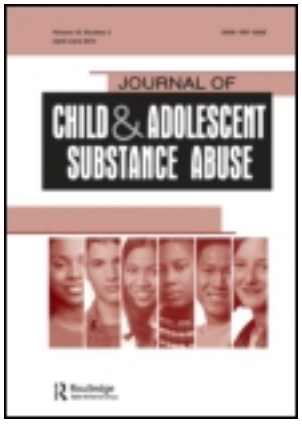

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A Comparison of Individual-Level and Community-Level Predictors of Marijuana and Cocaine Use among a Sample of Newly Arrested Juvenile Offenders

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Variations in drug use have been found across individual-level factors and community characteristics, and by type of drug used. Relatively little research, however, has examined this variation among juvenile offenders. Based on a sample of 924 newly arrested juvenile offenders, two multilevel logistic regression models predicting marijuana test result and cocaine test result were separately examined. The results highlighted a strong association between individual-level socio-demographic characteristics, most notably age and seriousness of arrest charge, and drug use. Residential stability was related to cocaine use, yet none of the community variables were related to marijuana use. These findings suggest that different risk factors are related to adolescent marijuana and cocaine use. The research implications of the findings are discussed.

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KEYWORDS cocaine use, community characteristics, juvenile offenders, marijuana use

INTRODUCTION

Over the past two and a half decades, a large body of research has been conducted on drug use among adolescent offenders. Across these studies, a rather robust and enduring relationship between delinquency and substance use has emerged. For example, the National Center on Addiction and Substance Abuse (2004) estimates that up to 78% of arrested youths are alcohol or drug involved. Similarly, McClelland, Teplin, and Abram (2004) reported that 77% of the youths included in a sample of 1,829 Cook County, Illinois, juvenile detainees reported using drugs or alcohol in the past six months. Furthermore, based on the 1999 Arrestee Drug Abuse Monitoring (ADAM) results, the percentage of detained juveniles who tested positive for any drug ranged from 38% to 69% (National Institute of Justice, 2000). In addition, studies suggest that delinquency and drug use are two of the most resistant forms of problem behavior found in adolescence (Huizinga, Loeber, & Thornberry, 1994; Mann, 2003). These findings highlight a critical social problem in need of further study.

Despite consistent findings that substance use and delinquency are linked, the nature of this association varies by important socio-demographic factors including criminal history, age, gender, and race (Barnes, Welte, & Hoffman, 2002; Dembo, Wareham, & Schmeidler, 2007a; Huizinga & Jakob-Chien, 1998; Teplin et al., 2005), as well as type of substance used (Fagan, Weis, & Chang, 1990; Teplin, Mericle, McClelland, & Abram, 2003; Van Kammen, Loeber, & Stouthamer-Loeber, 1991; Wei, Makkai, & McGregor, 2003). For example, Dembo and colleagues examined a longitudinal sample of justice-involved youths and found significant socio-demographic differences in marijuana use. Males, older adolescents, and non-African-American youths reported higher levels of marijuana use; however, no significant demographic differences were found in the use of cocaine (Dembo et al., 2007a,b). As such, it is important to consider the variation in drug use across these demographic subgroups, as well as across type of substance used.

Variations in the Substance Use–Delinquency Link across Socio-Demographic Characteristics

GENDER

Gender differences in illicit drug use are fairly complex. The majority of studies suggest that male juvenile offenders report higher levels of marijuana use than female offenders (Barnes et al., 2002; Dembo et al., 2007a; Teplin

et al., 2003; Wei, Makkai, & McGregor, 2003). However, female juvenile offenders are found to report earlier initiation and higher levels of serious drug use, such as cocaine and amphetamines (Kim & Fendrich, 2002; Neff & Waite, 2007; Teplin et al., 2003; Wei et al., 2003). For example, Belenko, Sprott, and Peterson (2004) found that males were more likely to be marijuana positive, but girls were significantly more likely to have tried cocaine, crack, amphetamines, and inhalants. Thus, the direction of gender differences in substance use varies across the type of substance used.

Race

Interestingly, racial differences in substance use tend to be in contrast to racial differences found in criminal offending. According to 1997 ADAM data, white juvenile detainees self-reported substantially higher rates of lifetime prevalence of the use of marijuana, cocaine, crack, amphetamines, and inhalants than minority detainees (Belenko et al., 2004). Stenmark, Wackwitz, Peffrey, and Dougherty (1974) and LeBeau-Craven and colleagues (2003) found white juvenile drug offenders to be heavier users of alcohol, marijuana, and "other" illicit drugs than minority offenders. Teplin and colleagues (2005) and Vaughn, Wallace, Davis, Fernandes, and Howard (2008) found that white detainees, compared to African-American detainees, were more likely to have substance-related problems, including substance use disorders, blacking out, and earlier age of onset. In general, white juvenile offenders tend to report higher levels of a variety of different substances.

