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Individual and Contextual Factors of Sexual Risk Behavior in Youth Perinatally Infected with HIV

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Abstract

This study prospectively examines the effects of maternal and child HIV infection on youth penetrative and unprotected penetrative sex, as well as the role of internal contextual, external contextual, social and self-regulatory factors in influencing the sexual behaviors of HIV – infected (PHIV +), HIV – affected (uninfected with an HIV + caregiver), and HIV unaffected (uninfected with an HIV – caregiver) youth over time. Data ($N = 420$) were drawn from two longitudinal studies focused on the effects of pediatric or maternal HIV on youth (51% female; 39% PHIV +) and their caregivers (92% female; 46% HIV +). PHIV + youth were significantly less likely to engage in penetrative sex than HIV – youth at follow-up, after adjusting for contextual, social, and self-regulatory factors. Other individual- and contextual-level factors such as youth alcohol and marijuana use, residing with a biological parent, caregiver employment, caregiver marijuana use, and youth self-concept were also associated with penetrative sex. Youth who used alcohol were significantly more likely to engage in unprotected penetrative sex. Data suggest that, despite contextual, social, and self-regulatory risk factors, PHIV + youth are less likely to engage in sexual behavior compared to HIV – youth from similar environments. Further research is required to understand delays in sexual activity in PHIV + youth and also to understand potential factors that promote resiliency, particularly as they age into older adolescence and young adulthood.

Introduction

In the US, pediatric HIV has become an *adolescent* epidemic due to the success and widespread use of antiretroviral treatment (ART)[1] to promote the health of those already infected and to prevent new cases through maternal-to-child HIV transmission. In 2009, approximately 73% of perinatally HIV – infected (PHIV +) youth in New York City (NYC), where the current study is located, were 13 years or older.[2] As they enter and progress through adolescence, PHIV + youth may experience unique challenges that impact the onset and development of sexual risk behaviors.[3,4] However, our understanding of the sexual development of these youth, including the role of HIV infection and other key contextual factors in offsetting or promoting sexual health, is limited. Without such information, we cannot offer effective prevention interventions targeted to these youth as they age. The current study aims to understand the individual- and contextual-level factors associated with emerging sexual risk behaviors in PHIV + youth across adolescence.

Similar to uninfected youth, the period between adolescence and young adulthood is a challenging developmental transition for PHIV + adolescents[5,6] that includes initiation and development of romantic and intimate partnerships and the onset of sexual behavior. However, the sexual development of PHIV + youth is complicated by their HIV infection.[3,4] Some researchers examining PHIV + youths' sexual behaviors have found rates of sexual activity to be the same or lower than in other populations, with a delayed age of onset.[7–9] In contrast, other studies and clinical data suggest that there is a group of PHIV + youth who are initiating sexual activity early and engaging in unprotected sex in combination with

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other HIV risk behaviors such as substance use.[10,11] One cross-sectional study found that 33% of 13- to 24-year-old PHIV+ youths had initiated vaginal intercourse, 35% of whom had reported their first occurrence before age 16 years.[12] These youth were also at higher risk for early pregnancy compared to youth in the general population.

There are multiple factors that might confound studies of PHIV+ youth, leading to mixed results in the literature. Individual-level factors related to HIV infection such as pubertal delays, neurological/cognitive difficulties associated with HIV infection and long-term ART, social stigma, and fear of disclosure[3,13–16] may explain delayed or reduced sexual behavior in PHIV+ youth. Conversely, other key individual and contextual factors associated with increased risk in other adolescent populations, as well as the demography of pediatric HIV, may offset the intrapersonal factors associated with delayed sexual debut in PHIV+ youth.

In the US, the majority of PHIV+ youth live in impoverished inner-city communities where syndemics other than HIV often occur, including neighborhood violence, poverty, and crime,[17,18] all of which have been associated with poor behavioral outcomes, including sexual risk in other populations.[19,20] Also, PHIV+ youth are often living with single parents, experiencing multiple caretaking transitions due to maternal illness, or death, as well as family disruption due to violence, or maternal substance abuse or psychiatric illness.[30] High rates of psychiatric disorders and substance abuse problems, including injection drug use, have been found in HIV+ women, including those who are mothers.[21,22] Thus, their children are also at risk for psychiatric and substance use disorders due to genetic and environmental pathways previously described in other populations.[23] All of the above factors, including caregiver mental illness and substance abuse,[24,25] disrupted family relationships and functioning,[26–28] and youth mental health and substance use problems[10,29–32] have been associated with sexual risk behaviors in various adolescent populations. Thus, taken together, individual and contextual factors place PHIV+ youth at elevated risk for behaviors that may lead to poor individual (re-infection of resistant strains of the virus, STIs, and unplanned pregnancy) and public health (transmission to partners) outcomes.

