

TESTING A SOCIAL MECHANISM:  
DOES ALCOHOL OUTLET DENSITY MODERATE THE RELATIONSHIP BETWEEN  
LEVELS OF ALCOHOL USE AND CHILD PHYSICAL ABUSE?

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Does alcohol outlet density moderate the relationship between drinking patterns and child physical abuse?

**Abstract**

*Objectives.* Parental alcohol use and alcohol outlet density are both associated with child abuse. Guided by alcohol availability theory, this paper examines whether alcohol outlet density moderates the relationship between parental alcohol use and child physical abuse.

*Methods.* A general population telephone survey of 3,023 parents or legal guardians 18 years or older was conducted across 50 California cities, while densities of alcohol outlets were measured for by zip code. Data were analyzed via overdispersed multilevel Poisson models.

*Results.* Ex-drinkers, light drinkers, and heavy drinkers use physical abuse more often than lifetime abstainers. Moderate drinking was not related to child physical abuse. Proportion of bars was negatively related to frequency of physical abuse. Moderating relationships between alcohol outlet density and drinking categories were found for all drinking patterns.

*Conclusion.* Different types of alcohol outlets may be differentially related to drinking patterns, indicating that the interaction of drinking patterns and the drinking environment may place children at greater risk for being physically abused.

Key Words: physical abuse, alcohol use, alcohol outlet density, multilevel analysis

Over 3 million children were referred to Child Protective Services (CPS) as potential victims of maltreatment in 2012, of whom 125,000 were found to be physically abused (U.S. Department of Health and Human Services, 2013). This number may underestimate the true US prevalence, however, as not all abused children are referred to or identified by CPS (Sedlak et al., 2010). Children who are physically abused can experience behavioral, mental health, and health problems that last well into adulthood (Afifi et al., 2013; Elliot et al., 2014; Fuller-Thomson et al., 2011; Springer et al., 2007).

Alcohol use and the larger alcohol environment are considered risk factors for child physical abuse. Heavy drinkers and those who abuse or are dependent on alcohol are more likely to physically abuse children (Berger, 2005; Famularo, Stone, Barnum, & Wharton, 1986; Murphy et al., 1991; Kelleher, Chaffin, Holleberg, & Fischer., 1994; Sun, Shillington, Hohman, & Jones, 2001). Additionally, the physical availability of alcohol (as measured by alcohol outlet density) appears to be related to neighborhood rates of child maltreatment (Freisthler, 2004; Freisthler, Needell, & Gruenewald, 2005; Freisthler, Gruenewald, Remer, Lery, & Needell, 2007; Freisthler & Weiss, 2008) and physical abuse (Freisthler, Midanik, & Gruenewald, 2004). Despite these relationships, little is known about how neighborhood alcohol outlet density might moderate the relationship between individual drinking behaviors and physically abusive parenting behaviors.

### **Alcohol Use and Physical Abuse**

Alcohol appears to be involved in approximately 11.1% of cases where children experienced at least moderate harm from physical abuse (Sedlak et al., 2010). Alcohol-abusing parents are more likely to be reported multiple times to the child welfare system for child maltreatment than those parents who do not abuse alcohol (Fluke, Shusterman, Hollinshead, &

Yuan, 2008; Murphy et al., 1991; Wolock & Magura, 1996). While a rich literature suggests that heavy drinking, alcohol abuse, and alcohol dependence are associated with physically abusive parenting, other studies have not found a positive relationship (Harter & Taylor, 2000; Widom & Hiller-Sturmhöfel, 2001). Additionally, a cohort study of children involved with the child welfare system in Florida found that reoccurrence of abuse was less likely in families that where perpetrator had used alcohol (Yampolskaya & Banks, 2006). These disparate findings may be due to how alcohol use was measured and the populations studied (Testa & Smith, 2009). Studies of the relationship between alcohol use and child maltreatment are limited in that they generally use clinical populations of individuals already involved with the child welfare system or in treatment for alcohol abuse or dependence, thereby limiting the generalizability of study findings (Testa & Smith, 2009). This focus on clinical alcohol use disorders may mean that relationships between lower levels of alcohol use and physical abuse are not being captured. For example, a recent study found that the frequency of alcohol use in particular contexts (e.g. bars) is associated with physical abuse, regardless of how much alcohol is consumed there (Friesthler & Grunewald, 2013). However, this study only included current drinkers, and therefore was unable to ascertain whether drinkers had greater risk of physical abuse compared to non-drinkers. Therefore, little is known about how patterns of alcohol use (other than heavy use) may place children at risk for physical abuse.

