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## A multi-level analysis of the impact of neighborhood structural and social factors on adolescent substance use

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## **Abstract**

**Background:** This paper examined the effects of neighborhood structural (i.e., economic disadvantage, immigrant concentration, residential stability) and social (e.g., collective efficacy, social network interactions, intolerance of drug use, legal cynicism) factors on the likelihood of any adolescent tobacco, alcohol, and marijuana use.

**Methods:** Analyses drew upon information from the Project on Human Development in Chicago Neighborhoods (PHDCN). Data were obtained from a survey of adult residents of 79 Chicago neighborhoods, two waves of interviews with 1,657 to 1,664 care-givers and youth aged 8 to 16 years, and information from the 1990 U.S. Census Bureau. Hierarchical Bernoulli regression models estimated the impact of neighborhood factors on substance use controlling for individual-level demographic characteristics and psycho-social risk factors.

**Results:** Few neighborhood factors had statistically significant direct effects on adolescent tobacco, alcohol or marijuana use, although youth living in neighborhoods with greater levels of immigrant concentration were less likely to report any drinking.

**Conclusion:** Additional theorizing and more empirical research are needed to better understand the ways in which contextual influences affect adolescent substance use and delinquency.

**Keywords:** adolescent substance use, neighborhood context, multi-level analysis

## **1. Introduction**

Adolescent substance use is a public health concern (National Academy of Sciences, 2004). In the U.S., 22% to 35% of high school students report current use of tobacco, alcohol, and marijuana (Kann et al., 2014) and lifetime drug use is even higher (Johnston et al., 2013). Moreover, worldwide estimates of substance use disorders and dependency range from 6% to 16% among adolescents (National Research Council and Institute of Medicine, 2009). These rates are concerning given the immediate and long-term consequences of substance use on public health problems including drug abuse, crime and violence, and physical and mental illness (Hingson et al., 2006; Mrug & Windle, 2009).

The extent and consequences of illegal substance use by adolescents has led to calls for more preventative interventions to reduce use (National Prevention Council, 2011; National Research Council and Institute of Medicine, 2009). Doing so requires a full understanding of the circumstances that place adolescents at risk for substance use. Research has indicated that adolescents' individual characteristics, peer groups, families, and schools affect their likelihood of smoking, drinking, and illicit drug use (Durlak, 1998; Hawkins et al., 1992). There is also evidence that rates of substance use vary significantly across neighborhood contexts (Bernat et al., 2009; Karriker-Jaffe, 2011; Wilcox, 2003), but the specific structural and social factors which contribute to this variation have not yet been clearly identified (Leventhal & Brooks-Gunn, 2000).

### **1.1 Contextual influences on adolescent substance use**

Social disorganization theories (Sampson et al., 1997; Shaw & McKay, 1942) posit that areas of economic and social deprivation will have more delinquency and crime than affluent and socially organized neighborhoods. Social ecological theories (e.g., Bronfenbrenner, 1979) also

emphasize the role of the neighborhood context in shaping development and also recognize the importance of other social influences, such as peer interactions and family processes. Guided by these theories, studies have increasingly examined the impact of neighborhood context on adolescent development (e.g., Ennett et al., 2008; Karriker-Jaffe et al., 2013; Lambert et al., 2004; Sampson, 2012; Tobler et al., 2009; Zimmerman & Messner, 2011).

In contrast to the predictions of social disorganization and social ecological theories, however, much of this literature has failed to show a direct effect of neighborhood factors on substance use, and when significant effects have been evidenced, they have been mixed across studies. For example, a review of 34 studies found that 18% reported a negative relationship between community socioeconomic status (SES) and alcohol use by adolescents and young adults (i.e., drinking was more likely in low-SES areas), 14% of studies showed the opposite effect (i.e., drinking was greater in high-SES areas), and the remainder (68%) did not find a significant relationship (Karriker-Jaffe, 2011). Similarly mixed findings are reported in other systematic reviews of contextual influences on adolescent drinking (Bryden et al., 2013; Hanson & Chen, 2007; Jackson et al., 2014). Studies have shown more consistent direct effects of community SES on smoking, with most showing higher rates of tobacco use in lower-SES communities, but some research has indicated the opposite relationship or a lack of significant effects (Gardner et al., 2010; Hanson & Chen, 2007). Investigations of neighborhood structural factors on marijuana use are too few to draw strong conclusions (Gardner et al., 2010).

