that government policies restricting the retail availability of alcoholic beverages will reduce the per capita rates of alcohol consumption and, in turn, reduce the level of alcohol-related mortality and morbidity in the general population.

PMID: 3485738 [PubMed - indexed for MEDLINE]

MeSH Terms

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## The Community Guide

# Preventing Excessive Alcohol Use: Regulation of Alcohol Outlet Density

Alcohol outlet density regulation is defined as applying regulatory authority to reduce alcoholic beverage outlet density or to limit the increase of alcoholic beverage outlet density. Regulation is often implemented through licensing or zoning processes. An alcohol outlet is a place where alcohol may be legally sold for the buyer to drink there (on-premises) or elsewhere (off-premises). Density refers to the number of alcohol outlets in a given area.

## Task Force Recommendations & Findings

The Task Force on Community Preventive Services recommends the use of regulatory authority (e.g., through licensing and zoning) to limit alcohol outlet density on the basis of sufficient evidence of a positive association between outlet density and excessive alcohol consumption and related harms.

### Task Force Findings

## Results from the Systematic Reviews

No studies were found that directly examined the effects of local interventions to limit alcohol outlet density. Several types of studies were found that consistently indicated that alcoholic beverage outlet density and policy changes that affect alcohol outlet density were associated with excessive alcohol consumption and related harms.

Findings from these various types of studies are described below.

## Policy Changes That Increased Alcohol Outlet Density

Four studies qualified for systematic review.

- Policies that increased alcohol outlet density were found to result in increased excessive alcohol consumption and related harms
- Studies were conducted in Iceland, Finland, New Zealand, and North Carolina

## Alcoholic Beverage Retail Privatization

This occurs when governments relinquish monopoly control over the retail sale of alcoholic beverages. Privatization commonly results in increased alcohol outlet density, among other changes.

Seventeen studies that assessed the effects of privatization in 14 settings and one study of government re-monopolization qualified for the review.

- Privatization of alcohol sales was associated with increases in excessive alcohol consumption of the privatized beverage and minimal effects on beverages not privatized
- One study of government re-monopolization indicated that re-monopolization may reduce alcohol-related harms

## Bans Against Alcoholic Beverages

Bans against alcoholic beverages reduce the density of alcohol outlets to zero. Repeal of bans allows for expanded density of outlets.

Seven studies qualified for systematic review.

- Bans against alcoholic beverages can reduce excessive alcohol consumption and related harms, particularly in isolated environments without other sources of alcohol

- Reviewed studies were conducted in non-tribal areas of the United States and Canada and within American Indian and Native settings in Alaska, northern Canada, and the southwestern United States.

## Association Between Alcohol Outlet Density Change and Alcohol-related Harms, in Which the Cause of Density Change Was Not Assessed

Nine studies qualified for the review

- Generally, increased outlet density was associated with increases in alcohol-related harms
- One possible exception was alcohol-related motor vehicle crashes for which evidence was mixed.
- Studies were conducted in the United States (6 studies), Canada (1), the United Kingdom (1), and Norway (1)

These results were based on a systematic review of all available studies, conducted on behalf of the Task Force by a team of specialists in systematic review methods, and in research, practice and policy related to excessive alcohol use

## Supporting Materials

- Analytic framework (108kb)
- Research gaps
- Summary evidence table (126kb)
- Included studies
- Search strategy

## Publications

Campbell CA, Hahn RA, Eider R, Brewer R, Chattopadhyay S, Fielding J, Naimi IS, Loomney I, Briana Lawrence B, Middleton JC, Task Force on Community Preventive Services. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. *Am J Prev Med* 2009;37(6):556-9.

Task Force on Community Preventive Services. Recommendations for reducing excessive alcohol consumption and alcohol-related harms by limiting alcohol outlet density. *Am J Prev Med* 2009;37(6):570-1

More Community Guide publications about Preventing Excessive Alcohol Use

## Disclaimer

The findings and conclusions on this page are those of the Task Force on Community Preventive Services and do not necessarily represent those of CDC

## Sample Citation

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Original article

# Does Alcohol Outlet Density Affect Youth Access to Alcohol?

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Manuscript received March 27, 2008; manuscript accepted October 27, 2008

### Abstract

**Purpose:** To investigate how community alcohol outlet density may be associated with alcohol access among adolescents.

**Methods:** Data were collected through a three-wave panel study with youth aged 14–16 at baseline using computer-assisted telephone interviews. Study participants were recruited from 50 zip codes with varying alcohol outlet density and median household income in California. Data analyses were conducted using multilevel, linear growth models and data from 1028 youth (52% male, 51% white).

