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# Off-premise Alcohol Outlet Characteristics And Violence

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## Abstract

Background: There is considerable evidence of an association between alcohol outlet density and violence. Although prior research reveals the importance of specific characteristics of bars on this association and that the relationship between bar density and violence may be moderated by these characteristics, there are few similar studies of the characteristics of off-premise outlets (e.g. liquor and convenience stores). Objectives: We examined whether immediate environment, business practice, staff, and patron characteristics of off-premise alcohol outlets are associated with simple and aggravated assault density. Methods: Cross-sectional design using aggregate data from 65 census block groups in a non-metropolitan college town, systematic social observation, and spatial modeling techniques. Results: We found limited effects of immediate environment, business practice, staff, and patron characteristics on simple assault density and no effect on aggravated assault density. Only two out of 17 characteristics were associated with simple assault density (i.e. nearby library and male

patrons). Conclusion: This is the first study to examine the association between several off-premise alcohol outlet characteristics and assault. Our findings suggest that where the off-premise outlets are located, how well the immediate environment is maintained, what types of beverages the outlets sell, who visits them, and who works there matter little in their association with violence. This suggests the importance of outlet density itself as a primary driver of any association with violence. Public policies aimed at reducing alcohol outlet density or clustering may be useful for reducing violence.

## Keywords

alcohol outlet characteristics; Geographic Information System; neighborhood/place; spatial analysis; Alcohol outlet density

## Introduction

This study aims to improve our understanding of the role that off-premise alcohol outlets play in community violence rates. Broadly defined, alcohol outlets are places that are licensed to sell alcohol beverages. Alcohol outlets are commonly disaggregated into on-premise (i.e. places that sell alcohol beverages that are meant for consumption while visiting the place, such as a bar or restaurant) and off-premise (i.e. places like liquor and convenience stores that sell alcohol beverages that are meant for consumption elsewhere).

This study examined whether characteristics of off-premise alcohol outlets are associated with assault density. Several criminological theories may be helpful in explaining this association.<sup>1</sup> First, it could be that the association between off-premise alcohol outlet characteristics and violence exists because some off-premise alcohol outlets may be located in socially disorganized neighborhoods, and thus the immediate environment in which the outlets are located may be characterized by social and physical disorder (e.g. litter, broken glass, graffiti, drug dealing, prostitution, etc.)<sup>1,4</sup>. This is especially important because if an alcohol outlet is littered with trash, for example, it may signal to potential offenders that in these "deviant places" social norms are ambiguous and that the owners of those establishments might not intervene when conflicts arise<sup>2</sup>. Alternatively, it could be that the association can be explained by the characteristics of people as they convergence in time and space in or around off-premise alcohol outlets<sup>3</sup>.

A growing body of empirical research has found an association between characteristics of bars and the risk of aggression<sup>5</sup>. For example, violence is more likely to occur in bars that are not kept clean<sup>10</sup>, that are frequented by young<sup>9</sup> unemployed<sup>11</sup> patrons, and that employ staff who respond aggressively when altercations occur<sup>5</sup>. Extended operating hours<sup>12</sup>, irresponsible serving practices and promoting overconsumption (e.g. very cheap drinks, happy hours)<sup>13</sup>, other business-related choices made by bar managers<sup>14</sup>, and even the interior layout of bars<sup>15</sup> are also associated with greater crime and violence in and around bars.

There are few studies that similarly examine the association between the characteristics of off-premise alcohol outlets and violence. In fact, Graham recently called for more research on this exact topic, asking explicitly in the title of her commentary, "Isn't it time we found out more about what the heck happens around American liquor stores?"<sup>16</sup>. The present study provides an initial attempt to address her question. We examine whether immediate environment, business practice, staff, and patron

characteristics of off-premise alcohol outlets are associated with violence. Specifically, to collect data on the immediate environment we used systematic social observations techniques to observe whether outlets were bordered by an alley, located on a main street or an intersection, located in a strip mall, and whether there was a park, a library, empty alcohol containers, or other evidence of drinking within two city blocks in either direction from the outlet. For business practice characteristics we determined whether outlets sold gas, wine, spirits, or single servings of beer. For staff and patron characteristics we observed age and gender of staff and patrons, ethnicity of staff members, and whether patrons generally drove or walked to the outlets.