Far fewer studies have investigated the impact of neighborhood social processes on substance use. One review (Jackson et al., 2014) found only three studies that analyzed the impact of community attitudes regarding substance use on adolescent drinking, three studies assessing collective efficacy (i.e., social cohesion and efforts to informally control crime or

deviance; see Sampson et al., 1997), and five studies examining social capital or neighborhood attachment. Most of these studies indicated null or contradictory effects of social processes on adolescent drug use (e.g., De Haan & Boljevac, 2010; Ennett et al., 2008; Ennett et al., 2010; Musick et al., 2008).

## **1.2 Limitations and gaps in prior research**

The reviews cited above concur that more information is needed to better understand if and how contextual influences affect adolescent substance use (Bryden et al., 2013; Jackson et al., 2014; Karriker-Jaffe, 2011). Available literature has focused more on structural factors like SES than social processes such as social capital, collective efficacy, and community norms (Bryden et al., 2013; Jackson et al., 2014). In addition, most research has evaluated either tobacco or alcohol use, with fewer studies evaluating other substances or comparing effects across different substances (Karriker-Jaffe, 2011).

More methodologically rigorous examinations are also needed. Leventhal and Brooks-Gunn (2000) note that relatively few studies have been specifically designed to study neighborhood effects and that few have collected reliable and valid data on neighborhood processes from enough geographical areas and respondents per neighborhood to ensure sufficient variability in constructs and adequate statistical power to find effects. In addition, neighborhood constructs, especially those intended to measure social processes, are typically measured using data from the same adolescents who report on substance use (Wilcox, 2003). However, relying on the same sources to report independent and dependent variables can inflate effect sizes. In addition, individuals' perceptions of their neighborhood environments are likely influenced by their own experiences and/or psychological characteristics and may not represent actual neighborhood conditions (Sampson & Raudenbush, 1999). To avoid bias, neighborhood

characteristics are ideally measured with objective sources like archival data (e.g., U.S. Census data), systematic observations, or surveys of community leaders (Leventhal & Brooks-Gunn, 2000; Sampson & Raudenbush, 1999). It is also important to ensure that “neighborhoods” represent meaningful ecological contexts, but the common use of administrative data (e.g., census tracts) to define neighborhood boundaries may not produce areas which match residents’ views of their neighborhoods (Sampson, 2012).

Neighborhood studies often fail to investigate the impact of community *and* individual-level factors and to utilize multi-level analyses when doing so. Based on social ecological theories and research indicating that many individual, peer, and family factors influence adolescent substance use (Hawkins et al., 1992), failure to control for these variables could artificially inflate neighborhood effects<sup>1</sup>. Model mis-specification can also occur if factors which affect neighborhood selection (e.g., individual SES; Gardner et al., 2010) are not included. Multi-level statistical techniques should be used when simultaneously investigating the impact of community- and individual-level factors in order to minimize correlated error and heteroskedasticity and to avoid biased hypotheses testing (Sampson & Raudenbush, 1999). Finally, many studies have relied on cross-sectional data which limits causal inferences regarding the impact of contextual influences on substance use (Jackson et al., 2014; Leventhal & Brooks-Gunn, 2000).

