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Are Barroom and Neighborhood Characteristics Independently Related to Local-Area Assaults?

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Abstract

Background—Two separate but complimentary literatures examine bar-related violence: one has focused on barroom features, the other has focused on features of neighborhoods near bars. This study unifies these two perspectives using a microenvironmental approach.

Methods—In a purposive sample of 65 bars in 4 California cities, we used premise assessments to characterise the physical, social and economic environments of barrooms (e.g., patron count, average pace of drinking, restaurant service); and a combination of Systematic Social Observation, census, and alcohol license data to characterize the neighborhoods in which they were located (e.g., physical disorder, alcohol outlet density, median household income). Hierarchical Poisson models then assessed relationships between these features and counts of police-reported assaults within buffer areas around bars.

Results—Aspects of both barroom environments (more patrons, more dancing and louder music) and neighborhood environments (greater bar density, greater physical disorder, lower population density, and lower income) were independently related to increased incidence of assaults.

Conclusions—Preventive intervention to reduce bar-area violence may be directed at both bar environments (e.g., limiting the number of patrons) and neighborhood environments (e.g., limiting outlet density).

Keywords

Alcohol; violence; barrooms; prevention; neighborhood

INTRODUCTION

Studies of violence in and around bars are motivated by three observations: (i) alcohol consumption is strongly associated with violence (Bushman, 1997); (ii) bars are heterogeneous places dedicated to the sale and consumption of alcohol (Cavan, 1966); and (iii) violence contributes substantially to preventable morbidity and mortality (Murray et al., 2012). Two distinct but complimentary lines of investigation have addressed the relationship between bars and violence, and whether and how some bars generate more violence than others. The first line of research has related features of barroom environments to violence and aggression within bars (intrinsic risks); the second line of research has related features of neighborhood environments to violence and aggression within and around bars (extrinsic risks). In this study we measure intrinsic and extrinsic sources of risk and assess the degree to which each contributes to violence independent of the other. By identifying substantive sources of intrinsic vs. extrinsic risks, social ecological research enables the development of effective targeted prevention programs.

Violence within Bars

Based on the clear evidence that a small number of venues account for a large number of problems (Rowe et al., 2010), a modest literature examines relationships between the characteristics of barrooms and the occurrence of violence within them (Hughes et al., 2011). These studies suggest a fairly consistent set of social, physical and economic barroom characteristics are associated with violence and aggression. Specific physical barroom features associated with observed aggression are indicators of decay (e.g., “shabby” décor) and floor plans that encourage milling, crowding, and greater or closer patron interaction (e.g., those with dance floors, pool tables, or more noise; Graham et al., 2012; Graham et al., 1980; Homel et al., 1992; Lang et al., 1995; Quigley et al., 2003). Specific social and economic barroom features associated with observed aggression in bars pertain to the nature of alcohol sales and consumption (e.g., serving intoxicated patrons, price discounting, the estimated level of patron intoxication; Graham et al., 2006; Homel et al., 2004; Ker and Chinnock, 2006; Lang et al., 1995; Quigley et al., 2003; Stockwell et al., 1993; Warpenius et al., 2010). Other studies suggest the individuals found within bars also matter a great deal, including that bars with more impulsive, heavy drinking, male patrons may have more violence (Leonard et al., 2003; Quigley et al., 2003; Quigley and Leonard, 2004). However, these studies of individuals have typically used surveys from the general population, as no studies have assessed these individual level characteristics using a generalizable sample of patrons from a generalizable sample of bars (Morrison et al., in press).

Theories explaining the mechanisms by which barroom environments might be related to violence generally focus on interactions between individuals with predisposing characteristics for violence and environments conducive to violence. For example, Leonard et al. (2003) proposed that barroom aggression would be related to patron characteristics (e.g., gender) and traits (e.g., impulsivity), and that aggressive patrons would be attracted to more aggressive bars. They found support for the first hypothesis, but not the second. Similarly, Graham (2009) used a situational crime prevention model to describe violence as a result of combinations of participants, guardians, environmental deterrents, environmental

precipitation, the effects of alcohol, and the social interaction processes of aggression. Based on this theory and the supporting evidence, the researchers developed a server training module which reduced aggression in high-risk establishments (Graham et al., 2004).