Age

The bulk of empirical evidence suggests that as an individual moves through adolescence, the likelihood of engaging in substance use and delinquency increases (Kelley, Huizinga, Thornberry, & Loeber, 1997; LeBlanc & Loeber, 1998; Menard, Mihalic, & Huizinga, 2001; White, Loeber, Stouthamer-Loeber, & Farrington, 1999). For example, in a sample of 5,045 students, Tubman, Gil, and Wagner (2004) found that the proportion of students reporting both delinquency and substance use increased fourfold from early to late adolescence. Research conducted on juvenile offender populations also highlights this positive linear relationship (Dembo et al., 2007a; Loeber, Stouthamer-Loeber, & Raskin-White, 1999; McClelland et al., 2004; Teplin et al., 2003).

Criminal offending

It has been well-documented that serious offenders report higher levels and more serious use of alcohol and other drugs (Dembo et al., 2007a; Farrington, 1998; Huizinga & Jakob-Chien, 1998; Johnson, Wish, Schmeidler,

& Huizinga, 1991; Van Kammen et al., 1991; White et al., 1999). In general, compared to cocaine users, marijuana users tend be less criminally involved; and compared to all types of substance users, non-drug users tend to be the least criminally involved. The results of these studies also highlight the notion that, not only are drug use and delinquency related, but the extent of involvement in one behavior is strongly related to the extent of involvement in the other.

Accordingly, socio-demographic variations in substance use should be accounted for when considering the nature of substance use among juvenile offenders. Failing to consider variations across individual-level factors, as well as type of substance used, has the potential of leading to an inaccurate understanding of the nature of substance use, which in turn, may lead to the development of under-informed prevention and intervention services for juvenile offenders.

An additional area to be considered is the adolescent's social environment. Although widely recognized as an important contributor to adolescent substance use, research on community-level factors has been sparse (Wilson & Donnermeyer, 2006). Few studies have examined the simultaneous influence of community- and individual-level factors on adolescent substance use (Jang & Johnson, 2001; Lambert, Brown, Phillips, & Ialongo, 2004), and fewer studies have compared these factors across different types of substances. The few studies that have examined these simultaneous relationships highlight the importance of both community- and individual-level predictors of substance use (Esbensen & Huizinga, 1990; Hawkins, Catalano, & Miller, 1992; Jang & Johnson, 2001; Simcha-Fagan & Schwartz, 1986).

Community Characteristics

Prior research and theory have suggested that youths residing in disadvantaged and disorganized neighborhoods are more likely to engage in antisocial behavior (Bursik & Grasmick, 1993; Sampson, Raudenbush, & Earls, 1997; Shaw & McKay, 1969). This research points to a lack of social support networks, inadequate institutional resources, low-income schools, deficient economic opportunities, and the existence of negative role models, which are characteristic of disadvantaged neighborhoods, as the cause for the association between community-level factors and antisocial behavior (Little & Steinberg, 2006; Massey & Denton, 1993; Wilson, 1996; see Sampson, Morenoff, & Ganon-Rowley, 2002, for a review).

The bulk of empirical evidence examining delinquent behavior suggests that these associations are valid. Youths who live in areas characterized by disadvantage are more likely to engage in delinquent behavior (Huizinga et al., 1994; Little & Steinberg, 2006; Sampson et al., 1997; Wikstrom & Loeber, 2000). The small number of studies on variation in substance use across community characteristics provides similar results. On average, youths residing

in neighborhoods characterized by low economic status, high African-American populations, high unemployment rates, urbanization, and single-parent families tend to report higher rates of alcohol use, marijuana use, and the use of other drugs (Barnes et al., 2002; Esbensen & Huizinga, 1990; Jang & Johnson, 2001; Wagner, 1996).

However, this body of research has failed to identify the relative influence of community characteristics on substance use among juvenile offenders. In particular, research examining the simultaneous influence of community and individual risk factors for substance use among juvenile offenders, as well as studies that compare the influence of community characteristics across the use of different substances, is relatively nonexistent. The present study builds on this gap in the existing literature by examining the influence of both community- and individual-level risk factors on marijuana and cocaine use, separately.