### **1.3. The current study**

The current study seeks to address these issues and advance our understanding of how neighborhood context affects adolescent substance use. Analyses draw on data from the Project on Human Development in Chicago Neighborhoods (PHDCN) (Earls et al., 2002), a study

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<sup>1</sup> It is also true that analyses which include factors that mediate the effects of neighborhood context on substance use may under-estimate neighborhood direct effects. To avoid this problem in our analyses, our first set of multi-level multivariate analyses includes a limited number of individual-level controls.

purposefully designed to examine contextual effects on youth development. We examine the impact of structural and social neighborhood constructs on the three substances most commonly used during adolescence---tobacco, alcohol and marijuana---controlling for many individual-level predictors and using prospective measures from multiple informants. Two research questions are examined: 1) To what extent does adolescent substance use (tobacco, alcohol, and marijuana) vary by neighborhood? 2) What are the direct effects of neighborhood structural and social characteristics on adolescent substance use, controlling for individual-level factors?

## **2.0 Material and Methods**

### **2.1 Participants**

We draw on data from three sources of data collected in the PHDCN. The first is the **Community Survey** of adult residents of Chicago neighborhoods. To obtain reliable estimates of neighborhood processes across the city, Chicago's 847 census tracts were divided into 343 neighborhood clusters (NCs) based on knowledge of existing neighborhoods and geographic boundaries and to ensure homogenous units of analysis (Sampson, 2012). Using a three-stage sampling design, city blocks were then sampled within each NC, dwelling units were sampled within blocks, and one adult resident was sampled within each dwelling unit and interviewed in 1994-1995 regarding neighborhood social processes. To assess neighborhood structural characteristics, data from the 1990 **U.S. Census** were collected and linked to the 343 NCs.

To examine the impact of neighborhood characteristics on youth outcomes, the 343 NCs were stratified by seven categories of racial/ethnic diversity and three levels of SES, and 80 NCs were selected via stratified probability sampling. Households within these areas with at least one child in one of seven age cohorts (newborns and children ages 3, 6, 9, 12, 15, and 18) were eligible to participate in the **Longitudinal Cohort Study**. In 1994-1997, wave one interviewers

were conducted with 6,228 children and caregivers. Wave two interviews were conducted in 1997-2000.

Because this study focuses on adolescent substance use, participants included youth from Cohorts 9, 12, and 15 who resided in 79 of the 80 NCs (one NC was not included due to missing data from respondents in these cohorts) and who provided data at waves one and two. Wave one included 2,344 youth, while 1,987 youth (85% of the original sample) participated at wave two. After listwise deletion, the analysis samples included 1,657-1,664 youth across the three outcomes<sup>2</sup>. At wave one, youth were a mean age of 12 years, about half were male, 48% reported their race/ethnicity as Hispanic, 34% African American, 14% Caucasian, and 4% as another race/ethnicity (See table 1).

## **2.2 Measures**

### **2.2.1 Adolescent substance use**

Substance use was measured at wave two based on adolescent reports on three items rating the frequency of *tobacco*, *alcohol*, and *marijuana use* in the past year using a nine-point scale ranging from no use to 200 or more times (National Household Survey on Drug Abuse, 1991). Because substance use was relatively low and few respondents reported frequent use, we created dichotomous outcomes reflecting *any tobacco use*, *any alcohol use* and *any marijuana use* in the past year, which distinguished users (19%, 23%, and 11%, respectively) from non-users.

### **2.2.2 Neighborhood characteristics**

The neighborhood structural and social characteristics were based on information from the same 79 NCs in which youth resided. A principal components factor analysis of items from

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<sup>2</sup> A comparison of all youth in Cohorts 9-15 at wave one (N=2,344) and the analyses samples showed no significant differences on the primary independent or dependent variables. However, the analyses samples had significantly ( $p \leq .05$ ) more Hispanic youth and higher family income compared to the initial sample.

the 1990 U.S. Census was conducted to create the three neighborhood structural variables. As in prior research (Browning et al., 2005; Maimon & Browning, 2010), *neighborhood economic disadvantage* included four poverty-related variables ( $\alpha=0.88$ ): the percentage of residents in the NC below the poverty line, receiving public assistance, unemployed, and in female-headed households. *Immigrant concentration* included two items ( $\alpha=0.70$ ): the percentage of foreign-born and Hispanic residents (Maimon & Browning, 2010; Morenoff et al., 2001). *Residential stability* was based on two items ( $\alpha=0.76$ ): the percentage of owner-occupied homes and those living in the same home for five years (Morenoff et al., 2001; Sampson et al., 2005).