Sustained sexual risk reduction in youth requires the development of interventions that target factors within the broader socio-ecological context as well as individual-level factors that influence risk.[34,35] Yet, few longitudinal studies of PHIV+ youth have taken into account the youth's socio-ecological context when examining sexual behavior.[36] In particular, no longitudinal study has examined the complex role of youth *and* caregiver HIV infection in influencing risk behavior, since by definition 100% of PHIV+ youth were born to HIV+ mothers, making it difficult to separate out the effects of maternal and child HIV. Similar to studies of PHIV+ youth,[7,8,11,12] studies of uninfected children of HIV+ mothers have shown mixed results. Some have found worse outcomes and higher rates of risk behavior[37,38] and others report delays in sexual onset across adolescence.[39] Thus, studies are needed that can disentangle potential maternal and child HIV effects as well as identify other risk factors across multiple domains on sexual behavior to inform the development of much needed multilevel interventions for these youth.

We, therefore, had the unique opportunity to examine the role of youth and caregiver HIV status, in addition to other key contextual factors and self and social regulation processes on youth sexual behavior and risk outcomes as they develop by combining data from two large, longitudinal behavioral studies: (1) a study of perinatally HIV exposed youth (both infected and uninfected), and (2) a study of HIV− youth with and without HIV+ caregivers. The resulting sample comprised both PHIV+ and HIV− youth with either HIV+ or HIV− caregivers, all of whom were recruited from similar neighborhoods in NYC. We used Social Action Theory (SAT) to guide or analysis.[40] The emphasis of the SAT model on the context in which behavior occurs makes it a useful framework for understanding sexual risk in youth.[41] Specifically, SAT posits that behavioral health outcomes are influenced by (a) the context (internal and external) in which behavior occurs and (b) self and social regulation processes.

Methods

Participants and procedures

Data were combined from the baseline and follow-up assessments of two longitudinal studies, "Risk and Resilience in Youth with HIV+ Mothers" (R&R[42,43]) and "Child and Adolescent Self-Awareness and Health Project" (CASAH[44]). Both studies were designed to examine differences in mental health and behavioral health outcomes, as well as sexual and drug use risk behaviors among youth and caregiver dyads, using SAT as a theoretical framework. Neither study included an intervention component. By merging the data sets, we were able to tease out the effects of maternal and child HIV and contribute to the existing gap examining the unique effects of these constructs in the literature. The merging of these studies, which used the same theoretical framework and all of the same measures used for the current analysis, provided a comparison group of youth and caregivers unaffected by HIV, as well as greater statistical power through the inclusion of additional HIV− subjects with HIV+ mothers.

All study participants were drawn from general pediatric and HIV primary care clinics and a network of HIV care providers based in the same inner-city environments in NYC with high HIV seroprevalence. In both studies, caregiver-youth dyads were excluded if one of the dyad members had severe cognitive impairment (e.g., severe mental deficiency, autism and other pervasive developmental disorders) that precluded understanding study questions. For both studies, trained interviewers administered all measures; caregivers and children were interviewed separately, but simultaneously. Institutional Review Board approval was obtained for both studies. All caregivers provided written informed consent for themselves and youth; youth provided assent. Monetary reimbursement for time and travel was provided. Details regarding participants and procedures are briefly summarized below and in Table 1 with more details, including data pooling procedures for both data sets discussed elsewhere.[43–45]

R&R

Research participants included two groups of caregiver-youth dyads: (a) HIV^- youth with HIV^+ birth mothers and (b) HIV^- youth with HIV^- or untested birth mothers. Both groups of caregiver-youth dyads were eligible if the youth was 10–14 years of age (mean = 12), the mother was the birth parent of the youth, and the mother and youth had lived

Table 1. Demographic and Study Characteristics of the Two Study Samples ($N=420$)

	R&R (n=*144*)		*CASAH* (n=*276*)		*Comparisons by study sample*
Variable	N	%	N	%	χ^2/t
Youth demographics					
Male	73	50.7	135	48.9	0.12
Hispanic	61	42.4	104	37.7	0.87
African American	65	45.1	158	57.3	5.57[f]
Other[a]	18	12.5	14	5.1	7.42[g]
Age[b]	12.0 yrs (1.4)		11.9 yrs (2.2)		0.32
Youth HIV+	–	–	163	59.1	n/a
Viral load[c]			3150 copies/ml		n/a
Disclosed			114	69.9	n/a
Caregiver demographics					
Caregiver female	144	100	241	87.3	—[d]
Residing with birth parent	143	99.3	133	48.2	109.7[h]
Caregiver HIV+	68	47.2	125	45.3	0.14
Currently employed	43	32.8	74	26.8	1.57
Income[b,e]	3.6 (1.8)		5.5 (2.7)		7.65[h]
Caregiver age[b]	37.8 yrs (5.5)		48.7 yrs (12.2)		10.11[h]
Study characteristics					
PHIV+ y & HIV+ cg	0	0.0	50	18.1	
PHIV+ y & HIV− cg	0	0.0	113	40.9	
HIV− y & HIV+ cg	68	47.2	75	27.2	
HIV− y & HIV− cg	76	52.8	38	13.8	
Recruitment dates	1998–2000		2003–2005		
Time to follow-up	18 months		24 months		

CASAH, Child and Adolescent Self-Awareness and Health Project; R&R, Risk & Resilience.
[a]Other race/ethnicity comprises white, Caribbean-American, and mixed race/ethnicity; [b]Mean score (sd); [c]Median score (sd=26,383 copies/ml); [d]Comparisons not conducted due to lack of variability (i.e., 100%) in R&R sample; [e]Income score: 3=$10,001–$15,000; 4=$15,001–$20,000; 5=$20,001–$25,000; 6=$25,001–$30,000.
[f]$p<0.05$; [g]$p<0.01$; [h]$p<0$ .001.