Examining closely these off-premise alcohol outlet characteristics is important because grouping all alcohol outlets together to measure total alcohol outlet density or even the density of off-premise outlets could potentially obscure variation in outlet attributes that may be at greater risk of spawning violence and related social problems. Some off-premise alcohol outlets may serve as a social gathering spot, where alcohol is consumed in the course of social interaction, usually in an adjoining parking lot or alley. Other outlets may draw people to their location in the search for entertainment, relaxation, and "time out" opportunities<sup>17</sup>. Off-premise outlets with different characteristics may attract different clientele: some outlets may be popular among students and younger people, while others among professionals. More obviously, some outlets may attract a greater number of patrons and have a large volume of alcohol sales relative to others, quite possibly depending on location.

### Immediate environment characteristics

There are a number of characteristics of the immediate physical environment in which off-premise alcohol outlets are embedded that may be associated with violence: proximity of on-premise alcohol outlets to public transportation stations and other alcohol outlets<sup>18</sup>, the presence of physical and social disorder (e.g. presence of garbage, litter, or empty beer bottles in the street or gutter to indicate physical disorder, and adults loitering or drinking alcohol in public to indicate social disorder)<sup>1</sup>, the density of pro-social places (e.g. schools, churches, libraries, and recreational centers)<sup>19</sup>, and location of on-premise alcohol outlets (e.g. located on established commercial streets)<sup>6,18</sup>.

### Business practices characteristics

The operating procedures and business practices of alcohol outlets may explain why violence occurs in or around the outlets. For example, availability of single serve alcohol beverages in off-premise alcohol outlets has been shown to be related to violence rates within census block groups<sup>20</sup>, though other research found that density of off-premise stores that allow single sales was not<sup>19</sup>. In the context of bars, on the other hand, lower beverage prices and serving intoxicated patrons are associated with higher levels of alcohol consumption and harm<sup>21,22</sup>, while responsible business practices can reduce crime around the on-premise alcohol outlets<sup>13</sup>. Also in the context of on-premise alcohol outlets, restriction of bar drinking hours also has been shown to be followed by a decrease in homicides<sup>23</sup>, and an increase of even one hour in bar trading hours has been shown to be associated with an increase in violent crime<sup>12</sup>.

### Staff characteristics

Staff characteristics may also be associated with violence, as staff can have direct control over who buys and consumes alcohol. For example, older staff may be more likely to ask for identification during

the course of a transaction. Evidence shows that young bar employees tend to overestimate the age of patrons<sup>30</sup> and are much more likely to sell to underage patrons relative to older employees<sup>31</sup>. Female employees are more likely than male employees to sell alcohol beverages to underage patrons<sup>31</sup>. Prior research also showed that violent bars tend to be staffed by a higher male-female staff ratio<sup>9</sup>.

### Patron characteristics

Age and gender of outlet patrons are strong predictors of experiencing negative consequences of drinking. In the context of bars, young patrons are at highest risk for heavy drinking<sup>24</sup> and are more likely to be implicated in alcohol-related violence<sup>25</sup>. Males are more likely than females to drink heavily, to experience alcohol-related harm<sup>26</sup>, and to drink in public places<sup>27,28</sup>. Males tend to demonstrate more interpersonal aggression after drinking alcohol, especially when drinking spirits rather than beer<sup>29</sup>.

Most of these characteristics – immediate environment, business practices, staff, and patron – have been examined in the setting of bars (i.e. on-premise alcohol outlets). Little is known, however, about whether these characteristics operate similarly in their association with violence in the setting of off-premise alcohol outlets. This study is among the first to examine systematically the role played by a number of off-premise alcohol outlet characteristics in community violence rates.

## Methods

### Research site

Bloomington, Indiana, is a non-metropolitan college town in the Midwestern United States. It has a total area of 20 square miles. In 2010, the population was estimated to be 80 405<sup>32</sup>, with about 140 000 residents in the county. Bloomington is home to Indiana University, a large state university which hosts about 40 000 undergraduate and graduate students who play an important role in the life of the town. Bloomington is a typical non-metropolitan college town that has the usual drinking problems (e.g. binge drinking, underage drinking, transient personal relationships, etc.) associated with such places<sup>33-36</sup>.

