Published in final edited form as:
J Community Psychol. 2013 August 1; 41(7): 867–883. doi:10.1002/jcop.21579.

Alcohol Environment, Perceived Safety, and Exposure to Alcohol, Tobacco, and Other Drugs in Early Adolescence

AJ Milam, PhD[1], **CDM Furr-Holden, PhD**[1], **CP Bradshaw, PhD**[1], **DW Webster, ScD, MPH**[2], **MC Cooley-Strickland, PhD**[1,3], and **PJ Leaf, PhD**[1]

[1]Johns Hopkins Bloomberg School of Public Health; Department of Mental Health; 624 N. Broadway, 8th floor; Baltimore, MD; 21205

[2]Johns Hopkins Bloomberg School of Public Health; Department of Health Policy and Management; 624 N. Broadway, 5th floor, Baltimore, MD; 21205

[3]University of California-Los Angeles; NPI-Semel Institute, Center for Culture and Health; 760 Westwood Plaza, Los Angeles, CA 90095, USA

Abstract

This study examined the association between the count of alcohol outlets around children's homes and opportunities to use alcohol, tobacco, and other drugs (ATOD) during pre-adolescence. Data were collected in 2007 from 394 Baltimore City children aged 8-13 (86% African American). Participants' residential address and alcohol outlet data were geocoded with quarter mile (i.e., walking distance) buffers placed around each participant's home to determine the number of outlets within walking distance. The unadjusted logistic regression models revealed that each unit increase in the number of alcohol outlets was associated with a 14% increase in the likelihood of children seeing people selling drugs (OR=1.14, p=.04) and a 15% increase in the likelihood of seeing people smoking marijuana (OR=1.15, p<.01). After adjusting for neighborhood physical disorder, the relationship between alcohol outlets and seeing people selling drugs and seeing people smoking marijuana was fully attenuated. These results suggest that alcohol outlets are one aspect of the larger environmental context that is related to ATOD exposure in children. Future studies should examine the complex relationship between neighborhood physical disorder and the presence of alcohol outlets.

Keywords

Alcohol; drugs; tobacco; children; African American

1. Introduction

Although alcohol, tobacco, and other drug (ATOD) use during childhood and early adolescence has declined over the last decade it continues to be a major public health problem. According to the Monitoring the Future study, 20% of youth had used an illicit drug by 8th grade in 2011, down from 26.8% in 2000 (Johnston, O'Malley, Bachman, &

Corresponding author: Adam J. Milam; phone: 410-347-3209 fax: 410-955-9088; amilam@jhsph.edu.

Schulenberg, 2011). Early exposure to ATOD and early initiation of ATOD use is associated with later adverse effects including later drug use, abuse and dependence (Anthony & Petronis, 1995; King & Chassin, 2007), mental health problems (Odgers et al., 2008), academic problems (Ellickson, Tucker, & Klein, 2001; Jeynes, 2002), risky sexual behaviors (Stueve & O'Donnell, 2005; Odgers et al., 2008), and criminal activity (Odgers et al., 2008). Stueve and O'Donnell (2005) examined early initiation of alcohol use and later alcohol and drug use as well as risky sexual behaviors.

Initiating alcohol use by 7th grade was associated with binge drinking and the number of sexual partners in 10th grade (Stueve & O'Donnell, 2005). Similarly, Odgers et al. (2008) found that adolescents with early ATOD exposure were more likely to have substance use problems, risky sexual behaviors, and be crime involved at age 32. This study was important in that it provided support for a potentially causal association between early ATOD exposure and subsequent substance use disorders. The current study builds on prior research by examining the association between the count of alcohol outlets around urban children's homes and opportunities to use ATOD during pre-adolescence as well as perceived neighborhood safety.

Factors Associated with ATOD Use in Adolescence

Initiation of ATOD use closely follows opportunities to use alcohol, tobacco, and other drugs (Van Etten, Neumark, Anthony, 1997; Van Etten & Anthony, 1999; Wagner & Anthony, 2002). ATOD use can only occur when there is an exposure opportunity, an opportunity to obtain ATOD. National data also suggest that 45% of individuals initiated marijuana use within a year after initial opportunity to use marijuana (Van Etten et al., 1997). The transition from opportunity to use to actual use also is influenced by the age of the individual during initial opportunity. Specifically, as the age at first opportunity to use increases the time from opportunity to initial use also increases. Given this prior research, it would be important to identify strategies to prevent early opportunities to use ATOD. The sample used in this current investigation is ideal to study exposure opportunity as they are in elementary school and actual use is relaively low compared to older children and adolescents in middle school.

When aiming to understand potential influences on opportunities to use ATOD, the ecological model (Bronfenbrenner & Morris, 1998) draws our attention to three major contexts of the family, peer, and neighborhood; prior research has linked each of these ecological spheres with adolescents' use and opportunity to use ATOD (e.g., Crum, Lillie-Blanton, & Anthony, 1996; Harrison et al., 2000; Hearst, Fulkerson, Maldonado-Molina, Perry, & Komro, 2007; Storr et al., 2004). For example, Hearst et al. (2007) examined where youth obtained alcohol (e.g. from parents, from commercial sources) in a large sample of adolescents during 6th to 8th grade. During 6th grade parents were the most prevalent source of alcohol. Over time (from 6th to 8th grade) the percentage of youth obtaining alcohol from parents decreased, and the percentage of youth obtaining alcohol from commercial sources (e.g., bars, liquor stores, gas station), adults, underage individuals, and taking alcohol from home increased. These findings also highlight the potential for the relative importance of the

three major contexts to change as youth age (Hearst et al., 2007; Harrison, Fulkerson, & Park, 2000; Wagenaar et al., 1996).

Although youth are most likely to obtain alcohol from social sources, such as their peers or parents, individuals (and the social sources) are nested within neighborhoods and opportunities to obtain alcohol may vary among neighborhoods. These environmental contextual effects can occur directly, through the presence of commercial sources like alcohol outlets, or indirectly through social sources (i.e., adults who are more likely to consume alcohol in neighborhoods with high alcohol outlet density) (Hearst et al., 2007; Harrison et al., 2000; Wagenaar et al., 1996).

Related research on neighborhoods has shown that the level of disorder, which is often operationalized as visible cues within the neighborhood environment that reflect lack of order and social control, is associated with more opportunities to use drugs, as well as greater overall exposure to ATOD (Crum et al., 1996; Storr, Chen, & Anthony, 2004; Storr, Arria, Workman, & Anthony, 2004a). For example, Crum et al. (1996) found that youth living in the most disadvantaged communities were more than five times more likely to be offered cocaine compared to youth living in more advantaged communities. Although research examining the relationship between neighborhood environment and exposure opportunity has found consistent results, fewer studies have looked for malleable targets within the neighborhood context to reduce youth exposure to ATOD. For example, potential malleable targets include alcohol outlets and tobacco outlets (Furr-Holden et al., 2011; Holder et al., 2000; Komro et al., 2008; Perry et al., 2002).