Four constructs representing neighborhood social processes were created from responses from approximately 40 adults per NC participating in the Community Survey. *Neighborhood collective efficacy* was based on 10 items (internal consistency=0.85) representing social cohesion and informal social control. Residents rated their agreement with five items assessing trust and support between neighbors (e.g., people around here are willing to help their neighbors) using a five-point Likert scale. Another five items asked about the likelihood (on a five-point scale) that residents would utilize informal social control to help keep the neighborhoods safe (e.g., neighbors would intervene if children were skipping school and hanging out). Following prior research (Browning et al., 2004; Sampson et al., 1997), the ten items were combined using a three-level item response model (IRM) which helps avoid the loss of data from missing item responses (Osgood et al., 2002), and accounts for item severities and respondent characteristics (e.g., sex or race/ethnicity) as covariates (Raudenbush & Sampson, 1999).

The other three social process measures were also created using IRMs. *Social network interaction* was based on four items (internal consistency=0.73) asking residents to rate how

often neighbors do favors for each other, ask for advice, have get-togethers, and visit each other (Browning et al., 2004). Each was rated on a four-point scale from “never” to “often.”

*Community intolerance of drug use* was based on residents’ reports of how wrong they consider teenage smoking, drinking and marijuana use (internal consistency=0.50) using a five-point scale for each of the three items (from “not wrong at all” to “extremely wrong”) (Kirk & Papachristos, 2011; Wright & Fagan, 2013). *Legal cynicism* was based on levels of agreement (rated on a five-point scale from “strongly disagree” to “strongly agree”) to five statements (internal consistency=0.48) regarding the legitimacy of laws and social norms, such as “laws were meant to be broken” (Sampson & Bartusch, 1998).

### **2.2.3 Control variables**

Statistical models controlled for individual-level factors shown to be associated with adolescent substance use (Donovan, 2004; Hawkins et al., 1992). Control variables were taken from wave one surveys when available; otherwise, wave two reports were used. Demographic characteristics included adolescents’ *age, sex, race/ethnicity, immigrant status, and socio-economic status*. SES was a factor score based on caregivers’ responses to three items regarding personal or household income, the highest educational level of either parent, and employment status of the primary caregiver. Measures of *peer social support* (alpha=0.70; e.g., “I have at least one friend I can tell anything to”) and *family social support* (alpha=0.67; e.g., “No matter what happens, my family will be here for me”) were based on youth responses to nine and six items, respectively (Turner et al., 1983). Youth *low self-control* was based on 17 responses (alpha=0.75) from caregivers rating children’s impulsivity, decision-making, and sensation-seeking (Buss & Plomin, 1975; Gibson et al., 2010). At wave two, youth reported on their *involvement in unstructured/routine activities* (4 items, alpha=0.58; e.g., "going to parties";

Osgood et al., 1996), perceptions that *drug use is harmful* (7 items,  $\alpha=0.76$ ), perceived *availability of drugs* (3 items,  $\alpha=0.87$ ; e.g., “how easy would it be to get alcohol”), and exposure to *peer substance use* (4 items,  $\alpha=0.85$ ; e.g., number of friends who use marijuana). These variables were created by standardizing and summing responses to all items. Youth supervision was the sum of three dichotomous items ( $\alpha=0.60$ ) asking caregivers if children had a *curfew*.

### **2.3 Statistical Analyses**

The statistical analyses relied on hierarchical modeling techniques using HLM 7.0 software (Raudenbush & Bryk, 2014). Hierarchical Bernoulli regression models, analogous to logistic regression models, were utilized to predict the three dichotomous outcomes. Tolerance values were all above 0.40, suggesting that multicollinearity was not a problem (Allison, 1999).