Violence around Bars

Moving outside the barroom, a complimentary literature has identified that a greater density of bars in a geographic area is related to greater incidence of assaults (Campbell et al., 2009). This relationship has been observed both cross-sectionally and longitudinally, in numerous geographic regions, and at a range of spatial scales (Gruenewald and Remer, 2006; Livingston, 2008a, 2008b; Mair et al., 2013; Scribner et al., 1995).

Several theories seek to explain relationships between bar density and violence. Availability theory proposes that people who reside in areas with more alcohol outlets will drink more due to the reduced total cost of obtaining alcohol (i.e., including financial and convenience costs; Stockwell and Gruenewald, 2004). People who drink more are involved in more assaults (Quigley and Leonard, 2004), so by extension, assaults will occur more frequently in areas with greater access to alcohol (e.g., with more outlets). Alternatively, violence occurs more commonly in “socially disorganized” neighborhoods with limited ability to organize and advocate for allocation of social goods and limiting of social risks, like overconcentration of alcohol outlets (Gerson and Preston, 1979; Sampson and Groves, 1989; Sampson et al., 1997). Indicators of disorganization include physical decay, poverty, and greater transience among resident populations. Because bars are found in greater density in disorganized neighborhoods (Gruenewald and Lipton, 2002; Roncek and Maier, 1991), this theory suggests neighborhood conditions may confound relationships between bar density and assaults. Finally, niche theory proposes that a high density of on-premise alcohol outlets in an area allows for a diversity of establishments which may appeal to specific market segments (Gruenewald, 2007). Heavy drinkers and people at risk for violence and drunk-driving may thus select into (i.e., regularly patronize) establishments with other similar drinkers, while people at lower risk for problem drinking may select into other bars. In these contexts, core groups will mutually reinforce the selected norms and behaviors, hence the appearance of “problem bars” in areas of high bar density.

Study Aims

Considered side-by-side, it is clear that these two lines of research identify similar themes. For example, violence and aggression occur more frequently in both barrooms and neighborhoods with greater physical decay. It also seems plausible that the social, physical and economic environment of barrooms will reflect the conditions of neighborhood in which bars are located (so the more physically decayed bar may be found in a more disorganized neighborhood). If this is the case, associations between barroom and neighborhood features and violence may be confounded in either direction. For the present study we collected data on barrooms and their neighborhoods in four Northern California cities. We combined data from ethnographic observations of barrooms and from Systematic Social Observations of the local areas around these bars together with police-reported assault data in the associated cities. Multilevel models were used to assess statistical relationships between barroom and

neighborhood characteristics and police reported assaults around bars within the four cities (assault events within buffered areas around bars, nested within cities).

MATERIALS AND METHODS

Sample

As part of a larger project, the Prevention Research Center in Oakland, California has collected data on alcohol sales, consumption, and potentially related harms in 50 randomly selected California cities with populations of between 50,000 and 500,000 (Gruenewald et al 2014). Because data collection for the present study had a substantial fieldwork component requiring frequent travel to the study sites, from among the 50 cities we selected those within 60 miles of the research center (n=14). We then selected the three cities with the greatest and the three with the least density of bars per roadway mile, for a purposive sample of six cities. Of these, we were unable to obtain police assault data at sufficiently high resolution for one of the low density cities and one of the high density cities. This provided a final sample of four Northern California cities for the analyses and results reported here.

Alcohol outlets in the study cities were geocoded to street addresses (geocoding rate = 100%). From April to October 2012, field scouts visited all establishments within the limits of the six cities that had a bar/tavern license (California Department of Alcoholic Beverage Control license type 23, 40, 42, 48, 61, 75) or a restaurant licenses (type 47). All establishments with bar/tavern licenses were eligible for inclusion in the present study. For establishments with restaurant licenses we required that the scouts had identified a separate barroom area. Within the four cities for which we had outcome data, the 116 eligible establishments (hereafter, “bars”) were then stratified by city and outlet density (defined as the median Euclidean distance to the five nearest bars). We removed the middle third of bars from each city, leaving a sample of 78 bars in high and low density areas of cities with high and low overall densities of bars. We were able to collect data from 65 of these bars (13 were excluded for not being open or not having enough patrons to allow for an ethnographic observation).

