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Substance Use and Sexual Risk Behaviors in Perinatally Human Immunodeficiency Virus-exposed Youth: the Role of Caregivers, Peers and HIV Status

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Abstract

Purpose—To examine the association between sexual risk behaviors and substance use, as well as the impact of caregiver characteristics and perceived peer norms among perinatally HIV-exposed but uninfected and perinatally HIV-infected youth.

Methods—Using baseline data from a multi-site study of psychosocial behaviors in perinatally HIV-exposed urban youth ($N = 340$; 61% HIV+; 51% female; ages 9-16). We conducted interviews with youth-caregiver dyads. Using hierarchical logistic regression, we explored the association between lifetime sexual risk behaviors, cigarettes, alcohol, marijuana, other drug use, caregiver relationship characteristics and peer influence.

Results—Cigarettes, alcohol and marijuana were significantly associated with HIV sexual risk behavior; no youth reported other drug use. After accounting for peer norms, the relationship between substance use and risky sexual behaviors was somewhat diminished. Irrespective of substance use, perception that more peers were involved in risky sex was associated with sexual risk behavior. Caregiver relationship characteristics had no effect on the association between substance use and risky sexual behavior. In all analyses, we found no effect across HIV status.

Conclusion—Regardless of HIV status, perinatally-exposed youth who use substances are more likely to engage in sexual risk behaviors. While the current study shows that peer influence on risky sexual behavior is more robust, caregivers are still important. The pediatric and adolescent HIV community must develop multilevel prevention initiatives that target youth, their peers and families.

Keywords

perinatal adolescent HIV-infection; substance use; sexual risk behavior; caregiver characteristics; peer norms

Introduction

With the enormous success and widespread use of antiretroviral treatment (ART) in the US, fewer babies are born with HIV; those that are HIV-infected now live prolonged and enhanced lives [1,2]. Pediatric HIV has become an *adolescent* epidemic in the US. By 2006, in New

York City (NYC), where the current study is located, 64% of perinatally HIV-infected (PHIV+) youth were 12 years and older [3].

Adolescence is a period in which sexual and drug use behavior typically begins and escalates [4,5]. Alcohol and drug use are linked to early sexual debut and increased risky sexual behaviors such as inconsistent condom use, multiple and high-risk partners in adolescence [6,7,8,9,10]. Clinical reports suggest that PHIV+ youth also begin to experiment with substance use and sexual behavior during adolescence [11], yet no study has examined the relationship between substance use and sexual risk among PHIV+ adolescents. The emergence of substance use and sexual behavior in PHIV+ youth is a potential public health challenge. Substance use may increase the likelihood that PHIV+ youth engage in sexual risk behaviors, placing others at risk for secondary HIV-transmission, and may lead to poor health outcomes [12].

Sex and drug use risk behaviors often cluster together in adolescent populations [13,14]. The literature identifying a causal relationship between these behaviors is inconsistent (i.e. does substance use cause sexual risk behavior), suggesting other contextual factors may be at play. Bronfenbrenner's ecological model posits that adolescents exist in multiple inter-connected systems (e.g. family and peer networks) that affect their behavior either directly or indirectly [15]. Thus, the impact of ecological factors, such as family and peers, may be a critical link in understanding the relationship between drug use and sexual risk behavior among adolescents [16].

Family processes are essential to youth well-being and development. Positive parent-child relationships such as parental involvement, promotion of child autonomy, and parent-child communication have been identified as key characteristics in preventing youth substance use and risky sexual behavior [16-18]. However, the influence of family processes on substance use and sexual risk behavior is unknown among PHIV+ adolescents and findings from other populations may not readily generalize to these youth whose families have been affected by HIV. Perinatally HIV-infected and HIV-exposed youth are primarily of ethnic minority status, living in impoverished, inner-city communities, confronted by disrupted family attachments due to parental illness and death [19,20,35].