As of spring 2011, the majority of licensed off-premise alcohol outlets in Bloomington were convenience stores (35%) followed by an equal number of liquor stores (25%) and grocery stores (25%), and other types of off-premise alcohol outlets (14%). All off-premise alcohol outlets were licensed to sell packaged beer in six-packs or larger (100%), and most of the outlets were licensed to sell wine (84%), spirits (53%), and single servings of beer (bottles or cans that are 40 oz. or smaller) (63%). Liquor stores were licensed to sell all of the different types of alcohol beverages. Grocery stores were licensed to sell beer and wine, and some grocery stores were licensed to also sell spirits and single servings of beer. Convenience stores were not licensed to sell spirits, although some of them were licensed to sell wine, or single servings of beer.

### Unit of analysis

The units of analysis for this study were the 65 census block groups that lie within the City of Bloomington boundaries. The block group is the smallest geographic entity for which the Census Bureau collects and publishes sample data. The population of these 65 block groups ranged from 393–

4588, with a mean population of 1268<sup>32</sup>. The size of these 65 block groups ranged from 0.07–5.2 square miles, with a mean of 0.76 square miles<sup>32</sup>.

## Measures

### Outcome variables

The outcome variable was assault density per square mile, disaggregated into simple and aggravated assaults per square mile to provide a more nuanced picture of the relationship between off-premise alcohol outlet characteristics and varying levels of harm. For example, aggravated assaults are typically accompanied by the use of a weapon and tend to result in severe or aggravated bodily injury, while simple assaults typically do not involve a weapon and the victims tend not to sustain serious injuries. Data on assaults were obtained from the Bloomington Police Department based on incidents that occurred during the two-year period between 1 January 2008 and 31 December 2009, and excluded domestic violence incidents. We standardized assault data by the total land area of each census block group (i.e. per square mile) rather than by the population of a census block group (i.e. per 1000 residents). If we standardized the data on assaults with a traditional population-based rate the resulting metric would take into account only the population that lives in each block group but fail to account that both victims and offenders move into and out of multiple block groups as they go about their daily activities, including purchasing alcoholic beverages, drinking, and becoming assault victims and offenders. Addresses of assaults were geocoded using ArcGIS software and aggregated to the block group level. Approximately 99% of the original assaults during this two-year period were geocoded successfully. This high rate of successful geocoding was obtained by carefully cleaning the address data and manually matching instances in which ArcGIS was unable to find a successful match. Personal familiarity of the authors with the research site helped in this case, and the process included selecting a random sample of geocoded addresses and visually and physically verifying the accuracy of geocodes.

### Main predictor variables

The main predictor variables were immediate environment, business practice, staff, and patron characteristics of all off-premise alcohol outlets in Bloomington. We created a social observation instrument to collect data on these characteristics. The instrument for this research project was approved by the Institutional Review Board of Indiana University. Survey development was informed by prior studies on on-premise alcohol outlets (e.g. bars)<sup>5, 6,8,19,27,28,37</sup> and by the systematic social observation instrument employed by the Project on Human Development in Chicago Neighborhoods<sup>1</sup>. We fielded the survey in two waves: in January 2011 and April 2011. These two periods were chosen purposely to gauge activity during a cold month and a warm month in Bloomington. Similarly, the outlets were purposely visited on Friday and Saturday nights from 8 p.m. until about 1 a.m.

To collect data on the immediate environment characteristics we observed whether off-premise alcohol outlets were bordered by an alley (that would allow a quick escape away from the public eye, or a place for public drinking), located on a main street or an intersection or located in a strip mall (which could bring more people to the area), and whether there was a park or a library (libraries are included as a measure of local public places where people gather for social interaction – like schools, churches, recreational centers, etc. – but which are not usually riskier than other public venues), empty alcohol containers, or other evidence of drinking within two city blocks in either direction from the

outlet (to indicate physical disorder). For business practice characteristics we observed whether outlets sold gas, wine, spirits, or single servings of beer. For staff and patron characteristics we observed age and gender of staff and patrons, ethnicity of staff members, and whether patrons generally drove or walked to the outlets. We estimated age and ethnicity based on observation only. In rare instances of variations in the age and gender of staff and patron characteristics in the two observation periods (e.g. majority male in January 2011, and majority female in April 2011), we returned to the off-premise alcohol outlets and conducted a third set of observations on those particular characteristics.