Data Collection

Assault Data—We acquired assault data from the police departments of the study cities from 2010 and 2011, then geocoded cases to the highest available resolution (street address or point location). Based on our experience studying bars in these cities, we considered two years to be a reasonable period to capture sufficient cases for analysis but to limit aggregation bias due to changes in bar environments (Ponicki et al., 2013). The outcome of interest was a count of police-reported assaults within a 10 meter buffer of the bars (for example, in Figure 1, Bar A had three assaults, and Bar B had one assault). This distance was selected because beyond that level some assaults fell into the buffers of two or more bars, leading to double counting. Importantly, definitions of assault cases differed between cities (e.g., some provided arrest data, others provided incident reports) but were internally consistent within cities.

Bar Observation Data—A team of trained research assistants, selected for their prior experience working in or frequenting bars, conducted ethnographic observations in the study bars. Working in pairs between January and July 2013, they completed two 60- to 90-minute observations in each eligible bar on Friday and Saturday evenings after 8pm (excluding holiday weekends), except those in which there were fewer than five patrons present when they entered the premises. For maximum consistency between bars we did not conduct observations on holiday weekends. Due to the relatively stable year-round climate in the San Francisco Bay Area, seasonal changes due to weather are unlikely to have affected bar characteristics.

After leaving the bar, each observer completed a 57-item checklist containing items that coded the social, physical and economic environments of the bars. These measures were derived from our own and other researchers' prior quantitative studies of barroom environments (e.g., Graham and Homel, 2008; Hennessy and Saltz, 1993; Holder and Saltz, 1997; Lee et al., 2003; Treno et al., 2007) and from observational and ethnographic studies of barroom characteristics associated with problem behaviors (e.g., Aitken and Jahoda, 1983; Antin et al., 2010; Hunter et al., 1982; Lee et al., 2008; Roebuck and Murty, 1996). We report elsewhere the reliability of these measures and results of principal components analyses to develop scales describing specific aspects of the barrooms (Morrison et al., under review). The field staff conducted these observations naturalistically: they entered and acted in the barroom like other patrons, ordered food or drinks, and sat quietly conducting their observation. In addition to attending to the checklist items, each observer walked through all publically-accessible barroom space to observe all areas, and conducted time-sampled counts of patron throughput and patron drinking pace.

Neighborhood Data—To enable us to account for the characteristics of the neighborhoods in which the bars were located, between July and August 2013 we conducted Systematic Social Observations (SSO), a method developed in Chicago to characterize disorganization in urban neighborhoods (Raudenbush and Sampson, 1999; Sampson et al., 1997). In this approach, research teams systematically walk or drive around whole city blocks, documenting the physical features of the neighborhood environment on each block face using a validated data collection instrument. As our sample bars were located in exurban and rural areas as well as within conventional city blocks, we modified the SSO procedure and instrument slightly to accommodate very large or irregularly shaped "blocks".

Pairs of research assistants conducted SSOs of the blocks around the study bars. Blocks were defined as the tightest drivable perimeter on navigable named roads (i.e., excluding internal unnamed roads within shopping malls). Starting with the bar on their right, they first drove the full block, taking a right turn at every intersection until they returned to their starting position. They then agreed on the precise route that constituted a block around that bar (bypassing cul-de-sacs) and the number of block faces in the route (defined as complete road segments between intersections, not including intersections with cul-de-sacs). For blocks with a perimeter of one mile or more teams were permitted to complete the observations in a vehicle, otherwise observations were completed on foot. Teams completed two circuits of the route, first observing the internal block faces (including the block face on which the bar was located) and then the external block faces. For the three blocks with

perimeters of greater than 20 miles, observations were truncated at 10 miles in either direction of the bar.

