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A Momentary Exposures Analysis of Proximity to Alcohol Outlets and Risk for Assault

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Abstract

Aims—This study estimated, with high spatial and temporal specificity, individuals' risk of being assaulted relative to their momentary proximity to alcohol outlets during daily activities.

Design—Case-control study.

Setting—Philadelphia, Pennsylvania, USA.

Participants—Cases were 194 non-gun assault victims and 135 gun assault victims aged between 10 and 24 years. Age-matched controls (n = 274) were selected using random-digit dialing.

Measurements—Participants described minute-by-minute movements (i.e. activity paths) over the course of the day of the assault (cases) or a recent randomly selected day within three days of interview (controls). The dependent measure was being an assault case compared with a non-assault control. The main independent measures were participants' momentary proximity to alcohol outlets. The units of analysis were 10-minute segments beginning at 4 a.m.

Findings—Proximity to bars and restaurants was associated with decreased odds of non-gun assault before 1pm (e.g. 7am to 9:59 a.m.: OR = 0.78; 95% CI: 0.64, 0.94; p = 0.008), and increased odds after 7pm (e.g. 1am to 3:59am: OR = 1.96; 95% CI: 1.24, 3.09; p = 0.004). Proximity to beer stores was associated with increased odds before 1pm (e.g. 7am to 9:59am: OR = 2.34; 95% CI: 1.58, 3.46; p = < 0.001) and from 4pm to 6:59pm (OR = 1.50; 95% CI: 1.14, 1.96; p = 0.004), but decreased odds after 7pm (e.g. 1am to 3:59am: OR = 0.28; 95% CI: 0.12, 0.63; p = 0.002). Proximity to alcohol outlets was mostly unrelated to risks for gun assault.

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Conflicts of Interest: None

Conclusions—Individuals in areas with greater densities of bars and restaurants and beer stores appear to be increased risk for non-gun assault at times when these outlets are likely to be most heavily patronized.

Keywords

Alcohol outlets; outlet density; assault; violence; individual; gun; firearm; case-control

Introduction

Ecological studies suggest assaults occur with greater frequency in areas with greater concentrations of alcohol outlets (1, 2). Evidence is available across geographic locations, at different spatial scales, and in both cross-sectional and longitudinal studies (3-7), and results are consistent with theories regarding the physical availability of alcohol, its consumption, and related problems within populations (8-10). Collectively, these studies support the strong claim that reducing aggregate densities of alcohol outlets will reduce aggregate incidence of assault in populations (11).

Whether these ecological relationships apply to individuals is unclear. Very few studies assess individuals' risks of being assaulted relative to local densities of alcohol outlets (i.e. their “physical exposure” to alcohol outlets). Those that are available provide mixed results (12-15). There are clear methodological and theoretical explanations for these inconclusive findings. First, imprecise assessment of physical exposure (e.g. counts of outlets within distance buffers around participants' homes) may lead to measurement error. Second, routine activities theory (16) suggests most criminal acts require convergence in space and time of *motivated offenders*, *suitable targets* and *the absence of capable guardians* (16). Because human activity is constrained by biological and social factors, relative densities of offenders, victims, and guardians are likely to vary over time at specific places (17). Thus, individuals' risk of being assaulted relative to local alcohol outlet density may not be uniform throughout the day. To address these key methodological and theoretical limitations, this study assesses whether individuals are at increased risk of being assaulted when they are physically located in areas with more alcohol outlets, and whether risks differ by time of day.

Individual-Level Studies

Three systematic reviews (1, 2, 18) identify very few individual-level studies that relate alcohol outlets to assault risk. Two studies (13, 14) describe cross-sectional analyses of survey data in which physical exposure to alcohol outlets was calculated by combining the spatial locations of participants' homes with spatial locations of alcohol outlets. Using data from a sample of residents aged 18 to 65 from Los Angeles and Southern Louisiana, Theall et al. (13) calculated the count of outlets within a 1-mile buffer of respondents' homes and the distance to the nearest outlet. Experiencing violence (defined as hearing or witnessing violence or being assaulted) was positively related to off-premise outlet counts, but all cause injury risk was not. Similarly, using data from a telephone survey of residents aged ≥ 18 years in two states, Treno et al. (14) found counts of both on-premise and off-premise outlets within a 2km buffer around respondents' residences were related to all-cause injury risk.