#### Control variables

We controlled for several potential confounders. Social disorganization was operationalized as an index consisting of four traditional measures of social disorganization at the block group level: ethnic heterogeneity, poverty, residential instability, and female-headed households. Total alcohol outlet density was measured as the number of bar, restaurant, and off-premise outlets per square mile in each block group, and transformed using the natural log. Addresses of the outlets were geocoded using ArcMap (with a 99% successful match) and aggregated to the block group level. As with assault data, we first cleaned the address data and manually matched instances in which ArcGIS was unable to find a successful match. We selected a random sample of geocoded addresses and visually and physically verified the accuracy of the geocodes. We also controlled for the proportion of the block group population that was African American and for population density, both of which were transformed using the natural log. Data on control variables were obtained from the U.S. Census Bureau and the Indiana Alcohol and Tobacco Commission.

#### Statistical analysis

We employed GeoDa software<sup>38</sup> and estimated spatially lagged regression models with linear regression coefficients to test for an association between immediate environment, business practice, staff, and patron characteristics and simple and aggravated assault density by obtaining block group-level scores for these characteristics. In terms of the main predictor variables (i.e. characteristics), block groups were coded as 0 if there were no off-premise alcohol outlets in a block group with a given characteristic, and 1 if there was at least one off-premise alcohol outlet with a given characteristic in a block group. Preliminary Ordinary Least Squares (OLS) models indicated spatial lag dependence for simple assault density models (and we subsequently controlled for it by adding a term [*Rho*] for it to the models) but not for aggravated assault density models.

## Results

Table 1 shows descriptive statistics for all outcome and predictor variables for the 65 Bloomington block groups. The values in the parentheses in the mean column show the mean for outcome variables and for each of the main predictor variables for Bloomington block groups that contained off-premise alcohol outlets. Assault density varied widely, with a mean of 62 simple and 17 aggravated assaults per square mile. Twenty percent of block groups contained an outlet neighboring an alley, and about one-third contained an outlet located on a main city street. Fourteen percent of block groups contained an outlet with empty alcohol containers found within two blocks, and 18% contained an outlet with other evidence of drinking within two blocks. About 20% of block groups contained an outlet that sold gas and one-third contained an outlet that sold single servings of beer in bottles or cans.

Table 1. Descriptive statistics for all outcome and predictor variables in Bloomington block groups (n = 65).

	Minimum	Maximum	Mean	Standard deviation
<b>Outcome variables</b>				
Aggravated assault density (2008–2009)	0.00	242.73	17.01 (30.44)	34.96
Simple assault density (2008–2009)	0.00	861.47	61.97 (116.69)	128.64
<b>Immediate environment characteristics</b>				
Alley	0.00	1.00	0.20 (0.50)	0.05
Main street	0.00	1.00	0.37 (0.92)	0.06
Strip mall	0.00	1.00	0.11 (0.27)	0.04
Nearby park	0.00	1.00	0.06 (0.15)	0.03
Nearby library	0.00	1.00	0.03 (0.08)	0.02
Empty alcohol containers	0.00	1.00	0.14 (0.35)	0.04
Evidence of drinking	0.00	1.00	0.18 (0.46)	0.05
<b>Business practices characteristics</b>				
Sell gas	0.00	1.00	0.18 (0.46)	0.05
Sell wine	0.00	1.00	0.35 (0.88)	0.06
Sell spirits	0.00	1.00	0.26 (0.65)	0.05
Sell single beer	0.00	1.00	0.34 (0.85)	0.06
<b>Staff characteristics</b>				
In their 20s	0.00	1.00	0.23 (0.58)	0.05
Mostly male	0.00	1.00	0.34 (0.85)	0.06
Mostly non-White ethnicity	0.00	1.00	0.18 (0.46)	0.05
<b>Patron characteristics</b>				
In their 20s	0.00	1.00	0.28 (0.69)	0.06
Mostly male	0.00	1.00	0.28 (0.69)	0.06
Mostly walk to outlet	0.00	1.00	0.06 (0.15)	0.03
<b>Control variables</b>				
Social disorganization index	-4.67	6.51	0.04	2.76
Total outlet density	0.00	247.19	13.41	37.50
% African-American	0.00	0.73	0.16	0.18
Population density	106.68	31 071.27	4243.78	4699.86

The values in the parentheses in the mean column show the mean for each of the major predictor variables for 26 Bloomington block groups that contained off-premise alcohol outlets, omitting the remaining 39 block groups that had no off-premise alcohol outlets.