Alcohol outlets—The association between alcohol outlets and individual-level adult health and community-level problems has been well studied. Several studies have found that alcohol outlets are magnets for crime and incivility (Franklin, LaVeist, Webster, & Pan, 2010; Gorman, Speer, Gruenewald, & Labouvie, 2001; Livingston, 2008; Scribner, Cohen, Kaplan, & Allen, 1999) and are associated with increased consumption and availability of alcohol (Huckle, Huakau, Sweetsur, Huisman, & Casswell, 2008; Kuntsche & Kuendig, 2005; Kypri, Bell, Hay, & Baxter, 2008; McCord & Ratcliffe, 2007; Treno, Ponicki, Remer, & Gruenewald, 2008; Truong & Strum, 2009; Weitzman, Folkman, Folkman, & Wechsler, 2003). Alcohol outlets are also related to exposure to and availability of tobacco and other drugs. McCord & Ratcliffe (2007) explored alcohol outlets as crime attractors, specifically focusing on drug markets. Alcohol outlets are ideal locations for drug markets because alcohol outlets are more likely to be located in disorganized communities, they attract drug users as many use multiple substances (i.e. tobacco, alcohol), and areas of violent crime tend to be accessible by public transportation (McCord & Ratcliffe, 2007). Many alcohol outlets sell tobacco products and are locations for the illegal sale of loose cigarettes (Cannuscio, Weiss, & Asche, 2010; Naum, Yarian, & Cannuscio, 1995; Stillman et al., 2007). Fewer studies have examined the relationship between alcohol outlets and outcomes during childhood (Freisthler, Midanik, & Gruenewald 2004; Freisthler, Gruenewald, Remer, Lery, & Needell, 2007). For example, one such study has examined the association between alcohol outlets and children's physical abuse due to parental alcohol use (Freisthler, Midanik, & Gruenewald 2004).

Alcohol outlets are also promising locations for investigation as they are salient targets for future environmental interventions (Ashe, Jernigan, Kline, & Galaz, 2003; Duailibi et al., 2007; Holder et al., 2000; Komro et al., 2008; Maantay, 2001; O'Donnell, 1985). Land use and zoning policies can limit the density of alcohol outlets and restrict alcohol outlets from opening in certain zones (e.g., in close proximity to churches and schools or in residential areas). For example, in Maryland alcohol outlets cannot be located within 300 feet of a church or school, providing some geographic buffer for school children. As well, some legislative districts within Maryland that have high densisities of alcohol outlets have restricted hours of operation, namley prohibiting outlets from opening until after 10 am and requiring that they close by 2 am. Some states have also begun to limit the density of many "unhealthy" businesses including alcohol outlets and fast food restaurants (Sturm & Cohen, 2009). Regualting the density, proximity, and general operations of liquor stores have been shown to minimize their potential impact on youth alcohol use (Komro et al., 2008; Perry et al., 2002) and increase the need for empirical research to support future efforts.

Overview of the Current Study

The current study aimed to better understand ecological influences on youth's substance use. We were particularly interested in the relationship between alcohol outlets density around children's home and exposure to alcohol, tobacco, and other drugs during pre-adolescence. We focused on alcohol outlets considered to be off-premise license classes (e.g., package goods stores). This includes package good stores that sell liquor, beer, and wine, package good stores that sell wine and beer, and seven-day taverns that can sell package goods. Studies generally find that off-premise outlets are more strongly associated with drinking problems, crime, and violence (Scribner et al., 1999; Schonlau et al., 2008). Unlike bars and restaurants (i.e., on premise alcohol outlets), off-premise alcohol outlets can sell alcoholic beverages in large quantities, which can be consumed in uncontrolled environments (e.g., motor vehicles, outside the outlet, home; LaVeist & Wallace, 2000). In bars and restaurants, servers control how much patrons receive and can stop serving patrons if they appear intoxicated. The uncontrolled environment coupled with the potential to purchase large quantities can lead to excessive consumption and injuries. Excluded from these analyses are bars without off-premise sales and restaurants.

Using innovative spatial analyses, we focused on the association between (off-premise) alcohol outlet density and pre-adolescents' opportunities to use ATOD. We hypothesized that the greater the density of alcohol outlets, the more likely the youth would be to have opportunities to use. This work addresses gaps in the literature by examining the association between alcohol outlets and exposure to ATOD among youth. In fact, our focus on the pre-adolescence age is an important aspect of this study, given the literature on the timing of the onset of substance use (Anthony & Petronis, 1995; King & Chassin, 2007). This line of research has important implications for policies related to alcohol outlets and substance abuse prevention.

Methods

Study Design

The Multiple Opportunities to Reach Excellence (MORE) Project was a community-based epidemiological study which aimed to examine the effect of chronic violence exposure on elementary school-aged children's emotional, substance use, behavior, and academic functioning (Cooley-Strickland et al., 2009). The 55 Community Statistical Areas (CSAs) in Baltimore City were ranked based on homicide rate in 2002. Three violence strata were created based on the homicide rate and divided into tertiles corresponding to low, moderate, and high violence. There were 10 CSAs in Baltimore City with no homicides in 2002; these CSAs were placed in the low violence strata, the four CSAs in the middle of the distribution were placed in the moderate violence strata, and the four CSAs with highest homicide rate were classified as high violence. The two largest elementary schools in each violence strata were selected, resulting in six elementary schools. Two of the schools originally contacted declined to participate and the next largest elementary schools were contacted and subsequently agreed to participate.

To be eligible, students had to be between the ages of 8 and 12, enrolled at one of the selected Baltimore City Public Schools, speak English, and live with an English-speaking parent or guardian. Children with serious mental disorders were not allowed to participate. Recruitment materials were distributed in classrooms and mailed to the residential addresses of eligible participants; MORE Project staff also contacted eligible households via telephone. Incentives were offered to encourage participation. Consent was obtained from parents and principals. Data collection began in January 2007 with 490 consenting families. The consent rate for the study was 67% (Cooley-Strickland et al., 2009). Of the families who agreed to participate and consented, 87% had a child interview, 88% had a teacher interview, and 66% had a parent interview. Trained interviewers conducted child assessments during the school day in a private location within the school using pencil and paper and computer assessments; parental interviews were conducted over the phone or in-person (at the parent's home or at the project's University offices), and teacher interviews were conducted using a paper assessment at the end of the school year.

Participants

The first cohort of children (n = 425; 87% with child interviews) was followed for two subsequent waves of data collection. The current analytical sample included 394 (93%) of the children who completed the child interview. There were no differences between the analytical sample (n = 394) and the entire sample of children interviewed (n = 425) in race, gender, age or free lunch status. The majority of the analytical sample was African American (86%). Fifty-four percent were female and the average age was 9.6 years old (*SD*=1.1; *Median* = 10.0). The majority of children received free and reduced lunch (86.5%, n = 347). Table 1 displays additional demographic the characteristics of the sample.