The analyses proceeded in a step-wise fashion. First, unconditional models were estimated to examine if the distribution of substance use varied significantly across NCs (Research Question 1). Next, all individual-level predictors were grand-mean centered and fixed to remove within-NC variation potentially related to substance use and to aid in the interpretation of coefficients<sup>3</sup>. The neighborhood characteristics were then added to the models to assess their direct effects on cigarette, alcohol, and marijuana use (Research Question 2). The first set of models analyzed the relationship between each neighborhood variable and each outcome, without the other neighborhood-level variables in the model. These analyses first controlled for child demographic characteristics and low self-control, then all other individual-level variables were added. Because neighborhood social processes have been shown to mediate the effects of structural characteristics (e.g., Sampson et al., 1997), the second set of models estimated the

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<sup>3</sup> When conducting the individual-level analyses, the reliability of the intercepts were reduced. To adjust for this situation, the Empirical Bayes estimates were modeled at level-two (Raudenbush & Bryk, 2002, 2014).

relationship between each of the four social characteristics and each drug use outcome, controlling for the three structural characteristics and all individual-level variables.

### **3.0 Results**

The unconditional models showed significant ( $p < .05$ ) variation in all three substance use outcomes across NCs (results not shown). The intra-class correlations (ICCs) for tobacco, alcohol and marijuana use were 0.037, 0.047, and 0.024, respectively, indicating that 3.7%, 4.7%, and 2.4% of the variation in substance use existed at the neighborhood-level.

Before examining the neighborhood factors that might account for this variation, we assessed the relationship between the individual-level control variables and each outcome. The findings, shown in Table 1, are largely consistent with prior research. Individual and peer factors were the most robust and consistent predictors of use. A greater likelihood of substance use was reported by older and Caucasian adolescents compared to younger and African American youth. Use was also more likely among those who spent more time engaging in routine, unstructured activities (without adult supervision), reported that drugs were available to them, and had more substance-using peers. Adolescents who perceived drug use to be harmful were less likely to report any tobacco, alcohol or marijuana use.

#### **Table 1 about here**

The direct effects of the neighborhood characteristics on substance use are shown in Tables 2 and 3. As shown in Table 2, Model 1, none of the neighborhood factors had a significant ( $p < .05$ ) direct effect on adolescent substance use when controlling for youth demographic characteristics and low self-control. Similarly, as shown in Model 2, no

neighborhood variables had a significant effect on substance use when controlling for all individual-level variables.

**Table 2 about here**

Table 3 presents the results of models in which all the neighborhood structural variables were assessed simultaneously, along with each of the social variables (entered one by one) and controlling for all the individual-level variables shown in Table 1. These results also demonstrated a lack of significant, direct effects of neighborhood factors on adolescent substance use. The only significant ( $p < .05$ ) effect indicated that youth from NCs with a higher percentage of residents from immigrant backgrounds were less likely to report alcohol use compared to those in NCs with fewer immigrant residents.

**Table 3 about here**

#### **4.0 Discussion**

This study utilized a rigorous research design, prospective data, and multi-level analysis to investigate the direct effects of neighborhood factors on adolescent tobacco, alcohol, and marijuana use. In models controlling for individual-level risk factors, and even in scaled-down models with only demographic characteristics and self-control as controls, direct neighborhood effects were not significant. The only exception was that, in some of the models predicting alcohol use, youth living in areas with higher levels of immigrant concentration were significantly less likely to report drinking in the past year compared to those living in areas with lower immigrant concentration.

These findings are somewhat surprising, as they do not support social ecological (e.g., Bronfenbrenner, 1979) or social disorganization theories (Sampson et al., 1997; Shaw & McKay,

1942), both of which suggest that neighborhood characteristics will have direct effects on youth delinquency. However, the results are consistent with several reviews which indicate a lack of significant effects in the majority of studies investigating neighborhood predictors of adolescent substance use (Bryden et al., 2013; Jackson et al., 2014; Karriker-Jaffe, 2011). Those reviews all emphasize the need for additional investigation of contextual influences on adolescent substance use, especially studies that measure social processes. Our study sought to fill this gap and provide a comprehensive analysis of the direct effects of a range of structural and social factors on the three most commonly used substances using multi-level analyses and controlling for many individual risk factors for substance use.