Tables 2–5 show the results of models that test groups of venue characteristics separately. We do this to provide consistency between our research and prior research. We also do this in consideration of our relatively small sample size and a large number of predictor variables. Thus, Table 2 shows the results of models that tested for an association between immediate environment characteristics of off-premise alcohol outlets (i.e. location on a main street or in a strip mall or on an alley, within two blocks of a park or library, empty alcohol containers or other evidence of drinking within two blocks) and



simple and aggravated assault density net of control variables. Model 1 is a spatial regression model for simple assault density. Results of Model 1 suggest that out of seven immediate environment characteristics only the characteristic that measured whether off-premise alcohol outlets were near a library was significantly associated with simple assault density ( $B = -2.02, p = 0.01$ ). Total outlet density was positively and significantly associated with simple assault density. The model explained 65% of the variance in simple assault density. Model 2 in Table 2 shows the results for aggravated assault density. The OLS estimator was used here because unlike in the first model there was no spatial autocorrelation for aggravated assault density. Results of Model 2 suggest that, net of the control variables, none of the immediate environment characteristics were significantly associated with aggravated assault density. The association between having an alley and aggravated assault was not significant at  $p < 0.05$ , though the direction of the relationship and the  $p$ -value ( $B = 0.49, p = 0.08$ ), together with a relatively small sample size and a fairly large number of predictor variables, suggest this association may warrant further investigation.

Table 2. Simple and aggravated assault density (2008–2009) regressed on presence of immediate environment characteristics and control variables for Bloomington block groups (n = 65).

	Model 1: Simple assault			Model 2: Aggravated assault		
	B	SE	p	B	SE	p
Immediate environment						
Alley	0.371	0.414	0.370	0.867	0.485	0.080
Main street	0.479	0.439	0.274	0.238	0.511	0.641
Strip mall	-0.359	0.494	0.467	-0.440	0.579	0.451
Nearby park	0.656	0.648	0.311	1.109	0.754	0.147
Nearby library	-2.020	0.823	0.014	-1.177	0.966	0.228
Empty alcohol containers	0.751	0.732	0.305	1.075	0.857	0.215
Evidence of drinking	-0.441	0.713	0.536	-0.707	0.836	0.402
Control variables						
Rho – simple assault density	0.488	0.122	0.000	–	–	–
Ln Total outlet density	0.311	0.144	0.031	0.147	0.166	0.384
Social disorganization	0.031	0.059	0.600	0.091	0.069	0.192
Ln Population density	0.442	0.140	0.001	0.265	0.161	0.106
Ln % African American	1.481	0.958	0.122	1.016	1.122	0.370
Constant	-2.843	1.106	0.010	-0.861	1.289	0.507
R <sup>2</sup>		0.65		0.45		
Akaike info criterion		216.139		218.339		
Breusch-Pagan		17.200 (p = 0.102)		13.188 (p = 0.281)		
Standard error		1.019		1.195		

Ln = natural log transformation.

Table 3. Simple and aggravated assault density (2008–2009) regressed on presence of business practices characteristics and control variables for Bloomington block groups (n = 65).

	Model 1: Simple assault			Model 2: Aggravated assault		
	B	SE	p	B	SE	p
Business practices						
Sell gas	0.270	0.431	0.531	-0.308	0.494	0.536
Sell wine	-0.156	0.620	0.801	0.257	0.717	0.721
Sell spirits	0.683	0.538	0.205	0.605	0.623	0.336

Sell single beer	-0.205	0.577	0.723	-0.050	0.668	0.940
Control variables						
Rho – simple assault density	0.516	0.123	0.000	–	–	–
Ln Total outlet density	0.349	0.150	0.020	0.194	0.171	0.260
Social disorganization	0.030	0.062	0.621	0.106	0.071	0.143
Ln Population density	0.469	0.147	0.001	0.301	0.166	0.076
Ln % African American	1.571	1.020	0.124	0.980	1.181	0.410
Constant	-3.083	1.157	0.008	-1.114	1.334	0.407
R <sup>2</sup>		0.61			0.37	
Akaike info criterion		218.127			221.79	
Breusch-Pagan		15.010 (p = 0.059)			13.653 (p = 0.091)	
Standard error		1.080			1.250	

Ln = natural log transformation.

