Published in final edited form as:

J Child Adolesc Subst Abuse. 2017 ; 26(4): 303–313. doi:10.1080/1067828X.2017.1305932.

Contextual Factors that Influence Alcohol Use Behaviors

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Abstract

This study tests a multilevel model of factors that affect adolescents' decisions to use alcohol. Hierarchical linear modeling was used to estimate the variance in alcohol use accounted for by the influences of individual, social, and neighborhood factors. Social factors are significant predictors of alcohol use across several models tested, while selected neighborhood factors were generally not. Results indicate that social and community contexts have important effects on adolescent alcohol use, and that social influences were more significant predictors of alcohol use than neighborhood factors for this sample.

Introduction

The Centers for Disease Control and Prevention (CDC) reports that alcohol is the most commonly used and abused substance among US adolescents, and is responsible for an estimated 4,700 deaths per year among youth under age 21 (CDC, 2015a). According to 2011 CDC estimates, 39 percent of high school students drank some amount of alcohol in the past 30 days, and 22 percent of students binge drank in the same timeframe (CDC, 2015a). The Youth Behavioral Risk Survey (YBRS) indicates that dangerous drinking ("within a couple of hours on at least 1 day during the 30 days before the survey") declined from 30.0 percent to 20.8 percent between 2003 and 2013 (CDC, n.d.). Behavioral Risk Factor Surveillance System (BRFSS) 2012 data indicate that 16.9 percent of people in the U.S. binge drink, and 6.1 percent of people are heavy drinkers. Assessment of 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) indicated that approximately 45 percent of people aged 18–24 exceeded the recommended daily drinking limit; and 15 percent of people in that age group exceeded the recommended weekly drinking limit (Chen, Dufour, & Yi, 2005). People aged 18–24 in this sample had episodes of heavy drinking on 39 days and were intoxicated 18 days during the previous year (Chen et al., 2005).

Since several of the health problems associated with alcohol use are long-term, it is important to prevent alcohol use and abuse among adolescents. The earlier an adolescent uses alcohol, the more likely he/she is to develop alcohol dependence or abuse later in life (CDC, 2015a). The CDC estimates that 80,000 deaths a year in the US are attributable to alcohol (CDC, 2015b). Alcohol has been linked to several immediate health problems, including injury and violence, risky sexual behaviors, pregnancy complications, and alcohol

poisoning, and long-term health conditions, including high blood pressure, heart disease, stroke, liver disease, digestive problems, neurological problems, cardiovascular conditions, psychiatric and social health issues, and increased cancer risk (CDC, 2015b).

Alcohol use behaviors are one example of the ways in which individual, social, and environmental and neighborhood factors interact to affect individual and population health status and outcomes. Individual socioeconomic resources, knowledge, attitudes, and beliefs are factors that influence health behaviors. Social norms, social support, and resources available through a social network constitute social-level influences on individual health behavior. People's social influences develop within their built environment and neighborhoods (Burlew et al., 2009; Karriker-Jaffe, Roberts, & Bond, 2013; Mennis & Mason, 2011). Individual attributes and social and neighborhood influences interact to form the circumstances in which individuals make health behavior decisions, leading to variations in health status and health outcomes. Prior studies have identified social (Chauvin, 2012; Cox & Bates, 2011; Groh, Jason, Davis, Olson, & Ferrari, 2007; Kiesner, Poulin, & Dishion, 2010; Kung & Farrell 2000; Malatestini, Miovi, Kendel, & Baricev-Novakovi, 2005; Menagi, Harrell, & June, 2008; Robertson, Xu, & Stripling, 2010; Simons-Morton, 2007; Song, Smiler, Wagoner, & Wolfson, 2012; Sutherland & Shepherd, 2001; West et al., 2010) and environmental and neighborhood (Ahern, Margerison-Zilko, Hubbard, & Galea, 2013; Lambert, Brown, Phillips, & Ialongo, 2004; Lipton et al., 2013; Mennis & Mason 2011; Pereira, Wood, Foster, & Haggard, 2013; West et al., 2010) correlates of risky alcohol behaviors, or addressed social characteristics in respondents' neighborhoods; for example, exposure to negative activities such as "someone drinking on the streets, getting robbed, using drugs, getting arrested and fighting" (Burlew et al., 2009).