Current Study

The purpose of this study is to examine the relative influence of various socio-demographic and community-level factors on marijuana and cocaine use, separately, among a sample of newly arrested juvenile offenders. This study contributes to the current body of research in several ways. First, examining separate drug use models will allow for the direct comparison of the influence of various risk factors on different types of drug use. Second, only a few studies have been conducted that simultaneously examine the influence of individual- and community-level risk factors on substance use, and even fewer are based on juvenile offenders. Hence, this study provides much-needed information regarding which level of risk—the individual, the community, or both—exerts the most influence on drug use among juvenile offenders. Third, this study is based on biological assay test results rather than self-report measures. Relying on biological data comes with important limitations, most notably the short time span for which the use of substances is observed and the inability to obtain information on the frequency, intensity, and duration of use. These weaknesses, however, are counterbalanced by validity issues with self-reported substance use measures, especially among juvenile offenders. Relying on self-reported information runs the risk of reporting bias due to several factors including inaccurate recall, variation in the interview process, drug misidentification, and the general unwillingness to disclose information regarding socially undesirable behavior (Harrison, 1995; Katz, Webb, Gartin, & Marshall, 1997; Sloan, Bodapati, & Tucker, 2004). Research has also demonstrated differences in reporting across demographic characteristics and type of substance used (see Rosay, Najaka, & Herz, 2007, for a review). Relying on biological data, although not completely desirable, protects against these threats to validity.

Finally, this study is based on newly arrested adolescents. To date, the large majority of research examining substance use among juvenile offenders is based on incarcerated adolescents. While these studies offer important information regarding the substance use-delinquency link, they only provide an indication of substance use among juvenile offenders at the back end of the juvenile justice system, who tend to be the most serious offenders. National data indicate that nearly 80% of offenders are released back into the community, and never detained, following arrest (Stahl, Finnegan, & Kang, 2007). As such, a substantial portion of existing literature fails to provide an accurate portrayal of the substance use-delinquency link across the entire body of juvenile offenders. The current study builds on this limitation by examining marijuana and cocaine use among newly arrested juvenile offenders, including first-time, non-serious offenders as well as more serious chronic offenders.

Three main research questions guided our analyses: (1) What are the individual-level and community-level risk factors relating to marijuana use among newly arrested juvenile offenders? (2) What are the individual-level and community-level risk factors relating to cocaine use among newly arrested juvenile offenders? (3) What are the similarities and differences between these risk factors in regard to marijuana and cocaine use?

METHODS

Sample

Data for this study were collected in a National Institute on Drug Abuse (NIDA)-funded research project located in Hillsborough County, Florida. Based on estimates obtained from the United States Census Bureau in 2006, 16.5% of the population residing in Hillsborough County were African American, 78.4% were white, and 22% were Hispanic (regardless of race). The median household income was $46,766. The median age was 36 years old and just over 14% of the population was between the ages of 10 and 19 (United States Census Bureau, 2007).

The project involved a successful collaboration among the Hillsborough County Juvenile Assessment Center (HJAC), the Florida Department of Health (DOH), Hillsborough County Health Department (HCHD), and the Florida Department of Juvenile Justice (DJJ). Project goals included estimating the prevalence of sexually transmitted diseases (STDs) among juvenile offenders, examining the relationship between drug use and risky sexual behaviors, and assessing the feasibility of providing public health services to the participating delinquents.

As a standard procedure in Hillsborough County, newly arrested juveniles are transported to the HJAC for intake processing. To be eligible to participate in the research project, youths had to (1) be 12 years of age

or older,[1] (2) agree to provide a urine specimen for drug testing, which is part of the standard assessment protocol at the HJAC, and (3) voluntarily consent to have their urine specimen split for STD testing. All study protocols were approved and monitored by the project's oversight Institutional Review Board. From June 2006 to December 2006, a total of 948 youths, 506 males and 448 females, agreed to participate in the project.[2]

To obtain community-level characteristics of the youths involved in the study, the address that each youth provided was geocoded. After interactively matching the complete, partial, and non-matching addresses of the 948 youths involved in the study, 924 of the youths (97.5%) were successfully geocoded in a six-county area, covering residential locations within Hillsborough County and its five adjacent counties (Hardee, Manatee, Pasco, Pinellas, and Polk).[3] Therefore, the final study sample involved 924 newly arrested juvenile offenders.

Finally, the data used for this study were weighted. On average, girls account for about 25% of the overall HJAC population; therefore, they were over-sampled to yield sufficient power for gender-specific analyses. To accurately represent the juvenile offending population in Hillsborough County during the study time period, the proportion of potential male enrollees per month was used to estimate the number of eligible males booked over the entire recruitment period, resulting in a weighting factor of 1.901 for eligible males ($N = 493$, weighted $N = 937$). In all analyses, the male cohort was weighted to provide estimates for the full population during the recruitment period. The female cohort, based on all eligible females, was not weighted ($N = 431$). Thus, the total weighted sample involved 1,368 newly arrested adolescents.