Table 4. Simple and aggravated assault density (2008–2009) regressed on presence of staff characteristics and control variables for Bloomington block groups (n = 65).

	Model 1: Simple assault			Model 2: Aggravated assault		
	B	SE	p	B	SE	p
Staff characteristics						
In their 20s	-0.320	0.484	0.508	-0.050	0.562	0.930
Mostly male	0.467	0.453	0.303	0.182	0.520	0.727
Mostly non-White ethnicity	0.170	0.535	0.751	0.347	0.618	0.577
Control variables						
Rho – simple assault density	0.548	0.120	0.000	–	–	–
Ln Total outlet density	0.339	0.143	0.018	0.236	0.164	0.154
Social disorganization	0.022	0.063	0.732	0.114	0.073	0.121
Ln Population density	0.454	0.147	0.002	0.293	0.167	0.084
Ln % African American	1.524	1.027	0.138	1.215	1.193	0.313
Constant	-3.054	1.150	0.008	-1.079	1.332	0.421

R <sup>2</sup>		0.60			0.35	
Akaike info criterion		217.031			221.768	
Breusch-Pagan		15.586 (p = 0.029)			10.598 (p = 0.233)	
Standard error		1.083			1.258	

Ln = natural log transformation.

Table 5. Simple and aggravated assault density (2008–2009) regressed on presence of patron characteristics and control variables for Bloomington block groups (n = 65).

	Model 1: Simple assault			Model 2: Aggravated assault		
	B	SE	p	B	SE	p
Patron characteristics						
In their 20s	-0.551	0.451	0.223	-0.351	0.546	0.523
Mostly male	1.397	0.449	0.002	0.981	0.538	0.074
Mostly walk to outlet	0.545	0.558	0.327	0.834	0.675	0.222
Control variables						
Rho – simple assault density	0.602	0.112	0.000	–	–	–
Ln Total outlet density	0.238	0.118	0.044	0.178	0.139	0.207
Social disorganization	0.044	0.057	0.440	0.125	0.069	0.073
Ln Population density	0.379	0.134	0.005	0.227	0.159	0.159
Ln % African American	1.641	0.929	0.077	1.306	1.126	0.251
Constant	-2.653	1.059	0.012	-0.611	1.278	0.635
R <sup>2</sup>		0.67			0.40	
Akaike info criterion		207.015			216.248	
Breusch-Pagan		15.016 (p = 0.036)			13.734 (p = 0.056)	
Standard error		0.994			1.206	

Ln = natural log transformation.

Table 3 shows results of the models that tested for an association between business practice characteristics (i.e. if it sold gas, wine, spirits, or single containers of beer) and simple and aggravated assault density. Model 1 shows that none of the business practice characteristics were significantly associated with simple assault density. Total outlet density was positively and significantly associated with simple assault density. Model 2 shows that none of the business practice characteristics were significantly associated with aggravated assault density, net of control variables.

Table 4 provides results of the models that tested for an association between staff characteristics of off-premise alcohol outlets (i.e. mostly in their 20s, mostly male, mostly non-White) and simple and aggravated assault density. Model 1 in Table 4 shows that none of the staff characteristics were significantly associated with simple assault density. As before, total outlet density was positively and significantly associated with simple assault density, net of control and staff characteristics variables. Model 2 shows that none of the staff characteristics were significantly associated with aggravated assault density, net of control variables.