While the effects of these factors on alcohol and other substance use have been examined, their interactions with one another remain understudied. Social epidemiology literature discusses the importance of including many social, environmental, economic, political, and historical factors when assessing the impact of context on individual and population health, but relatively few studies have tested the influence and interaction of these factors together. One example includes an assessment of alcohol consumption behaviors of adult kickball participants (Ward, 2011). Ward (2011) identifies how physical location, group demographics, and social activities link together to influence alcohol behaviors, finding that a combination of these factors leads to increased alcohol consumption among people in his study. Another study found that parental supervision moderates the influence of exposure to negative neighborhood activity (Burlew et al., 2009). In a more general assessment, higher income inequality was associated with a higher prevalence of unhealthy alcohol use in minority groups, and this was not moderated by specific household income or neighborhood factors (Karriker-Jaffe et al., 2013). Finally, in assessing schools and community climate, positive school climate and positive sense of community were associated with lower adolescent substance use (Mayberry, Espelage, & Koenig, 2009). Positive sense of community moderated the influence of peer and parental substance use behaviors (Mayberry et al., 2009).

Providing spaces and events in the neighborhood for people to form social relationships may increase the influence of social variables on alcohol use behaviors. People who interact more

with their neighbors and people who live nearby may reinforce social norms related to alcohol use due to multiple social interactions. Including this assessment in future studies will help explain how space allows for social relationships to develop and how social norms are reinforced as a result of public spaces.

These assertions have implications for the current theoretical model and statistical analysis. Substance use is associated with risky spatial locations (Mennis & Mason, 2011). Social influences are embedded in space; social interactions occur at specific places (Mennis & Mason 2011). Individual behaviors are nested within their social and neighborhood contexts, and hierarchical linear model (HLM) analysis can analyze and illustrate relationships more accurately than multiple linear regression or logistic regression. HLM analyzes influences across multiple theoretical analytic levels and can inform public health practice by identifying the most predictive correlates of risky alcohol behaviors. The structure of HLM analysis allows for estimation of how much of total variance is explained by each analytic level. This allows researchers to distinguish between the variance that is explained by individual-level variables and context-level variables. This is important as public health practitioners seek to understand how a person's context affects his or her behaviors.

The objective of this study is to test the mutually moderating effects of select individual-level health resources, health behaviors, social network resources, and neighborhood characteristics that influence health behaviors, specifically alcohol use behaviors. This test is the foundation for an analytical model of alcohol use based on multiple levels of influence, which draws on ecosocial theoretical propositions put forward by Levins and Lopez (1999) and Krieger (2011), among others. They maintain that it is necessary to consider multiple social, environmental, and economic dimensions to fully describe and understand the nature of health behaviors, and associated outcomes. The multi-level model proposed in this article attempts to measure the importance of contextual factors by measuring and describing select individual, social, and environmental factors that affect individual health.

Methods

Data Source and Data Collection Procedure

Data were drawn from the second generation data set of a longitudinal study conducted by the Johns Hopkins Prevention Intervention Research Center (JHU PIRC). The original study population consisted of a total of 798 children and families, representative of students entering first grade in nine Baltimore City public elementary schools in 1993. The schools were selected based on a randomized block design with schools serving as the block, and all the students in first grade were selected to participate in the study (Ialongo et al., 1999). The children were recruited for participation in two school-based, preventive intervention trials targeting early learning and aggressive/disruptive behavior (Ialongo et al., 1999). Of the children who participated in the intervention trials, just over half were male, nearly 90% were African-American. The remainder were white with the exception of a handful of Asian and Latino participants. Just under 2/3 of the children received free or reduced lunch—a proxy for family income. The current analysis consists of children from the nine elementary schools at follow-up when they were in 12th grade.¹ This research was reviewed and approved by the institutional review board of Johns Hopkins University. Signed consent was

obtained from each child's legal guardian prior to age 18 and from each participant once he or she reached the age of 18 since many of the respondents are aged 18 or older during their senior year.

The sources of data for participants in Grades 6–12 included annual youth, parent, teacher, and school mental health professional reports; annual school record searches; and the annual characterization of participants' neighborhoods based on data from the U.S. Census, city and county planning offices, and police records of neighborhood criminal activity.

The constructs assessed on an annual basis in Grades 6–12 included the developmental outcomes of interest, which are the distal targets of the interventions (youth substance use, abuse, and dependence, antisocial behavior and disorder, gambling, anxious and depressive symptoms and disorders, academic achievement, and mental health, drug treatment, and special education service use) and hypothesized mediators and moderators of outcome and intervention impact in terms of the characteristics of the youth (e.g., concentration problems, shy/withdrawn behavior, perceived competence, control and contingency related beliefs, perfectionism, and reward dominant response style), and the social fields of the classroom, peer group, family, and the neighborhood/community.