Individual-Level Measures

Drug test results

Drug-use data were based on the urine specimen (UA) that was voluntarily provided by study participants. At the testing lab, the split urine specimens were tested for drugs using the EMIT procedure.[4] The cutoff level for a positive marijuana test result was 50 ng/ml of urine and the cutoff level for a positive cocaine test result was 300 ng/ml. The surveillance window for marijuana is 5 days for moderate users, 10 days for heavy users, and 20 days for chronic users (Dembo et al., 1999). For cocaine, the surveillance window is 96 hours. The marijuana and cocaine UA results were dichotomized (0 = negative, 1 = positive) for the analyses.

Socio-demographic characteristics

Gender was a dichotomous variable coded 1 = male and 0 = female. Age was a continuous variable reflecting the number of years. Race was also

dichotomized with 1 = African American and 0 = non-African American (mainly Caucasian).

Current charge level

In accordance with Florida State law, each youth brought to the HJAC on a delinquency charge must have a Detention Risk Assessment Instrument (DRAI) completed on him or her by a trained HJAC screener (Dembo et al., 1994). The DRAI takes into consideration the youth's most serious current offense, other current offenses, pending charges, prior offense history, current legal status, and aggravating or mitigating circumstances. On the basis of this information, each youth is assigned a point score of risk. Youths receiving a score of 7 or more on the DRAI are placed under the supervision of the DJJ; they are assigned a DJJ case manager who monitors their case until final court disposition. The current charge level variable used in our analyses differentiated diversion-eligible youths (0 = DRAI score 0 to 6 points) from youths whose scores placed them under the supervision of DJJ (1 = DRAI score 7 points or higher).

Community-Level Measures

Community characteristics were obtained from the 2000 Census Data, Summary File 3 (U.S. Bureau of Census, 2002). Census tracts represent geographic regions established by the U.S. Census Bureau that are relatively homogenous areas with respect to demographic and economic characteristics. Census tracts contain anywhere from 1,500 to 8,000 people, with an optimal size of 4,000 people. The selection of census tracts, rather than block groups, was based on the statistical distribution of the community-level data analyzed. The distribution of cases within the census tracts limited the performance of block-level analyses. Specifically, of the 221 tracts in which the sample resided, 103 (46%) contained only one or two youths; thus, use of block-level community measures would have substantially increased the number of blocks containing few, if any, cases and reduced variance. Therefore, the final sample used in all analyses was 924 recently arrested juvenile offenders (weighted = 1,368) residing in 221 census tracts.

The census tract-level community indicators included several sociocultural descriptors and variables reflecting community organization shown in existing literature to affect adolescent behavior (Ingoldsby & Shaw, 2002; Leventhal & Brooks-Gunn, 2000; Sampson et al., 2002). Each tract-level measure was coded as a continuous variable, using logarithmic transformations (base 10) of these variables, where indicated, in the analyses. For variables with the lowest kurtosis (i.e., skewed distribution), transforming the data was not necessary. For variables with high kurtosis, a logarithmic

transformation addressed the issue of skewness, while also preserving the continuous nature of the variable.

Community disadvantage

Following the work of previous community-level research (Browning, Leventhal, & Brooks-Gunn, 2004; Sampson et al., 1997), an index was created with four socioeconomic indicators of disadvantage. These four variables were

1. the proportion of the population below the poverty line (mean = 0.139, *SD* = .117),
2. the proportion of African-American residents (mean = .174, *SD* = .225),
3. the proportion of residents unemployed (mean = .040, *SD* = .071), and
4. the proportion of female-headed households with children (mean = .084, *SD* = .058).

Three variables, the proportion of female-headed households with kids, proportion unemployed, and proportion living below the poverty line, revealed kurtosis values over 5. Therefore, all three of these variables were log transformed to reduce the skewness of the variable. The correlations among the three log-transformed variables and proportion African American were all significant (mean = .580). Confirmatory factor analysis revealed a one-factor solution fit the data best (χ^2 [2, N = 221] = 1.823, p = .40). Therefore, the factor scores for this latent variable were saved and used in the following analyses.

Residential stability

Stability was defined as the proportion of the population five years old and over that lived in the same house five years prior to 1999. The average level of residential stability across the 221 census tracts was 0.474 (*SD* = .126).

Hispanic

The proportion of the population that identified themselves as Hispanic or Latino comprised this variable. The mean value across the census tracts was 0.167 (*SD* = .128).

Youth

This variable was defined as the proportion of the population less than 18 years old. The average of the proportion of youths under the age of 18 residing in the census tracts equaled 0.257 (*SD* = .064).

ETHNIC HETEROGENEITY

Similar to Sampson and Groves (1989) and others, a measure of ethnic heterogeneity was included as an indicator of social disorganization. Ethnic heterogeneity was calculated as one minus the sum of the squared proportion of each given race/ethnicity (as provided by the U.S. Census) in each tract's population (see Blau, 1977). Values of 0 indicated complete ethnic homogeneity; values of 1 indicated complete maximum heterogeneity. The mean value for ethnic heterogeneity equaled 0.326 ($SD = .159$).