Peer relationships also play a significant role in adolescent development as youth strive to individuate and attain autonomy [21]. Peer norms, particularly approval of sex or drug use, and peer substance use and sexual behavior have been associated with adolescent substance use and risky sex [22,23]. However, as with family influence, few data on the impact of peers on PHIV+ youth risk behavior exist. There are complicated decisions related to HIV-disclosure to others that may affect friendships and intimate relationships. As with other stigmatized groups, PHIV+ youth may engage in risky sexual and drug use behavior as an attempt to obtain peer approval [24], or may abstain out of fear of transmission or disclosure.

In an effort to halt the spread of the HIV epidemic, there has been a call to develop HIV prevention programs that focus on reducing sexual and drug risk behavior in HIV+ populations [25]. However, few programs have been developed for PHIV+ youth. Understanding the relationship between substance use and risky sex, and whether parents and peers play a critical role in either promoting or offsetting risk, can help identify whether interventions for PHIV+ youth will be most effective if they intervene at the individual (e.g., reduce substance use), peer (e.g., change normative beliefs) and/or family (e.g., modify parenting style) levels [26].

Using baseline data from Project CASA (Child and Adolescent Self-Awareness and Health Study), a large multicenter US based study of psychosocial determinants of behavior in a sample composed of both PHIV+ youth and perinatally HIV-exposed but uninfected youth (seroreverters or HIV-) with similar age and demographic backgrounds, this study asked the following questions: 1) Is substance use associated with sexual risk behavior? 2) Are key

caregiver and peer characteristics associated with sexual risk behavior after accounting for substance use? 3) Does the association between substance use and sexual risk change after accounting for peer and parental variables? For all questions, we explored whether the associations differed by youths' HIV status. Seroreverters were chosen as the comparison group for PHIV+ youths, because, with the exception of child's HIV status, their sociodemographic and family characteristics, including maternal HIV, are for the most part very similar. Thus, these two groups provide a unique opportunity to explore the contribution of HIV infection to risk behavior.

Methods

Participants and Procedures

Participants for Project CASAH were recruited from four medical centers in NYC providing primary and tertiary care to HIV-infected children and families. Inclusion criteria for study participation were: 1) youth aged 9 to 16 years with perinatal exposure to HIV, 2) caregiver and youth cognitive capacity to complete the interview, 3) English or Spanish speaking, and 4) caregiver with legal capacity to sign consent for the child's participation (foster care parents cannot provide consent for child participation in psychosocial research in NYC).

Among the 443 eligible participants, 11% refused to participate and 6% could not be contacted. A total of 367 (83%) were approached, of whom 93% were enrolled. The final baseline sample included 340 caregiver/youth dyads; 206 HIV+ and 134 HIV- youths. This study received Institutional Review Board approval from all sites. Caregivers provided consent and youth provided assent. Interviews were conducted in the family's home, at the family's clinic or in our research offices; youth and caregivers were interviewed separately but concurrently. All youth were interviewed in English, and Caregivers were interviewed in Spanish (20%) and English (80%). Child awareness of their HIV status was assessed by parental report prior to the interview. HIV was not discussed with any child who had not been formally told their diagnosis. Monetary reimbursement for time and transportation was provided.

Assessments

Demographics—We assessed child and caregiver age, gender, ethnicity and HIV status; caregiver employment, and type (e.g. biological parent, relative); and household income. We extracted data on CD4+ cell count (cells/m³) and viral load values (copies/mL) from medical records for the HIV + youth.

Sexual Risk Behavior—We used the Adolescent Sexual Behavior Assessment (ASBA [27]) to assess adolescent sexual behavior with questions appropriate for use with younger and older adolescents. The ASBA contained gateway questions so that participants with no sexual experience were not asked about specific sexual practices. Male and female versions of the instrument were developed. The ASBA was administered to approximately half the sample using ACASI (audio computer assisted self interview) and half with face-to-face interview as part of a sub-study; no differences were found on rates and types of reported behavior due to mode of administration (available from authors). The following dichotomous risk behaviors (yes/no) were measured: lifetime vaginal or anal penetrative sex, unprotected vaginal sex and multiple partners.