Participant Description

Table 1 presents the sample characteristics for the variables used in this analysis. The investigator analyzed 359 cases with complete data for all variables included in the analytic model. This study examined correlation and association in an exploratory manner and complete data was required for inclusion in analysis. Conducting analysis with complete data reduces the impact of any bias from the imputation process (Ragunathan, 2004). Missing data in the discarded cases was not systematic; and statistical power was maintained without imputing values for these cases.

Table 1: Sample Characteristics

The data used in this analysis were collected when the participants were in high school. This analysis will use data from the 12th grade observation point. Summed scores represent cumulative scores of observations over the course of the participants' time in high school; and mean scores represent the average of scores over that time. Due to lack of variability, age and race were not included in analysis. All participants were in 12th grade at the time these data were collected, with an average age of 17.81 and an age range between 17 and 20. The sample was approximately 89 percent black and 11 percent white.

Measure Descriptions

Scores for indicators labeled as averages or sums include information across 4 years of high school. The ranges and standard deviations of each variable are presented in Table 1. The dependent variable for this analysis is frequency with which the respondent has used alcohol in his/her lifetime. This variable is collected through the drug and alcohol component of the youth interviewer which was self-administered via computer, with audio as well as visual

¹ For more information about the sample and interventions, please see Ialongo and colleagues (Ialongo et al., 1999).

presentation of the questions. Frequency of substance use (lifetime, last year, last month, last week) was measured using questions from the Monitoring the Future National Survey (MTFNS, Johnston, O'Malley, Bachman, 1995).

The Diagnostic Interview Schedule for Children-IV (DISC-IV)'s conduct disorder (CD), major depressive disorder (MDD) and Dysthymic Disorder modules were administered in Grades 6–12. The DISC-IV is a fully structured interview that generates a Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, American Psychiatric Association, 1994) diagnosis as well as the number of diagnostic criteria met and a symptom count for each disorder. The impairment criteria are based on the youth's level of functioning in the social/friends, school, and home/family spheres. The conduct disorder variable was gathered using this method.

The JHU PIRC has used the Harter Self-Perception Profile for Adolescents (SPPA) to assess perceived competence in Grades 6–12. The domains assessed in middle and high school included Social Acceptance, Behavioral Conduct, and Close Friendship. The behavioral conduct, self-worth, social acceptance, and close friendship variables were gathered using this method.

In grades 6–12, the JHU PIRC used Capaldi and Patterson's (1989) self-report scale to measure deviant peer association. Youths are asked in forced choice format to indicate how often their peers and/or siblings have engaged in antisocial behavior and/or substance use. The Friends Drug Use subscale from the MTFNS was administered in Grades 6–12 to assess the youth's perception of how many of his/her friends (1 = None to 5 = All) used tobacco, alcohol, marijuana, crack, cocaine, heroin, inhalants, or ecstasy. The deviant peer affiliation and how many friends use alcohol variables were gathered using this method.

The items the youth respond to on the Racism and Life Experiences Survey (RLES) include: "How often have you been ignored, overlooked, or not given service in a restaurant, store, etc?"; How often have you been treated rudely or with disrespect because of your race. Youths respond on a five-point frequency scale (1= Less than once a year, 2= A few times a year, 3= About once a month, 4= A few times a month, 5= Once a week or more). The overall alpha for this 12-item scale was .85. The racism index variable was gathered using this method across the 4 years the respondents were in high school.

The Children's Report of Violence Exposure (CREV) is a self-report instrument that was used in Grades 6–12 to assess the frequency of exposure to violence. The violence directly witnessed and victimization (violence directly/personally experienced) subscales were employed. Reports were limited recall to the last year. The CREV has proven to be highly reliable in urban African-American youth and to be related to psychological well-being (Cooley-Quille, Turner, & Beidel, 1995).

The Structured Interview of Parental Monitoring Skills and Practices (SIPMSP) assessed the development of antisocial behavior and substance use in children and adolescents. The SIPMSP assesses family processes targeted for change in the parent discipline component of the family-school partnership intervention (FSP). The items assess parental monitoring, discipline, reinforcement, rejection, and problem solving. The adolescent version of the

SIPMSP was used in grades 6–12. The adolescents' responses about parent monitoring variable was gathered using this method.