### **Alcohol Outlets and Child Maltreatment**

A growing body of research suggests that areas with higher densities of some types of alcohol outlets also have higher rates of maltreatment (Freisthler, 2004; Freisthler et al., 2004; Freisthler et al., 2005; Freisthler et al., 2007; Freisthler, Gruenewald, Ring, & LaScala, 2008; Markowitz & Grossman, 1998; Morton, 2013; Morton, Simmel, & Peterson, 2014). In

longitudinal studies, increases in off-premise alcohol outlets (i.e. places where alcohol is purchased but consumed elsewhere, such as liquor stores) are related to increases in referrals, substantiations, and foster care entries, while increases in bars are related to increases in foster care entries (Freisthler, Gruenewald, et al., 2007; Freisthler & Weiss, 2008). California-based studies have found that density of off-premise outlets per roadway mile are positively related to injuries due to child abuse (Freisthler et al., 2008) and higher rates of physical abuse (Freisthler et al., 2004). However, a recent study found that off-premise outlets were negatively related to rates of physical abuse in New Jersey (Morton, Simmel, & Peterson, 2014), suggesting the relationship might not be clear cut. Unfortunately, these ecological studies cannot control for individual alcohol use behaviors. As a result, little is known about the mechanisms by which alcohol outlets are associated with physical abuse.

### **Alcohol Outlet Density, Alcohol Use, and Physical Abuse: The Role of Availability Theory**

Availability theory could provide a potential explanation for relationships between alcohol outlet density and child abuse. In short, the theory argues that increased physical availability of alcohol through higher densities of alcohol outlets increases consumption of higher amounts of alcohol (Stockwell & Gruenewald, 2004). This higher level of consumption of alcohol may be related to greater alcohol-related problems, including the use of physically abusive parenting practices. For example, given the finding that greater densities of off-premise alcohol outlets are associated with neighborhood child abuse (Freisthler et al., 2004; Freisthler et al., 2008), it could be that more local opportunities to purchase alcohol at liquor stores makes parents more likely to buy it. Parents may then in turn consume this alcohol at home, where their children may be present. The combination of exposure to children and drinking, which may cause some parents to exhibit disinhibition (Pihl, Lau, & Assaad, 1997; Pihl, Peterson, & Lau,

1993) could lead to greater frequency of physical abuse. Similarly, parents living in areas where there are greater densities of on-premise outlets may be more likely to drink at bars and restaurants, potentially returning home to their children disinhibited or aggressive as a result of alcohol use (Bushman, 1997; Weafer & Fillmore, 2012). Thus the primary mechanism by which densities of alcohol outlets affect child physical abuse may be through a parent's drinking behavior.

Guided by availability theory, we predicted that the density of alcohol outlets (off-premise and on-premise) would not be associated with physical abuse when controlling for individual drinking behaviors. In addition, we predicted that the relationship between individual alcohol use and frequency of physically abusive behaviors would be moderated by density of alcohol outlets (off-premise and on-premise), such that parents living in areas with greater densities of outlets would have a stronger relationship between any alcohol use and greater frequency of physical abuse. We examined these hypotheses in a general population survey of 50 California cities, thereby reducing biases introduced by the use of child welfare system or clinical samples.

## **Methods**

### **Study Sample and Design**

Data from this study came from a telephone survey of 3,023 parents or legal guardians of at least one child 12 years old or younger. These data were collected during March 2009 through October 2009 via computer-assisted telephone interview (CATI) procedures that incorporated use of both a live interviewer and interactive voice recording (IVR). Participants were eligible for the study if: (1) the child had to live with the parent or legal guardian at least 50% of the time; (2) the child was 12 years or younger; (3) the participant spoke English or Spanish; and (4)

if the participant lived within the study area. Participants were chosen from listed samples of addresses and telephone numbers of households with a goal of obtaining about 60 participants (range 47-74) for each of 50 cities in California. Participant pools generated from listed samples appear to be unbiased relative to random digit dialing techniques (Brick, Waksberg, Kulp, & Starer, 1995; Kempf & Remington, 2007; Tucker, Lepkowski, & Piekarski, 2002). A pre-notification letter describing the study purpose and containing a fact sheet about the study were sent to all individuals from the listed samples. This letter also provided individuals with a toll-free number to call if they wanted to opt out of the study.