Child substance use—We assessed child substance use using the Diagnostic Interview Schedule for Children-IV (DISC-IV; child version) [28,29], an extensively used and well-validated comprehensive instrument to assess common DSM diagnoses [29]. Children were interviewed about their lifetime use of cigarettes, alcohol, marijuana, and other drug use (e.g. cocaine, heroin, methamphetamine). All substance use variables were dichotomous (yes/no).

Caregiver Relationship Characteristics—The *Parent Child Relationship Inventory* (PCRI) [30], a self-report instrument for caregivers acting in a parental role, was used to assess parental involvement. Three of the four subscales were used: 1) involvement (i.e., spending time and showing interest in the child and the child's activities); 2) quality of communication (i.e., parent empathy and conversation across situations); and 3) autonomy (i.e., the extent to which the caregiver promotes the child's independence). Each item is rated on a 4-point scale ranging from 0=Strongly Agree to 3=Strongly Disagree. High scores on communication, autonomy, and involvement scales indicate good communication, promotion of youth autonomy, and high caregiver involvement with the youth, respectively. The PCRI was normed on an urban sample and is appropriate for single and dual adult parent households. In our data, we found good reliability for the parental involvement (Cronbach $\alpha=.77$) and communication (Cronbach $\alpha=.78$) scales and adequate reliability for the autonomy scale (Cronbach $\alpha=.66$).

Peer Norms—We used two measures to assess peer norms regarding substance use and sexual behavior.

Substance Use Subjective Norms—Subjective norms regarding alcohol use was measured using an adapted instrument [31] assessing the acceptability of various alcohol use behaviors. Each begins with the stem question “how acceptable is it for an adolescent of your age to...” followed by situations such as “have a sip of a parent's drink when offered” and “have a few beers at a friends house after school”, among others. This measure was refined by Bauman and colleagues [32] to include subjective norms about use of cigarettes, marijuana or other types of drugs. Youth rated these items on a 5-point scale ranging from 1=Not at all acceptable to 5=Totally acceptable. We found strong reliability (Cronbach $\alpha=.91$) and computed a mean composite score. High scores indicate perceived acceptability of substances among peers.

Peer Sexual Behavior—This scale comprises 5 items on adolescent's beliefs about how many friends' in their social network are engaging in sexual activity, hold negative attitudes toward condoms, do not use condoms when inebriated from drinking alcohol, do not use condoms when high from using drugs, have been pregnant or impregnated someone else [33]. Adolescents answered each item using a 4-point scale ranging from 0=None to 3=All. We created a mean composite score with good reliability (Cronbach's $\alpha=.78$). High scores indicated participants' perception that more friends in their social network were engaging in risky sexual behavior.

Statistical Analysis

We examined differences by HIV status in demographic characteristics, prevalence of substance use and HIV risk behaviors, peer influence and caregiver relationship characteristics using t and χ^2 tests, as appropriate. We then examined the prevalence of dichotomous lifetime sexual behaviors (i.e., vaginal or anal penetrative sex [henceforth referred to as penetrative sex], unprotected vaginal sex, and multiple partners) and substance use (i.e., cigarette, alcohol, marijuana use, and other drugs [e.g. methamphetamine, stimulants, heroin, and cocaine]). Without prior data in the literature on the effects of specific substances on sexual risk behaviors among perinatally HIV-exposed and infected youth, the effects of cigarettes, alcohol, marijuana, and other drugs on sexual risk behaviors were examined separately in all analyses. Participants' awareness of their HIV status was highly correlated with age ($r = .58$); thus, we did not include youth's awareness of their HIV status in the regression models to avoid multicollinearity.

In the main analyses, we employed a hierarchical logistic regression model to examine the association between sexual risk behaviors, and demographic, substance use, family and peer

variables. We only retained variables from each step if they were marginally significant ($p \leq .10$). In the first step, we included demographic variables and substance use (step 1; individual-level factors); we only included age, male sex and poverty as they were the only demographic variables correlated with the outcomes at $p \leq .10$ (data not shown). We then added family variables (step 2; family-level factors) and peer variables (step 3; peer-level factors) into the model. As part of our sensitivity analyses, we also altered the order of entry of peer and family variables and found the pattern of results did not change (data not shown).