together for at least the past 6 months. Participants were recruited between 1998 and 2000. Among the 294 eligible families approached for the study, 14% refused to participate primarily due to time constraints, and 11% frequently cancelled or failed to show up for interviews. The remaining 220 (75%) caregiver-youth dyads completed the baseline interview. Although initially a cross-sectional study, additional funds for a follow-up interview were obtained 2 years into the R&R project; we were able to re-recruit 65% of the baseline sample with a mean time between baseline and follow-up interviews of 35 months. Youth age ranged from 13–19 years (mean=15) at follow-up.[43] Baseline and follow-up data from 144 dyads are included here (68 HIV− youth with HIV+ mothers and 76 HIV− youth with HIV− mothers).

CASAH

Research participants were youth aged 9–16 years perinatally exposed to HIV (as confirmed by medical providers and chart data, including both PHIV+ and PHIV− youth) who had a caregiver with legal capacity to sign consent for child participation (foster care parents cannot provide consent for child participation in behavioral research in NYC). Caregiver included HIV+ and HIV− birth parents, and other types of caregivers (e.g., relatives, adoptive parents). Participants were recruited, between 2003 and 2005. Of the ~443 eligible participants, 11% refused contact with the research team and 6% could not be contacted by the site study coordinators. A total of 367 (83%) caregiver-youth dyads were approached, of whom n=340 were enrolled (77% of eligible families), and 325 caregiver-youth dyads completed both baseline interview sessions. CASAH is an ongoing longitudinal study and the first follow-up was conducted at 18 months post baseline (mean=20 months) with youth age ranging from 11–19 years (mean age follow-up=14 years). We were able to retain 84.3% of CASAH participants between baseline and follow-up. In this analysis, we include the n=276 dyads with follow-up data, representing PHIV+ youth with HIV+ caregivers ($N=50$) or with HIV− caregivers ($N=113$); and HIV− youth with HIV+ caregivers ($N=75$) or with HIV− caregivers ($N=38$).

Merged sample.

Across the merged samples ($N=420$), approximately half the youth were male, the mean age was 12 years ($SD=2.0$), and the majority was African American or Hispanic (Table 1). The majority of caregivers were females. All caregivers were birth mothers in R&R compared to 48.2% in CASAH. The CASAH sample contained significantly more African American youth (χ^2 (1, $N=420$)=5.57, $p<0.02$), and R&R had more youth of "other" race/ethnicity (χ^2 (1, $N=420$)=7.42, $p<0.01$). More youth in R&R reported ever using alcohol (χ^2 (1, $N=420$)=63.74, $p<0.001$) and marijuana (χ^2 (1, $N=420$)=9.46, $p<0.01$). There were no other differences by study sample. Table 1 provides a detailed description of characteristics of each study sample.

Among PHIV+ youth at baseline, the majority had been told their diagnosis (69.9%) and were currently receiving ART ($N=194$; 84%). The median HIV RNA viral load (VL) was 3150

copies/ml ($SD = 26{,}383$ copies/ml); 36% had undetectable VLs (≤400 copies/ml), and 4% had VL ≥100,000 copies/ml.

Attrition analyses. We conducted preliminary attrition analyses between participants included in our analyses ($N = 420$) to those who were excluded from this analysis due to missing data at baseline ($N = 125$) to determine potential bias of follow-up sample. Participants who completed baseline only ($N = 125$) were more likely to: (1) be older ($M = 12.50$, $SD = 1.71$) ($M = 11.96$, $SD = 1.99$; $t(232.16) = 3.02$; $p < 0.01$), (2) have younger caregivers ($M = 41.65$, $SD = 9.57$) ($M = 44.99$, $SD = 11.62$; $t(243.16) = -3.25$, $p < 0.01$), and (3) have a caregiver who was a biological parent (χ^2 ($N = 545$, $df = 1$) $= 12.66$, $p < 0.001$) than those included in our analyses. Baseline only participants also reported slightly lower mean household income ($M = 4.17$, $SD = 2.40$) than our analytic sample ($M = 4.83$, $SD = 2.59$; $t(524) = -2.52$; $p < 0.05$) and were more likely at baseline to report having engaged in penetrative sex (χ^2 ($N = 540$, $df = 1$) $= 7.26$, $p < 0.01$) and unprotected sex (χ^2 (N = 535, $df = 1$) $= 5.95$, $p < 0.05$); this effect remained even after controlling for age. Youth were also more likely to be excluded if they were HIV−negative (χ^2 ($N = 545$, $df = 1$) $= 6.42$, $p < 0.05$) We noted no differential attrition effects of gender, or race/ethnicity or of caregiver HIV status, gender, education, or work status; the proportion of older ($t = -1.13$, $p = 0.27$) or sexually experienced (χ^2 (N = 128, $df = 1$) $= 1.10$, p = 0.29) youth who were lost to follow-up did not vary by serostatus.