Other studies have used similar approaches to relate alcohol outlet density to outcomes other than assault, including alcohol-related aggression (19), driving after drinking (20), alcohol consumption (e.g. 21-23), and mortality (24). For example, in a multi-level cross-sectional analysis of students from eight colleges, Weitzman et al. (25) found that on-campus residence at a college with greater proximity to alcohol outlets was associated with more problems related to students' drinking. Nevertheless, these studies of individuals may be affected by measurement error. Because people routinely move through space over time, static measures such as the number of alcohol outlets around a person's home may not reflect their actual physical exposure to outlets (26, 27).

Advances in Study Methods

In recent years, there have been substantial advances in methods used to assess physical exposure to neighborhood features in the areas where study participants spend time (known as "activity spaces") (28). Using survey methods (29-35) or GPS tracking (36, 37) to approximate participants' routine movements, physical exposures are measured within polygons that capture each persons' unique activity space. This approach provides greater spatial specificity compared to measures based on home location alone (36, 37).

Two individual-level studies from our group have used a variant of activity spaces ("activity paths") to examine relationships between assault risks and physical exposure to alcohol outlets with high spatial *and* temporal specificity. The first (12) was a case-control study of adults comparing the neighborhoods in which cases were assaulted with a gun to the neighborhoods in which controls were located at the same time of day. Aggregated over the course of the day, risks for gun violence were higher when participants were located in areas with more off-premise outlets. The second (15) combined interviewer prompts with live electronic data collection using a Geographic Information System (GIS) to capture the activity paths of adolescents and young adults over a single day. The study was both a case-control and a case-crossover study of non-gun and gun assaults, comparing both momentary proximity to alcohol outlets and other neighborhood features between cases and controls (case-control) and within cases (case-crossover). Aggregated over the course of the day, there was no detectable association between assault risk and momentary proximity to alcohol outlets (i.e., combining on-premise, off-premise outlets, as well as other neighborhood features in a factor scale).

Study Aims

The aim of this study was to assess whether and how physical exposure to alcohol outlets (time spent nearby alcohol outlets) is related to assault risk for individuals, and whether relationships differed across times of day. To do so we conducted a secondary analysis of data from our GIS-assisted case-control study (15). Guided by routine activities theory, we hypothesized that individuals' risk of being assaulted would be greatest when they were in greater proximity to alcohol outlets at times when the outlets were most heavily patronized and were would be most likely to attract or generate motivated offenders (e.g. at night for bars and restaurants) (38).

Methods

Study Design

The Space-Time Adolescent Risk Study (STARS) was a case-control study conducted among young people aged 10 to 24 in Philadelphia, Pennsylvania.

Study Sample

Eligible cases were patients aged 10 to 24 presenting to the Emergency Departments of the Hospital of the University of Pennsylvania or the Children's Hospital of Philadelphia for treatment of a non-gun assault (n = 194) or gun assault (n = 135) injury. Eligible non-gun assaults were patients admitted for treatment of a traumatic injury which they self-reported was intentionally inflicted by another person with or without a non-gun weapon; gun assaults were patients admitted for treatment of a traumatic injury which they self-reported was inflicted by another person with a gun. Age-matched controls (n = 274) were selected using random digit dialing among residents of the 12 ZIP code catchment area for the hospitals (response rate: 57.1%). The required sample size for this study was calculated for analyses examining aggregate relationships between assault risk and physical exposure to all alcohol outlets over participants' entire days. Because this secondary analysis disaggregates by time of day and alcohol outlet type, results may be biased towards null.