The Teacher Report of Classroom Behavior Checklist (TRCBC) was administered in the Grades 6–12 follow-up. The teacher rating scores used in this analysis were collected when students were in the 12th grade. It is an adaptation of the Teacher Observation of Classroom Adaptation-Revised (TOCA-R; Werthamer-Larsson, Kellam, & Wheeler, 1991), a structured interview, used in Grades 1–3 and in the first generation JHU PIRC trial (Werthamer-Larsson et al., 1991). Like the TOCA-R, the domains assessed in the TRCBC are: accepting authority (the maladaptive forms being Conduct Problems and Oppositional Defiant Behavior), attention/concentration and readiness for work (or attention/concentration problems), and social participation (or shy behavior). Also measured are students' self-regulation (impulsivity), and likeability (peer likeability/rejection). The coefficient alphas for the TRCBC subscales in middle school were .91 (Conduct Problems), .89 (Oppositional Defiant Behavior), .83 (Shy Behavior), .79 (Impulsivity), and .78 (Likeability/Rejection). Items were largely drawn from the DSM-III-R and IV for all the subscales with the exception of likeability/rejection and social participation/shy behavior. The TOCA-R and the TRCBC items remained constant over the course of the study. Like Achenbach and Edlebrock (1983), rather than delete or add items over time out of concern for the age appropriateness of the items, the JHU PIRC created a scale that included items that represented the breadth of common maladaptive behaviors seen *either* in the child *and/or* adolescent years. In terms of the concurrent validity of the TRCBC, the Conduct Problems and Oppositional Defiant Behavior subscales were significantly related to whether a child had been suspended from school during elementary and middle school. The shy behavior, likeability, impulsivity, proactive aggression, and oppositional defiant behavior variables were gathered using this method.

Analysis Methods and HLM Preparation

The multilevel Hierarchical Linear Modeling (HLM) approach was chosen to analyze the influence of individual, social, and neighborhood factors on alcohol use behaviors. HLM should be used when factors at a higher level of analysis influence characteristics or processes at lower analytic levels (Luke, 2004; Raudenbush & Byrk, 2002). It is an appropriate method for this analysis because the individual level of analysis is nested within the contexts of social and neighborhood factors. HLM coefficients will be used to assess statistically significant predictors of adolescent alcohol use.

This study will consider all independent variables as moderating effects. Moderating variables affect the impact of a predictor variable on the outcome variable (Kim et al., 2001). Each individual and contextual factor cannot be understood without considering the impact of all other variables under investigation, so all variables included in the analysis of this study have the potential to moderate the relationships between other variables. HLM is ideal to test these moderations because it provides the most accurate way to estimate impact based on individual and contextual analytic levels.

In order to prepare the data set for analysis using the program HLM 7.0, the data were split into two distinct files. The first of these contained individual-level variables for first level of

analysis. The second data file contained the social and neighborhood variables needed for the second level of analysis. The two data sets formed the basis of the HLM analysis discussed in the article.

Results

Descriptive analyses presented in Table 1 indicate most respondents have used alcohol at least once, with some respondents indicating they have used it 40 or more times by the 12th grade. The respondents in this sample have high levels of social acceptance and close friendships. Respondents have high levels of parental monitoring, including letting parents know the respondents' whereabouts and presence in the respondents' lives. They also experience relatively low levels of racism. The respondents have an average of approximately 5 peers in their social network, with a range of 1 to 9. The respondents also associate with between an average of 1 and 2 deviant peers. An average of between 2 and 3 of their friends use alcohol. The means and standard deviations of the two neighborhood variables indicate that less than half of the respondents have encountered violence in their neighborhoods and that they experience moderate levels of neighborhood disorder (higher scores for the neighborhood mean score indicate higher levels of disorder).

Most of the means for those scores in this sample are between 1 and 3, with the shy behavior and likeability scores being higher, and the impulsivity, proactive aggression, oppositional defiant behavior, and conduct disorder problems scores being below 2 on a 1–6 scale. The means and standard deviations indicate that most of the respondents in this sample do not consistently display impulsive, aggressive, or oppositional defiant behaviors, and do not generally have conduct disorder problems. Two other variables show that the respondents in this sample have good classroom behavioral conduct and a high sense of self-worth. The final individual-level variable included in this analysis is the respondents' perceptions of regular alcohol use. For this variable, the higher score means higher disapproval of regular alcohol use. The mean and standard deviation values for this variable indicate that the respondents disapprove of regular alcohol use for themselves and their peers.

Tables 2 and 3 present the results of the HLM analysis conducted for this analysis. This model was used to assess the variance divided between individual (level 1) and contextual (level 2) factors (Dearfield, 2014; Luke, 2004; Raudenbush & Byrk, 2002; Saxton-Ross, 2009; Woltman, Feldstain, MacKay, & Rocchi, 2012). These tables assess the predictors for adolescent alcohol use across the respondents' lifetimes.