Data Sources

Alcohol outlet data—Data on all the alcohol outlets (n=1338) in the records of the Board of Liquor License Commissioners for Baltimore City were obtained for this investigation.

The data included address and license type of all establishments licensed to sell alcohol in Baltimore City in 2007, during which there were 14 alcohol license classes. This investigation focused on off-premise license classes (e.g., package goods stores; *n*=788), which include package good stores that sell liquor, beer, and wine, package good stores that sell wine and beer, and seven-day taverns that can sell package goods. As noted above, studies generally report that off-premise outlets are more closely related to drinking problems, crime, and violence (Scribner et al., 1999; Schonlau et al., 2008). We excluded from these analyses bars without off-premise sales and restaurants.

Neighborhood data—Studies have reported a relationship between neighborhood disorder and exposure and opportunity to use ATOD (Crum et al., 1996; Furr-Holden et al., 2011). Neighborhood disorder refers to the lack of order and social control within the neighborhood and is often measured by visible cues within the neighborhood environment (e.g., graffiti, abandoned structures). This investigation controlled for neighborhood physical disorder using items from the Neighborhood Inventory for Environmental Typology (NIfETy), a standardized instrument that is used to assess characteristics of the neighborhood environment related to violence, alcohol, and other drug (VAOD) exposure (Furr-Holden et al., 2008; Furr-Holden et al., 2010). The NIfETy instrument includes seven domains: (1) physical layout of the block, (2) types of structures, (3) adult activity, (4) youth activity, (5) physical disorder and order, (6) social disorder and order, and (7) violence and AOD indicators.

The NIfETy assessments were conducted independently by a pair of trained field raters. The raters traveled to their assigned blocks and perform the ratings; raters spent an average of 30 minutes on each block. The environmental assessments were entered into personal digital assistants (PDAs) that are programmed with the instrument; the data was then uploaded to a secure server. NIfETy ratings were conducted on each child's residential block face within 3 months of their other assessments. The block-level data was then merged with the self-report survey data. If more than one participant lived on the same block, the environmental assessment was conducted once and used for each participant residing on that block. The NIfETy has high reliability for the total scale [Intraclass Correlation Coefficients (ICC) = . 87], the VAOD subscale (ICC=.71), and across raters (ICC=.67-.79). Validity metrics are also good. NIfETy indicators of VAOD exposure correlated strongly with self-reported VAOD exposure in a sample of young adults and also with local crime data (Furr-Holden et al., 2010). For additional details on the administration or psychometric properties of the NIfETy see Fur-Holden et al. (2008) and Furr-Holden et al. (2010).

Exposure to ATOD—Exposure to and opportunity to use ATOD were measured using questions from the Baltimore Substance Use Scale (BSUS; Chilcoat & Anthony, 1996; Chilcoat, Dishion, & Anthony, 1995; Kellam & Anthony 1998). The BSUS consists of 90 questions focused on youth's knowledge of ATOD, current and/or anticipated use of tobacco, alcohol, marijuana, crack cocaine, heroin, inhalants, and stimulants (Chilcoat, et al., 1995; Cooley-Strickland et al., 2009). Opportunity to use ATOD was a composite variable created using the following question stem: “Have you ever been offered ____?” This question was asked for tobacco, alcohol, marijuana, crack, cocaine, heroin, ecstasy, and

methamphetamine. Additionally, the following two questions, also from the BSUS, were used as outcomes: “Have you ever seen someone smoking marijuana?” and “Have you ever seen someone selling drugs?” The responses to all questions included in this investigation were yes/no.

Neighborhood safety—Children were asked if they agree with the following statement: “I feel safe in my neighborhood.” These items were answered on a four-point Likert scale (agree a lot to disagree a lot). This item was dichotomized and reverse coded (disagree and disagree a lot [1]; agree and agree a lot [0]). Approximately, 32% of the children reported not feeling safe in their neighborhood.

Alcohol outlets—The count of alcohol outlets within walking distance was the main variable of interest in this investigation. Consistent with prior studies, which have generally used a quarter mile (1320 feet) as the range of maximum walking distance (10-15 minutes; Pollack, Cubbin, Ahn, Winkleby, 2005; Treno, Gruenewald, & Johnson, 2001; West et al., 2010) for adolescents, we also used a ¼ mile to measure walking distance.

Covariates—The adjusted models controlled for sex, free and reduced price lunch status (a proxy for low socioeconomic status), age (in years) and neighborhood physical disorder. Children are eligible for free or reduced lunch if their family income is below 185% of the federal poverty level. In Baltimore City Public Schools, 84% of students are eligible for free and reduced lunch. The neighborhood physical disorder score is based on an exploratory factor analysis (EFA) of eight indicators that are theoretically related to neighborhood physical disorder: unboarded abandoned structures, boarded abandoned structures, structures with broken windows, vacant houses, graffiti, evidence of vandalism, unmaintained properties (e.g. paint chipping, missing bricks) and vacant lots (Cohen, Farley, & Mason, 2003; Furr-Holden et al., 2011; Perkins, Meeks, & Taylor, 1992). Four items consistently loaded together (loadings: .76-.82) had prevalence greater than 5%: unboarded abandoned structures, boarded abandoned structures, unmaintained properties, and presence of graffiti. The fit indices for the EFA were good; the chi-square test for model fit was insignificant (p =.42) indicating that the model fits the data and the Root Mean Square Error of Approximation (RMSEA) was estimated at zero (.06>RMSEA indicates a good fit; Hu & Bentler, 1999). The neighborhood physical disorder score was created by multiplying the factor loadings from the EFA by one if the indicator was present and summing the score for each participant's block face. The neighborhood physical disorder score ranged from 0 to 3.19, the mean was 1.32 (SD=1.03). The factor analysis was conducted in Mplus 5.0 (Muthén & Muthén, 1998-2007).

Spatial Analysis

Alcohol outlet location data were obtained from the Board of Liquor License Commissioners for Baltimore City and geocoded using ArcGIS v.9 (ESRI, 2005). There were 1338 addresses included in list obtained from the Liquor Board. 99.8% (n=1336) of the addresses were geocoded including 787 off-premise and 549 on-premise alcohol outlets. The residential addresses of 401 young adults residing in Baltimore City were also geocoded. Quarter-mile buffers (i.e. walking distance) were added around the study participants'

residential address using Service Area tool in ArcGIS. The service area tool creates a buffer around a layer of points (e.g., the residential location of the participants) based on distance navigating street networks excluding highways (compared to straight line distance which would ignore street networks, bodies of water, and buildings). The count of alcohol outlets within the buffer was determined using the spatial join tool (a tool used to append data from one map layer to another map layer using geographic location) in ArcGIS.