Measures

From the barroom observation checklist, we used scales describing *social disorder* (which contained items documenting observed patron aggression, interaction between groups, circulation of patrons within the bar, and profanity) and *dancing and music* (brightness, dance floor, music volume, stage). Other bar-level items were the presence of restaurant service and characteristics identified in the literature as potentially related to bar violence and aggression (Graham et al., 2012; Graham et al., 2006; Quigley et al., 2003; Stockwell et al., 1993): number of patrons (count during the observation), games (the presence of a pool table), and drinking pace (based on time-sampled counts of drinks consumed by patrons seated at tables proximate to the observers over a 60 minute period). We intended to measure the economic environment using the price at which an index item was sold, however this was not possible due to inconsistent item availability between bars. We therefore used the availability of Bud Light (a low cost domestic beer) as an indicator of lower priced alcohol.

From the SSO data, we replicated Raudenbush and Sampson's (1999) original scale of physical disorder. In their Chicago data, the scale had high internal consistency within clusters of Census tracts ($r = 0.98$) and high correlation with perceived social disorder in a community survey ($r = 0.71$). Given the small buffers from which we obtained counts of assaults, we considered the observations from only the block face on which the bar fronted. The dependent variable was a count of the presence of five items (discarded cigars/cigarettes, moderate or heavy garbage, empty beer bottles, graffiti, and abandoned cars) that were observed by either of the research assistants. We omitted three items from Raudenbush and Sampson's original scale (discarded injecting equipment, identifiable gang graffiti, discarded condoms) as none of these were observed in any of the 46 street segments on which the 65 bars were located, and three items indicating graffiti (tagging graffiti, graffiti painted over, and political message graffiti) were collapsed into one. Interrater reliability was moderate to high on the five included items ($\kappa = 0.574$), but the scale explained only 25.1% of variance and had moderate internal consistency for observations within street segments (Cronbach's $\alpha = 0.538$). We also developed an alternative scale characterizing industrial neighborhoods (abandoned cars, no trees, commercial buildings in fair or poor condition, and high mesh fences with barbed wire), which appeared slightly better suited to our data. This scale explained 45.5% of variance and had similar internal consistency compared to the scale of physical disorder ($\alpha = 0.525$). For consistency with the extant literature we used the physical disorder scale in our main effects models, and tested the industrial neighborhoods scale in specification tests. The two SSO scales were uncorrelated ($r = 0.011$). Given the mostly fixed nature of the component items, these measures are likely to be robust to variation in the time of day and the day of week that observations were conducted.

Other neighborhood measures included the demographic characteristics of the Census block groups in which the bars were located. We used 2013 intercensal estimates of population

density and median household income (GeoLytics, 2014). Additionally, we calculated the local bar density as the median Euclidean distance to the nearest five bars, such that higher values represent lower bar density.

Analyses

We constructed hierarchical Poisson models for a two-year cross-section of police reported assaults within 10 meters of the study bars, with random effects for the four cities. It was unnecessary to add another level (nesting bars within block faces within cities) due to the small number of bars located on the same block face. Model 1 examined the relationship between counts of assaults and the social environment of the barrooms (social disorder, patron count, and drinking pace). In Model 2 we added measures of the physical and economic environment (Bud Light available, restaurant service, pool table, dancing and music scale). Model 3 used only the bar-area neighborhood conditions (population density, bar density, median household income, and physical disorder) as independent variables, and Model 4 combined both barroom and bar-area neighborhood conditions. The Poisson exposures were set to expect a uniform distribution of assaults for bars. Likelihood ratio tests indicated that the hierarchical structure improved model fit in all four models compared to a single level structure ($p < 0.001$).