Measures

Sexual behavior. Youth sexual behavior was assessed with an adapted version of the Sexual Risk Behavior Assessment Schedule for Youth (SERBAS-Y);[46,47] in R&R and the Adolescent Sexual Behavior Assessment (ASBA);[48] in CASAH. Both assessments examine a range of sexual behaviors with gateway questions that make the batteries appropriate for the younger children in the study (e.g., if youth deny being touched or having sex, further questions on specific practices and condom use are not asked). The following lifetime sexual behaviors (yes/no) were examined at each follow-up interview: *penetrative sex* (vaginal or anal), and *unprotected penetrative sex* (one or more occasions of penetrative sex without a condom). We aggregated reports of vaginal and anal sex behavior into one variable ("penetrative sex") given the low frequency of anal sex and high overlap with vaginal sex.

Internal context

Background. Youth HIV status was determined for CASAH via youth enrollment in an HIV primary care clinic, verified by medical chart review. For R&R, caregivers reported youth's HIV−negative status. Youth demographics included age, gender, and race/ethnicity.

Arousal/mood. Youth mental health was assessed based on the Child Depression Inventory (CDI)[49] and the trait scale of the State–Trait Anxiety Inventory for Children (STAIC),[50] respectively. The CDI is comprised of 27 items rated on a 3-point scale (0 = none to 2 = distinct symptom). The STAIC trait subscale is a widely used self-report indicator of anxiety, permitting the identification of subjects who are prone to generalized anxiety. The trait scale consists of twenty 3-point Likert-format items that assess an individual's tendency to experience anxiety states; adequate reliability and validity have been established.[50] We found high internal consistency for the CDI ($\alpha = 0.80$) and STAI trait scale ($\alpha = 0.88$). Youth lifetime alcohol and marijuana use was determined based on youth endorsing any use of alcohol or marijuana. Questions were derived from gateway questions of the Diagnostic Interview Schedule for Children-IV[51] and from Monitoring the Future, a national longitudinal study of behaviors, including substance use of US high school and college students, and young adults.[52] Specifically, youth in CASAH were asked: "Not including sips from another person's drink, have you ever, in your whole life, even once, had a drink?" and "Have you ever, in your whole life, used marijuana?" Youth in R&R were asked: "Have you tried one or two drinks of alcohol ever in your lifetime?" and "Have you tried marijuana once or twice ever in your lifetime?" For both studies, participants responded yes or no.

External context

Living environment. Caregiver demographics included caregiver age, gender, current employment, and household income. Also, because PHIV+ youth were more likely to not be living with a birth parent due to maternal AIDS-related illness and death or other factors such as maternal substance abuse during pregnancy,[46,53] we also accounted for the biological relationship between the caregiver and the child (e.g., birth parent vs. caregiver or relative).[45]

Caregiver health. Caregiver HIV status was assessed via several questions about personal HIV tests and the results. These were confirmed, when possible, via clinician report. For data analysis, caregiver HIV status was treated as a dichotomous variable (HIV infected *vs.* uninfected or untested). Caregiver physical health was assessed using two items: whether the caregiver reported any overall physical health problems (y/n) and the number of days they had spent in hospital in the past 12 months.

Caregiver mental health and substance use. Caregiver mental health was assessed with two well-validated self-report measures that correspond with child measures, the Beck Depression Inventory (BDI)[54] and the trait subscale of the State-Trait Anxiety Inventory (STAI),[55] corresponding with the youth measures. The BDI is a 21-item scale of depressive symptoms experienced in the past 2 weeks. The trait subscale of the STAI is a 20-item scale measuring how the respondent feels in general. For each measure, a well validated total score is created.[9,53] We found high internal consistency for the BDI ($\alpha = 0.89$) and STAI trait scale ($\alpha = 0.92$). Caregiver substance use was measured with two items assessing the frequency of alcohol or marijuana use in the past 6 months. Participants responded using a 6-point scale (0 = never to 6 = everyday).

Regulation processes

Social-regulation. Family processes were assessed with the Parent Child Relationship Inventory (PCRI),[56] a self-report instrument for caregivers acting in a parental role. Three subscales were used: (1) involvement (i.e., spending time with and showing interest in the child), (2) quality of communication (i.e., parent empathy and conversation across situations), and (3) autonomy (i.e., the extent to which the caregiver promotes child independence). Each item is rated on a 4-point scale

(0 = Strongly Agree to 3 = Strongly Disagree). We found good internal consistency for involvement (α = 0.84), communication (α = 0.81), and autonomy (α = 0.65) scales.