Data Collection

The materials and methods for STARS have been described in detail previously (15). Briefly, a trained interviewer administered a GIS-assisted survey to cases and controls in the hospital, at the research office, or in participants' homes. The survey assessed demographics, general health, and perceptions of their residential neighborhood. Participants chronologically described their minute-by-minute locations and activities for the day of the assault (cases) or a randomly selected day from among the three days prior to the interview (controls). Interviewers sat side-by-side with participants while looking at a shared computer screen. Data were entered into a custom GIS-based software package that collected the latitude and longitude coordinates and time of participants' movements. For each point in time at which their activities or location changed, participants described their current activities (free text), whether an adult family member was present (dichotomous), whether a peer was present (dichotomous), mode of transport (on foot, in vehicle, or other), and whether they were in possession of alcohol (dichotomous). We also identified weekend hours (from sunset on Friday to 11:59pm Sunday) and times when participants were at home.

Measures of Proximity to Alcohol Outlets

For the current study, we divided each participant's one-day data into ten-minute segments beginning at 4:00am (e.g., 4:00 to 4:09am). The latitude and longitude at the start of each segment described participants' geographic locations for the following ten minutes (Figure 1a). In total, there were 10,808 segments for the non-gun cases, 8,989 segments for the gun assault cases, and 24,077 segments for the controls. We then estimated spatially and temporally specific proximity to alcohol outlets and other neighborhood features for each segment.

The main independent variable was proximity to alcohol outlets. The Pennsylvania Liquor Control Board issues three classes of retail alcohol license relevant to this study. Restaurant Licenses permit beer, wine and liquor sales for on-premise consumption (hereafter, “bars and restaurants”). Eating Place licenses permit the sale of beer for on-premise consumption with a meal and for off-premise consumption provided sales are not in single containers (“beer stores”). Off-premise sales of wine and liquor are limited to government monopoly off-premise outlets located throughout the state (“liquor stores”). To construct raster layers describing continuous densities of the city's 427 bars and restaurants, 1056 beer stores, and 634 liquor stores, we spatially smoothed these data using kernel density estimation (Figure 1b, 1c and 1d). We then spatially joined these raster data to the points representing the beginning of each ten-minute segment. Given the high spatial precision of our data, we considered this a better approach than taking values aggregated within arbitrary administrative units (e.g. Census block groups). The three resulting variables describing proximity to alcohol outlets were heavily positively skewed ($0.89 \leq$ skewness ≤ 6.25). We calculated their natural logarithm to reduce the likelihood that the extreme high values would inordinately influence results.

Other Independent Measures

We collected key demographic characteristics and behavioral indicators that could be related both to participants' physical exposure to alcohol outlets and to risk for assault, and may therefore confound relationships (e.g. whether they had ever carried a gun).

Neighborhood characteristics may also be related both to assault risk and to alcohol outlet density. Data to describe 26 neighborhood characteristics were obtained from four sources: Census 2010 data described demographic characteristics for the local resident population within Census block groups; tax parcel data from Philadelphia described land use; the 2008 Southeastern Pennsylvania Household Survey (39) described local population characteristics; and participant responses described perceptions of local areas. Similar to the approach for alcohol outlets, these spatially referenced data were converted to raster layers using kernel density estimation for point data and inverse distance weighting based on the centroids of polygon data. In a factor analysis, 23 characteristics loaded onto five factors: (i) neighborhood connectedness, (ii) income, (iii) vacancy, vandalism, violence, (iv) emergency services, and (v) race/ethnicity. The composition of these scales is described in a previous paper (15). The three variables not captured in the factor scales but included as independent variables in the current analysis were commercial land use (to account for the possibility that alcohol outlets mark for physical exposure to retail areas), population density (possibly representing guardianship) and the density of middle/high schools (also representing guardianship).

Statistical Analyses

The units of analysis were the ten-minute segments nested within eight uniformly defined three-hour time phases (e.g. 4am to 6:59am). Two conditional logistic regression models estimated the (i) overall odds of non-gun assault compared to controls, or (ii) the overall odds of gun assault compared to controls. Both models included a fixed effect for the time phase, such that exposures for cases were compared to controls within the same three-hour period. This approach partially controlled for the possibility that segments were autocorrelated within participants. All independent variables describing physical exposure to alcohol outlets, neighborhood conditions, and other behavioral and temporal characteristics were included in both models. Analyses included all segments for the controls, but only the final observation before the assault for cases. Gun assault cases were dropped from the non-gun assault model, and non-gun cases were dropped from the gun assault model. This procedure produced an overall estimate (i.e. aggregated over the whole day) of the odds ratio and 95% confidence interval for non-gun and gun assault per unit increase in physical exposure to alcohol outlets.

