Full length article

The location of late night bars and alcohol-related crashes in Houston, Texas

Ned Levine*

Ned Levine & Associates, Houston, TX, USA

ARTICLE INFO

ABSTRACT

A study in the City of Houston, Texas, related the location of establishments primarily serving alcohol ("bars") after midnight to late night alcohol-related motor vehicle crashes. There were three data sets for 2007–09: 1) 764 bars that were open after midnight; 2) 1660 alcohol-related crashes that occurred within the City of Houston between midnight and 6 am; and 3) 4689 modeling network road segments to which bars and alcohol-related crashes were assigned.

Forty-five percent of the late night alcohol-related crashes were within a quarter mile of a late night bar. The bars were highly concentrated in 17 small bar clusters. Using the modeling network, Poisson-Gamma-CAR and Poisson-Lognormal-CAR spatial regression models showed a positive exponential relationship between late night alcohol-related crashes and the number of late nights bars and bar clusters, and a negative exponential relationship to distance to the nearest late night bar controlling for the type of road segment (freeway, principal arterial, minor arterial). A more general model dropped the bar cluster variable.

Further, the Poisson-Gamma-CAR model appeared to produce a better representation than the Poisson-Lognormal-CAR model though the errors were different. The general Poisson-Gamma-CAR model showed that each late night bar increased the frequency of alcohol-related crashes on a segment by approximately 190%. For each mile closer a segment was to a late night bar, the likelihood increased by 42%.

1. Introduction

This study examined the relationship between the location of late night businesses that serve alcohol and late night alcohol-related motor vehicle crashes in Houston, Texas in 2007–09. There were two goals to the study. The first was to study the association between late night bars and late night alcohol-related crashes using a modeling network. Previous studies have used zonal data to establish the relationship between alcohol serving establishments and alcohol-related crashes (traffic analysis zones – Levine and Canter, 2011; zip codes – Ponicki et al., 2013; Treno et al., 2007).

A second goal compared two different functional forms of statistical model for examining the association between late night bars and late night alcohol-related crashes, one using a Poisson-Gamma-Conditional Autoregressive (CAR) and the other using a Poisson-Lognormal-CAR model. Some research has suggested that the Poisson-Lognormal-CAR is a better statistical model where there is a low sample mean (Wang and Kockelman, 2013; Park and Lord, 2007; Jin et al., 2005).

2. Theory

Excessive alcohol-use has long been related to many social ills. First,

alcohol use is involved in many serious motor vehicle crashes. The percentage of fatalities involving drivers with a Blood Alcohol Concentration (BAC) greater than 0.08 g per deciliter (the legal limit in all U.S. States) is sizable, although it has decreased over time from 49% in 1982 (IIHS, 2013) to 31% for 2013 (NHTSA, 2015a, 2013; CDC 2015, 2011). Still, there are around 10,000 alcohol-related fatalities each year in the U.S. Further, in 2013, around 34% of pedestrian fatalities involved the victims having a BAC level of 0.08 or greater (CDC, 2016; NHTSA, 2015b).

Second, excessive alcohol consumption has also been associated with crime, particularly violent crime (e.g., Erickson et al., 2015; Livingston, 2008; Block and Block, 1995; Roncek and Pravatiner, 1989; Sherman et al., 1989; Roncek and Bell, 1981). Third, alcohol abuse has been associated with increased child and spousal violence (NIAAA, 2014; McKinney et al., 2009; Bell et al., 2006), increased sexual assaults (Abbey et al., 2001), increased suicides (Pompili et al., 2010; Markowitz et al., 2003), and increased health problems (Hingson and Rehm, 2013).

Regarding establishments that serve alcohol, studies have shown that on-premise drinking locations, where alcohol is consumed where it is purchased, have been associated with alcohol-related crashes using zonal data (Ponicki et al., 2013; Levine et al., 2011; Treno et al., 2007;

Gruenewald et al., 1999; Levine et al., 1995). Also, there are many studies that have shown higher levels of crime around bars and taverns, particularly those open late at night (e.g., Jernigan et al., 2013; Groff, 2014, 2013; Ratcliffe, 2012; Bernasco and Block, 2011; Campbell et al., 2009; Roncek and Pravatiner, 1989; Roncek and Bell, 1981).

2.1. Regulation of alcohol sales and distribution

There is variation in the regulation of alcohol-serving establishments. In the United States, the 21st Amendment that repealed Prohibition required States to regulate alcohol sales.[1] That is, the States were given the explicit and sole authority for regulating alcohol distribution and sales. Each state, in turn, regulates alcohol sales differently.

In Texas, for example, there is a 'local option' whereby each county, municipality, or Justice Precinct decides whether to be 'wet' or 'dry' and chooses which beverages can be sold (Swann, 2015; Hanson, 2015). A distinction is made between on-premise establishments, where alcohol is consumed where it is purchased (e.g., bars, restaurants), and off-premise establishments, where alcohol can be purchased but not consumed (e.g., liquor stores, grocery stores). Licensing of alcohol for special events is usually treated differently. Beer and wine are licensed differently than distilled liquor with the latter, obviously, being more restricted.