Self-regulation. Self-concept was measured using the Tennessee Self-Concept Scale:2 (TSCS:2),[57] composed of self-descriptive items that are answered on a 5-point Likert Scale (1 = always false to 5 = always true). The instrument yields a global score and sub-domain self-concept scores, including: personal self-concept, which assesses an individual's sense of personal worth and feelings of adequacy; family self-concept, which assesses an individual's feelings of adequacy worth and value as a family member; social self-concept, which assesses an individual's sense of adequacy and worth in the context of social interactions; and academic self-concept, which measures how people perceive themselves in school settings and how they believe others perceive them in those settings. Higher scores indicate better self-concept in those

Table 2. Sample Characteristics by Youth HIV Status ($N = 420$)

	PHIV+ (n = 163)		*HIV− (n = 257)*			
	N	%	N	%	χ^2/t	p
Youth internal context						
Background						
Male	78	47.9	130	50.6	0.30	0.59
Hispanic	59	36.2	106	41.3	1.07	0.30
African American	97	59.5	126	49.0	4.4	0.04
Other	7	4.3	25	9.7		
Age[a]	12.1 (2.16)		11.9 (1.86)		1.11	0.27
Arousal/mood						
Youth depression[a]	6.69 (6.03)		6.06 (4.83)		1.19	0.23
Youth anxiety[a]	33.04 (7.79)		33.94 (7.12)		1.21	0.23
Any alcohol use	20	12.3	83	32.6	21.7	0.01
Any marijuana use	6	3.7	26	10.2	5.89	0.02
External context						
Background and living environment						
Caregiver age[a]	49.9 (12.13)		41.9 (10.15)		7.24	0.01
Biological parent	55	33.7	221	86.0	120.9	0.00
Caregiver employed	48	29.5	69	23.3	0.07	0.79
Caregiver income[a,b]	5.81 (2.82)		4.22 (2.24)		6.27	0.01
Number in household[a]	4.32 (1.77)		4.32 (1.70)		1.34	0.18
Caregiver health						
Caregiver seropositive HIV status	50	30.7	143	55.6	25.03	0.01
Any health problems	114	70.4	181	70.7	0.01	0.94
Number of days in hospital[a]	0.27 (0.77)		0.47 (1.8)		1.30	0.19
Caregiver MH and substance use						
Alcohol use[a]	0.66 (1.15)		0.71 (1.01)		0.42	0.68
Marijuana use[a]	0.15 (0.06)		0.32 (1.04)		1.81	0.07
Anxiety[a]	7.64 (7.21)		9.53 (8.13)		2.41	0.02
Depression[a]	16.5 (10.0)		19.7 (10.37)		3.16	0.01
Regulation processes						
Social regulation						
Communication[a]	20.27 (3.58)		20.14 (3.91)		0.33	0.74
Involvement[a]	8.59 (4.95)		8.16 (5.48)		0.82	0.41
Autonomy[a]	14.68 (3.55)		15.08 (3.84)		1.08	0.28
Self-regulation						
TSCS-personal[a]	43.22 (6.45)		45.56 (5.91)		3.79	0.01
TSCS-family[a]	44.16 (6.09)		45.46 (6.22)		2.10	0.04
TSCS-academic[a]	19.97 (3.58)		20.70 (3.52)		2.05	0.04
TSCS-social identity[a]	37.86 (5.98)		40.39 (6.16)		4.14	0.01
Youth sex behavior						
Baseline[c]						
Penetrative sex	12	7.36	19	7.48	0.002	0.96
Unprotected penetrative sex	7	4.29	4	1.58	–	–
Follow-up[c]						
Penetrative sex	34	21.4	104	41.1	17.05	0.01
Unprotected penetrative sex	15	9.6	35	15.1	2.49	0.12

[a]Mean (sd); [b]Income was assessed using a categorical variable: 5 = $20,000–25,000; 6 = $25,000–30,000.
[c]Due to missing data for baseline and follow-up sex behavior variables, percentages do not reflect denominator of $n = 163$ for HIV+ youth or $n = 257$ for HIV− youth.

areas. We found moderate to good internal consistency for the personal ($\alpha = 0.70$), family ($\alpha = 0.70$), social ($\alpha = 0.56$), and academic ($\alpha = 0.67$) scales.

Statistical analysis

All analyses were conducted in Stata 8.0SE. Differences in contextual and regulation process factors at baseline and youth sexual behavior at baseline and follow-up by youth HIV status were examined using Chi-Square (χ^2) and *t*-tests for categorical or continuous variables, respectively (Table 2). Given the likelihood that different SAT model domains are correlated and therefore results will be potentially biased due to statistical suppression resulting from multi-collinearity and over-estimated models, we fit seven separate logistic multiple regressions to examine the association between youth sexual behavior at follow-up (i.e., penetrative and unprotected penetrative sex) and each of the SAT domains as assessed at baseline; we divided the internal and external context domains into several related subdomains: internal context (composed of background and arousal/mood models), external context (composed of living environment, caregiver health, and caregiver mental health and substance use models), social regulation processes (family processes) and self-regulation processes (self-concept) (Table 3). Each of the models contained all variables from the specific domain as well as youth HIV status.

For example, in the arousal/moods model, we examine the concurrent relationship between youth depression, anxiety, alcohol use, marijuana use, and youth HIV status with youth sexual behavior. As a result, these models allowed us to test concurrently the association between youth HIV status and other contextual factors and youth sexual behavior.