We then conducted separate logistic regression models within each time phase, dropping cases whose assault event occurred outside the three-hour window. We thus produced time-of-day specific estimates for the relationships between proximity to alcohol outlets and the odds of assault. Given that proximity to alcohol outlets was calculated from the kernel density estimate then log transformed, individual parameter estimates are not easily interpretable, but the direction of the association and comparison within outlet types across day phases is informative.

Spatial data management was performed using ArcGIS v10.1 (40). Parameters for the regression models were estimated using Stata v14 (41).

Specification Tests

We conducted several specification tests to reduce the likelihood that observed relationships were artefacts of model construction. First, after comparing individual-level participant characteristics for cases vs. controls using Students t-test for continuous measures and Chi-square tests for categorical measures, we adjusted our main effects analyses for variables where the groups differed systematically. Second, a correlation matrix for the logged alcohol outlet variables demonstrates that these measures were moderately collinear (Table 1). After systematically removing one and then two of the alcohol outlet variables, we repeated the conditional logistic regression and the logistic regression models. Finally, we then tested alternate time-phases (e.g., two-hour periods, four-hour periods), and further stratified the analyses by age ($<$ or ≥ 18).

Results

Participant characteristics are presented in Table 2. Non-gun and gun cases were systematically different compared to controls based on age, sex, race/ethnicity, and some indicators of risk (e.g. 28.2% gun assault cases had ever carried a gun vs. 16.0% controls).

Counts of non-gun and gun assaults within time phases are presented in Table 3. The low incidence (≤ 2 cases) of gun assaults during the 7am to 10:59am phase and of both assault types during the 4am to 6:59am phase prevented estimation of relationships during these periods. Results of the conditional logistic regression models are presented in Table 4.

Greater liquor store density was related to increased odds of non-gun assault. There was no relationship for bars and restaurants or for beer stores. Being in an area with lower neighborhood connectedness, higher income, and more vacancy, vandalism, and violence was associated with increased odds of non-gun assault. Being on foot, away from home, possessing alcohol, and being younger were also related to increased odds. By contrast, the gun assault analysis shows a negative relationship with greater proximity to liquor stores. There was no association for bars and restaurants or beer stores.

Figure 2 shows the odds ratio and 95% confidence intervals for the associations between non-gun and gun assaults and densities of bars and restaurants, beer stores, and liquor stores (adjusted for the same covariates as the overall analyses). Results are presented within the three-hour time strata. From 7am to 12:59pm, greater proximity to bars was associated with decreased odds of non-gun assault. From 1pm to 6:59pm there was no association, but from 7pm to 12:59am, relationships were positive. Point estimates increase steadily throughout the day. By comparison, the trend for the odds of non-gun assault related to proximity to beer stores was approximately reversed. Relationships were positive in the morning and early afternoon, mixed between 1pm and 6:59pm, and negative thereafter. Proximity to liquor stores was positively related to non-gun assault only between 10pm and 12:59am. As in the overall analysis, proximity to alcohol outlets was mostly unrelated to gun assaults within time strata, with a few isolated exceptions (e.g. relationships were positive for bars and restaurants between 4pm and 6:59pm).

Results of the specification tests were substantively similar to the results of the main effects models reported here. Adjusting for the individual-level variables on which cases were systematically different from controls (Table 2) did not materially affect results.

Discussion

This study provides evidence that increased risk for non-gun assault is specific to the time and place of physical exposure to alcohol outlets for adolescents and young adults, and that relationships differ by time of day. Being in a neighborhood with a greater concentration of bars and restaurants was associated with increased assault risk in evening and nighttime hours (after 7pm), peaking between 1am and 3:59am; whereas being in a neighborhood with greater concentration of beer stores was associated with increased assault risk during daytime hours (7am to 12:59pm, and 4pm to 6:59pm). Proximity to alcohol outlets was mostly unrelated to risks for gun assaults.