RESULTS

Bivariate Analyses

Table 1 compares the individual-level characteristics of the full sample to the individual-level characteristics of the cocaine-positive and marijuana-positive youths. As can be seen, relatively few youths were cocaine positive, compared to marijuana positive. Based on these descriptive statistics, it appears that drug-test-positive youths were older and scored higher on the DRAI. Cocaine-positive youths were also significantly more likely to be non-African American, and marijuana-positive youths were significantly more likely to be male.

TABLE 1 Demographic Characteristics, Charge Level, and Drug Test Results

	Full sample	Cocaine positive	Marijuana positive
Gender[a]			
Male	68.5% ($N = 937$)	6.1% ($N = 57$)	42.9% ($N = 401$)
Female	31.5% ($N = 431$)	4.0% ($N = 17$)	27.0% ($N = 116$)
Age[a,b]			
12	2.8% ($N = 39$)	–	7.7% ($N = 3$)
13	9.5% ($N = 129$)	1.5% ($N = 2$)	20.8% ($N = 27$)
14	14.1% ($N = 194$)	2.1% ($N = 4$)	29.4% ($N = 57$)
15	19.1% ($N = 262$)	4.2% ($N = 11$)	33.1% ($N = 86$)
16	24.8% ($N = 339$)	7.1% ($N = 24$)	45.3% ($N = 153$)
17	26.1% ($N = 356$)	8.4% ($N = 30$)	49.0% ($N = 175$)
18	3.6% ($N = 49$)	8.0% ($N = 4$)	34.7% ($N = 17$)
Mean (*SD*)	15.46 (1.48)	16.18 (1.09)	15.84 (1.28)
Race[b]			
African American	52.3% ($N = 716$)	3.4% ($N = 25$)	35.9% ($N = 257$)
Non-African American	47.7% ($N = 652$)	7.5% ($N = 49$)	40.0% ($N = 260$)
Charge level[a,b]			
Diversion	62.7% ($N = 858$)	3.7% ($N = 32$)	34.8% ($N = 298$)
DJJ case	37.1% ($N = 508$)	8.3% ($N = 42$)	43.3% ($N = 219$)
Drug test result[a,b]			
Marijuana positive	37.8% ($N = 517$)	12.2% ($N = 63$)	–
Cocaine positive	5.4% ($N = 74$)	–	84.0% ($N = 63$)

[a]Marijuana test result chi-square test of significance: $p < .05$.

[b]Cocaine test result chi-square test of significance: $p < .05$.

Table 2 displays the community characteristics attributed to the full sample, cocaine-positive, and marijuana-positive youths. The results are somewhat interesting because they help to describe the neighborhood conditions of the youths, but it is important to note that attributing contextual features directly to youths in this way should only be used for descriptive purposes, not statistical comparisons—for which multilevel modeling is more appropriate. Interestingly, cocaine-positive youths lived in census tracts with higher proportions of residents above the poverty line and were also more likely to reside in areas characterized by residential stability.

Multivariate Analyses

The descriptive statistics presented in Tables 1 and 2 suggest that the individual and community characteristics may differentially influence the use of marijuana and cocaine. Therefore, two separate multilevel logistic regression models were conducted, one predicting marijuana test result and one predicting cocaine test result. M*plus* (version 5.1) (Muthén & Muthén, 2007) was used to estimate the multilevel models. The estimator for the analysis was maximum likelihood with robust standard errors using a numerical integration algorithm (Muthén & Muthén, 2007). Model 1 predicted the youths' cocaine test results, and Model 2 predicted the youths' marijuana test results. For each model, the within part of the model involved the logistical regression of that particular drug test result on four individual-level predictor variables: gender, age, race, and current charge level. The between part of the model involved the regression of the particular drug test result (Model 1 = cocaine; Model 2 = marijuana) on the five census tract characteristics discussed above. The within and between parts of the model reflect the

TABLE 2 Average Level of the Community Characteristics across the 221 Census Tracts Attributed to Youths

Community characteristics	Full sample ($N = 1334$)	Cocaine negative ($N = 1291$)	Cocaine positive ($N = 74$)	Marijuana negative ($N = 848$)	Marijuana positive ($N = 517$)
Concentrated Disadvantage Index					
Female-headed house with kids	12.4%	12.3%	12.1%	12.3%	12.2%
Unemployment	4.8%	4.7%	4.3%	4.7%	4.7%
Below poverty	20.7%	20.6%	17.1%	20.5%	20.2%
Percent African American	32.2%	32.2%	33.0%	32.0%	32.6%
Youth	28.6%	28.6%	29.0%	28.4%	28.9%
Residential stability	47.8%	47.7%	51.5%	47.7%	48.1%
Percent Hispanic	16.9%	16.8%	18.1%	16.9%	16.9%
Ethnic heterogeneity	37.9%	37.6%	38.0%	37.7%	38.1%

individual level and community level, respectively, of a multilevel regression model. Figure 1 represents the models estimated in the analyses.