The majority of the children had an alcohol outlet within walking distance (54.8%). The number of alcohol outlets within walking distance for children ranged from 0 to 13 and the mean count was 1.56 (*SD*=2.03, *median*=1.00). The count of alcohol outlets based on network distance was truncated at seven to improve normality. The count of alcohol outlets walking distance was then exported into Stata 11.2 and merged with to the self-report data.

Sixty-one participants (14.4%) were missing data on the neighborhood physical disorder score. Inverse distance weighting (IDW) was used to estimate the disorder score for participants with a geocoded address. IDW is available in the Spatial Analyst extension in ArcGIS. Inverse density weighting is a commonly used interpolation method that approximates a value to an unsampled point based on weighted averages from neighboring points (Burrough, 1986; Watson, 1987; 1992). The interpolated value of the unsampled point is most influenced by the closer points (i.e. the closer points have a greater weight). The unadjusted models were run with and without the estimated neighborhood data from the interpolation. The mean for the neighborhood physical disorder score with the interpolated data was 1.34 (*SD*=1.03), which was similar to the non-interpolated neighborhood physical disorder score (*M*=1.32, *SD*=1.03). All outcomes of interest (alcohol and other drug exposure and perceived safety) were analyzed for spatial autocorrelation (Moran's I) in ArcGIS. There was no evidence of spatial autocorrelation (i.e. $p>.05$).

Statistical Analyses

Missing data ranged from 0% to 14.4% for individual measures. Twenty-four children (5.6%) were missing useable address information; 16 children (3.8%) were missing outcome data, and 24 (5.6%) children were missing free-reduced lunch data. Sixty-one participants (14.4%) were missing data on the neighborhood disorder score, which was estimated using spatial interpolation described above. The final analytical sample included 379 to 394 children. The children with missing data were similar to the children with complete data by race, gender, age and free lunch status.

Logistic regression models via Generalized Estimating Equations (GEE) were used to estimate the strength of association between the count of alcohol outlets within walking distance and exposure to ATOD as well as perceived neighborhood safety. GEE accounts for the clustering of outcomes by providing robust standard errors (Zeger & Liang, 1986). Although each participant has their own walking distance buffer placed around their individual home; the sampling design produced clustering (recruitment at six elementary schools). To determine the degree of clustering, intraclass correlation coefficients (ICCs) were calculated for each outcome using Neighborhood Statistical Area (NSA), as the cluster; all ICCs were below .06. There are 277 NSAs in Baltimore City, these are smaller than Census tracts and were designed by the City government in conjunction with city residents.

There were approximately seven children per NSA (*M*=7.2, Range: 1-48). There are three other concepts of neighborhood included in this investigation: 1) children's perception of their neighborhood used for perceived neighborhood safety (no defined geography), 2) the individualized neighborhoods created by the walking distance buffers in ArcGIS (quarter mile around children's home), and 3) the objective measure of neighborhood physical disorder from the NIfETy (conducted on the children's residential block). All of the measures of neighborhood overlap with the NSAs but may not be entirely confined within the NSA.

Odds ratios were estimated to convey the strength of the association. Significant findings were reported for alpha levels below 0.05 and marginally significant findings (or trends) were reported for alpha levels between 0.05 and 0.10. Each outcome of interest was analyzed independently. The models were extended to include statistical adjustment for sex, socioeconomic status (measured via free or reduced lunch status), and neighborhood physical disorder. Stata 11.2 was used for all statistical analyses (StataCorp. 2009).

Results

Descriptive Statistics

The analytical sample included 394 children. The demographic characteristics of the analytical sample as well as the prevalence of the outcome and independent variables are included in the methods sections. Spearman's rank correlation revealed a significant correlation between the neighborhood physical disorder score and the count of alcohol outlets (r_s = .60, p<.01).

Unadjusted Logistic Regression Models

The regression analyses (Table 2) indicated that each increase in the count of alcohol outlets within walking distance of children's home was associated with a 14% increase in the likelihood of seeing people selling drugs (OR=1.14, p=.04); a similar relationship was found with seeing people smoking marijuana (OR=1.15, p<.01). Alcohol outlet count was also positively associated with perceived neighborhood safety, for each unit increase in the count of alcohol outlets, children were 21% more likely to disagree that they feel safe in their neighborhood (OR=1.21, p<.01).

For each unit increase in neighborhood physical disorder on children's residential block face, children were 26% more likely be offered ATOD (OR=1.26, p=.04), and 39% more likely to report seeing people smoking marijuana (OR=1.39, p<.01). There was a positive and marginally significant relationship between neighborhood physical disorder and seeing people selling drugs (OR=1.27, p=.05). Children were 92% more likely to disagree that they feel safe in their neighborhood for each unit increase in neighborhood disorder (OR=1.92, p<.01). Odds ratios and p-values when using the interpolated neighborhood physical disorder score for missing data were similar to estimates and p-values obtained without the interpolated neighborhood data providing support for the use of the interpolated values. Males were twice as likely to report being offered alcohol, tobacco and other drugs (OR=2.59, p<.01). There was a positive association between age and being offered ATOD

(OR=1.49, p=.01, respectively). Age was also positively associated with seeing people selling drugs (OR=1.24, p<.01).

Logistic Regression Models

Individual-level covariates—The semi-adjusted model controlled for individual-level variables: age, gender, and socioeconomic status. After adjusting for individual-level characteristics the count of alcohol outlets within walking distance of children's home continued to be associated with seeing people smoking marijuana and perceived neighborhood safety (Table 3). Each unit increase in the count of alcohol outlets was associated with an 11% increase in the likelihood of seeing people smoking marijuana and a 20% increase in perceived neighborhood safety (OR=1.11, p<.01 & 1.20, p<.01, respectively). The number of alcohol outlets was no longer associated with seeing people selling drugs (OR= 1.07, p=.22). Receiving free and lunch was strongly associated with seeing people smoking marijuana and seeing people selling drugs (OR=2.38, p<0.01 & OR=3.06, p<0.01).

Fully-adjusted model—The fully-adjusted model extended the semi-adjusted model by adjusting for neighborhood physical disorder, a proxy for neighborhood disadvantage. These models indicated that the count of alcohol outlets with walking distance of children's home was not associated with exposure to ATOD or perceived neighborhood safety (Table 4). Although there was no longer a statistically significant relationship between exposure to alcohol outlets and ATOD or perceived neighborhood safety, the relationship between neighborhood physical disorder and seeing people smoking marijuana as well as perceived safety remained significant after controlling for alcohol outlets and demographic variables (OR=1.26, p=.047; OR=2.05, p<.01 respectively).