The 50 cities were selected from a sampling frame of all 138 cities in California with a population size between 50,000 and 500,000 residents. The sample was a purposive geographic sample of cities designed to ensure none of the cities shared boundaries in order to maximize validity with regard to the geography and ecology of the state (Thompson, 1992).

Poststratification survey weights based on race/ethnicity, gender, and household type (single vs. two parent households) were constructed to increase generalizability to all 138 cities of this size in California.

The survey took 30 minutes on average to complete. Interviewers obtained verbal consent for each of the participants and conducted either English or Spanish. The survey was translated into Spanish using translation-back translation methods. Potential respondents who did not speak English or Spanish were not eligible to participate in the study. Participants were mailed a \$25 check for participation to an address they specified. The response rate of 47.4% was calculated using standard definitions from the American Association for Public Opinion Research (American Association for Public Opinion Research Standard Definitions, 2002).

## **Measures**

**Physical Abuse.** Child physical abuse was measured using the Parent-Child Conflict Tactics Scale (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). Participants were asked questions about frequency of severe physical abuse (e.g., slapping the child on the face, head, or ears, and throwing or knocking the child down) and responded to categories ranging from “Never” to “more than 10 times”. This scale has fair internal consistency ( $\alpha = .55$ ) and has shown both construct and discriminant validity in a general population telephone survey (Straus et al., 1998). If more than one child under the age of 13 was in the household, participants were instructed to answer the question about parenting behaviors for the child who had the most recent birthday, called the “focal child”. The scale was scored using the midpoint of the response category for each item and then summed (Straus et al., 1998).

Self-report measures by parents for physical abuse are prone to underreporting due to social desirability bias. The current study uses several procedures to minimize these effects. The order of physical abuse questions were interspersed so that all the physical abuse items were not asked consecutively but were followed by nonviolent parenting strategies. The CTS-PC is a multi-item scale allowing for a more complete measure of frequency of physical abuse. Finally, the physical abuse items were asked using interactive voice response technology (IVR). IVR is a computerized system where parents use a touchtone phone to answer questions, as opposed to speaking to a live interviewer. Use of IVR has been shown to increase accurate responding for sensitive subjects (Midanik & Greenfield, 2008).

**Alcohol Use Categories.** Five categories of alcohol use were created from a series of questions regarding how often and how much they drank. First, respondents were asked about how often they drank alcohol and given twelve response categories ranging from “every day” to “never had a drink of alcohol in my life.” Depending on the answer to that question, respondents

were (1) skipped out of additional drinking questions (e.g., lifetime abstainers who did not drink), (2) asked a series about drinking behaviors over the past 365 days (for respondents who drank in the past year, but did not drink monthly), or (3) asked about drinking in the past 28 days for those that indicated they drank in the past month. Drinkers were then asked about the number of times they had 1 or more, 2 or more, 3 or more, 6 or more, and 9 or more drinks in either the past 28 or 365 days. Finally, drinkers were asked the maximum number of drinks they consumed on any occasion in either the past 28 or 365 days. A standard “drink” was defined for the respondents as a 12-ounce can of beer, a 5-ounce glass of wine, or a 1-ounce shot of liquor.

The current study uses five categories to assess different levels of drinking among respondents: (1) lifetime abstainers - respondents that report never drinking; (2) ex-drinkers - did not drink alcohol in past year, but report drinking alcohol at some time during his/her lifetime); (3) light drinkers - drank either in the past month or past year but never more than 1-2 drinks per occasion; (4) moderate drinkers - drank 3-4 drinks at least once during past month but never drank more than 4 drinks; and (5) heavy drinkers - drank 5 or more drinks when they drank. These categories have been used in previous work examining intimate partner violence and depression (Kaufman Kantor & Straus, 1987; Paschall, Freisthler, & Lipton, 2005).

**Alcohol Outlet Density.** Data on alcohol outlets was obtained from the California Department of Alcoholic Beverage Control for 2009. Outlet locations were geocoded to the street address of the establishment. Numbers of active alcohol outlets by zip code were calculated for off-premise alcohol establishments (license type 20 or 21) and on premise establishments that included restaurants that serve alcohol (license type 41 or 47) and bars and pubs (license type 23, 40, 42, 48, 61 or 75). A proportion of on-premise alcohol outlets that were bars was calculated using these license types. Geocoding rates of these data exceeded 99%.