The general pattern of results found in the current study and in much past research, that neighborhoods do not have direct, robust effects on adolescent substance use, suggests the need to more carefully consider how neighborhoods influence various forms of delinquency (Jackson et al., 2014). Most social disorganization theories were developed to explain youth violent or property crimes, not substance use, and the role of the community may differ for these behaviors. Unlike predatory and economic crimes, drinking and drug use may be considered less harmful and more of a “rite of passage” for adolescents, which could result in less adult condemnation and regulation (Ennett et al., 2010; Foley et al., 2004). If this is the case, substance use will likely be unaffected by social norms and controls. In addition, drug use often occurs indoors (Maimon & Browning, 2012), making it difficult for adult residents to influence. Lastly, although drug use has been hypothesized as a coping mechanism used to alleviate the stressful conditions of disorganized neighborhoods (Lambert et al., 2004), teenagers often engage in smoking and drinking because they are fun and social activities (Kuntsche et al., 2005). As such, these actions may not be affected by adverse neighborhood conditions.

More nuanced theories that can better specify the ways in which neighborhood context affects youth development and substance use are needed. Such perspective can help direct future research and inform the development of environmentally-focused substance use/abuse prevention programs. Far fewer of these models have been created, tested, and/or shown to affect substance use compared to interventions which target individual-level factors, despite the potential of neighborhood-level interventions to reach large numbers of youth and to reinforce messages communicated in other types of interventions (Fagan & Hawkins, 2012).

Although the current study failed to identify significant direct effects of certain contextual variables, the fact that the unconditional models indicated significant variation in substance use across NCs suggests that some important neighborhood factors may have been omitted. In fact, analyses did not include all possible contextual risk factors for substance use, such as physical or social disorder (e.g., Furr-Holden et al., 2011), tobacco and alcohol outlet density (e.g., Maimon & Browning, 2012; Tobler et al., 2009) and neighborhood levels of crime (e.g., Mrug & Windle, 2009). In addition, analyses did not examine the degree to which neighborhood factors *moderated* the impact of individual, peer and family influences on adolescent substance use, although other studies have shown such results (Fagan et al., 2014; Lo et al., 2006; Snedker et al., 2009; Wright et al., in press; Zimmerman & Vasquez, 2011). Likewise, we did not assess if neighborhood processes were *mediated* by influences in other contexts, as also demonstrated in past research (Chuang et al., 2005; Gibbons et al., 2004; Tobler et al., 2009). The current study focused on *direct* effects given the inconclusive evidence to date that neighborhoods exert such influences (particularly when social processes are examined), but we acknowledge that a more complete understanding of the role of neighborhood context requires specification of both mediating and moderating effects (Leventhal & Brooks-Gunn,

2000). A final limitation of our study is that the outcome variables were dichotomized to represent *any* substance use and did not capture more frequent or problematic levels of use. It is possible that a different pattern of results would have been evidenced if more serious forms of substance use were assessed and we hope that future research will test this possibility.