Discussion

During the last decade research has been conducted to better understand the influence of alcohol outlets on adult alcohol use and community-level problems (e.g., crime, injuries; Franklin et al., 2010; Gorman et al., 2001; Livingston, 2008; Scribner et al., 1999). The current study explored the relationship between alcohol outlet density around children's home and exposure to alcohol, tobacco, and other drugs. We observed a significant association between alcohol outlets and seeing people selling drugs and smoking marijuana as well as perceived neighborhood safety in the unadjusted models. After adjusting for individual-level characteristics, the count of alcohol outlets continued to be associated with seeing people smoking marijuana and perceived neighborhood safety. However, when a proxy for neighborhood disadvantage was included, the relationship between alcohol outlets and illegal drug activity (i.e., seeing people selling drugs and seeing people smoking marijuana) disappeared. This finding suggests that alcohol outlet density is just one feature of the larger environmental context influencing children's exposures to ATOD.

Although neighborhood physical disorder was treated as a confounder in this investigation as it was associated with the predictor (count of alcohol outlets) and the outcomes variables (exposure to ATOD and perceived neighborhood safety), neighborhood physical disorder could be a mediator. Alcohol outlets could lead to increased neighborhood disorder and the

disorder and disadvantage from the alcohol outlets can expose children to ATOD. Due to the cross-sectional study design we are unable to determine whether neighborhood disorder mediates or confounds the relationship between alcohol outlet density and youth exposure to ATOD. It is difficult to distinguish between mediators and confounders in cross-sectional designs (MacKinnon, Krull, & Lockwood, 2000). Longitudinal data would be needed to determine whether the neighborhood environment influences alcohol outlet density or whether the alcohol outlets produce disorder within the neighborhood environment.

Consistent with prior research, males were more likely than females to be offered alcohol, tobacco, and other drugs. Males generally have more access to the neighborhood environment due to decreased parental monitoring which may account for increased likelihood to be offered ATOD (Borawski, Levers-Landis, Lovegreen, & Trapl, 2003; Li, Feigelman, & Stanton, 2000). As suggested by the ecological perspective, we also found that neighborhood disorder was associated with opportunities to use ATOD and perceived safety, which is consistent with prior investigations (Crum et al., 1996; Storr et al., 2004). Neighborhood physical disorder continued to be associated with seeing people selling drugs and perceived safety after statistical adjustment for the count of alcohol outlets.

Studies among older youth generally report an association between alcohol outlets and youth drinking and perceived availability (Chen et al., 2009; Chen et al., 2010; Huckle et al., 2008; Treno et al., 2003; Truong & Sturm, 2009) with few exceptions (e.g., Pasch et al., 2009). However, there are several differences between this current study and previous investigations. Most studies examine alcohol outlet density as an aggregate measure at the zip code or census tract level (Chen, Gruenewald, & Remer, 2009; Chen, Grube, & Gruenewald, 2010; Huckle et al., 2008; Treno et al., 2003), whereas this study took advantage of available GIS technologies and examined the count of alcohol outlets within walking distance of children's home. The current study focused on younger youth (i.e., pre-adolescents), whereas previous investigations have generally examined adolescent and young adult outcomes (Chen et al., 2009; Chen et al., 2010; Huckle et al., 2008; Treno et al., 2003; Truong & Sturm, 2009).

With regard to the results of the spatial analyses, the measures and geographic units for this investigation were generally more specific to the child and seemingly their residential experience. Specifically, alcohol outlet exposure was operationalized as the network walking distance to the child's home. Network distance accounts for natural walking paths and excludes natural borders and boundaries, such as a large body of water or highways that people often do not cross in the course of moving through their neighborhood. The majority of studies of this type have relied on straight-line distance (or density of alcohol outlets at the zip code or census tract level) (Chen et al., 2009; Chen et al., 2010; Pollack et al., 2005). Straight-line distance and density at the zip code or Census-tract miss this nuance and erroneously attribute neighborhood characteristics (e.g., an alcohol outlet within walking distance of one's home but on the other side of a highway with no walking access) to residential experiences. In addition, we adjusted for neighborhood disadvantage on the children's block face compared to previous studies that use Census-tract level measures for neighborhood disadvantage (Chen et al., 2009; Chen et al., 2010; Huckle et al., 2008; Truong & Sturm, 2009). Census tracts are relatively large geographic units, that again, may

not correlate with residents' experience of their neighborhoods. As well, the macro-level measures often encompass several smaller neighborhoods with heterogeneous demographics. This is problematic because averaging economic and other measures within a tract or zip code will often produce data that do not match any of the smaller geographic units that actually map onto residents actual neighborhood environment.

The importance of Geographic Information System (GIS) technology (the combination of data with geographic location) is becoming increasingly important for public health researchers. This technology allows researchers to address limitations of prior research that use aggregated data at the level of the census tract or zip code. Additionally, much of the data required (e.g., participant location, alcohol outlet location) to perform GIS analyses at the individual-level are available in most studies. These GIS strategies provide opportunities for translating research findings to practice by identifying specific factors that may not be apparent when averaged over large geographic units with heterogeneous populations.

The current study does have some limitations that are important to note. First, data were not available to indicate where or when the children were exposed to alcohol, tobacco, or other drugs. Exposure to ATOD could have occurred outside of the children's neighborhood. Similarly, the measure of perceived neighborhood safety does not explicitly define neighborhood boundaries and the size of a neighborhood may vary among children. Future investigations should include measures of exposure specific to location (e.g. home, neighborhood, school). Secondly, the children were recruited from six schools in three violence strata, which limits our ability to examine higher-level contextual factors, as well as the generalizability of our findings. Future studies should replicate this investigation with representative populations. There was no measure indicating how long children had been exposed to their neighborhood environment. Children living in disadvantaged communities may have higher levels of parental monitoring and involvement or spend more time indoors due to neighborhood safety, reducing exposure to the neighborhood environment and alcohol outlets (Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999). The current study was also cross-sectional which precludes ascertainment of temporal relationships between alcohol outlets, neighborhood physical disorder, and exposure to ATOD. It is possible that the neighborhood physical disorder could also lead to more alcohol outlets, as communities with more physical disorder may also be disorganized and therefore may not work together to prevent additional outlets in the neighborhood. Given the design of the study, we are unable to draw firm conclusions regarding the direction of the associations or causality. Nevertheless, prior research and theory would suggest that the presence and concentration of alcohol outlets would lead to greater neighborhood disorder (Mair & Mair, 2003; McCord & Ratcliffe, 2007; Steenbeek, Völker, Flap, & van Oort, 2012). Future studies should examine these relationships longitudinally. Lastly, other confounders including parental and peer substance use were not included in this investigation. Prior research has found parental substance use to be causally linked to exposure opportunities and should be included in future investigations, more specifically, exposure parental substance use during childhood has been linked to later substance use in adolescence and adulthood (Biederman, Faraone, Monuteaux, & Feighner, 2000; Chassin, Pillow, Curran, Molina, & Barrera, 1993).