**Results:** After taking into account individual-level factors and zip code median household income, zip code alcohol outlet density was significantly and positively related to the initial levels of the likelihood and frequency of getting alcohol through various sources including commercial outlets, shoulder tapping, home or family members, and underage acquaintances.

**Conclusions:** High levels of alcohol outlets in the community enable youth access to alcohol through commercial outlets, family, and social networks. © 2009 Society for Adolescent Medicine. All rights reserved.

### Keywords:

Alcohol outlet density; Alcohol access; Availability of alcohol; Adolescent

One widely used intervention strategy to reduce underage drinking in the United States has focused on restricting youth ability to purchase alcohol from commercial establishments. This approach is proved to be effective. For example, increasing minimum drinking age is associated with reduction in alcohol consumption among young people [1,2]. Community-based intervention activities such as responsible beverage service training and enforcement of underage sales laws also appear to reduce rates of alcohol to minors [3–5]. Yet, American youth still find alcohol readily available. The Monitoring the Future study reports that in 2006, 63% of the 8th graders, 83% of the 10th graders, and 93% of the 12th graders considered alcohol “fairly easy” or “very easy” to get [6]. This should not be surprising given the various sources through which youth can acquire alcohol. Research examining alcohol availability through retail outlets suggests that, despite the intervention efforts, such availability is quite widespread. For example, alcohol

purchase studies indicate that underage-looking individuals could purchase alcohol from off-premise outlets 30% to 70% of the time [3,7–11]. In addition, the likelihood that purchase attempts succeed at one outlet is higher if similar outlets exist nearby [8]. In this respect, youth who wish to drink may have greater access to alcohol through commercial outlets in areas with higher alcohol outlet densities. A related form of underage alcohol purchase occurs when a youth “shoulder taps” an adult stranger outside an off-premise establishment asking that person to buy alcohol on his or her behalf. A recent study reported that 8% of a general sample of approached adults agreed to buy alcohol for minors, and adults in urban areas were more likely to do so than adults in suburban areas [12]. As urban areas have greater alcohol outlet densities, shoulder tap would be more prevalent in areas with higher alcohol outlet densities. High alcohol outlet densities have been found to be associated with negative youth well-being, including underage drinking and driving [13], violent assaults [14], and injuries related to accidents and assaults [15]. That youth alcohol access and negative health outcomes are related to alcohol outlet densities seems surprising because commercial outlets are not the major venue through which youth acquire alcohol. Instead, youth access alcohol primarily through social contacts

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# Alcohol outlet density and assault: a spatial analysis

Michael Livingston

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## ABSTRACT

**Aims** A large number of studies have found links between alcohol outlet densities and assault rates in local areas. This study tests a variety of specifications of this link, focusing in particular on the possibility of a non-linear relationship. **Design** Cross-sectional data on police-recorded assaults during high alcohol hours, liquor outlets and socio-demographic characteristics were obtained for 223 postcodes in Melbourne, Australia. These data were used to construct a series of models testing the nature of the relationship between alcohol outlet density and assault, while controlling for socio-demographic factors and spatial auto-correlation. Four types of relationship were examined: a normal linear relationship between outlet density and assault, a non-linear relationship with potential threshold or saturation densities, a relationship mediated by the socio-economic status of the neighbourhood and a relationship which takes into account the effect of outlets in surrounding neighbourhoods. **Findings** The model positing non-linear relationships between outlet density and assaults was found to fit the data most effectively. An increasing accelerating effect for the density of hotel (pub) licences was found, suggesting a plausible upper limit for these licences in Melbourne postcodes. **Conclusions** The study finds positive relationships between outlet density and assault rates and provides evidence that this relationship is non-linear and thus has critical values at which licensing policy-makers can impose density limits.

**Keywords** Alcohol availability, assaults, outlet density, violence.

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## INTRODUCTION

This paper examines the nature of the link between alcohol outlet density and assault in Melbourne, Australia. Alcohol-related violence in Australia is a substantial problem. In 1998/99, an estimated 62 534 alcohol-related assaults were reported to the police, and 8661 people were admitted to hospital for injuries sustained from alcohol-related assaults [1]. The links between alcohol consumption and violence have been well established in the international research literature [2]. In turn, alcohol consumption levels have been linked to the degree of alcohol availability through retail outlets and on-premise drinking establishments [3]. A series of studies have linked violence directly to alcohol outlets, with alcohol-related assaults often taking place in or around licensed premises [4] and substantial proportions of all assault victims injured while on licensed premises [5]. In recent years, a growing body of literature has examined the relationship between violence rates and outlet densities in local areas [6]. These studies, largely from urban areas of the United States, have focused on the cross-sectional associations between violence and alcohol outlets in small areas such as census tracts, while adjusting for a series of socio-economic and demographic factors. The results of these studies have almost uniformly suggested significant positive relationships between outlet density and violence [7-15], with units of analysis varying from cities down to street blocks. The results of the one study that found no relationship between outlet density and violence at the city level in New Jersey [16] were explained later as an artefact of the geographic units used [17]. In addition, one US study has shown that changes in outlet density over time are related to changes in violence rates [18]. A handful of studies from outside the United States have also found positive relationships between outlet density and violence, both cross-sectionally [19] and over time [20]. Despite the broadly consistent results found in these studies, the specifics of the relationships between outlet