**Table 1: Individual-Level Models Predicting Any Adolescent Substance Use<sup>a</sup>**

|                                   | Cigarette Use<br>(N=1664) |     | Alcohol Use<br>(N=1657) |     | Marijuana Use<br>(N=1660) |     |
|-----------------------------------|---------------------------|-----|-------------------------|-----|---------------------------|-----|
|                                   | b                         | SE  | b                       | SE  | b                         | SE  |
| Intercept                         | -2.28**                   | .11 | -2.17**                 | .11 | -4.40**                   | .21 |
| Age                               | .21**                     | .05 | .38**                   | .05 | .51**                     | .06 |
| Male                              | -.06                      | .16 | -.13                    | .17 | .46                       | .28 |
| Socioeconomic status              | .16*                      | .08 | .03                     | .09 | -.04                      | .14 |
| African American <sup>b</sup>     | -.78**                    | .26 | -.65**                  | .22 | .14                       | .32 |
| Hispanic <sup>b</sup>             | .22                       | .27 | .13                     | .24 | .08                       | .38 |
| Other race/ethnicity <sup>b</sup> | -.58                      | .47 | -.36                    | .48 | -.57                      | .64 |
| Immigrant                         | -.25                      | .27 | -.10                    | .30 | -.94**                    | .34 |
| Low self-control                  | .16*                      | .08 | .06                     | .08 | .05                       | .12 |
| Peer social support               | .30**                     | .10 | .16                     | .10 | .38**                     | .11 |
| Family social support             | -.24**                    | .09 | .03                     | .09 | -.23*                     | .11 |
| Curfew                            | .08                       | .14 | .20                     | .16 | .14                       | .15 |
| Routine activities                | .27**                     | .09 | .56**                   | .09 | .30**                     | .11 |
| Perceived harm of drugs           | -.37**                    | .08 | -.28**                  | .09 | -.57**                    | .10 |
| Perceived availability of drugs   | .04                       | .12 | .27*                    | .12 | .57**                     | .15 |
| Peer substance use                | .97**                     | .09 | .95**                   | .12 | .97**                     | .11 |
| $\chi^2$                          | 70.22                     |     | 80.02                   |     | 92.78                     |     |

\*\* p ≤ .01      \* p ≤ .05

<sup>a</sup>Results are based on Bernoulli models and fixed effects for all variables

<sup>b</sup>Compared to Caucasian youth

**Table 2: The Impact of Each Neighborhood Factor on Any Substance Use, with Individual-Level Controls<sup>a</sup>**

|                               | Model 1<br>(Demographic<br>Controls) |     | Model 2<br>(All Controls) |     |
|-------------------------------|--------------------------------------|-----|---------------------------|-----|
| <b>Cigarette Use (N=1664)</b> |                                      |     |                           |     |
|                               | b                                    | SE  | b                         | SE  |
| Economic Disadvantage         | -.01                                 | .01 | .00                       | .01 |
| Immigrant Concentration       | -.01                                 | .01 | -.01                      | .01 |
| Residential Stability         | .00                                  | .01 | .00                       | .01 |
| Collective Efficacy           | .12 <sup>†</sup>                     | .06 | .04 <sup>†</sup>          | .03 |
| Social Network Interaction    | .12                                  | .08 | .04                       | .03 |
| Intolerance of Drug Use       | -.24                                 | .17 | -.07                      | .07 |
| Legal Cynicism                | .11                                  | .21 | .02                       | .09 |
| <b>Alcohol Use (N=1657)</b>   |                                      |     |                           |     |
|                               | b                                    | SE  | b                         | SE  |
| Economic Disadvantage         | -.00                                 | .02 | -.00                      | .01 |
| Immigrant Concentration       | -.01                                 | .02 | -.01 <sup>†</sup>         | .01 |
| Residential Stability         | -.01                                 | .02 | .00                       | .01 |
| Collective Efficacy           | .04                                  | .07 | .02                       | .03 |
| Social Network Interaction    | .01                                  | .09 | -.02                      | .04 |
| Intolerance of Drug Use       | -.03                                 | .19 | -.00                      | .07 |
| Legal Cynicism                | -.01                                 | .22 | -.01                      | .09 |
| <b>Marijuana Use (N=1660)</b> |                                      |     |                           |     |
|                               | b                                    | SE  | b                         | SE  |
| Economic Disadvantage         | -.01                                 | .01 | -.02                      | .03 |
| Immigrant Concentration       | -.01                                 | .01 | -.02                      | .03 |
| Residential Stability         | -.01                                 | .01 | -.02                      | .03 |
| Collective Efficacy           | .02                                  | .06 | -.02                      | .12 |
| Social Network Interaction    | .05                                  | .08 | .00                       | .16 |
| Intolerance of Drug Use       | -.07                                 | .17 | .02                       | .33 |
| Legal Cynicism                | -.05                                 | .21 | -.23                      | .40 |

\*\*  $p \leq .01$  \*  $p \leq .05$  †  $\leq .10$

<sup>a</sup>Empirical Bayes analyses predicting any cigarette, alcohol and marijuana use among individuals living in 79 NCs. Coefficients reflect the impact of each neighborhood variable on substance use without the other level-two variables in the model. Model 1 controls for demographic characteristics (age, sex, African American, Hispanic, other race/ethnicity, immigrant status, socioeconomic status) and low self-control; Model 2 includes all individual-level controls shown in Table 1.