Table 5 shows results of the models that tested for an association between patron characteristics of off-premise alcohol outlets (i.e. mostly in their 20s, mostly male, mostly non-White) and simple and aggravated assault density. Model 1 in Table 5 shows that only one of the patron characteristics, mostly male patrons, was significantly associated with simple assault density ( $B = 1.40$ ,  $p < 0.01$ ). Total outlet density was positively and significantly associated with simple assault density. Model 2 shows that none of the patron characteristics were significantly associated with aggravated assault density net of control variables. The association between mostly male patrons and aggravated assault was not significant at  $p < 0.05$ , though the direction of the relationship and the  $p$ -value ( $B = 0.98$ ,  $p = 0.07$ ), together with a relatively small sample size and a fairly large number of predictor variables, suggest this association may warrant further investigation.

### Additional analyses

For each type of general characteristic (i.e. immediate environment, business practices, staff, and patron) we also used factor analysis to determine if the individual variables measuring different aspects of that characteristic exhibited latent factor structure and, if so, if the factor was associated with simple and aggravated assaults. Results suggested that immediate environment characteristics loaded on two factors. The first included: (a) main street, (b) strip mall, (c) empty alcohol containers, and (d) evidence of drinking, with Cronbach's  $\alpha$  of 0.784. This factor was not significantly associated with simple or aggravated assault density when we re-estimated the spatially lagged and OLS models. The second factor included: (a) alley, (b) park, and (c) library. This factor had very poor internal consistency, with a Cronbach's  $\alpha$  of only 0.470, and so we did not re-estimate the models using this factor.

The four business practice variables all loaded on one factor (Cronbach's  $\alpha = 0.885$ ), as did the three staff characteristics (Cronbach's  $\alpha = 0.844$ ) and the three patron characteristics (Cronbach's  $\alpha = 0.721$ ). When we re-estimated each of the models to include these factors, only one of the six associations with simple and aggravated assaults was significant. Specifically, the patron characteristics factor was positively and significantly associated with simple assault density ( $p = 0.01$ ). All three variables positively loaded on this factor, so this result suggests that areas that possess off-premise outlets where patrons are mostly male, mostly in their 20s, and mostly walk to the outlet may experience

greater levels of simple assault. However, the male variable was already associated with simple assault in the original model and it loaded most strongly on this factor. Thus, the result is probably reflecting the influence of this male variable. For example, when we created a new patron factor with the other two variables – patrons mostly in their 20s and patrons mostly walk to the outlet – the association between this factor and simple assault density was not statistically significant ( $p = 0.11$ ).

## Discussion

Ours is the first study that systematically measures and examines the association between several different types of off-premise alcohol outlet characteristics and violence. Controlling for other factors, we found that two out of 17 immediate environment, business practice, staff, and patron characteristics of off-premise alcohol outlets were associated with simple, but not with aggravated, assault density in our sample of block groups from a non-metropolitan college town. Given the 34 significance tests carried out, this is about the number of significant associations we would expect by chance. Further, when we estimated these same models but with a control for prior simple and aggravated assault rates, the two significant associations we did find here were no longer significant.

Our findings on these characteristics are different from prior empirical studies that found a positive association between violence and physical environment characteristics<sup>1,19</sup>, such as density of prosocial places (e.g. libraries)<sup>19</sup> and trash or litter in neighborhood blocks<sup>1</sup>. We found that proximity of off-premise alcohol outlets to libraries (as a type of prosocial place) served as a buffer against simple assaults. Additionally, when comparing our findings with the limited number of studies that examined characteristics of off-premise alcohol outlets, our findings on business practice characteristics (e.g. sale of single containers of beers) diverge from prior research that found an association between shelf space devoted to single serve alcohol beverages and violence across San Bernardino census block groups<sup>20</sup>, and an association between single serve alcohol beverages ban and violence<sup>19</sup>. Our study suggests that single servings of alcohol are not associated with either simple or aggravated assaults in our sample of block groups in a non-metropolitan college town. Additionally, our findings also diverge from prior research that identified a set of possibly risky on-premise alcohol outlet characteristics such as age and gender of staff<sup>25,31</sup>, and age and of patrons in bars<sup>25,26</sup>. It is interesting to note that we also found that off-premise alcohol outlets that are frequented mostly by male patrons were likely to be attractors of simple assaults in our sample of non-metropolitan block groups.