Model 1: Predicting Cocaine Test Result

Table 3 compares the results of the separate two-level logistical regression analyses for youths' marijuana and cocaine test results. Model 1 includes the results of the model predicting cocaine test results. The critical ratios indicated older youths, non-African-American youths (mainly Caucasian), and youths who scored higher on the DRAI were significantly more likely to be cocaine positive. According to the odds ratios in Model 1, the odds of African-American youths being cocaine positive were 60% lower than for non-African-American youths. DJJ-eligible youths were 2.6 times more likely than diversion-eligible youths to be cocaine positive; and for every year older, youths were 2.9 times more likely to be cocaine positive.

The between-level results in Model 1 indicated that youths living in census tracts characterized by higher levels of residential stability were more likely to test cocaine positive. These results suggest that the newly arrested youths residing in stable areas were more likely to use cocaine compared to youths residing in unstable areas.

Model 2: Predicting Marijuana Test Result

As the critical ratios reported in Model 2 of Table 3 indicate, males, older youths, and youths who scored higher on the DRAI were more likely to test

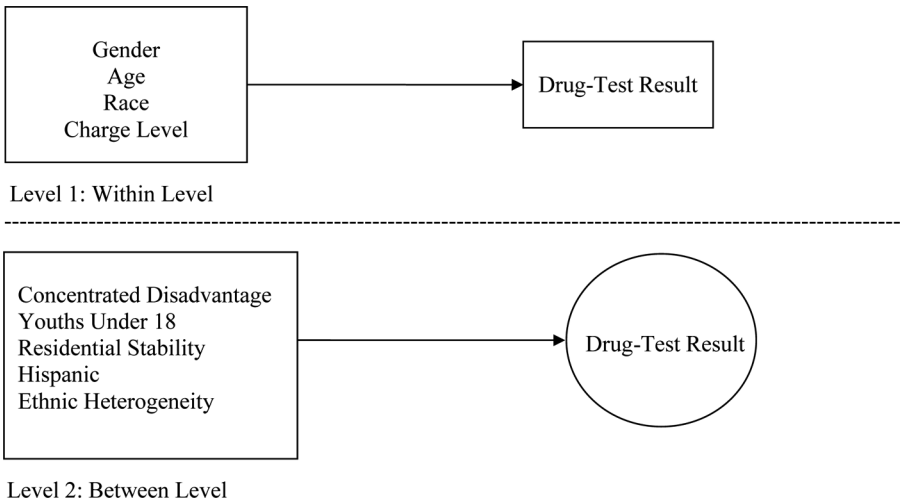

FIGURE 1 Two-level logistical regression analysis predicting drug-test result. *Note*: Community-level data derived from 2000 U.S. Census Bureau.

TABLE 3 Multilevel Logistic Regression Analyses Predicting Youths' Cocaine and Marijuana Urine Test Results

	Model 1: Cocaine				Model 2: Marijuana			
	Estimates	*SE*	Critical Ratio	OR	Estimates	*SE*	Critical Ratio	OR
Within level								
Gender (male)	0.363	0.358	1.016	1.438	0.635	0.162	3.917****	1.887
Age	0.398	0.136	2.917***	1.488	0.299	0.049	6.165****	1.349
Race (African American)	−0.919	0.399	−2.302**	0.399	−0.177	0.150	−1.184	0.838
Charge level (DJJ case)	0.971	0.375	2.589**	2.641	0.340	0.136	2.492**	1.404
Between level								
Concentrated disadvantage	−1.346	1.357	−0.992		−0.162	0.482	−0.336	
Youth	4.139	2.849	1.453		1.739	1.128	1.542	
Residential stability	3.911	1.351	2.895***		0.015	0.535	0.028	
Hispanic	0.842	1.321	0.638		0.005	0.594	0.008	
Ethnic heterogeneity	0.947	1.422	0.666		0.027	0.479	0.056	
Threshold	14.216	2.593	5.482****		6.466	0.827	7.815****	

Note: Since the multilevel logistic regression analyses relied on random effects modeling, calculations of the odds ratios (OR) at the between level are not appropriate.
$^{**}p < .05$; $^{***}p < .01$; $^{****}p < .001$.

positive for marijuana. Based on the odds ratios, males were nearly two times more likely to be marijuana positive, compared to females. For every year older, youths were 1.3 times more likely to be marijuana positive, and DJJ-eligible youths (i.e., arrested on more serious charges) were 1.4 times more likely to be marijuana positive than diversion-eligible youths. None of the community-level variables were significantly related to marijuana test results.