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Prevention Research Center



Kathryn Stewart

# How Alcohol Outlets Affect Neighborhood Violence

*Translating Science into Practice*

**PIRE**

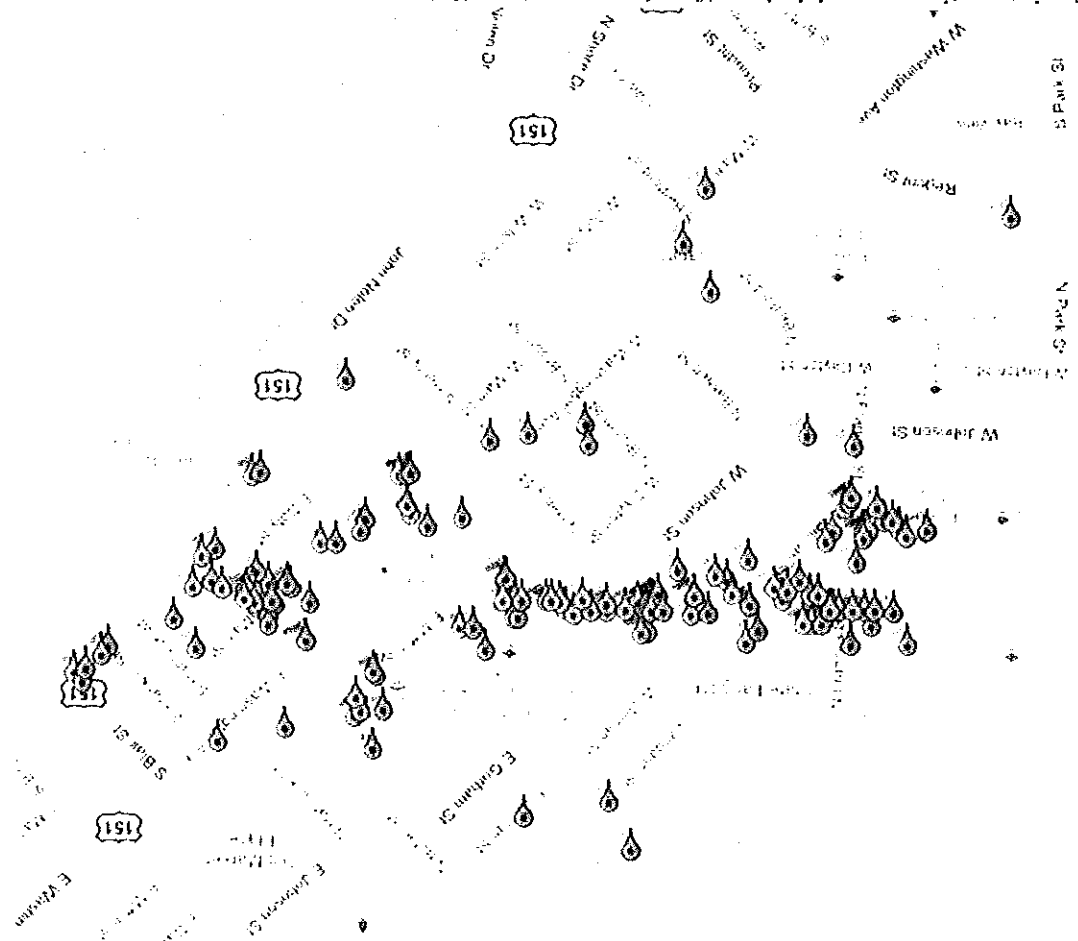
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**Table A.**  
**Capacities for Alcohol-Serving Establishments within Downtown Madison's Alcohol License Density Ordinance (ALDO)**

Type of Capacity Estimate	Description	Capacity
Ceiling	Includes all businesses.	25,001
Midpoint	Includes bars/taverns, restaurants, and 6 (of 14) exceptional circumstances.	19,437
Floor	Includes only bars/taverns and restaurants.	16,346
Bars/Taverns Only	Includes all bars/taverns.	5,920

**Table B.**  
**Businesses with licenses to serve alcohol within ALDO**



For interactive map, visit: <http://batchgeo.com/map/f70005e7129e3c1128c115519983b80a>