Table 2: HLM Analysis Results

Individual Results—As shown in table 2, the individual factors that statistically significantly predict alcohol use ($p < 0.05$) in this analysis are gender, teacher-rated proactive aggression, and behavioral conduct. In this sample, females consumed alcohol more often than males. An increase in teacher-rated aggression was associated with consuming alcohol more often. The more appropriate a respondent self-reports his or her actions to be, the less likely he or she is to use alcohol.

Context Results—The contextual factors that were statistically significant predictors in this analysis were deviant peer affiliation, parent monitoring, and friends who use alcohol. No neighborhood variables were significant in this analysis. The intraclass correlation coefficient (ICC) is calculated to determine how much additional variance in the outcome is explained by the second level of analysis beyond the variance explained by the first level. Approximately 19 percent of variation in alcohol-related use behaviors explained by these variables is accounted for by contextual variables.

Additional Models—This section presents the results for models with different variable combinations in order to decrease the deviance value for the set of predictor variables. The first model used variables that were statistically significant or nearly statistically significant in the model that included all of the predictor variables. The second model tested only social context variables at the second analytic level; and the third model tested only neighborhood context variables at the second analytic level. This analysis was conducted in order to isolate the influences of social and neighborhood contexts represented by the variables and to explore the significance of these relationships when testing models that do not include other types of contexts. In the literature review above, variables from both sets of contexts were described as significant predictors of health behaviors. These models were tested to assess the relationships between social and neighborhood contexts.

Table 3: Additional HLM Test Results

The only model that decreased the deviance value for this set of variables was the model containing only statistically significant or near statistically significant variables. These variables had a lower deviance score, indicating that this model fit the data better. This model also had a higher ICC score, indicating contextual level variables accounted for more of the explained variance in respondent alcohol use.

In the model with only the significant and near statistically significant variables, gender, parental monitoring, deviant peer affiliation, and number of friends using alcohol remained significant. In that model, two individual variables, proactive aggression and behavioral conduct, were nonsignificant. The results for the model that only included social context variables were similar. The gender, parental monitoring, deviant peer affiliation, and number of friends using alcohol variables remained significant, while other variables were nonsignificant. Finally, in the model that only included neighborhood context variables, neighborhood disorder and perceptions of peer alcohol use were significant predictors of alcohol use. Higher neighborhood disorder is associated with more alcohol use among adolescents in this sample. The significance of peer alcohol use in this model may be a result of removing other social variables from analysis. Additionally, gender and proactive aggression were nonsignificant in this model.

Discussion

The analysis in this article was meant to build on epidemiological assertions that individual, social, and neighborhood factors are important correlates of health behaviors. The statistical models were an attempt to operationalize and test the interrelationships between these factors.

When assessing a set of variables that represent individual, social, and neighborhood factors, several individual-level variables were significant. In this analysis, gender, proactive aggression, and behavioral conduct were statistically significant. These results support literature that has identified psychosocial correlates such as impulsivity, sensation seeking, and negative affect to alcohol use in adolescents (White & Jackson, 2004/2005).

Additionally, social factors were important predictors of increased alcohol use. In this analysis, peer alcohol use, deviant peer association, and parental monitoring were statistically significant predictors. Peer alcohol use and deviant peer association predicted respondent alcohol use, supporting previous findings. Parental monitoring had a positive coefficient, indicating that increased parental monitoring leads to an increase in alcohol use. Prior studies have found that parental relationships are important factors that influence alcohol use (for example Borawski, Ievers-Landis, Lovegreen, & Trapl, 2011; Jackson, 2002; Rai et al., 2003), but there are several dimensions to this relationship. Parental relationships may serve as a protective factor to prevent or reduce alcohol behaviors (Jackson, 2002; Borawski et al., 2011). However, having a trusting relationship with parents was found to be more influential on adolescent alcohol use than simply monitoring adolescents' activities (Borawski et al., 2011). Further, Rai and colleagues (2003) found that peers were more likely than parents to influence a wide range of risk behaviors, which is supported by findings from this study that peer alcohol use behaviors and association with deviant peers increased the likelihood of using alcohol in this population.

Social factors accounted for approximately 18.7 percent of variation in alcohol behavior explained by these variables. This is a moderately high amount of variance explained by the higher analytic level variables (Luke, 2004; Raudenbush & Byrk, 2002; Woltman et al., 2012). When social variables were omitted, other variables were predictive, especially neighborhood variables. This indicates that other mechanisms may provide significant prediction in the models that include social variables, such as social factors mediating the influence of neighborhood factors.