**Depression and anxiety.** Symptoms of depression and anxiety were measured using the Primary Care Evaluation of Mental Disorders (PRIME-MD). Depressive symptoms was measured using two items that asked about whether or not the respondent had little interest or pleasure in doing things and whether or not he or she felt down depressed or hopeless in the past month. A positive response for either question resulted in being coded as having depressive symptoms. Symptoms of anxiety were measured as past month behavior for three items: (1) having "nerves," feeling anxious or on edge; (2) worrying about a lot of different things; and (3) having an anxiety attack. Responding yes to any item indicated anxiety. Nineteen percent of respondents reported feeling depressed and 47.4% reported feeling anxious.

**Impulsivity.** Impulsivity was measured using a modified version of Dickman's Dysfunctional Impulsivity Scales (Dickman, 1990) which included seven items. Dysfunctional impulsivity refers to acting rapidly and inaccurately (e.g., I often get into trouble because I don't think before I act). Survey participants responded with a yes or no to each of the seven questions. The number of yes responses was summed with higher values on the scale indicating higher levels of impulsivity. Internal consistency for this version of the scale was .73.

**Social Support and Social Networks.** Social support was measured using the Interpersonal Support Evaluation List short form (Cohen, Mermelstein, Kamarck, & Hoberman, 1985). This scale measured three types of social support: emotional, tangible, and social companionship. Each subtype of support included 4 items For emotional support, this included items like "I feel that there is no one I can share my most private worries and fears with." Tangible was measured using items such as "If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment." "If I wanted to have lunch with someone, I could easily find someone to join me" is a sample question measuring

social companionship support. Response categories included definitely false, probably false, probably true, and definitely true. Items were summed to create a level of social support for each of the three types of support measured. Test-retest reliability has previously been assessed at .71 - .82, depending on the subscale (Cohen et al., 1985). A measure of the average size of social network was assessed by questions asking the number of people they could go to for emotional support, tangible support, and social companionship support. As the same person could be included in multiple categories, the values across all types of support were summed and divided by three to obtain an average.

**Neighborhood Context.** Overall neighborhood context was measured using three variables to loosely represent measures of social disorganization, particularly salient for child maltreatment (Coulton, Korbin, Su, & Chow, 1995; Molnar, Buka, Brennen, Holton, & Earls, 2003). These included measures of the proportion of people who moved recently compared to a national average (representing residential stability), percentage of households with income less than \$25,000 (as a measure of disadvantage), and male to female ratio (for child care burden).

**Demographic Variables.** Demographic control variables include focal child's gender, focal child's age in years, respondent's age in years, gender and race/ethnicity, number of children in the home, and household income. Race/Ethnicity was dummy coded as Non-Hispanic White, Non-Hispanic Black, Hispanic, Asian, and multi-racial or other race/ethnicity. Household income was measured by seven categories and recoded as households with an income of \$20,000 or less, \$20,001 to \$40,000, \$40,001 to \$60,000, \$60,001 to \$80,000, \$80,001 to \$100,000, \$101,000 to \$150,000, and \$150,001 and higher.

---INSERT TABLE 1 ABOUT HERE---

## **Statistical Analysis**

Non-linear multilevel (Poisson) regression techniques adjusting for overdispersion under the HGLM module of the HLM Version 7 software (Raudenbush, Bryk, Cheong, & Congdon, 2006) were used for data analysis. Allowing for overdispersion relaxes the Poisson assumption that the mean and variance be equal, permitting greater variability than traditional Poisson models. Multilevel models are used to address intraclass correlations due to respondents (Level 1) being nested within zip codes (Level 2). Intraclass correlation is the degree to which respondents from the same zip code are more like other respondents within that zip code compared to those that live outside that zip code. In the models presented here, the Level 2 zip code variables represent neighborhood or environmental characteristics with Level 1 variables are those individual demographic and psychosocial characteristics.

The general form of the multilevel model used was:

Level 1:

$$Y = b_0 + b_1X_1 + b_2X_2 + \dots b_pX_p + e \quad (1)$$

In Equation 1, Y was the outcome measure of interest (e.g., frequency of child physical abuse), measured at the person level,  $b_0$  is the zip code-specific intercept,  $b_{1-p}$  are regression coefficients expressing the associations (slopes) between p person-level predictors ( $X_{1-p}$ ; e.g., age) and the outcome, and e is the individual-specific residual or error.

Level 2:

$$b_0 = g_{00} + u_0 \quad (2)$$

In Equation 2,  $g_{00}$  shows the overall sample intercept for the equation predicting zip code-specific intercepts and  $u_0$  is the random zip code-specific residual component. Cross level interactions are used to examine the moderating relationship between drinking categories and alcohol outlet densities on child physical abuse.