DISCUSSION

The goals of this study were to examine the individual- and community-level risk factors related to marijuana and cocaine use, and to compare the risk factors associated with each substance, among a sample of newly arrested juvenile offenders. Separate, multilevel logistic regression models highlighted the importance of individual-level, socio-demographic risk factors for substance use.

On one hand, these results suggest a degree of similarity in risk factors for marijuana and cocaine use, particularly for individual-level factors. Age and seriousness of arrest charge predicted use of both drugs. Older youths and youths with more serious arrest charges were substantially more likely

to test positive for marijuana and cocaine. On the other hand, important individual-level differences in drug use were also found. Males were significantly more likely to be marijuana positive, but no gender differences were found for cocaine. Non-African-American youths were significantly more likely to be cocaine positive, but no racial differences were observed for marijuana. These findings coincide with prior research regarding variation in marijuana use across gender groups (Belenko et al., 2004; McClelland et al., 2004; Neff & Waite, 2007) and cocaine use across racial groups (Barnes et al., 2002; Lebeau-Craven et al., 2003; Teplin et al., 2005; Vaughn et al., 2008), and indicate the need to consider the specific type of substance used when identifying individual-level risk factors for substance use.

Furthermore, the community characteristics associated with marijuana use also differed from the community characteristics associated with cocaine use. Youths residing in areas characterized by residential stability were more likely to be cocaine positive; however, none of the community characteristics were related to the marijuana test result. Several points regarding these results are worth mentioning.

At first glance, the relationship between residential stability and cocaine use seems to contradict neighborhood-level research that highlights an inverse relationship between adolescent misbehavior and neighborhood stability (Brewster, Billy, & Grady, 1993; Cantillon, Davidson, & Schweitzer, 2003; Hawkins et al., 1992; Kowaleski-Jones, 2000). However, macro-level research also suggests that higher-income neighborhoods are more likely to be residentially stable (Shaw & McKay, 1969). Drawing from the bivariate relationships reported in Table 2, cocaine-positive youths were more likely to reside in census tracts characterized by a higher proportion of residents with residential stability, as well as a higher proportion of residents who lived above the poverty line. Thus, the cocaine-positive youths in this study were more likely to come from higher-income, residentially stable neighborhoods.

Prior studies have revealed relatively high levels of substance use among middle-class adolescents. In fact, a number of studies have revealed greater levels of substance use, including cocaine, among middle-class adolescents compared to lower-class adolescents (Luthar & D'Avanzo, 1999; Yoav & Friedman, 1980). As a result, availability and access to cocaine may be somewhat higher in these areas. At the same time, if the social networks present in these stable neighborhoods support the use of cocaine among adolescents, the chances of cocaine use are heightened. Exposure to pro-cocaine attitudes, cocaine-using role models, and positive reinforcement for the use of cocaine will be amplified in such neighborhoods, and in turn, adolescents exposed to these circumstances will be more likely to use cocaine.

Parental and peer factors play a critical role in determining the direction of these social relationships. Parents and peer groups provide definitions about the acceptability of behavior and different kinds of family environment

and/or peers groups provide differing standards for behaviors (Wilson & Donnermeyer, 2006). Research also suggests that community conditions indirectly influence substance use through their impact on a youth's immediate social environment (i.e., family and peers) (Chuang, Ennett, Bauman, & Foshee, 2005; Jang & Johnson, 2001; Li, Feigelman, & Stanton, 1999; South & Baumer, 2001; Tarter, Vanyukov, & Kirisci, 2006; Vazsonyi, Trejos-Castillo, & Young, 2008). These studies suggest that the interaction of community- and individual-level factors determines an adolescent's *developmental pathway* to substance use (Leventhal & Brooks-Gunn, 2000). Communities influence the ability of the family to provide opportunities to adolescents to be exposed to, and learn about, substance use. At the same time, community characteristics also influence the opportunities to associate with different types of peer groups (Wilson & Donnermeyer, 2006). Therefore, the interaction between community, family, and peer factors may not only determine if a child will engage in substance use, but may also influence *which* substances the child will use depending on availability, community perception, and level of usage of each specific substance in a given neighborhood. Unfortunately, we were unable to include such social factors in the analysis, which is a major limitation to the current study. Without the inclusion of family and peer variables, the findings of this study should be considered preliminary.

The modest findings regarding the predictive ability of the community-level variables found in our study are similar to results obtained in prior neighborhood-level research on adolescent problem behaviors. Overall, research examining the influence of community-level factors on adolescent problem behaviors has been inconsistent, and when effects are found, modest in magnitude (Cattarello, 2000; Hays, Hays, & Mulhall, 2003; Leventhal & Brooks-Gunn, 2000; McRae, Beebe, & Harrison, 2001; Simcha-Fagan & Schwartz, 1986; Vazsonyi et al., 2008).