There are a few possible reasons for these differences. First, the research site for this study is a non-metropolitan college town, while prior studies used data from large cities like Chicago and Washington, DC. Bloomington is home to about 40 000 students who engage in the typical college-age drinking patterns (e.g. binge drinking, weekend house parties, drinking before going out, etc.) that may influence crime and violence in different ways than those found in large urban areas with different population characteristics. For example, in a non-metropolitan college town like Bloomington, a large proportion of the consumption of alcohol beverages may be limited to consumption in one's or a friend's home for both financial and legal (e.g. underage) reasons. Moreover, as a typical non-metropolitan college town characterized by underage drinking, off-premise outlet owners or managers may be especially sensitive to what is happening immediately around the outlet (e.g. whether there are cars parked outside, loitering, who comes in to the outlet) and provide an extra layer of surveillance that may not exist in an urban setting.

Finally, only a handful of Bloomington block groups contain at least one off-premise alcohol outlet in a block group whose patrons normally walk to the outlet. An important difference in the findings may have to do with the use of off-premise alcohol outlets in urban areas as *de facto* taverns, types of social gathering spots to which most customers probably walk. Relative to densely populated urban areas with substantially greater foot traffic, in a non-metropolitan setting like Bloomington where a car culture is stronger and where most patrons were observed driving to the outlets, the utility of the off-premise alcohol outlet may only be in the availability of alcohol beverages rather than in the availability of a social gathering spot in which alcohol can be consumed.

## Limitations

There are a few limitations to consider when interpreting our results. First, because Bloomington contains 65 block groups the statistical power of the study was limited. Second, the outcome variable (i.e. assault density) was based on incidents of assaults reported to the Bloomington Police Department. As such, it is a conservative estimate of violence, as it does not include instances of violence that are unreported and not known to the police. However, the data were recorded and provided by one police department and past research has found that reporting and recording procedures for violent crimes tend to be similar across units of analysis (Baumer 2002). Second, our study is among the first to examine systematically the immediate environment, business practices, staff, and patron characteristics of off-premise alcohol outlets. Therefore, it is possible that measurement error related to these characteristics may play a role in our largely null findings. Nevertheless, our systematic social observation survey measures were informed by prior studies on bars<sup>5,6,8,19,27,28,37</sup> and by the systematic social observation instrument employed by the Project on Human Development in Chicago Neighborhoods<sup>1</sup>. A similar limitation pertains to the collection and analyses of only those characteristics that were readily observable by the authors. Thus, some characteristics that could be important, such as how long the store has existed at the present location, annual volume of alcohol beverage sales, percent of annual spirits sales relative to total alcohol annual sales, employee turnover, regular patrons, etc., went unmeasured in this study. Many of these variables are unavailable from most US markets, as they are considered proprietary data. In fact, we fielded a separate survey of off-premise outlet owners and managers in which we asked several questions related to these items. As expected, the response rate was so low as to make the data gathered from this supplemental survey unreliable for use here.

A final key limitation is associated with the decision to collect off-premise outlet characteristics and aggregate those characteristics to the block group. In the future, it may be informative to use: (1) the outlet itself as the unit of analysis, (2) measure floor space or shelf space given to different beverage types as a proxy measure for alcohol sales, (3) a radial buffer around the actual off-premise outlets to examine the extent to which these off-premise outlet characteristics exert influence on simple and aggravated assaults occurring in very close proximity to the outlets, or (4) proximity analysis and spatial cluster detection to search for clusters of off-premise outlets with certain characteristics and clusters of violent events to see if those sets of clusters are spatially associated and to identify the distance over which such outlet clusters exert their influence<sup>39</sup>.

## Conclusion

Our study suggests that "what the heck happens around American liquor stores" may not matter too much when it comes to their association with violence, at least at the block group level and outside of metropolitan areas. Unlike the careful work that has shown the importance of bar characteristics when it comes to increased risk of violence, using data from a non-metropolitan college town our findings suggest limited support for the argument that where the off-premise outlets are located, how well the immediate environment is maintained, what types of beverages the outlets sell, who visits them, and who works there matters in their association with violence. While this first systematic study of off-premise alcohol outlet characteristics and violence presents an initial glimpse, it also suggests other areas of future research. In the end, the question of "What the heck goes on around the American liquor store?" remains to be answered.

## Declaration of interest

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