**Missing data.** Missing data on most variables was negligible at less than four percent. During the transition from live interviewer to interactive voice response about 10% of respondents dropped off from the survey. Multivariate comparisons of those who completed the survey with those who dropped out of the survey found the only significant difference was for respondents who were born in the U.S. (vs. foreign born). U.S. born respondents were over two times more likely to complete the survey than non-U.S. born respondents (Kepple, Freisthler, & Johnson-Motoyama, 2014). Cases with missing data were excluded from the analyses.

### **Results**

The results for the model of the direct relationship of the density of alcohol outlets (at the zip code level) and alcohol use categories (at the individual level) are shown in Table 2. Table 3 adds the moderating relationship for each alcohol use category individually. All possible drinking x outlet density interactions were not included in one model due to concerns of multicollinearity.

Results in Table 2 for the direct relationship of the density of alcohol outlets found that contrary to hypothesis, the proportion of bars (compared to restaurants) at the zip code level was negatively related to frequency of child physical abuse. As predicted, there was no relationship between the density of off-premise outlets or density of on-premise outlets and physical abuse. Also at the zip code level, the higher percent of residents who moved in the past year and the percent of families who were living in poverty the more frequent physical abuse was used. With regards to drinking behaviors, ex-drinkers, light drinkers, and heavy drinkers report using physical abuse more often than lifetime abstainers. Older children and males experienced physical abuse more often than younger children and females. Fathers used physical abuse more frequently than did mothers. Parents who report depressive symptoms, higher levels of

impulsivity, and higher levels of parenting stress also report using physical abuse more often. Parents who received higher levels of tangible support report less use of physical abuse, but higher levels social companionship support was related to more frequent use of physical abuse. No relationship was found between parent age, race/ethnicity, income, marital status, and number of children with child physical abuse.

In Table 3, the negative relationship between proportion of bars and child physical abuse remains in all four models testing moderating relationship of outlets and categories of alcohol use. The density of off-premise alcohol outlets moderated the relationship between all four types of levels of alcohol use and child physical abuse, albeit in different directions. Light and heavy drinkers living in areas with high densities of off-premise alcohol outlets were more likely to use physical abuse while moderate and ex-drinkers living in zip codes with high densities of alcohol outlets use physical abuse less often. Finally the interaction between proportion of bars and light drinkers was negatively related to child physical abuse. Parents who report being heavy drinkers who live in zip codes with a higher proportion of bars use physical abuse more frequently. Relationships between the remaining individual and zip code level variables in these moderation models were similar to those found in Table 2.

---INSERT TABLES 2 AND 3 ABOUT HERE---

### **Discussion**

This study tested both the direct and the moderating relationships of alcohol outlets for child physical abuse. Consistent with availability theory, we hypothesized that the density of alcohol outlets at the zip code level would not be directly related to frequency of child physical abuse, but instead that outlet density would interact with drinking behaviors. Contrary to our hypothesis, some types of alcohol outlets were directly related to child physical abuse, even after

controlling for moderating relationships. Specifically, parents living in areas with a higher proportion of bars used physical abuse less frequently. As the proportion of restaurants in a neighborhood is the inverse of the proportion of bars, this suggests that parents living in places with more restaurants use physical abuse more often. Previous work has found that density of on-premise outlets moderated the relationship between local social companionship support and child physical abuse, resulting in more frequent use of abusive parenting practices (Freisthler, Holmes, & Price Wolf, 2014). Thus greater proportions of restaurants that serve alcohol might provide more opportunities for parents to socialize and eat out of the home with their family. If children are acting inappropriately at restaurants, parents may become overstressed and be more likely to hit or slap their children. These explanations remain speculative, as much remains to be discovered about how proportion of restaurants is directly associated with physical abuse outside of a parent's drinking behaviors. Overall, our finding suggests that availability theory does not adequately explain all mechanisms between the alcohol environment and child abuse.