Finally, neighborhood factors were generally non-significant across multiple analytic models. The only instance in which a neighborhood variable was a statistically significant predictor of alcohol use behaviors was in the model that only included neighborhood context variables at the second analytic level. In this model, whether the respondent experienced higher levels of disorder in his/her community was associated with an increase in alcohol use. This indicates that the relationship between a respondent's neighborhood and health behaviors and outcomes is complex, and social factors may account for most of the variation across neighborhood settings. As previously stated, the intervention took place in classrooms where most (62.3%) of the children received a free lunch. This may indicate similar levels of neighborhood disadvantage across the sample. The similarity in neighborhood context can be seen in the description of the values for this variable, which has a mean of 1.61 and a standard deviation of 0.59, with most of the values between 1.00 (the minimum) and 1.70. The neighborhood index from this study included items about whether respondents routinely encounter alcohol and drug use and sale, and their perceptions of safety. These items are directly relevant to the normalization of alcohol use. If all respondents live in an area where alcohol use and sale is normalized at a similar level, then that may explain the non-

significance of this variable. This receives additional support from the significance of social variables when included in the same model. When neighborhood influence is relatively similar across respondents, then social network variables explain most of the variation in alcohol use. It contributes an understanding of how this relationship works when social and neighborhood influences on alcohol use behaviors are considered together in the same model.

Implications for Practice

Prevention of dangerous alcohol use behaviors must include social interventions, including from friends and family members (Skiba, Monroe, & Wodarski, 2004; Valente et al., 2007). These results support that assertion by highlighting the relative importance of social variables when explaining variation in alcohol use behaviors. Further, alcohol control policies, including those that restrict alcohol availability and change the characteristics of the built environment (by limiting the number and therefore density of alcohol outlets and restrictions on marketing methods and materials), have the potential to change the perceptions of alcohol use and abuse in social networks (Wagenaar et al., 2004/2005). While the current study found neighborhood disadvantage was significantly associated with increased alcohol use in one model, these findings add to the evidence base for increasing efforts to support alcohol abstinence in social networks. As mentioned previously, social influences are embedded in space, and changing those spaces has the potential to affect the social behaviors that take place in them (Mennis & Mason 2011).

Limitations

The primary limitation of this study is that neighborhoods influence individual health behaviors and outcomes in many ways. This analysis focused primarily on disorder and exposure to violence. Measuring protective factors, such as parks and green space, and land use for community centers adds clarity to the mechanisms through which a neighborhood influences alcohol use behaviors. Further, since respondents had similar backgrounds, they may have similar neighborhood conditions. Most respondents had relatively low neighborhood disorder scores. Using similar models across different settings so that respondents would have higher variation in neighborhood characteristic variables would provide more evidence on the nature of the relationship between neighborhood and adolescent alcohol use.

The study also did not assess social norms about alcohol use. Measuring variations in this would provide more detail about the relationship between individual alcohol use behaviors, and social group influences.

Another limitation of the current study is the lack of variation in age and race and ethnicity. Examining these relationships with participants from different background and at different ages will help understand variations and commonalities in social support for alcohol use behaviors predicted by these factors.

Future Research

The main recommendation for future research is to gather information about more relationships from a more diverse sample. This is especially important for the variables omitted from analysis: socioeconomic status, race, and age. These three factors are extensively discussed in the public health literature as important influences on health behaviors. Gathering additional data will help assess how a wider range of individual characteristics impacts alcohol use behaviors. Age data will help identify how influences across youth, adolescents, and young adulthood vary in importance.

Another area for future investigation is gathering more complex information on social influence. Based on these results, this is especially important with regard to parental monitoring. This can be a relationship that discourages alcohol use (Valente et al., 2007). However, some studies have shown that the relationship between parental monitoring and alcohol use is not always protective. Prior studies found that adolescents need a trusting relationship in addition to simply parents who monitor their whereabouts (Borawski et al., 2011; Jackson, 2002; Rai et al., 2003). The results from this study may mean that parents who are creating a monitoring but not trusting relationship increase the likelihood that their adolescent children will consume alcohol outside of the home.

Future studies should assess how peer social norms and parental relationships interact as this analysis found that association with delinquent peers, peer alcohol use, and parental monitoring were consistently significant across multiple models. Although this remains understudied with regard to alcohol, prior studies have shown how social norms influence people to continue smoking (Albertson et al., 2006; Dearfield, 2014; Fish et al., 2012; Karasek et al., 2012). These studies indicate that even when smokers have a desire to quit, they have difficulties because of the people in their social network, including both friends and family.