Recognizing the potential problems associated with our small 10m buffers and the small sample size, we conducted multiple specification tests to ensure that results were not artifacts of variable or model construction. First, we added the industrial neighborhood scale to Model 4 both in place of and in addition to the physical disorder scale. Second, we increased the size of the buffers around the bars in which we calculated counts of assaults to 20m, 30m, 40m, and 50m, expecting that the double counting of between 30.0% (20m) and 45.4% (50m) of assaults would inflate associations for outlet density (as the double counting tended to occur in high density downtown areas), and would have an unpredictable effect on other variables. Third, we repeated Model 4 using counts of police reported assaults at the 10m buffer level from different combinations of annual cross-sections (2008 to 2009; and 2008 to 2011). Fourth, we constructed an alternative analysis in which the outcome measure was counts of assaults on the street segment in which the bar was located. Finally, we constructed Thiessen polygons around the study bars, then inspected Global Moran's I for the dependent and independent measures and the Poisson model residuals to ensure that results were not biased by spatially autocorrelated errors.

RESULTS

Table 1 shows the distribution of assaults within cities; the social, physical and economic characteristics of the barrooms (and the inter-rater reliability of these measures); and the characteristics of the bar-area neighborhoods. There were 4,413 police reported assaults in the four cities during 2010 and 2011; 67 (1.5%) occurred within 10 meters of the 65 study bars. Table 2 shows the results of the three hierarchical Poisson models. In Model 1 considering only the relationship between the barroom social environment and the number of assaults within a 10m buffer of the address, both the number of patrons and greater social disorder predicted more bar-area assaults. One hundred more patrons was associated with a

3.8-fold greater incidence of assault (IRR = 3.80; 95% Confidence Interval [CI]: 2.21, 6.54), and a one unit increase in the social disorder scale was associated with a 1.5 fold increase (IRR = 1.57; 95% CI: 1.24, 2.00). In Model 2, the association for the patron count remained but the association for social disorder was no longer significant after accounting for the internal physical and economic environment of the barrooms. In this model, bars with pool tables ($p = 0.056$) and dancing and music ($p = 0.059$) had marginally greater incidence of bar-area assaults. In Model 3, bars with greater median distance to the five nearest bars (i.e., in areas with lower bar density) and bars in areas with lower population density had fewer bar-area assaults, and bars located on street segments with more physical disorder had more bar-area assaults. In Model 4, both bar-level (patron count, dancing and music) and neighborhood-level variables (population density, bar density, physical disorder, median household income) were independently related to bar-area assault incidence.

The substantive findings from Model 4 were repeated in each of the specification tests. The alternate SSO scale describing bars located in industrial neighborhoods was related to fewer bar-area assaults, and including this variable did not materially alter the relationships between neighborhood assaults and the aspects of the barroom environment or the neighborhood conditions. As expected, increasing the buffer size strengthened the associations for outlet density, and bars located in areas with higher population density had significantly fewer bar-area assaults in the 20m and greater buffers. The main findings were repeated in models using cross-sections of police-reported assaults from different combinations of years, and in models using counts of assaults on the street segments on which the bars were located. Global Moran's I was significant for both counts of assaults in 10m buffers around the bars and the neighborhood conditions (population density, outlet density, and physical disorder scales); however there was no evidence that the studentized residuals from the Poisson models were spatially autocorrelated, suggesting that the dependent measures collectively accounted for the spatial variance in the independent measure.

DISCUSSION

These findings demonstrate that assaults in and around bars are independently associated with aspects of both the internal social, physical, economic and features of bars *and* the characteristics of the neighborhoods in which they are located. These relationships have been demonstrated separately elsewhere, but this is the first study to observe both effects simultaneously for the same bars.

Our findings concur with previous studies relating both barroom and neighborhood characteristics to violence. For barroom characteristics, having large numbers of patrons, and having patrons crowd and interact with one another (particularly around dance floors) was associated with greater incidence of bar-area assaults (Graham et al., 2012; Lang et al., 1995; Quigley et al., 2003; Stockwell et al., 1993). For neighborhood characteristics, bars with greater proximity to other bars (Campbell et al., 2009), located in lower income areas (Gruenewald and Lipton, 2002; Roncek and Maier, 1991) with greater physical disorder (Sampson et al., 1997) had more bar-area assaults. It is possible the results from prior analyses were confounded by aspects of the bars or neighborhoods, but in our data

relationships were independent. These results suggest that the malleable barroom and neighborhood features identified here may be appropriate targets for intervention to reduce assault risk around bars. For example, at the barroom level, restricting the number of patrons in a bar, or designing the physical layout to reduce milling and crowding may reduce the incidence of neighborhood violence (Graham et al., 2012; Stockwell et al., 1993); at the neighborhood level, reducing bar density may have a similar public health impact.