Although we hypothesized that alcohol outlet density would moderate the relationship between individual drinking patterns and physical abuse, our findings suggest that these relationships are more complex than expected. For example, the density of off-premise alcohol outlets had a differential moderating relationship depending on the drinking pattern. While higher off-premise densities was related to more frequent use of child physical abuse for light and heavy drinkers, higher off-premise densities was related to less use of physical abuse for moderate and ex-drinkers. In the framework of availability theory, greater off-premise alcohol outlets may enhance access to alcohol in the home for light and heavy drinkers, potentially precipitating use of physical abuse. Ex-drinkers may be less likely to keep alcohol in the home, which could explain why the interaction between off-premise outlet densities and ex-drinking

status had a negative relationship with child physical abuse. This same relationship with moderate drinking status is more puzzling, however. It could be that moderate drinkers are more likely to drink out at bars or restaurants instead of at home. More research that examines the contexts in which moderate drinkers consume alcohol (i.e., drinking location, presence of other people, with a meal) could help explain these relationships.

Our findings examining the density of on-premise outlets were equally complex. Ex-drinkers living in areas with higher densities of on-premise outlets used physical abuse more often. If ex-drinkers no longer drink alcohol because of previous problematic drinking behaviors, socializing in bars and restaurants that serve alcohol may increase stress or struggles to maintain sobriety. These parents could in turn take these stressors out on their children with physical violence. In contrast, light drinkers living in areas with higher densities of on-premise outlets used physical abuse less often. This relationship may be a function of where light drinkers drink alcohol. Given their low levels of alcohol use, they may primarily drink at homes or parties where off-premise availability of alcohol is more important.

Finally, heavy drinkers living in neighborhoods with a greater proportion of bars used physical abuse more frequently, a finding that is consistent with other violent behaviors (assaults, intimate partner violence) and density of bars (Cunradi, Mair, Ponicki, & Remer, 2012; Gruenewald & Remer, 2006). Unfortunately, we were unable to examine whether or not the role of alcohol outlet density in moderating the relationship between drinking levels and maltreatment is due to increased use of these venues by respondents (see, for example, Freisthler, 2011) or through the social influences at bars that encourage or promote aggressive behavior for heavy drinkers (see Treno, Gruenewald, Remer, Johnson, & LaScala, 2007). The extent to which heavy drinkers are exposed to this higher level of alcohol-related aggression due to higher densities of

bars in their local areas may increase their use of aggressive parenting techniques. Taken together, these complexity of these findings may help explain why ecological studies have found differential relationships of outlets on rates of child physical abuse (Freisthler et al., 2004; Morton et al., 2014), as the moderating role of outlets appears to differ by drinking pattern. This suggests that multi-level studies which are able to connect ecological features with individual behaviors and outcomes may be the best way to understand the nuances of these relationships.

Although alcohol abuse and dependence have been identified as risk factors for committing child physical abuse as found by studies with samples of alcoholic parents or among parents already involved with the child welfare system (Famularo et al., 1986; Murphy et al., 1991, Kelleher, 1994; Sun et al., 2001), we found that heavy alcohol use may not be the only type of drinking to place children at risk for physical abuse. In fact, all categories of drinkers (except moderate drinkers) reported more frequent use of child physical abuse than abstainers. Parents who do not drink heavily are not likely to meet the Diagnostic and Statistical Manual of Mental Disorders criteria for alcohol abuse or dependence. Children of these parents may consequently be overlooked by both the substance abuse treatment and child welfare systems.

### **Limitations**

The use of telephone surveys reduced the biases of using populations in the child welfare and substance abuse treatment systems; however, telephone survey procedures may underrepresent populations who do not have phones or rely exclusively on cell phones. To mitigate this issue, post-stratification survey weights were created and applied to the analyses. Results of this study may not be generalizable to other states or to cities larger than 500,000 or smaller than 50,000 residents. The fair to moderate response rate may also limit generalizability. The study was cross-sectional in nature, meaning no information on the timing and sequencing

of both the alcohol use and physical abuse was available. It was not possible to ascertain if heavy alcohol use causes child physical abuse. This study may not account for all other variables related to both the perpetration of child physical abuse and alcohol that may affect findings. Finally, the study does not include measures of current or past alcohol abuse or dependence. This means no distinction could be made between ex-drinkers who discontinued their alcohol use because of alcohol abuse or if other factors may be the cause of the change in drinking behaviors (e.g., new mothers).

### **Conclusions**

The current study was well suited to understand how alcohol outlet density moderates the relationship between drinking patterns and physical abuse, but questions remain. Most types of drinking behaviors appear to place children at greater risk for frequency of physical abuse. Future research is needed to examine the relationship of alcohol use for other types of maltreatment or incorporate where parents drink and the effects on child physical abuse. Further, alcohol outlet densities appear to play an important role in the use of child physical abuse. These lines of inquiry may provide insight into new avenues to develop and focus environmental prevention efforts.