**Table 3: The Relationship Between Neighborhood Structural and Social Factors and Any Substance Use, with Individual-Level Controls<sup>a</sup>**

|                               | Model 3           |     | Model 4           |     | Model 5           |     | Model 6           |     |
|-------------------------------|-------------------|-----|-------------------|-----|-------------------|-----|-------------------|-----|
| <b>Cigarette Use (N=1664)</b> |                   |     |                   |     |                   |     |                   |     |
|                               | b                 | SE  | b                 | SE  | b                 | SE  | b                 | SE  |
| Economic Disadvantage         | .01               | .01 | -.00              | .01 | -.00              | .01 | .00               | .01 |
| Immigrant Concentration       | -.00              | .01 | -.00              | .01 | -.00              | .01 | -.01              | .01 |
| Residential Stability         | -.00              | .01 | .00               | .01 | .00               | .01 | .00               | .01 |
| Collective Efficacy           | .06               | .04 | --                | --  | --                | --  | --                | --  |
| Social Network Interaction    | --                | --  | .03               | .04 | --                | --  | --                | --  |
| Intolerance of Drug Use       | --                | --  | --                | --  | -.08              | .08 | --                | --  |
| Legal Cynicism                | --                | --  | --                | --  | --                | --  | .00               | .09 |
| <b>Alcohol Use (N=1657)</b>   |                   |     |                   |     |                   |     |                   |     |
|                               | b                 | SE  | b                 | SE  | b                 | SE  | b                 | SE  |
| Economic Disadvantage         | -.01              | .01 | -.00              | .01 | -.00              | .01 | -.01              | .01 |
| Immigrant Concentration       | -.01 <sup>†</sup> | .01 | -.02 <sup>*</sup> | .01 | -.01 <sup>*</sup> | .01 | -.01 <sup>†</sup> | .01 |
| Residential Stability         | -.00              | .01 | -.00              | .01 | -.00              | .01 | -.00              | .01 |
| Collective Efficacy           | -.02              | .04 | --                | --  | --                | --  | --                | --  |
| Social Network Interaction    | --                | --  | -.05              | .04 | --                | --  | --                | --  |
| Intolerance of Drug Use       | --                | --  | --                | --  | .04               | .08 | --                | --  |
| Legal Cynicism                | --                | --  | --                | --  | --                | --  | -.01              | .09 |
| <b>Marijuana Use (N=1660)</b> |                   |     |                   |     |                   |     |                   |     |
|                               | b                 | SE  | b                 | SE  | b                 | SE  | b                 | SE  |
| Economic Disadvantage         | -.06              | .03 | -.04              | .03 | -.04              | .03 | -.04              | .03 |
| Immigrant Concentration       | -.05              | .03 | -.04              | .03 | -.04              | .03 | -.04              | .03 |
| Residential Stability         | -.03              | .03 | -.04              | .03 | -.05              | .03 | -.04              | .03 |
| Collective Efficacy           | -.16              | .18 | --                | --  | --                | --  | --                | --  |
| Social Network Interaction    | --                | --  | .01               | .17 | --                | --  | --                | --  |
| Intolerance of Drug Use       | --                | --  | --                | --  | .16               | .37 | --                | --  |
| Legal Cynicism                | --                | --  | --                | --  | --                | --  | -.08              | .42 |

\*\*  $p \leq .01$  \*  $p \leq .05$  †  $\leq .10$

<sup>a</sup>Empirical Bayes analyses predicting any cigarette, alcohol and marijuana use among individuals living in 79 NCs. Coefficients reflect the impact of each neighborhood social processes variable controlling for all other neighborhood structural variables on substance use. Models also control for all individual-level controls shown in Table 1.

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