Three theoretical mechanisms explain why both barroom and neighborhood characteristics might be related to assaults. First, bars might be *crime attractors*, in that people who at increased risk of perpetrating violence are more likely to go to bars and the surrounding areas (Parker, 1993; Parker and Rebhun, 1995). Previous studies suggest bar patrons are more impulsive and more aggressive than the general population (Gruenewald et al., 2014), these patrons may also be attracted to smaller quieter bars to a lesser degree than the larger louder bars that our data suggest are associated with greater neighborhood assault risk. Second, bars could be *victim generators*. Intoxicated people leaving bars may be more vulnerable to assault, and patrons leaving the larger louder bars may be more vulnerable and more abundant than patrons leaving smaller quieter bars. Finally, bars could be *social pumps*, first grouping collections of people predisposed to risk, then enabling behaviors which exacerbate these risks. This process generates movement and interaction between possibly intoxicated people at elevated risk both within bars and in the surrounding streets, leading to more assaults. By all three of these mechanisms, reducing the overall density of bars in a neighborhood, particularly the larger louder bars, would conceivably reduce the number of area assaults, either by reducing the number of potential perpetrators, reducing the number of potential victims, or reducing the number of potential meetings between victims and perpetrators.

In this study we intensively collected a large amount of information to describe multiple dimensions of a small number of bars. This approach gave rise to a number of limitations. The small sample size increased the probability that random variations in the data would substantially affect our results, possibly leading to biased findings. We conducted numerous specification tests to guard against that possibility, and the repeated similar findings give us confidence in our results. Importantly, removing the middle third of bars according to local outlet density may have affected the generalizability of the study findings. If the omitted bars were systematically different to the included bars, results could be biased in either direction. The very small 10m buffers also meant assaults may have been excluded by chance (due to minor errors in geocoding). However, the consistency of the parameter estimates in the sensitivity analyses suggests this potential error did not affect the overall findings. Additionally, the temporal mismatch between the assault data (2008 to 2011) and the bar and neighborhood observations (2013) may have affected our results. Our analyses assume stability over that period, however it is possible that some bars included in the study were not in operation at the time the assaults occurred, or that the operating characteristics were different. If this assumption is violated, the erroneous linking of assaults to bars could bias results in either direction. In 2008, field teams from our center conducted unobtrusive observations in all bars that were in business in the four cities (Ponicki et al., 2013),

including 51 (78.5%) of the 65 included in the current study. Operating characteristics were generally consistent within these outlets between 2008 and 2013.

Our study findings are also limited by the available data. Both empirical observations (Leonard et al., 2003; Quigley et al., 2003; Quigley and Leonard, 2004) and theoretical predictions (Gruenewald, 2007) suggest patron characteristics are likely to be related to assault risk, barroom characteristics and neighborhood characteristics; however we lacked survey data with which to systematically characterize psychological and behavioral attributes of the individuals present in the bars (Morrison et al., in press). Studies linking ecological bar- and neighborhood-level data with patron-level data could investigate this relationship. Given that the available police data contained only the event locations and incident type, we were unable to assess the temporal distribution of bar-area assaults and whether the assaults were alcohol-related (i.e., whether the victim or perpetrator had been drinking in the bar). Previous studies (Young et al., 2004) suggest it is unlikely that that 100% of the included assault cases were alcohol-related, potentially biasing our results. Finally, due to the cross-sectional design of our bar data collection we were not able to assess reverse causation (i.e., the extent to which assaults influence bar and neighborhood characteristics).