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Table 1: Descriptive Statistics of Study Variables

Variable Name	Weighted % or $\bar{x}$ (sd)	Sample n
Frequency of Child Physical Abuse	0.33 (1.98)	2770
<u>Level 1: Individual</u>		
Focal child gender		
Male	50.4	1495
Female	49.6	1414
Focal child age, in years	6.68 (3.6)	2914
Respondent gender		
Male	47.9	1050
Female	52.1	1973
Age		
18 – 30 years	14.1	404
31 – 45 years	64.7	2034
46 years and older	21.1	585
Number of children	2.19 (0.9)	3023
Marital Status		
Married or cohabiting	76.7	2673
Single/divorced/widowed	23.3	350
Race/Ethnicity		
Non-Hispanic White	50.5	1753
Non-Hispanic Black	5.0	111
Hispanic	29.4	733
Asian	10.0	236
Multi-Racial/Other	5.1	176
Income		
≤ \$20,000	10.9	258
\$20,001 - \$40,000	15.0	358
\$40,001 - \$60,000	14.2	373
\$60,001 - \$80,000	14.3	450
\$80,001 - \$100,000	12.9	412
\$100,001 - \$150,000	19.4	648
\$150,001 +	13.3	409
Depressive Symptoms		
Yes	19.1	504
No	80.9	2480
Anxiety Symptoms		
Yes	47.4	1401
No	52.6	1605
Impulsivity Level	0.78 (1.3)	2975
Social Support		
Tangible Support	14.41 (2.1)	2995
Emotional Support	14.73 (2.0)	2995
Companionship Support	14.07 (2.1)	2995
Parenting Stress	3.93 (1.3)	2984
Average Network Size	10.82 (10.5)	2971

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Alcohol Use		
Lifetime Abstainer	9.3	292
Ex-Drinker	19.2	564
Light Drinker	41.9	1357
Moderate Drinker	18.4	517
Heavy Drinker	11.1	278
<u>Level 2: Zip Code</u>		
Proportion of recent movers	112.44 (31.50)	194
Ratio of children to adults	0.34 (0.08)	194
% households with incomes < \$25,000	25.18 (12.95)	194
Off-premise outlets per area	2.93 (2.98)	194
On-premise outlets per area	5.04 (9.36)	194
Proportion bars	0.14 (0.10)	194

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Table 2: Multilevel Poisson Model with Overdispersion Examining Direct Effects of Alcohol Outlet Density on Frequency of Child Physical Abuse (n = 2581)

	b	SE	
Intercept	-1.127	0.119	***
<u>Level 1: Individual</u>			
Focal child male gender	0.890	0.135	***
Focal child age, in years	0.058	0.016	***
Respondent male gender	0.422	0.128	***
Age (reference group: 18 – 29 years)			
30 – 45 years	0.253	0.192	
46 years and older	0.273	0.233	
Number of children	0.063	0.087	
Currently married or cohabiting	-0.021	0.166	
Race/Ethnicity (reference group: White)			
Non-Hispanic Black	-0.252	0.344	
Hispanic	0.124	0.171	
Asian	0.063	0.168	
Multi-Racial/Other	-0.294	0.306	
Income	-0.024	0.040	
Depressed	0.524	0.157	***
Anxiety	-0.315	0.155	*
Impulsivity Level	0.179	0.048	***
Social Support			
Tangible Support	-0.141	0.033	***
Emotional Support	-0.013	0.036	
Companionship Support	0.139	0.045	**
Parenting Stress	0.294	0.033	***
Average Network Size	0.480	0.433	
Alcohol Use (reference group: abstainer)			
Ex-Drinker	0.614	0.174	***
Light Drinker	0.506	0.137	***
Moderate Drinker	0.148	0.223	
Heavy Drinker	0.524	0.162	***
<u>Level 2: Zip Code</u>			
Proportion of recent movers	0.012	0.004	**
Ratio of children to adults	-0.495	1.680	
% households with incomes < \$25,000	0.046	0.022	*
Off-premise outlets per area	-0.041	0.048	
On-premise outlets per area	0.004	0.013	
Proportion bars	-6.505	2.003	***