Despite these limitations, this investigation addressed important gaps in the literature by examining the association between alcohol outlets and exposure opportunity in a sample of urban elementary school children using enhanced measures of both the neighborhood environment and alcohol outlet exposure. It appears that alcohol outlets are just one feature of the larger neighborhood environment. More deliberate investigation is warranted to determine if reductions in alcohol outlets would be related to overall changes in the neighborhood environment given the salience of alcohol outlets and potential to regulate their location and density through environmental design and policy-level interventions. Future studies should replicate these findings in other urban communities and with a more diverse sample of children. Research should also explore this relationship as the children age and are more likely to be offered opportunities to use alcohol, tobacco and other drugs.

Acknowledgments

National Institute on Alcoholism and Alcohol Abuse (NIAAA) R01AA015196 to the Principal Investigator, C. Debra Furr-Holden, PhD; and the National Institute on Drug Abuse (NIDA) R01DA018318 to the Principal Investigator, Michele Cooley-Strickland, PhD

References

Anthony JC, Petronis KR. Early-onset drug use and risk of later drug problems. Drug and Alcohol Dependence. 1995; 40:9–15. [PubMed: 8746919]

Ashe M, Jernigan D, Kline R, Galaz R. Land use planning and the control of alcohol, tobacco, firearms, and fast food restaurants. American Journal of Public Health. 2003; 93:1404–1408. [PubMed: 12948952]

Biederman J, Faraone SV, Monuteaux MC, Feighner JA. Patterns of alcohol and drug use in adolescents can be predicted by parental substance use disorders. Pediatrics. 2000; 106:792–797. [PubMed: 11015524]

Borawski EA, Levers-Landis CE, Lovegreen LD, Trapl ES. Parental monitoring, negotiated unsupervised time, and parental trust: the role of perceived parenting practices in adolescent health risk behaviors. Journal of Adolescent Health. 2003; 33:60–70. [PubMed: 12890596]

Bronfenbrenner, U.; Morris, P. The ecology of developmental processes. In: Damon, W., editor. Handbook of child psychology. Vol. 1. New York: John Wiley & Sons; 1998. p. 993-1028.Theoretical models of human development

Burrough, PA. Principles of geographical information systems for land resources assessment. Oxford: Clarendon Press; 1986.

Cannuscio C, Weiss EE, Asch DA. The contribution of urban foodways to health disparities. Journal of Urban Health. 2010; 87:381–390. [PubMed: 20354910]

Chassin L, Pillow D, Curran P, Molina B, Barrera M. Relation of parental alcoholism to early adolescent substance use: A test of three mediating mechanisms. Journal of Abnormal Psychology. 1993; 102:3–19. [PubMed: 8436697]

Chen MJ, Gruenewald PJ, Remer LG. Does alcohol outlet density affect youth access to alcohol? Journal of Adolescent Health. 2009; 44:582–589. [PubMed: 19465323]

Chen MJ, Grube JW, Gruenewald PJ. Community alcohol outlet density and underage drinking. Addiction. 2010; 105:270–278. [PubMed: 20078485]

Chilcoat HD, Dishion TJ, Anthony J. Parent monitoring and the incidence of drug sampling in urban elementary school children. American Journal of Epidemiology. 1995; 141:25–31. [PubMed: 7801962]

Chilcoat H, Anthony J. Impact of parent monitoring on initiation of drug use through late childhood. Journal of the American Academy of Child and Adolescent Psychiatry. 1996; 35:91–100. [PubMed: 8567618]

Cohen D, Farley T, Mason K. Why is poverty unhealthy? Social and physical mediators. Social Science & Medicine. 2003; 57:1631–1641. [PubMed: 12948572]

Cooley-Strickland M, Quille TJ, Griffin RS, Stuart EA, Bradshaw CP, Furr-Holden CDM. Community violence and youth: affect, behavior, substance use and academics. Clinical Child and Family Psychology Review. 2009; 12:127–156. [PubMed: 19472053]

Crum RM, Lillie-Blanton M, Anthony JC. Neighborhood environment and opportunity to use cocaine and other drugs in late childhood and early adolescence. Drug and Alcohol Dependence. 1996; 43:155–161. [PubMed: 9023071]

Duailibi S, Ponicki W, Grube J, Pinsky I, Laranjeira R, Raw M. The effect of restricting opening hours on alcohol-related violence. American Journal of Public Health. 2007; 97:2276–2280. [PubMed: 17971559]

Ellickson PL, Tucker JS, Klein DJ. Ten-year prospective study of public health problems associated with early drinking. Pediatrics. 111:949–955. [PubMed: 12728070]

ESRI. ArcGIS ArcMap 9. Redlands, CA: 2005.

Franklin FA, LaVeist TA, Webster DW, Pan WK. Alcohol outlets and violent crime in Washington D.C. Western Journal of Emergency Medicine. 2010; 11:283–290. [PubMed: 20882151]

Freisthler B, Midanik LT, Gruenewald PJ. Alcohol outlets and child physical abuse and neglect: Applying routine activities theory to the study of child maltreatment. Journal of Studies on Alcohol and Drugs. 2004; 65:586–592.

Friesthler B, Gruenewald PJ, Remer LG, Lery B, Needell B. Exploring the spatial dynamics of alcohol outlets and child protective services referrals, substantiations, and foster care entries. Child Maltreatment. 2007; 12:114–124. [PubMed: 17446565]

Furr-Holden CDM, Smart MJ, Pokorni JL, Ialongo NS, Leaf PJ, Holder HD, Anthony JC. The NIfETy method for environmental assessment of neighborhood-level indicators of violence, alcohol, and other drug exposure. Prevention Science. 2008; 9:245–255. [PubMed: 18931911]

Furr-Holden CDM, Campbell K, Milam AJ, Smart M, Ialongo N, Leaf PJ. Metric properties of the Neighborhood Inventory for Environmental Typology (NIfETy): An environmental assessment tool for measuring indicators of violence, alcohol, tobacco, and other drug exposures. Evaluation Review. 2010; 34:159–184. [PubMed: 20479211]

Furr-Holden CDM, Lee MH, Milam AJ, Johnson RM, Lee SK, Ialongo NS. The growth of neighborhood disorder and marijuana use among urban adolescents: A case for policy and environmental interventions. Journal of Studies on Alcohol and Drugs. 2011; 72:371–379. [PubMed: 21513673]

Furstenberg, FF.; Cook, T.; Eccles, J.; Elder, GH.; Sameroff, A. Managing to make it: Urban families and adolescent success. Chicago: University of Chicago Press; 1999.

Gorman DM, Speer PW, Gruenewald PJ, Labouvie EW. Spatial dynamics of alcohol availability, neighborhood structure and violent crime. Journal of Studies on Alcohol and Drugs. 2001; 62:628–36.