The findings for non-gun assaults are consistent with our expectations based on routine activities theory (16). The times of day at which study participants (representing *suitable targets*) were exposed to more bars and restaurants and were at greatest risk for assault corresponds with the peak times for these establishments (i.e. most likely their busiest times and patron intoxication at its greatest). Alcohol consumption is related to increased aggression (42), and people who exhibit more aggression and hostility prefer to drink in bars (19, 43); therefore, it is possible that during later hours, bars and restaurants may either generate violence, attract people more likely to perpetrate violence, or both (44, 45). Either mechanism will lead to the presence of more *motivated offenders* in the local area. Finally, there may be fewer *capable guardians* later at night (16, 46). Thus, the three theoretical conditions for producing increased risks for assault are met.

Similarly, beer stores are more active during the day, typically operating between 9am and approximately 7pm to 10pm in Philadelphia (17). Meetings between suitable targets and motivated offenders proximate to these outlets are therefore more likely during daytime hours. The reduced odds of assault while near bars in the morning and beer stores at night may be due to fewer motivated offenders near these establishments when they are closed (12). The potentially attractive or generative effects of government liquor stores for motivated offenders may be mitigated by real or perceived increased guardianship. The mostly null findings for gun assaults suggest that proximity to alcohol outlets is not a major contributor to these comparatively rare and potentially more serious events among adolescents and young adults.

Our results may explain the mixed findings reported in previous individual-level studies, including our own. Prior survey studies used relatively imprecise measures of physical exposure to alcohol outlets (13, 14). Our own previous analyses estimated overall relationships between momentary proximity to outlets and assault risk aggregated across times of day, or included alcohol outlets in a composite measure with additional neighborhood variables (12, 15). We also previously used non-comparable samples (adults vs. adolescents and young adults). In contrast, the approach we took to the current analysis enabled us to assess relationships with high spatial and temporal specificity across different times of day. Disentangling relationships between individuals who move through time and space and outlets that attract or generate different risks over time may require such an approach. Comparing results of our overall analyses with results of our stratified analyses clearly illustrates this point (Figure 2). Parameter estimates for the conditional logistic regression models aggregated out the distinct signatures evident within the time strata. In that light, results of individual-level studies that do not provide this high degree of precision should be interpreted very cautiously.

Despite the many strengths of our design, there are some limitations. First, selecting non-gun and gun assault cases within Philadelphia produced a sample of mostly black young men from lower income areas. We were not able to examine relationships for women, older people, or for people from other racial/ethnic groups. Neighborhood exposures for these groups or for people from higher income areas may be associated with assault risk in different ways. Second, available alcohol outlet data enabled us to disaggregate alcohol outlets into only three types. Bars and restaurants were considered as like units, but activities and alcohol use in these establishments differ (38); relationships to assault risk are likely to differ. Third, cases and controls may not be exchangeable on all characteristics related to assault risk. Adjusting for individual-level characteristics that we knew differed between cases and controls did not materially affect our results, but some confounding from unmeasured variables may have occurred. Finally, perpetrating an assault is a very strong predictor of being assaulted (47). If offenders were systematically more likely to be physically exposed to alcohol outlets, results may be biased.

This study represents an important advance in the collective understanding of relationships between physical exposure to alcohol outlets and assault risks for individuals. Risks for non-gun assault increase when individuals are in neighborhoods with more bars and restaurants during evening and nighttime hours, and when they are in areas with more beer stores during daytime hours. These results complement the findings presented in numerous ecological studies that identify relationships between aggregate concentrations of alcohol outlets and aggregate incidence of non-gun assault (1, 2), and may help explain the mixed findings contained in the few prior individual-level studies (12-15). Although analyses should be replicated in other geographic areas with different population groups, these findings provide evidence that avoiding areas with high outlet density at times when the outlets are most heavily patronized may decrease risks for non-gun assault for individuals. Reducing densities of alcohol outlets within neighborhoods may have similar effects.