In general, there are also local restrictions that have been used to regulate the location of bars including zoning, proximity buffers, operations (limited hours and days), security (e.g., security guards, outdoor lighting), and alcohol outlet density controls. Currently, many community organizations recommend limiting the areal density of alcohol outlets to reduce alcohol consumption and related harm (CADCA and CAMY, 2011; Grover, 1999). A task force of the Centers for Disease Control and Prevention (CDC) attributed more than 79,000 deaths each year in the U.S. to binge drinking and strongly recommended controls at both state and local level of alcohol outlet density (The Community Guide, 2015; Campbell et al., 2009).

However, the effects of changes in alcohol outlet density control have been mixed in the few studies that have been conducted within the U.S. Gruenewald and Remer (2006) found that an increase in on-premise alcohol outlet densities in California zip codes was associated with an increase in hospitalization for assaults with a positive elasticity for bars (i.e., the rate increased with each additional bar). However, the City of Baltimore has been unable to reduce alcohol outlet density even though they created a formal goal to do so in 1968 (Thornton et al., 2013).

Texas requires a physical separation of 300 feet from a school, place of worship, or hospital for an establishment that primarily serves alcohol. In general, cities cannot be more restrictive than this if they permit alcohol sales though there are exceptions for municipal ordinances in place before 1987. However, the two largest Texas cities of Houston and Dallas are allowed to have 'alcohol-free zones' that are 1000 feet from schools.

Further, most homeowner associations (HOA), in Texas have restrictions in their Covenants, Conditions and Restrictions, usually defined as "residential use only", that prevent store-front businesses (Findlaw, 2016; Kapur, 2004). Few, if any, would allow a commercial establishment such as a bar to be located within their sub-division. These formal and informal land use restrictions have the effect of spatially concentrating bars in cities, either in special 'entertainment districts' or generally in commercial areas.

3. Materials and methods

3.1. Late night bars

In this study, businesses that primarily serve alcohol on the premise are called "Bars" although they encompass taverns, cocktail lounges, sports bars, night clubs, private clubs as well as businesses formally identified as bars. They are defined as business establishments that primarily serve alcohol as opposed to primarily serving food along with alcohol ("Restaurants").

The late night time period (midnight to 6 am) was chosen for three reasons: 1) A high proportion of alcohol-related crashes occur during this time frame; 2) In Texas, late hours permitting is required for bars to sell alcohol from midnight through 2 am; and 3) Few other businesses are open at those times and there is less uncertainty about associating alcohol-related crashes with bars. While many restaurants also sell alcohol with late night alcohol permits, this study concentrated on establishments that primarily serve alcohol.

3.2. Late night alcohol-related crashes

Similarly, alcohol-related crashes involve those in which one or more of the drivers was identified as having more alcohol in his/her bloodstream than is legally acceptable or in which a pedestrian who was hit by a vehicle had an unacceptable level of alcohol in his/her bloodstream.[2] These are frequently called "Driving while intoxicated" (DWI) or "Driving under the influence" (DUI), depending on particular state laws. Late night alcohol-related crashes involve the same time period (midnight to 6 am). In Texas, alcohol-related crashes involve both drivers and pedestrians that are under the influence of alcohol. Increasingly, research has focused on the role of alcohol by pedestrians in fatal crashes (CDC, 2016; NHTSA, 2015b).

3.3. Data sets

The analysis was conducted with 2007–09 data. There were three data sets. First, there was a database of 764 bars in the City of Houston that were open after midnight on most days at the end of 2009. This was compiled from licensing data held by the Texas Alcoholic Beverage Commission (TABC). The TABC database is defined by the type of license given, rather than by the type of establishment (e.g., mixed beverages v. wine and beer only). Thus, a re-categorization by analysts at the Houston Police Department was necessary to identify locations for establishments that primarily served alcohol. These included 346 bars (a business named as a 'bar'), 256 night clubs, 103 cocktail lounges, 32 adult entertainment businesses, 12 sports bars, 9 comedy clubs, and 6 discotheques though the sub-categorizations are approximate.[3] Fig. 1 shows a map of the 764 late night bars.

Second, there was a database of 1660 serious alcohol-related crashes that occurred in the City of Houston from midnight to 6 am in 2007–09. The data were compiled by the Texas Department of Transportation (TxDOT) and distributed by the Metropolitan Planning Organization (Houston-Galveston Area Council). These included all crashes that involved fatalities, injuries or serious property damage. Of these crashes, 44 (or 2.7%) involved a pedestrian who was under the influence of alcohol.

The geographic location was identified for 1368 (or 82%) of the

---

[1] Section 2 of the 21st Amendment states (Wikipedia, 2015): "The transportation or importation into any State, Territory, or possession of the United States for delivery or use therein of intoxicating liquors, in violation of the laws thereof, is hereby prohibited". This has been interpreted as giving States the sole right to regulate alcohol sales. However, several legal cases have challenged restrictions imposed by States (Wikipedia, 2015).

[2] An unacceptable level for a driver or pedestrian involved in a crash was defined as an adult, 21 or older having a Blood Alcohol Content (BAC) of 0.08 g/dl or higher or a minor (under age 21) having any alcohol in their blood stream (i.e., a BAC greater than 0). The determination is made by a police officer investigating a crash, increasingly with a supporting Blood Alcohol Test.

[3] The sub-categorizations were done on the basis of the establishment name (e.g., sports bar v. bar v. cocktail lounge). Clearly, this involved subjective decisions about the bar type.