Harrison PA, Fulkerson JA, Park E. The relative importance of social versus commercial sources in youth access to tobacco, alcohol, and other drugs. Preventive Medicine. 2000; 31:39–48. [PubMed: 10896842]

Hearst MO, Fulkerson JA, Maldonado-Molina MM, Perry CL, Komro KA. Who needs liquor stores when parents will do? The importance of social sources of alcohol among young urban teens. Preventive Medicine. 2007; 44:471–476. [PubMed: 17428525]

Holder HD, Gruenewald PJ, Ponicki WR, Treno AJ, Grube JW, Saltz RF, Roeper P. Effect of community-based interventions on high risk drinking and alcohol-related injuries. Journal of the American Medical Association. 2000; 284:2341–2347. [PubMed: 11066184]

Hu L, Bentler PM. Fit indices in covariance structure modeling: Sensitivity to underparametized model misspecification. Psychological Methods. 1998; 3:424–453.

Huckle T, Huakau J, Sweetsur P, Huisman O, Casswell S. Density of alcohol outlets and teenage drinking: living in an alcogenic environment is associated with higher consumption in a metropolitan setting. Addiction. 2008; 103:1614–1621. [PubMed: 18821871]

Jeynes WH. The relationship between the consumption of various drugs by adolescents and their academic achievement. American Journal of Drug and Alcohol Abuse. 2002; 28:15–35. [PubMed: 11853131]

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the Future national results on adolescent drug use: Overview of key findings 2010. Ann Arbor: Institute for Social Research: The University of Michigan; 2011.

Kellam S, Anthony J. Targeting early antecedents to prevent tobacco smoking: Findings from an epidemiologically based randomized field trial. American Journal of Public Health. 1998; 88:1490–1495. [PubMed: 9772850]

King KM, Chassin L. A prospective study of the effects of age of initiation of alcohol and drug use on young adult substance dependence. Journal of Studies on Alcohol and Drugs. 2007; 68:256–265. [PubMed: 17286344]

Komro KA, Perry CL, Veblen-Mortenson S, Farbakhsh K, Toomey TL, Stigler MH, Williams CL. Outcomes from a randomized controlled trial of a multi-component alcohol use preventive intervention for urban youth: Project Northland Chicago. Addiction. 2008; 103:606–618. [PubMed: 18261193]

Kuntsche EN, Kuendig H. Do school surroundings matter? Alcohol outlet density, perception of adolescent drinking in public, and adolescent alcohol use. Addictive Behaviors. 2005; 30:151–158. [PubMed: 15561455]

Kypri K, Bell ML, Hay GC, Baxter J. Alcohol outlet density and university student drinking: A national study. Addiction. 2008; 103:1131–1138. [PubMed: 18554346]

LaVeist TA, Wallace JM. Health risk and inequitable distribution of liquor stores in African American neighborhood. Social Science and Medicine. 2000; 51:613–617. [PubMed: 10868674]

Li X, Feigelman S, Stanton B. Perceived parental monitoring and health risk behaviors among urban low-income African American children and adolescents. Journal of Adolescent Health. 2000; 27:43–48. [PubMed: 10867351]

Livingston MA. Longitudinal analysis of alcohol outlet density and assault. Alcohol-Clinical and Experimental Research. 2008; 32:1074–1079.

Maantay J. Zoning, equity, and public health. American Journal of Public Health. 2001; 91:1033–1041. [PubMed: 11441726]

MacKinnon DP, Krull JL, Lockwood CM. Equivalence of the mediation, confounding, and suppression effect. Prevention Science. 2000; 1:173–181. [PubMed: 11523746]

Mair JS, Mair M. Violence prevention and control through environmental modifications. Annual Review of Public Health. 2003; 24:209–225.

McCord ES, Ratcliffe JH. A micro-spatial analysis of the demographic and criminogenic environment of drug markets in Philadelphia. Australian & New Zealand Journal of Criminology. 2007; 40:43–63.

Muthén, LK.; Muthén, BO. Mplus User's Guide. Fifth. Los Angeles, CA: Muthén & Muthén; 1998-2007.

Naum GP, Yarian DO, McKenna JP. Cigarette availability to minors. The Journal of the American Osteopathic Association. 1995; 95:663–665. [PubMed: 8575949]

Odgers CL, Caspi A, Nagin DS, Piquero AR, Slutske WS, Milne BJ, Moffitt TE. Is it important to prevent early exposure to drugs and alcohol among adolescents? Psychological Science. 2008; 19:1037–1044. [PubMed: 19000215]

O'Donnell MA. Research on drinking locations of alcohol-impaired drivers: Implications for prevention policies. Journal of Public Health Policy. 1985; 6:510–525. [PubMed: 3912407]

Pasch KE, Hearst MO, Nelson MC, Forsyth A, Lytle LA. Alcohol outlets and youth alcohol use: Exposure in suburban areas. Health & Place. 2009; 15:642–646. [PubMed: 19084464]

Perkins DD, Meeks JW, Taylor RB. The physical environment of street blocks and resident perceptions of crime and disorder: Implications for theory and measurement. Journal of Environmental Psychology. 1992; 12:21–34.

Perry CL, Williams CL, Komro KA, Veblen-Mortenson S, Stigler MH, Munson KA, Forster JL. Project Northland: Long-term outcomes of community action to reduce adolescent alcohol use. Health Education Research. 2002; 17:117–132. [PubMed: 11888042]

Pollack CE, Cubbin C, Ahn D, Winkleby M. Neighbourhood deprivation and alcohol consumption: Does the availability of alcohol play a role? International Journal of Epidemiology. 2005; 34:772–780. [PubMed: 15737966]

Schonlau M, Scribner R, Farley TA, Theall KP, Bluthenthal RN, Scott M, Cohen DA. Alcohol outlet density and alcohol consumption in Los Angeles County and Southern Louisiana. GeoSpatial Health. 2008; 3:91–101. [PubMed: 19021112]

Scribner R, Cohen D, Kaplan S, Allen SH. Alcohol availability and homicide in New Orleans: Conceptual considerations for small area analysis of the effect of alcohol outlet density. Journal of Studies on Alcohol and Drugs. 1999; 60:310–316.

Stata Version Release 11.0. Stata Corporation; College Station, TX: 2009.

Steenbeek W, Völker B, Flap H, van Oort F. Local businesses as attractors or preventers of neighborhood disorder. Journal of Research in Crime & Deliquency. 2012; 49:213–248.