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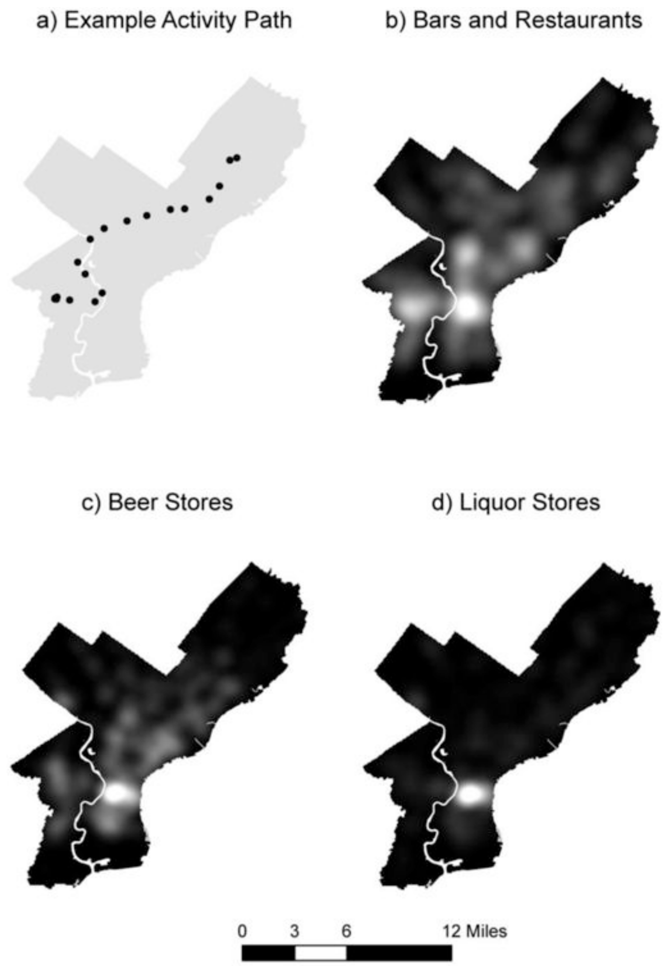