Results

Sample characteristics and sexual behavior by youth HIV status

Sample characteristics. Table 2 presents the significant differences by youth HIV status in baseline demographic characteristics and relevant SAT constructs, as well as the primary sex behavior outcomes at baseline and follow-up. More PHIV+ youth were African American and more HIV− youth were of other race/ethnicity (mixed race or Caucasian) and reported ever using alcohol (χ^2 (1, $N = 420$) = 21.7, $p < 0.01$) and marijuana (χ^2 (1, $N = 420$) = 5.89, $p < 0.02$). Caregivers of PHIV+ youth were older ($t = 7.24$, $p < 0.01$), and reported significantly higher income ($t = 6.27$, $p < 0.01$); however, the majority of all participants were significantly impoverished. Significantly more HIV− youth resided with a biological caregiver than PHIV+ youth (χ^2 (1, $N = 420$) = 120.9, $p < 0.001$). Just over half of caregivers of HIV− youth were HIV+ compared to 30% of caregivers of PHIV+ youth (χ^2 (1, $N = 420$) = 25.03, $p < 0.01$), although there were no differences in caregiver physical health problems or days spent in hospital. Caregivers of PHIV+ youth reported lower mean scores on the BDI ($t = 3.16$, $p < 0.01$) and the STAI ($t = 2.41$, $p < 0.02$). There were no differences in caregiver alcohol or marijuana use or social regulation factors within the family context (parent-child communication, autonomy or involvement). HIV− youth reported better personal ($t = 3.79$, $p < 0.01$), family ($t = 2.10$, $p < 0.04$), academic ($t = 2.05$, $p < 0.04$), and social ($t = 4.14$, $p < 0.01$) self-concept than PHIV+ youth.

Youth sexual behavior (Table 2). At baseline, there were no differences in rates of penetrative sex by youth HIV status; frequencies were too small to examine differences in unprotected penetrative sex. Fewer PHIV+ youth reported penetrative sex (χ^2 (1, $N = 420$) = 17.05, $p < 0.01$) at follow-up. In PHIV+ youth, older youth were more likely to have been told their diagnosis ($t = 8.61$, $p < 0.001$). However, there were no significant differences in penetrative (OR = 2.25 95%CI = 0.43–11.70; $p = 0.34$) or unprotected penetrative sexual behavior (OR = 0.95 95%CI = 0.15–6.12; $p = 0.96$) by disclosure.

Associations between SAT model constructs and sexual behavior. Table 3 presents the separate logistic regression models for each of the theoretical constructs of the SAT model at baseline and their association with any penetrative and unprotected penetrative sex at follow-up.

Any penetrative sex

Internal context

Background. Older youth were almost twice as likely (OR = 1.72; 95%CI = 1.50–1.97; $p < 0.001$) and PHIV+ youth were significantly less likely (OR = 0.26; 95%CI = 0.15–0.44; $p < 0.001$) to report any penetrative sex at follow-up.

Arousal/mood. Youth who had ever used alcohol or marijuana at baseline were over seven (OR = 7.02; 95%CI = 4.05–12.18; $p < 0.001$) and four times (OR = 3.60; 95%CI = 1.22–10.65; $p = 0.02$) as likely to report any penetrative sex at follow-up, respectively. There was no association between youth psychological distress and penetrative sex. After adjusting for arousal/mood covariates, PHIV+ youth were still significantly less likely to report engaging in any penetrative sex at follow-up (OR = 0.53; 95%CI = 0.32–0.90; $p = 0.02$).

External context

Living environment. Youth were more likely to report any penetrative sex at follow-up if they resided with a biological parent (OR = 2.44; 95%CI = 1.12–5.31; $p = 0.03$), or had a caregiver who was employed (OR = 1.78; 95%CI = 1.08–2.95; $p = 0.02$).

Caregiver health. There was no association between caregiver HIV status or caregiver physical health and youth penetrative sex at follow-up. After adjusting for caregiver health, PHIV+ youth remained significantly less likely to report engaging in any penetrative sex at follow-up (OR = 0.42; 95%CI = 0.27–0.67; $p < 0.00$).

Caregiver mental health and substance use. Youth whose parents reported greater frequency of marijuana use were significantly more likely to report any penetrative sex at follow-up (OR = 1.42; 95%CI = 1.10–1.83; $p = 0.007$); there was no association between caregiver mental health problems and youth penetrative sex. After adjusting for caregiver mental health and substance use covariates, PHIV+ youth were still significantly less likely to report engaging in any penetrative sex at follow-up (OR = 0.44; 95%CI = 0.27–0.73; $p < 0.001$).

Regulation processes

Social regulation. There was no association between any of the family process variables and penetrative sex at follow-up. PHIV+ youth were still significantly less likely to report

Table 3. Baseline Factors Associated with Sex Behaviors at Follow-Up ($N = 420$)