Results

Sample Characteristics: Differences by HIV Status

Table 1 presents the sample characteristics, substance use and sexual risk behavior of both HIV+ and HIV- youth. There were no significant differences between HIV+ and HIV- youth across age, gender, or race/ethnicity. Families of HIV+ youth reported a slightly higher average annual income (\$25,000-30,000) than families of HIV- youth (\$20,000-25,000), yet the average across both groups was under the NYC poverty line for a family of 4 people ($t = -2.44$, $p \leq .05$). Significantly fewer HIV+ youth were living with a birth parent (36% vs. 70%; $\chi^2 = 36.09$; $p \leq .001$), and thus, fewer were living with an HIV+ caregiver (31% vs. 69%; $\chi^2 = 43.96$, $p \leq .001$), as 100% of birth mothers were HIV+ by study definition. Corresponding with this finding, more HIV+ youth reported their long term primary caregiver (e.g. biological parent or adoptive parent who raised them from birth or early childhood) was deceased (53% vs. 24%; $\chi^2 = 9.84$, $p \leq .001$, $n = 297$). Among HIV+ youths, the majority (68.6%) were on ART. The mean CD4+ cell count was 606 (*Median*=577; *SD*=318.4) and only 10% had CD4+ < 200 cells/ m^3 . The median HIV RNA viral load was 1,7234.6 copies/ml (*SD*=22,973.4); 30% had not been told their HIV diagnosis.

The most prevalent substance used by both groups was alcohol (12.7% of HIV+ and 16.0% of HIV- youth). Use of marijuana and cigarettes was less frequent in HIV+ (4.4% and 4.4%, respectively) and HIV- (8.4% and 6.9%, respectively) youth. No youth reported using other substances. Penetrative sex (vaginal and anal) was reported by 9.9% HIV+ and 14.2% HIV- youth. Among those who were sexually active, 42.1% HIV+ compared to 29.4% of HIV- youth reported unprotected vaginal sex in their lifetime; 88.9% of HIV+ youth and 58.8% of HIV- youth reported multiple partners. At last intercourse, of those youth who were sexually active, 64.7% HIV+ and 50.0% HIV- youth described their partner as a girlfriend/boyfriend, 35.3% HIV+ and 25.0% of HIV- youth described their partner as a friend or casual partner, and 16.7% HIV- youth (0% HIV+) as a recent acquaintance or other type. There were no differences in sexual risk behavior, substance use or relationship categories by HIV status for the whole sample.

Tables 2, 3 and 4 present the associations between substance use, caregiver relationship characteristics and peer norms for each of the three outcomes, penetrative sex, unprotected sex and multiple partners, respectively. Of the demographic characteristics described in Table 1, only age, gender and poverty status, were significantly correlated with the dependent variables (i.e. sex risk behaviors) and were subsequently the only demographic variables included in the regression analyses.

Demographic and substance use variables (individual-level factors)

Irrespective of substance use, older youth were substantially more likely to report engaging in all risk behaviors. Males were significantly more likely to report multiple partners. After accounting for demographic variables, youth who had smoked cigarettes were significantly more likely to engage in all sexual risk behaviors aside from having multiple partners compared to those who did not smoke. Youth who used alcohol or marijuana were also more likely to

have ever engaged in *all* sexual risk behaviors compared to those who did not use alcohol or marijuana. We also examined whether HIV status moderated the association between substance use and sexual risk behaviors via interactions, yet found no significant results (data not shown). As HIV status was not associated with any of the sexual risk behaviors and did not moderate the relationship between sexual risk behaviors and substance use, it was excluded in subsequent analysis.

Caregiver Relationship Characteristics (family-level factors)

Youth whose caregivers did not promote youth autonomy were significantly more likely to engage in penetrative sex and to have multiple partners, respectively. No other family-level factors (i.e., parent-child communication or caregiver involvement) were associated with the sexual risk outcomes. Inclusion of caregiver characteristics into the model (step 2) did not alter the associations between substance use and the sexual risk outcomes. Youth who reported alcohol or marijuana use were significantly more likely to engage in all sex risk behaviors. Youth who used cigarettes were significantly more likely to engage in penetrative and unprotected vaginal sex.