Figure 1. Spatial data management

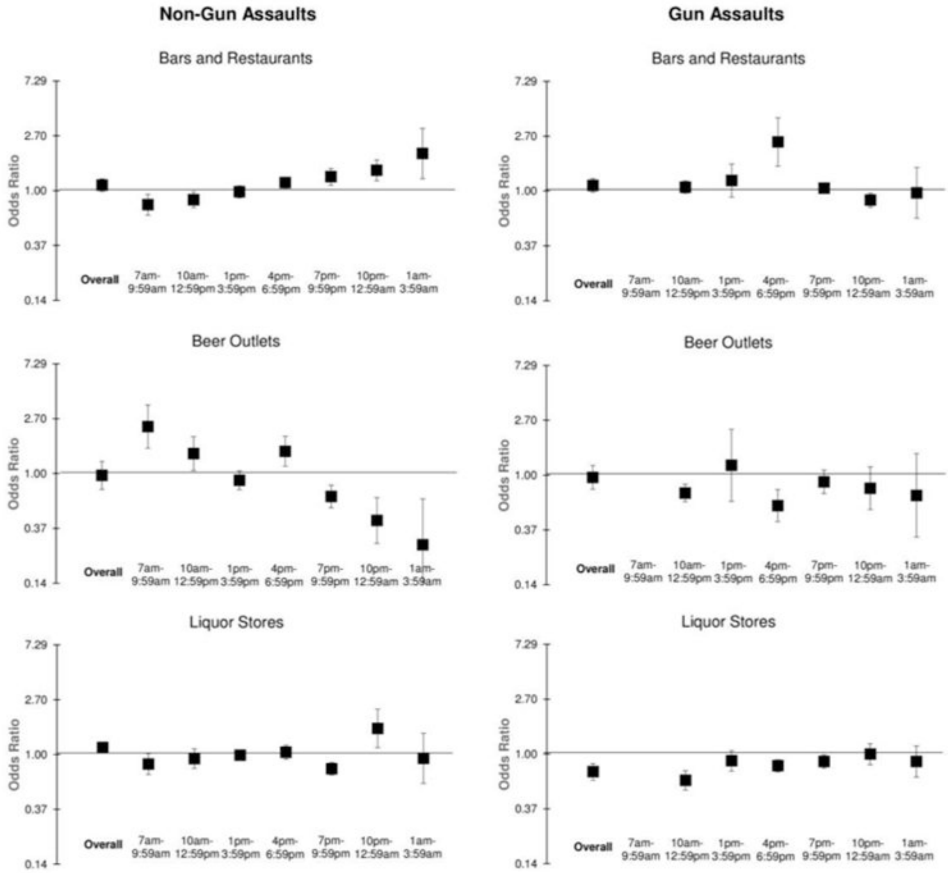

Figure 2. Parameter estimates for logistic regression models assessing odds of assault, stratified by time of day phases

Table 1

Correlation between alcohol outlet exposure variables (natural logarithm) for ten-minute segments

	ln(Bars and Restaurants)	ln(Beer Stores)	ln(Liquor Stores)
ln(Bars and Restaurants)	1.000		
ln(Beer Stores)	0.565	1.000	
ln(Liquor Stores)	0.272	0.387	1.000

Table 2

Participant characteristics

	Non-Gun Assaults (n = 194)	Gun assaults (n = 135)	Controls (n = 274)
Age (mean [SD])	15.9 [0.3] *	19.5 [0.3] *	17.8 [0.2]
Male	175 (90.2) *	123 (91.1) *	274 (100.0)
Race/Ethnicity			
Black (%)	170 (87.6) *	122 (90.4) *	268 (97.8)
White (%)	15 (7.7) *	1 (0.7) *	3 (1.1)
Hispanic (%)	3 (1.6) *	1 (0.7) *	0 (0.0)
Grades received in school			
A s and Bs	93 (48)	43 (34.1)	123 (45.1)
Bs and Cs	106 (56.0)	78 (61.9)	153 (56.0)
Cs and Ds	32 (25.4)	32 (25.4)	58 (21.3)
Ds and Fs	12 (6.2)	10 (7.9)	19 (7.0)
Wear seatbelt most of time or always (%)			
Never	19 (9.8)	21 (16.7)	33 (12.1)
Rarely	19 (10.0)	22 (17.5)	34 (12.5)
Sometimes	64 (33.0)	46 (36.5)	90 (33.1)
Most of the time	32 (16.5)	18 (14.3)	52 (19.1)
Always	60 (31.0)	19 (15.1)	63 (23.2)
Ever choose path based on safety (%)	80 (75.5) *	69 (71.1)	120 (74.1)
Change direction because route seems unsafe (%)			
Daily	65 (34.0)	40 (32.5)	95 (35.2)
Weekly	33 (17.3)	29 (23.6)	74 (27.4)
Monthly	45 (23.6)	23 (18.7)	53 (19.6)
Never	48 (17. 8)	31 (25.2)	48 (17.8)
Ever been jumped (%)	137 (71.0)	69 (55.2)	154 (56.4)
Ever in fistfight (%)	184 (95.3)	118 (93.7)	250 (91.6)
Know someone in jail or prison (%)	88 (83.8)	83 (84.7)	140 (87.5)
Ever been in jail or prison (%)	13 (37.1)	41 (53.3) *	26 (29.2)
Ever been on juvenile probation (%)	40 (20.7)	67 (53.2) *	48 (17.6)
Ever been shot (%)	7 (3.6)	20 (15.8) *	11 (4.0)
Ever carried a weapon (%)	50 (25.8)	60 (47.6)	107 (39.2)
Ever carried a gun (%)	19 (9.8)	38 (28.1) *	44 (16.0)
Could get a gun (%)	69 (35.9) *	66 (53.2)	158 (58.3)
Drank alcohol in past 30 days (%)	39 (20.1) *	46 (36.5)	90 (33.6)
Smoked marijuana in past 30 days (%)	35 (18.1)	50 (39.7) *	62 (23.2)
Ever sold drugs (%)	30 (15.7)	33 (26.4) *	45 (16.5)
Neighborhood environment scale (mean [SD])	0.52 [0.2]	0.51 [0.2]	0.49 [0.2]
Things I have seen and heard scale (mean [SD])	0.48 [0.2]	0.59 [0.2] *	0.51 [0.2]

	Non-Gun Assaults (n = 194)	Gun assaults (n = 135)	Controls (n = 274)
Generalized self-efficacy (mean [SD])	0.80 [0.1] *	0.84 [0.1]	0.84 [0.1]

*Characteristics for cases differ compared to controls, $p < 0.05$, assessed using Students t-test for continuous measures, and chi-square tests for trend for categorical measures

Nb. Characteristics for this sample previously reported in Wiebe, et al (15).