	Penetrative sex			*Unprotected penetrative sex*		
Variable	*AOR*[b]	*95% CI*	p	*AOR*[b]	*95% CI*	p
Internal context						
Background						
Male	1.53	0.96–2.45	0.07	1.23	0.66–2.31	0.51
Hispanic[a]	0.87	0.53–1.42	0.58	0.84	0.43–1.62	0.60
Other[a]	0.93	0.39–2.21	0.87	1.46	0.48–4.33	0.51
Age	1.72	1.50–1.97	0.001	1.52	1.28–1.81	0.001
Youth seropositive HIV Status	0.26	0.15–0.44	0.001	0.50	0.25–0.99	0.05
	$\chi^2 = 96.68$; $p < 0.001$			$\chi^2 = 3\ 0.02$; $p < 0.001$		
Arousal/moods						
Youth depression	1.04	0.98–1.09	0.22	1.06	0.99–1.14	0.11
Youth anxiety	0.97	0.94–1.01	0.19	0.96	0.90–1.01	0.11
Youth alcohol use	7.02	4.05–12.18	0.001	3.99	1.97–8.09	0.001
Youth marijuana use	3.60	1.22–10.65	0.02	1.89	0.75–4.74	0.18
Youth seropositive HIV Status	0.53	0.32–0.90	0.02	0.79	0.39–1.61	0.52
	$\chi^2 = 105.92$; $p < 0.0001$			$\chi^2 = 33.67$; $p < 0.0001$		
External context						
Living environment						
Caregiver age	1.01	0.99–1.04	0.35	1.01	0.97–1.05	0.78
Biological parent	2.44	1.12–5.31	0.03	1.97	0.66–5.93	0.23
Employed	1.78	1.08–2.95	0.02	0.91	0.44–1.90	0.80
Income	0.98	0.88–1.08	0.65	1.00	0.87–1.16	0.96
Number in household	0.98	0.86–1.11	0.73	1.00	0.83–1.20	0.94
Youth seropositive HIV Status	0.60	0.35–1.04	0.07	0.84	0.40–1.79	0.65
	$\chi^2 = 26.17$; $p < 0.001$			$\chi^2 = 0.66$; $p < 0.05$		
Caregiver health						
Caregiver seropositive HIV status	1.28	0.83–1.99	0.26	1.43	0.76–2.70	0.27
Any health problems	0.79	0.49–1.27	0.34	0.99	0.49–2.00	0.98
# days in hospital	1.12	0.92–1.35	0.26	1.17	0.95–1.44	0.15
Youth seropositive HIV Status	0.42	0.27–0.67	0.00	0.69	0.35–1.34	0.27
	$\chi^2 = 20.28$; $p < 0.05$			$\chi^2 = 5.84$; $p = 0.21$		
Caregiver MH and substance use						
Alcohol use	0.87	0.68–1.11	0.25	1.01	0.74–1.38	0.96
Marijuana use	1.42	1.10–1.83	0.007	1.10	0.79–1.51	0.56
Anxiety	1.01	0.97–1.04	0.63	1.03	0.99–1.08	0.18
Depression	0.98	0.94–1.02	0.38	0.98	0.93–1.04	0.56
Youth seropositive HIV Status	0.44	0.27–0.73	0.001	0.66	0.33–1.31	0.23
	$\chi^2 = 21.71$; $p < 0.001$			$\chi^2 = 4.47$; $p < 0.05$		
Regulation processes						
Social regulation						
Communication	0.94	0.88–1.01	0.11	0.98	0.88–1.09	0.70
Involvement	1.01	0.95–1.06	0.84	1.06	0.99–1.15	0.11
Autonomy	1.00	0.94–1.05	0.87	1.02	0.94–1.11	0.65
Youth seropositive HIV Status	0.37	0.23–0.56	0.00	0.57	0.30–1.11	0.09
	$\chi^2 = 23.92$; $p < 0.001$			$\chi^2 = 9.31$; $p < 0.05$		
Self regulation						
TSCS-personal	0.95	0.90–0.99	0.05	0.94	0.87–1.00	0.07
TSCS-family	0.95	0.90–0.99	0.04	0.97	0.91–1.03	0.30
TSCS-academic	1.25	1.15–1.36	0.00	1.18	1.06–1.32	0.003
TSCS-social identity	1.03	0.99–1.08	0.00	1.00	0.94–1.06	0.99
Youth seropositive HIV Status	0.37	0.23–0.61	0.00	0.55	0.28–1.09	0.09
	$\chi^2 = 56.65$; $p < 0.0001$			$\chi^2 = 15.80$; $p < 0.05$		

[a]African American is the reference group; [b]Association of each SAT domain with sexual behavior is examined using multiple logistic regression;

TSCS, Tennessee Self Concept Scale.

engaging in any penetrative sex at follow-up after adjusting for family processes (OR = 0.37; 95%CI = 0.23–0.56; $p < 0.00$).

Self-regulation. Youth who reported better academic self-concept (OR = 1.25; 95%CI = 1.15–1.36; $p < 0.00$) and lower family (OR = 0.95; 95%CI = 0.90–0.99; $p < 0.04$) and personal self-concept (OR = 0.95; 95%CI = 0.90–0.99; $p < 0.05$) were more likely to report penetrative sex. After adjusting for self-concept, PHIV + youth were significantly less likely to report engaging in any penetrative sex at follow-up (OR = 0.37; 95%CI = 0.23–0.61; $p < 0.00$).

Any unprotected penetrative sex

Internal context

Background. Older youth were more likely (OR = 1.52; 95%CI = 1.28– 1.81; $p < 0.001$) and PHIV + youth were less likely (OR = 0.50; 95%CI = 0.25–0.99; $p < 0.05$) to report unprotected penetrative sex at follow-up.

Arousal/mood. Youth who had ever used alcohol were almost 4 times as likely to report any unprotected penetrative sex at follow-up (OR = 3.99; 95%CI = 1.97–8.09; $p < 0.001$). There were no associations between psychological distress and unprotected penetrative sex. After adjusting for arousal/mood covariates, there was no association between youth HIV status and any unprotected penetrative sex at follow-up.