Peer Norms, Substance Use and Sexual Risk Behaviors (peer-level factors)

Overall, despite use of cigarettes, alcohol or marijuana, youth who believed more of their peers were engaging in risky sexual practices were significantly more likely to report engaging in all risk behaviors. Youth who endorsed peer substance use as acceptable were significantly more likely to engage in penetrative sex, unprotected sex, and to have multiple partners after accounting for the effects of cigarettes, and more likely to engage in penetrative sex after accounting for the effects of marijuana use.

After including peer norms in the model (step 3), the association between sexual risk behaviors and substance use attenuated. The significant associations between penetrative sex and cigarette and alcohol use were no longer significant after accounting for peer norms. Similarly, the association between unprotected sex and smoking cigarettes was no longer significant.

Discussion

This is the first study to examine the relationship between substance use and sexual risk behavior among HIV perinatally-infected and perinatally-exposed youth, while also identifying the role of caregivers and peers. Despite their young age ($M=12.2$ years), 12% of the full sample (29% of youth aged 14 and older) were sexually active. Among those who were sexually active, 74% engaged in two or more sexual risk behaviors, and 42% of HIV+ youth compared to 29% of HIV- youth reported unprotected sex. Although it is difficult to compare these rates of sexual risk behaviors to the general population given that these studies typically include older youth, the rate of lifetime sexual activity among the 14-16 year olds in our study (29%) is similar to national trends (30% of youth reporting sex by age 16) within this age group [34]. Compared to school-based populations aged 12-16 years, prevalence of cigarette (5% vs. 22-35%), alcohol (26% vs. 40-62%) and marijuana use (6% vs. 28%-40%) was substantially lower in the current study [35]. However, similar to other high-risk populations [10,36,37], substance use was associated with increased likelihood of engaging in penetrative sex, unprotected vaginal sex and multiple partners.

We found no association between HIV status and sexual risk behavior. Both PHIV-infected and PHIV-exposed youth come from high-risk contexts, of which HIV is one of myriad risks. Consequently, any negative effects associated with HIV status may be offset by additional risk factors within their social environment such as parental substance use, parental HIV status, and neighborhood stressors. Unfortunately, with the exception of caregiver HIV status, we had

limited data on many of these other factors. The association of these factors on sexual risk behaviors requires exploration in future studies.

One of the primary goals of this set of analyses was to identify factors that might further elucidate the co-occurrence of sexual risk behaviors and substance use in PHIV youth. Although caregiver promotion of child autonomy was associated with decreased likelihood of engaging in penetrative sex, caregiver characteristics did not diminish the association between substance use and sexual risk behavior. However, once peer norms were added to the model, the association between substance use and some sexual risk behaviors disappeared. Youth who perceived that more of their peers engaged in risky sexual behavior were more likely to engage in all sexual risk behaviors regardless of substance use. As with other urban populations [22, 23], these findings suggest that peer norms are a powerful influence on sexual risk behavior. Interventions designed for HIV-infected and exposed youth may need to promote behavior change among individuals and their peers. Most peer interventions for adolescents involve either same aged-peers or classmates, assuming that these peers are the most salient members of youth's friendship networks. However, few peer interventions have explicitly sought to identify and involve a youth's actual friendship network, in and out of school; that is, those peers with whom the adolescent is most likely to engage in risky behaviors. While challenging to implement, particularly for PHIV+ youth for whom stigma may prevent open discussion of sexuality, the involvement of an adolescent's friendship network (versus youth's larger peer network) in HIV prevention may reduce co-existing behavior problems such as substance use and increase the duration of behavior change.

Although these findings may suggest that peers may be more important than caregivers for PHIV+ and PHIV- youth, these data should be interpreted cautiously. Given the study's cross-sectional design, it is hard to propose definite statements on the relationship between sexual risk behaviors and caregivers and peers, respectively. Our findings may reflect the effects of caregiver self-report bias, or that salient caregiver-child variables (e.g., parent-child bonding) were not measured in the current study. Future research exploring these alternative explanations are required given prior studies suggest that caregiver influence on sex risk behavior becomes more salient as youth age, even after adjusting for peer influence [38]. Specifically, longitudinal studies of PHIV youth are needed to examine how peer and caregiver influence change and interact over time. Findings from these studies will inform the design of targeted interventions that address developmentally relevant issues, with appropriately timed intervention material [39].