Table 3

Time of day at which assault events occurred

Event Time	Non-Gun Assaults	Gun Assaults
7am – 9:59am	21	2
10am - 12:59pm	21	10
1pm - 3:59pm	52	11
4pm - 6:59pm	31	19
7pm - 9:59pm	32	41
10pm - 12:59am	22	37
1am – 3:59am	15	14
4am - 6:59am	0	1
Total	**194**	**135**

Table 4

Conditional logistic regression model for odds of being assaulted (ten-minute segments nested within three-hour time of day phases)

	Non-Gun Assaults				Gun Assaults			
	OR	**(95%**	**CI)**	**p-value**	**OR**	**(95%**	**CI)**	**p-value**
Alcohol Outlets								
Restaurant Licenses (ln)	1.103	(0.985,	1.236)	0.090	1.105	(0.978,	1.249)	0.109
Beer Stores (ln)	0.966	(0.750,	1.243)	0.786	0.959	(0.774,	1.189)	0.705
Liquor Stores (ln)	**1.136**	**(1.103,**	**1.170)**	**<0.001**	**0.723**	**(0.622,**	**0.841)**	**<0.001**
Neighborhood Characteristics								
Neighborhood Connectedness (factor scale)	**0.826**	**(0.726,**	**0.939)**	**0.004**	**0.741**	**(0.699,**	**0.786)**	**<0.001**
Income (factor scale)	**1.197**	**(1.040,**	**1.378)**	**0.012**	1.095	(0.815,	1.469)	0.548
Vacancy, Vandalism, Violence (factor scale)	**1.672**	**(1.318,**	**2.122)**	**<0.001**	**2.644**	**(1.681,**	**4.160)**	**<0.001**
Emergency Services (factor scale)	1.013	(0.680,	1.510)	0.949	**1.217**	**(1.108,**	**1.336)**	**<0.001**
Race/Ethnicity (factor scale)	1.142	(0.982,	1.328)	0.085	**0.856**	**(0.743,**	**0.988)**	**0.033**
Commercial Zone (z-score)	0.862	(0.701,	1.060)	0.160	0.864	(0.627,	1.189)	0.369
Population Density (z-score)	0.963	(0.746,	1.244)	0.772	0.885	(0.741,	1.057)	0.177
School Density (z-score)	0.977	(0.753,	1.267)	0.860	0.910	(0.691,	1.200)	0.506
Individual and Momentary Characteristics								
Age (1-year increase)	**0.794**	**(0.705,**	**0.895)**	**<0.001**	**1.124**	**(1.080,**	**1.170)**	**<0.001**
Weekend	0.718	(0.277,	1.859)	0.495	0.972	(0.603,	1.566)	0.907
At home	**0.345**	**(0.222,**	**0.535)**	**<0.001**	**0.546**	**(0.347,**	**0.860)**	**0.009**
With adult family member	1.127	(0.647,	1.965)	0.673	1.261	(0.558,	2.852)	0.577
With peer	0.873	(0.456,	1.669)	0.680	1.251	(0.702,	2.232)	0.447
In vehicle (ref)								
On foot	**4.613**	**(2.222,**	**9.575)**	**<0.001**	**17.913**	**(5.593,**	**57.378)**	**<0.001**
Other Transport	1.359	(0.428,	4.308)	0.603	**7.153**	**(2.885,**	**17.736)**	**<0.001**
Possess Alcohol	**2.898**	**(1.365,**	**6.152)**	**0.006**	0.592	(0.211,	1.658)	0.318