Future studies should continue to clarify the ways in which social and neighborhood contexts interact. Results from this analysis add to the understanding of the influence social and neighborhood variables have on individual health behaviors by showing the primacy of social explanations. Social group characteristics may vary across neighborhood settings, leading to the statistical significance of social factors in the models and not neighborhood factor significance. Neighborhood characteristics have been previously identified in the literature as a contributing factor to mental health problems (Burns & Snow, 2012; Evans 2003; Matthews & Yang, 2010) and substance abuse (Bernstein et al., 2007; Cohen et al., 2008; Lambert et al., 2004; West et al., 2010). Including other relevant measures that may affect alcohol consumption behaviors, such as land use, number of alcohol outlets or alternative activities, green space and parks, and walkability, will help identify which elements of the built environment have the greatest effect on adolescents.

Further, analyzing perceptions of neighborhoods will also provide insight about the influence of the built environment. Including this information will help determine whether adolescents have a sense that their neighborhood is a pleasant place to be and that the built environment encourages healthy behaviors.

Finally, the forms of the built environment are the result of macro-level economic and political decisions over time. Future studies can assess housing characteristics, land use over time (ex. types of shops and businesses, access to health services, and transportation types) to understand how these economic and political forces work to shape the built environment. Including these variables can help researchers understand how systematic factors affect individual alcohol use by influencing the forms of the built environment and how people react to them and the subsequent social norms related to health behaviors.

Conclusion

This study adds to the understanding of how individual, social, and neighborhood factors create a complex set of determinants of alcohol use behaviors with varying significance. This understanding could be applied to several other health behaviors and outcomes to begin further operationalize the ways in which the multiple levels of factors influence people's health.

Acknowledgement

The author acknowledges the contributions of Nicholas Ialongo, Robin H. Pugh-Yi, and Marie C. Jipguep-Akhtar who provided substantive and editorial feedback on the manuscript. The author also acknowledges Dr. Ialongo for providing data for analysis. The data were collected with the support of a grant from the National Institute on Drug Abuse, DA11796, Nicholas Ialongo, PI.

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Table 1:

Sample Characteristics

Variable	Range	Standard Dev.	Mean
<i>Dependent Variable</i>			
Frequency of alcohol use in lifetime, y12	0–7	2.13	1.75
<i>Individual Characteristics</i>			
Gender (Female)	0–1	0.50	0.50
Mean Teacher Rated Shy Behavior, spring, grade12, 2005	1–6	0.89	2.56
Mean Teacher Rated Likeability, spring, grade12, 2005	1–5.5	0.92	2.53
Mean Teacher Rated Impulsivity Spring, spring, grade12, 2005	1–6	0.79	1.72
Mean Teacher Rated Proactive Aggression, spring, grade12, 2005	1–4.75	0.48	1.26
Mean Teacher Rated Oppositional - Defiant Behavior, spring grade12 2005	1–6	0.87	1.84
Mean Teacher Rated Conduct Disorder Problems, spring, grade12, 2005	1–4.36	0.45	1.39
Behavioral Conduct, Mean Score, y12	1–4	0.43	3.81
Self-Worth, Mean Score, y12	1–4	0.41	3.82
How do you feel about kids your own age using alcohol regularly, Child Report, Spring 2005, Year 12	1–3	0.64	2.53
<i>Contextual Characteristics</i>			
Harter Social Acceptance, Mean Score, y12	1.25–4	0.50	3.61
Harter Close Friendship, Mean Score, y12	1–4	0.64	3.54
Parent Monitoring, Mean Score, y12	1–3.57	0.69	2.10
Number of people in Child Network, y9	1–9	1.94	4.65
Deviant Peer Affiliation, Mean Score, y12	1–5	0.52	1.40
How many of your friends use alcohol , Child Report, Spring 2005, Year 12	1–5	1.13	2.49
Racism, Mean Score, y12	1–4.43	0.65	1.46
Community Violence Exposure, y12	0–1	0.50	0.44
Neighborhood, Mean Score, y12	1–4	0.59	1.61

Table 2:

Results of Model 1 HLM Analysis for Lifetime Adolescent Alcohol Use

Variable	Final Estimation of Fixed Effects with Robust Standard Errors	p-values
Intercept	-0.67	0.69
<i>Individual Variables</i>		
Gender (Female)	0.53 *	0.02
Mean Teacher Rated Shy Behavior, spring, grade12, 2005	0.18	0.30
Mean Teacher Rated Likeability, spring, grade12, 2005	-0.03	0.88
Mean Teacher Rated Impulsivity Spring, spring, grade12, 2005	-0.16	0.35
Mean Teacher Rated Proactive Aggression, spring, grade12, 2005	0.84 *	0.03
Mean Teacher Rated Oppositional - Defiant Behavior, spring grade12 2005	0.08	0.71
Mean Teacher Rated Conduct Disorder Problems, spring, grade12, 2005	-0.40	0.44
Behavioral Conduct,Mean Score, y12	-0.57 *	0.02
Self-Worth,Mean Score, y12	-0.08	0.75
How do you feel about kids your own age using alcohol regularly, Child Report, Spring 2005, Year 12	-0.00	0.98
<i>Contextual Variables</i>		
Social Acceptance, Mean Score, y12	0.19	0.40
Close Friendship,Mean Score, y12	-0.18	0.28
Parent Monitoring, Mean Score, y12	0.55 **	0.00
Number of people in Child Network, y9	0.02	0.66
Deviant Peer Affiliation, Mean Score, y12	0.83 **	0.00
How many of your friends use alcohol , Child Report, Spring 2005, Year 12	0.63 **	0.00
Racism, Mean Score, y12	0.06	0.71
Community Violence Exposure, y12	0.37	0.07
Neighborhood, Mean Score, y12	-0.27	0.12
<i>Overall Model Statistics</i>		
Deviance	1441.22	-
ICC	0.19	-

Notes.

**
p < 0.01;*
p < 0.05

Table 3:

Results of Additional HLM Tests for Adolescent Lifetime Alcohol Use

Variable	Significant Variables		Social Context Variables Only		Neighborhood Context Variables Only	
	Final Estimation of Fixed Effects with Robust Standard Errors	p-values	Final Estimation of Fixed Effects with Robust Standard Errors	p-values	Final Estimation of Fixed Effects with Robust Standard Errors	p-values
Intercept	-0.81	0.57	-0.87	0.61	7.52	0.00
<i>Individual Variables</i>						
Gender (Female)	0.46 [*]	0.02	0.45 [*]	0.02	0.18	0.42
Mean Teacher Rated Shy Behavior, spring, grade 12, 2005			0.20	0.28	0.13	0.53
Mean Teacher Rated Likeability, spring, grade 12, 2005			-0.04	0.83	-0.06	0.75
Mean Teacher Rated Impulsivity Spring, spring, grade 12, 2005			-0.13	0.42	-0.18	0.35
Mean Teacher Rated Proactive Aggression, spring, grade 12, 2005	0.49	0.05	0.78	0.06	0.80	0.06
Mean Teacher Rated Oppositional - Defiant Behavior, spring grade 12 2005			0.09	0.67	0.17	0.47
Mean Teacher Rated Conduct Disorder Problems, spring, grade 12, 2005			-0.40	0.41	-0.63	0.24
Behavioral Conduct, Mean Score, y12	-0.58	0.06	-0.57	0.09	-0.95 ^{**}	0.01
Self-Worth, Mean Score, y12			-0.12	0.66	-0.52	0.08
How do you feel about kids your own age using alcohol regularly, Child Report, Spring 2005, Year 12			0.03	0.87	-0.36 [*]	0.05
<i>Contextual Variables</i>						
Harter Social Acceptance, Mean Score, y12			0.19	0.40		
Harter Close Friendship, Mean Score, y12			-0.18	0.26		
Parent Monitoring, Mean Score, y12	0.55 ^{**}	0.00	0.55 ^{**}	0.00		
Number of people in Child Network, y9			0.02	0.63		
Deviant Peer Affiliation, Mean Score, y12	0.74 ^{**}	0.00	0.82 ^{**}	0.00		
How many of your friends use alcohol , Child Report, Spring 2005, Year 12	0.63 ^{**}	0.00	0.64 ^{**}	0.00		
Racism, Mean Score, y12			0.07	0.63		
Community Violence Exposure, y12	0.32	0.12			0.00	1.00
Neighborhood, Mean Score, y12					0.79 ^{**}	0.00

Variable	Significant Variables		Social Context Variables Only		Neighborhood Context Variables Only	
	Final Estimation of Fixed Effects with Robust Standard Errors	p-values	Final Estimation of Fixed Effects with Robust Standard Errors	p-values	Final Estimation of Fixed Effects with Robust Standard Errors	p-values
<i>Overall Model Statistics</i>						
Deviance	1427.94	-	1443.42	-	1527.49	-
ICC	0.19	-	0.19	-	0.19	-

Notes.

**
p < 0.01;*
p < 0.05