There are other limitations to this study that should be considered when interpreting our results. Participants were recruited from HIV primary care clinics, and findings may not generalize to youth in other settings. Although, we were able to recruit and interview 76% of participants who met criteria for our study in the recruitment sites, this sample of convenience may not reflect the larger population of PHIV+ and PHIV-adolescents, particularly those outside NYC and youth not followed in HIV clinics. Although we attempted to recruit both groups from similar communities based on the demographics of pediatric HIV disease, other factors (e.g., access to services) may have altered the group effects. We also did not ascertain if youth were engaging in sexual behaviors with other HIV+ partners. Lack of findings may be a factor of statistical power given the relatively low rates of specific risk behaviors. We also did not examine how key caregiver factors, such as mental illness, impacted family functioning. Finally, the data are self-report and are subject to issues of social desirability and other biases related to self-report instruments, particularly reporting of sex and drug use.

Despite these limitations, findings from the current study have important clinical and policy implications. Ten percent of PHIV+ youth had penetrative sex, and of these, 42% had unprotected vaginal sex, some of whom were younger than 12. Therefore, a proportion of PHIV

+ youth is at high risk for secondary transmission of the virus to others beginning at a young age. Moreover, as HIV disease in women continues to grow in the US [4], the numbers of uninfected, but HIV-exposed children will also continue to grow. In our study, their risk behaviors were very similar to their HIV-infected counterparts. Thus, both groups of youth in this study are in need of HIV prevention efforts, a small portion at a very young age. Because risk behaviors did not differ by the youth's HIV status, existing family and peer-based interventions for non-PHIV adolescents may be suitable for this population. However, these interventions must be adapted to address parental infection, and for PHIV+ youth, the youth's own HIV infection.

Conclusions

Findings suggest adolescents perinatally exposed and infected with HIV are at risk for both substance use and engaging in risky sexual behavior. Substance use increases the likelihood that these youth will engage in risky sexual behavior. However, peer norms regarding sexual activity may partially explain this link. HIV serostatus appears to have little influence on sexual risk behavior or substance use during early and middle adolescence. Although, as these youth age and become more sexually active, the role of HIV may become more salient as youth increasingly confront situations related to intimate relationships, sexuality, and disclosure. Prevention initiatives that target and integrate parental and peer influences are needed and may prove effective in changing behavior.

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Table 1
Sample demographics by HIV Status among a sample of perinatally exposed youth (n=340)

Characteristics	HIV+ (n=206)		HIV- (n=134)		t-test/ χ^2
	N	%	N	%	
<i>Gender</i>					
Male	101	49.0	65	48.5	0.01
Female	105	51.0	69	51.5	
Age <i>a,b</i>	12.3	(2.18)	11.9	(2.37)	-1.40
<i>Race ethnicity</i>					
African American	119	57.8	66	49.3	0.68
Hispanic	62	30.0	43	32.1	
Other <i>c</i>	25	12.0	25	18.6	
Caregiver HIV+	65	31.4	92	68.7	43.96**
Caregiver is biological parent	75	36.2	94	70.2	36.09**
Caregiver Employed <i>a</i>	59	30.1	27	20.9	2.91
Household income <i>d</i>	5.8	(2.88)	5.0	(2.49)	-2.44*
Poverty status <i>a</i>	69	37.3	70	56.9	11.48**
<i>HIV characteristics</i>					
CD4 count <i>b</i>	606	(318.4)			
Viral load <i>e</i>	17234.6	(22973.4)			
ART	133	68.7			
<i>Sexual Behavior</i> <i>a</i>					
Penetrative vaginal or anal sex	19	9.9	18	14.2	1.36
Unprotected vaginal sex	8	4.2	5	3.9	0.01
2+ partners	16	8.4	10	7.9	0.02
<i>Substance Use Behavior</i> <i>a</i>					
Cigarettes	9	4.4	9	6.9	0.97
Alcohol	26	12.7	21	16.0	0.75
Marijuana	9	4.4	11	8.4	2.29
Other drug	0	0.0	0	0.0	n/a
<i>Caregiver Characteristics</i> <i>b</i>					
Involvement with child	0.74	(0.33)	0.71	(0.35)	-0.86
Quality of communication with child	2.3	(0.41)	2.3	(0.43)	-0.87
Promotes child's autonomy	1.34	(0.30)	1.31	(0.43)	-0.61
<i>Perceived Peer Norms</i> <i>b</i>					
Acceptability of friends' drug use	1.49	(0.62)	1.37	(0.53)	-1.94
Perceived friends' sexual activity	0.41	(0.55)	0.36	(0.54)	-0.81