One possible reason that may have influenced the community-level effects is related to the measure of community, namely the reliance on the use of census tracts as a proxy for communities. Some macro-level researchers suggest that relying on larger units of measurement, such as census tracts or zip codes, produces aggregation bias, or inaccurate parameter estimates due to examining theoretically inappropriate groups. This argument is based on the notion that the macro-level processes affecting behavior at the individual level are qualitatively different across levels of community measures, thus implying that the magnitude of relationships involving the same macro-level predictors (i.e., socioeconomic status, ethnic heterogeneity) could differ significantly by level of aggregation (Bursik & Grasmick, 1993; Wooldredge, 2002). This issue was considered in the present analysis. However, due to a low number of cases residing in each census tract in Hillsborough County, there were even fewer cases living in each block group and a substantial number of block groups with no cases, which inhibited our ability to examine these relationships across census block groups.

A few additional limitations of the current study need to be addressed. First, this study was based on biological data. Although using biological data guards against inaccurate self-reported information, it also has its shortcomings—for example, the short time period for which drug use is detectable in urine. For heavy users, marijuana only stays in a youth's system for approximately 20 days and cocaine remains in the system for less than 4 days (Dembo et al., 1999). Therefore, the UAs were only able to capture current drug use, which limited the number of drug users in the sample. Relying on self-reported data would have allowed for an extension in the observation time frame for drug use (e.g., past-year use), which, in turn, could have increased the number of drug users included in the sample; but this option would not have been without its own shortcomings (i.e., validity issues).

Also, this study was based on cross-sectional data. Conclusions regarding the risk factors for marijuana and cocaine use should be interpreted with caution. The use of cross-sectional data prohibits making any causal inferences based on these results (Cook & Campbell, 1979). Last, the number of cocaine-positive youths in the study was relatively small (5.4%). As a result, the variation in this variable was quite limited, which prevents a complete examination of the relationship between cocaine use and the individual- and community-level predictors. Therefore, our findings regarding the cocaine use model are preliminary and warrant additional research regarding the consideration of both community-level and individual-level risk factors for cocaine use among juvenile offenders at the front end of the juvenile justice system.

The failure to include ethnicity as an additional demographic factor was also a limitation of the current study. As a result of the data collection procedures, as well as Health Insurance Portability and Accountability Act (HIPAA) safeguards prohibiting the research team to see any confidential information, the participant's ethnicity was unable to be collected in a valid manner. For example, descriptive analysis indicated that less than 10% of the final sample was Hispanic. Given that over 26% of the population between the ages of 10 and 17 in Hillsborough County in 2006 was Hispanic, the proportion of study participants identified as Hispanic did not seem representative (United States Census Bureau, 2007).

Based on these limitations, future studies comparing the risk factors associated with the use of different types of substances are needed. This research should include (1) a large, representative sample of recently arrested juvenile offenders, (2) additional measures of the offender's immediate social environment, particularly family and peer factors, and (3) the influence of the interaction between community-level characteristics and socio-demographic, family, and peer variables on substance use among adolescent offenders. To date, research comparing individual-level factors, in addition to the interaction of these individual factors with community characteristics, across different types of substance use among juvenile offenders is relatively

nonexistent. Although our findings are preliminary and should be interpreted with caution, this study contributes to the scarce body of research examining the simultaneous influence of individual- and community-level predictors of substance use among juvenile offenders.

NOTES

1. Florida law requires that a youth be at least 12 years old to consent to STD testing, without parental permission.

2. Among the eligible 759 males and 634 females who were assessed and asked to participate in the study, 83% of each gender consented to provide the initial urine specimen. Of these, 85.3% of males and 87.5% of females also consented to be tested for STDs (70.5%, 72.7%, and 71.5% of assessed males, females, and youths overall). No significant differences were found in consent rates by gender, race, age, HJAC operational shift (7 a.m.–3 p.m., 3 p.m.–11 p.m., 11 p.m.–7 a.m.), or post-HJAC placement. In total, 948 youths, 506 males and 448 females, agreed to participate in the project.

3. For the non-geocoded youths, $N = 2$ (0.2%) provided an out-of-state address, $N = 8$ (0.8%) provided addresses with missing or incorrect address information, and $N = 14$ (1.5%) lived in counties that were not contiguous to Hillsborough County.

4. The urine specimens were collected at the Hillsborough County Juvenile Assessment Center as part of the assessment process within three hours following arrest. The collected specimens were kept in a refrigerator until picked up by a courier within 24 hours for transport to the testing laboratory.

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