Stillman FA, Bone L, Avila-Tang E, Smith K, Yancey N, Street C, Owings K. Barriers to smoking cessation in inner-city African American young adults. American Journal of Public Health. 2007; 97:1405–1408. [PubMed: 17600247]

Storr CL, Chen CY, Anthony JC. “Unequal opportunity”: Neighborhood disadvantage and the chance to buy illegal drugs. Journal of Epidemiology and Community Health. 2004; 58:231–237. [PubMed: 14966238]

Storr CL, Arria AM, Workman RL, Anthony JC. Neighborhood environment and opportunity to try methamphetamine (“Ice”) and marijuana: evidence from Guam in the Western Pacific Region of Micronesia. Substance Use & Misuse. 2004a; 39:253–276. [PubMed: 15061561]

Stueve A, O'Donnell LN. Early initiation and subsequent sexual and alcohol risk behaviors among urban youths. American Journal of Public Health. 2003; 95:887–893. [PubMed: 15855470]

Treno AJ, Grube JW, Martin SE. Alcohol availability as a predictor of youth drinking and driving: a hierarchical analysis of survey and archival data. Alcoholism: Clinical and Experimental Research. 2003; 27:835–840.

Treno AJ, Gruenewald PJ, Johnson FW. Alcohol availability and injury: The role of local outlet densities. Alcoholism. 2001; 25:1467–1471. [PubMed: 11696666]

Treno AJ, Ponicki WR, Remer LG, Gruenewald PJ. Alcohol outlets, youth drinking and self-reported ease of access to alcohol: a constraints and opportunities approach. Alcoholism: Clinical and Experimental Research. 2008; 32:1372–1379.

Truong KD, Sturm R. Alcohol environments and disparities in exposure associated with adolescent drinking in California. American Journal of Public Health. 2009; 99:264–270. [PubMed: 19059870]

Van Etten ML, Neumark YD, Anthony JC. Initial opportunity to use marijuana and the transition to first use: United States, 1979-1994. Drug and Alcohol Dependence. 1997; 49:1–7. [PubMed: 9476693]

Van Etten ML, Neumark YD, Anthony JC. Male-female differences in the earliest stages of drug involvement. Addiction. 1999; 94:1413–1419. [PubMed: 10615725]

Wagenaar AC, Toomey TL, Murray DM, Short BJ, Wolfson M, Jones-Webb R. Sources of alcohol for underage drinkers. Journal of Studies on Alcohol. 1996; 57:325–333. [PubMed: 8709591]

Wagner FA, Anthony JC. Into the world of illegal drug use: exposure opportunity and other mechanisms linking the use of alcohol, tobacco, marijuana, and cocaine. American Journal of Epidemiology. 2002; 155:918–925. [PubMed: 11994231]

Watson DF, Philip GM. Neighborhood based interpolation. Geobyte. 1987; 2:12–16.

Watson, DF. Contouring: a guide to the analysis and display of spatial data. Oxford: Pergamon; 1992.

Weitzman ER, Folkman A, Folkman K, Wechsler H. The relationship of alcohol outlet density to heavy and frequent drinking and drinking-related problems among college students at eight universities. Health Place. 2003; 9:1–6. [PubMed: 12609468]

West JH, Blumberg EJ, Kelley NJ, Hill L, Sipan C, Schmitz KE, Hovell MF. Does proximity to retailers influence alcohol and tobacco use among Latino Adolescents? Journal of Immigration and Minority Health. 2010; 12:626–633.

Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. Biometrics. 1986; 42:121–130. [PubMed: 3719049]

Table 1

Sociodemographic characteristics and exposure to alcohol, tobacco, and other drugs (*n*=394)

Characteristic	*n* (%)
Gender	
Male	183 (46.5)
Female	211 (53.5)
Race	
African American	339 (86.0)
Bi-racial/mixed	31 (7.9)
Caucasian	13 (3.3)
Other	11 (2.8)
Mean age (SD)	9.6 (1.1)
Lunch Status[a]	
Free/Reduced Priced	320 (86.0)
Paid	53 (14.0)
Mean count off-premise outlets within 1/4 mile (SD)	1.52 (1.92)
Offered alcohol, tobacco or other drug	59 (15.0)
Seen people smoking marijuana	174 (44.2)
Seen people selling drugs	184 (46.7)
Perceived neighborhood safety[b]	124 (31.6)

[a] *n*=379;

[b] *n*=393

Table 2

Unadjusted logistic regression model results for alcohol outlet count and exposure to alcohol, tobacco, and other drugs (*n*=394)

	Offered alcohol, tobacco, or other drugs		Seen people smoking marijuana		Seen people selling drugs		Perceived neighborhood safety	
	OR	***p***	**OR**	***p***	**OR**	***p***	**OR**	***p***
Alcohol outlet count	1.13	0.13	1.15	<0.01	1.14	0.04	1.21	<0.01
Neighborhood physical disorder[c]	1.26	0.04	1.39	<0.01	1.27	0.05	1.96	<0.01
Neighborhood physical disorder interpolated	1.23	0.08	1.41	<0.01	1.29	0.03	1.96	<0.01
Free/Reduced priced lunch[d]	0.82	0.70	2.56	<0.01	3.15	<0.01	1.00	0.99
Males	2.59	<0.01	1.14	0.48	0.98	0.88	0.77	0.19
Age	1.49	0.01	1.17	0.15	1.24	<0.01	1.11	0.32

[c] *n*=356

[d] *n*=379

Table 3

Semi-adjusted logistic regression model results for alcohol outlet count and exposure to alcohol, tobacco, and other drugs (*n*=379)

	Offered alcohol, tobacco, or other drugs		Seen people smoking marijuana		Seen people selling drugs		Perceived neighborhood safety	
	OR	***p***	**OR**	***p***	**OR**	***p***	**OR**	***p***
Alcohol outlet count	1.11	0.21	1.11	<0.01	1.07	0.22	1.20	<0.01
Free/reduced priced lunch	0.73	0.52	2.38	<0.01	3.06	<0.01	0.86	0.73
Males	2.24	<0.01	1.02	0.93	0.95	0.72	0.76	0.17
Age	1.42	0.02	1.15	0.27	1.23	<0.01	1.06	0.61

Table 4

Adjusted logistic regression model results for alcohol outlet count and exposure to alcohol, tobacco, and other drugs (*n*=379)

	Offered alcohol, tobacco, or other drugs		Seen people smoking marijuana		Seen people selling drugs		Perceived neighborhood safety	
	OR	***p***	**OR**	***p***	**OR**	***p***	**OR**	***p***
Alcohol outlet count	1.10	0.35	1.03	0.48	1.03	0.68	0.98	0.80
Neighborhood physical disorder	1.08	0.66	1.26	0.05	1.14	0.37	2.07	<0.01
Free/reduced priced lunch	0.69	0.46	2.24	<0.01	2.90	<0.01	0.66	0.36
Males	2.18	0.01	1.06	0.75	0.96	0.76	0.77	0.51
Age	1.40	0.03	1.15	0.29	1.23	<0.01	1.06	0.85