* p≤0.05

** p≤0.01

a Due to missing data, percents are not generated based on the total for each group

b Mean (sd)

c "Other" race/ethnicity category includes: white non-Hispanic, Caribbean English, mixed race, and other non-Hispanic

d Mean (sd) of a 12-point scale measuring household income; each point represents a \$5,000 increase such that 1=<\$5000, 2=\$5,001-\$10,000, 3=\$10,001-\$15,000, etc

^eMedian (sd)

Hierarchical logistic regression of demographic characteristics, substance use, caregiver characteristics and peer norms on penetrative sex (n=340)

Variables	Penetrative Sex		
	Step 1	Step 2	Step 3
	OR95%CI	OR95%CI	OR95%CI
Cigarettes			2.90.80 - 10.28
Age	3.31.01-10.51**	4.11.25-13.67*	1.81.36 - 2.39***
Caregiver autonomy	2.01.56-2.68	2.01.53-2.71***	0.30.10 - 0.88*
Caregiver communication		0.30.09-0.76*	---
Caregiver involvement		0.80.22-2.93	---
Peer drug use		1.20.25-6.19	---
Peers sexual activity			2.21.14 - 4.20*
<i>Model Chi²</i>			2.11.07 - 4.04*
<i>Pseudo R²</i>	58.6***	65.7***	76.8***
Alcohol	0.26	0.30	0.35
Age	4.01.66-9.51***	3.81.54-9.29**	2.50.92-6.76
Caregiver autonomy	1.81.38-2.42	1.81.36-2.45***	1.71.25-2.28**
Caregiver communication		0.30.11-0.94*	0.40.12-1.05
Caregiver involvement		1.10.29-4.00	---
Peer drug use		1.50.29-7.74	---
Peer sexual activity			---
<i>Model Chi²</i>	64.4***	68.9***	77.3***
<i>Pseudo R²</i>	0.29	0.31	0.35
Marijuana	5.01.64-14.96***	6.21.96-19.58**	3.771.09-12.95*
Age	2.01.49-2.57	1.91.45-2.57***	1.81.32-2.33***
Caregiver autonomy		0.20.08-0.70	0.30.09-0.84*
Caregiver communication		0.90.25-3.28	
Caregiver involvement		1.30.26-6.70	
Peer drug use			
Peer sexual activity			2.01.03-3.96*
<i>Model Chi²</i>	63.0***	70.5***	2.01.02-3.92*
<i>Pseudo R²</i>	0.28	0.32	78.7***
			0.36

^a Variable not included as not significant at p<0.10 level in prior step

* p≤0.05

** p≤0.01

*** p≤0.001

OR=odds ratio CI= Confidence Interval

Hierarchical logistic regression of demographic characteristics, substance use, caregiver characteristics and peer norms on unprotected vaginal sex (n=340)