Despite their clear utility for understanding associations between bars, neighborhoods, and violence, the separate literatures examining violence in bars and violence in neighborhoods view the problem from either side of the barroom door. This study advances prevention science by unifying these two perspectives with a microenvironmental approach, using small-scale observations both within and proximal to bars. Local-area assaults are related to both intrinsic (e.g., crowding and the number of patrons inside bars) and extrinsic bar features (e.g., outlet density), and opportunities for prevention are located in both domains.

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Figure 1.
Geocoded assaults, 10m buffers around bars, and SSO block faces in a downtown area.
Block Face A described neighborhood conditions for Bar A, and Block Face B described
Bar B.

Table 1

Reliability and descriptive statistics for 65 observed bars in 4 cities

	Reliability		Descriptive Statistics				
	κ	Agreement (%)	r	n (%)	Mean	SD	Min Max
Assaults in 10m Buffer of Bars							
City 1 (16 bars)					0.38	0.72	0.00 2.00
City 2 (18 bars)					0.89	1.84	0.00 7.00
City 3 (20 bars)					0.65	1.53	0.00 6.00
City 4 (11 bars)					2.91	4.83	0.00 14.00
Barroom Social Environment							
Social disorder scale			0.76		1.59	1.24	0.00 3.93
Patron count			0.78		43.25	40.81	6.75 243.33
Drinking pace (drinks/person/hour)			0.55		1.49	0.68	0.00 3.67
Barroom Physical and Economic Environment							
Bud Light available	0.46	83.64		57 (87.69)			
Restaurant	0.68	85.32		45 (69.23)			
Pool table	0.90	95.41		24 (36.92)			
Dancing and music scale			0.77		1.23	0.77	0.43 3.15
Bar-Area Neighborhood Conditions							
Population density (per mile ²)					5.24	4.03	0.01 21.62
Median distance to 5 nearest bars (km)					1.07	1.39	0.01 5.19
Median household income					70696	30600	19283 151462
Physical disorder (SSO scale)					1.38	0.88	0.00 4.00
Industrial site (SSO scale)					0.46	0.99	0.00 4.00

Table 2
Multilevel Poisson models for counts of assaults in 10m buffer of 65 bars nested within 4 cities

	Model 1			Model 2			Model 3			Model 4		
	IRR	(95% CI)	p-value	IRR	(95% CI)	p-value	IRR	(95% CI)	p-value	IRR	(95% CI)	p-value
Barroom Social Environment												
Social disorder scale	1.573	1.240	1.995	1.167	0.891	1.530	0.857	0.596	1.231	0.857	0.596	1.231
Patron count (×100)	3.799	2.207	6.538	5.362	2.820	10.194	6.420	2.714	15.185	6.420	2.714	15.185
Drinking pace (1 drink/person/hour)	0.909	0.589	1.403	0.795	0.516	1.224	1.231	0.732	2.071	1.231	0.732	2.071
Barroom Physical and Economic Environment												
Bud Light available				4.811	0.619	37.385	2.396	0.282	20.385	2.396	0.282	20.385
Restaurant				0.710	0.308	1.638	0.415	0.148	1.163	0.415	0.148	1.163
Pool table				2.258	0.980	5.202	2.446	0.842	7.111	2.446	0.842	7.111
Dancing and music scale				1.388	0.988	1.950	1.826	1.187	2.807	1.826	1.187	2.807
Bar-Area Neighborhood Conditions												
Population density (1000 per mile ²)							0.906	0.823	0.997	0.830	0.709	0.972
Median distance to 5 nearest bars (1km)							0.634	0.461	0.872	0.436	0.277	0.685
Median household income (\$10,000/year)							0.914	0.809	1.033	0.794	0.661	0.953
Physical disorder (SSO scale)							2.654	1.843	3.822	1.717	1.044	2.822
Constant	0.331	0.098	1.117	0.082	0.006	1.084	1.471	0.047	45.858	1.471	0.047	45.858
<i>Likelihood ratio test for hierarchical Vs single level model</i>	<0.001			<0.001			<0.001			<0.001		

Bolded values have p>0.05.