Table 3: Multilevel Poisson Model with Overdispersion Examining Moderating Effects of Alcohol Outlet Density and Drinking Categories for Frequency of Child Physical Abuse (n = 2581)

	b	SE		b	SE		b	SE		b	SE	
Intercept	-1.205	0.122	***	-1.172	0.117	***	-1.256	0.102	***	-1.159	0.120	***
<u>Level 1: Individual</u>												
Focal child male gender	0.960	0.129	***	0.943	0.133	***	0.876	0.138	***	0.881	0.128	***
Focal child age, in years	0.074	0.012	***	0.056	0.017	***	0.059	0.016	***	0.056	0.016	***
Respondent male gender	0.492	0.118	***	0.394	0.129	**	0.408	0.131	**	0.436	0.123	***
Age (reference group: 18 – 29 years)												
30 – 45 years	0.113	0.173		0.191	0.188		0.227	0.202		0.250	0.187	
46 years and older	0.218	0.223		0.205	0.232		0.261	0.236		0.264	0.225	
Number of children	0.070	0.084		0.074	0.086		0.084	0.086		0.067	0.087	
Currently married or cohabiting	-0.138	0.154		0.087	0.172		-0.032	0.154		0.063	0.157	
Race/Ethnicity (reference group: White)												
Non-Hispanic Black	-0.315	0.342		-0.311	0.350		-0.472	0.344		-0.287	0.355	
Hispanic	0.031	0.167		0.098	0.170		0.143	0.167		0.118	0.161	
Asian	0.170	0.149		0.080	0.171		0.164	0.175		0.034	0.167	
Multi-Racial/Other	-0.370	0.300		-0.295	0.291		-0.139	0.257		-0.338	0.288	
Income	-0.005	0.036		-0.021	0.040		-0.032	0.040		-0.040	0.037	
Depressed	0.343	0.128	**	0.463	0.141	***	0.573	0.173	***	0.569	0.148	***
Anxiety	-0.205	0.134		-0.274	0.148		-0.362	0.164	*	-0.280	0.150	
Impulsivity Level	0.202	0.043	***	0.180	0.046	***	0.210	0.049	***	0.173	0.047	***
Social Support												
Tangible Support	-0.169	0.029	***	-0.139	0.031	***	-0.152	0.033	***	-0.150	0.031	***
Emotional Support	-0.007	0.031		-0.018	0.034		0.018	0.035		-0.018	0.034	
Companionship Support	0.167	0.040	***	0.132	0.046	**	0.141	0.045	**	0.149	0.044	***
Average Network Size	-0.008	0.005		-0.011	0.005	*	-0.009	0.005		-0.011	0.005	*
Parenting Stress	0.317	0.030	***	0.296	0.034	***	0.304	0.032	***	0.290	0.032	***
Alcohol Use (reference group: abstainer)												
Ex-Drinker	0.665	0.176	***	0.680	0.180	***	0.648	0.175	***	0.673	0.169	***
Ex-Drinker * Off-premise	-0.184	0.055	***									
Ex-Drinker * On-Premise	0.183	0.041	***									
Ex-Drinker * Proportion Bars	1.399	2.205										
Light Drinker	0.496	0.208	*	0.359	0.172	*	0.508	0.148	***	0.534	0.134	***

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Light * Off-premise				0.255	0.059	***						
Light * On-Premise				-0.097	0.048	*						
Light * Proportion Bars				-6.549	1.461	***						
Moderate Drinker	0.256	0.207		0.092	0.252		-0.483	0.346		0.189	0.219	
Moderate * Off-premise							-0.842	0.265	**			
Moderate * On-Premise							0.102	0.117				
Moderate * Proportion Bars							3.330	1.984				
Heavy Drinker	0.476	0.161	**	0.549	0.167	***	0.551	0.167	***	0.566	0.199	**
Frequent Heavy * Off-premise										0.233	0.051	***
Frequent Heavy * On-Premise										-0.105	0.078	
Frequent Heavy * Proportion Bars										8.615	1.375	***
<u>Level 2: Zip Code</u>												
Proportion of recent movers	0.012	0.004	**	0.012	0.005	**	0.012	0.005	**	0.012	0.004	**
Ratio of children to adults	-0.754	1.886		-0.824	1.697		-0.061	1.641		-0.561	1.728	
% households with incomes < \$25,000	0.049	0.021	*	0.046	0.020	*	0.042	0.020	*	0.046	0.021	*
Off-premise outlets per area	-0.039	0.055		-0.040	0.046		-0.083	0.048		-0.047	0.052	
On-premise outlets per area	-0.012	0.016		-0.001	0.011		0.006	0.012		0.006	0.013	
Proportion bars	-6.695	1.944	***	-6.946	1.954	***	-6.166	1.900	***	-7.007	1.939	***