Table 3

Variable	Unprotected Vaginal Sex		
	Step 1	Step 2	Step 3
	OR95%CI	OR95%CI	OR95%CI
Cigarettes			3.10.70-13.98
Age	4.21.02-17.22 [*]	4.291.02-18.03 [*]	1.40.96-2.06
Caregiver autonomy	1.71.16-2.44 ^{**}	1.711.16-2.51 ^{**}	---a---
Caregiver communication		0.800.18-3.53	---a---
Caregiver involvement		0.670.10-4.40	---a---
Peer drug use		0.410.03-5.08	---a---
Peers sexual activity			2.81.17-6.69 [*]
<i>Model Chi²</i>			2.81.09-7.02 [*]
<i>Pseudo R²</i>	19.5 ^{***}	19.8 ^{***}	30.9 ^{***}
Alcohol	0.18	0.18	0.29
Age	7.561.79-32.00 ^{**}	17.395.0-60.89 ^{***}	7.41.99-27.31 ^{**}
Caregiver autonomy	1.390.93-2.09	---a---	---a---
Caregiver communication		1.140.24-5.23	---a---
Caregiver involvement		0.710.16-7.84	---a---
Peer drug use		0.06-8.91	---a---
Peer sexual activity			2.20.87-5.55
<i>Model Chi²</i>	24.5 ^{***}	21.7 ^{***}	31.8 ^{***}
<i>Pseudo R²</i>	0.23	0.20	0.30
Marijuana	42.88.37-218.58 ^{***}	88.6120.57-381.66 ^{***}	33.47.96-140.05 ^{***}
Age	1.230.80-1.89	---a---	---a---
Caregiver autonomy		0.490.07-3.32	---a---
Caregiver communication		1.100.14-8.56	---a---
Caregiver involvement		0.440.02-8.84	---a---
Peer drug use			1.80.67-4.94 [*]
Peer sexual activity			2.91.03-8.11 [*]
<i>Model Chi²</i>	41.9 ^{***}	42.0 ^{***}	46.8 ^{***}
<i>Pseudo R²</i>	0.39	0.39	0.43

^aVariable not included as not significant at p<0.10 level in prior step

^{*}

p≤0.05

^{**}

p≤0.01

^{***}

p≤0.001

OR=odds ratio CI= Confidence Interval

Table 4
Hierarchical logistic regression of demographic characteristics, substance use, caregiver characteristics and peer norms on multiple partners (n=340)

Variable	Multiple Partners	
	Step 1	Step 2
	OR95% CI	OR95% CI
Cigarettes	2.30.54-9.82	(2.50.60-10.02)
Age	2.11.51-3.05**	2.11.45-2.94***
Male	3.21.04-9.66*	3.41.22-9.63*
Poverty ^b	0.80.28-2.05	---a---a
Caregiver autonomy		0.350.11-1.11
Caregiver communication		0.550.12-2.57
Caregiver involvement		1.10.16-7.25
Peer drug use		---a---a
Peers sexual activity		2.31.12-4.92*
Model χ^2	40.3***	49.7***
Pseudo R^2	0.26	0.28
Alcohol	4.61.52-13.60**	3.91.40-11.11*
Age	1.81.27-2.64**	1.81.26-2.53**
Male	3.41.14-9.99*	3.31.21-9.24*
Poverty ^b	0.70.26-2.02	---a---a
Caregiver autonomy		0.40.13-1.42
Caregiver communication		0.70.15-3.46
Caregiver involvement		1.30.18-9.51
Peer drug use		---a---a
Peer sexual activity		---a---a
Model χ^2	46.6***	55.1***
Pseudo R^2	0.30	0.31
Marijuana	5.01.37-18.33*	7.52.16-25.87**
Age	2.01.39-2.84***	1.91.34-2.66**
Male	3.21.08-9.52*	3.51.23-9.88*
Poverty ^b	0.80.30-2.31	---a---a
Caregiver autonomy		0.30.08-0.94*
Caregiver communication		0.60.13-2.90
Caregiver involvement		1.20.17-9.13
Peer drug use		---a---a
Peer sexual activity		---a---a
Model χ^2	44.9***	58.6***
Pseudo R^2	0.29	0.33

^a Variable not included as not significant at $p < 0.10$ level in prior step

^b Poverty = Household family income below the poverty line for New York State

* $p \leq 0.05$

** $p \leq 0.01$

OR=odds ratio CI= Confidence Interval
p≤0.001