External context. There were no associations between unprotect penetrative sex at follow-up and living environment, caregiver HIV status and physical health, caregiver mental health, and substance use. After adjusting for these covariates, youth HIV status was not associated with any unprotected penetrative sex at follow-up.

Regulation processes

Social regulation. Tthere was no association between any of the family process variables and unprotected penetrative sex at follow-up.

Self-regulation. Youth who reported higher academic self-concept were more likely to report any unprotected penetrative sex at follow-up (OR = 1.18; 95%CI = 1.06–1.32; $p < 0.003$); there were no other associations between youth self-concept variables and unprotected penetrative sex. After adjusting for social- and self-regulation variables, youth HIV status was unrelated to unprotected sex at follow up.

Discussion

Our study is one of the first to attempt to disentangle the effects of maternal and child HIV infection on youth sexual behavior, as well as to examine the role of contextual, social, and self-regulatory factors in influencing PHIV + youth sexual behavior over time. PHIV + youth were consistently less likely to engage in sexual behavior at follow-up compared to HIV – youth, even after considering contextual, social, and self-regulation processes. This finding builds on prior studies on sexual risk from the CASAH sample that were unable to examine HIV status differences in youth risk behavior,[44] and is consistent with prior studies from this cohort that have found fewer PHIV + youth to be sexually active than youth exposed but uninfected with HIV,[7,58] as well as studies that have found fewer PHIV + youth to be sexually active and more likely to use condoms compared to youth in the general population.[8,9]

Although researchers have begun to identify reasons why PHIV + youth are delaying sexual behavior, including a desire to avoid risk of transmission or potential disclosure of their status to a partner,[15,58] our understanding remains incomplete. Delay in sexual debut in PHIV + youth may also be due to delayed puberty, poorer health, or neurocognitive/developmental delays. Future research that more closely examines reasons for delayed sexual debut is necessary. For example, studies of PHIV + youth have generally focused on negative outcomes (e.g., psychiatric disorders, sexual risk) with few studies examining positive outcomes in these youth. Our data suggest that despite contextual, social, and self-regulatory risk factors, PHIV + youth may be demonstrating protective behaviors compared to HIV – youth from similar environments. Future research that examines factors that promote resiliency in PHIV + youth, particularly as they age into older adolescence and young adulthood, is warranted.

Nevertheless, rates of penetrative sex increased by a third, and rates of unprotected sex doubled between baseline and follow-up among PHIV + youth. Overall rates of sexual behavior and unprotected sex in PHIV + youth are lower than studies of general population youth,[59] yet when we examine only those PHIV + youth who are sexually active, we find rates of unprotected sex (15/34; 48%) similar to HIV – youth in the current sample (42%), as well to rates seen in other studies of uninfected youth.[60] Although it is normative and expected that PHIV + youth will begin to have sex as they age, high rates of unprotected sex among sexually active PHIV + youth is a public health concern, as it may increase HIV transmission to partners, unintended pregnancy, as well as the potential for the youth to acquire a STI and/or be re-infected by drug-resistant strains of HIV. Thus, while these youth may not be more likely to engage in unprotected sex compared to their HIV – counterparts, we must remain attentive to their sexual development by developing prevention programs that promote strategies to decrease their sexual risk behavior and focus on the unique needs of PHIV + youth.

When we examined other internal contextual factors as defined in our SAT model (e.g., gender, age, psychological distress, substance use), we found several other factors were associated with increased risk behavior. Similar to most studies, older youth had a greater likelihood of engaging in sexual activity and/or unprotected sex. However, contrary to most prior research, there were no differences in sexual activity or sexual risk behavior by gender. For PHIV + youth, other internal contextual factors, such as youth's HIV status, may be more influential in determining sexual activity and sexual risk than gender. Also, contrary to past findings in some other populations,[30,31,61] we found no association between youth's psychological distress and their sexual behavior, after considering youth alcohol and marijuana use. As seen in some other studies of high-risk youth,[62] one plausible explanation for an absence of a relationship between distress and sexual risk in multivariate analyses may be that substance use mediates, or accounts for the relationship between psychological distress and sexual behavior. Furthermore, there was no effect of youth HIV status on unprotected sex after considering the effects of alcohol use at baseline, suggesting

that alcohol may also mediate the relationship between youth HIV status and unprotected sex or that these risk behaviors are clustering together.[63,64] In this study, youth who reported any alcohol or marijuana use at baseline were more likely to engage in penetrative sex at follow up, and those who drank alcohol at baseline were also more likely to report unprotected sex at follow up. Approximately 25% of youth in the total sample used alcohol at baseline (mean age = 12 years), with higher rates seen in HIV− youth and prior studies have identified an association between early alcohol use and risky sexual behavior.[65,66] These findings suggest that targeting youth substance use early, particularly alcohol, as a strategy to increase condom use as they age may be beneficial for both PHIV+ and HIV− youth.[67,68]

Key factors in the youths' external context related to greater likelihood of penetrative sex included caregivers' frequent use of marijuana. A small body of work has examined the association between caregiver substance use and youth risky sexual behavior;[69] however, few studies have examined the unique risk contribution of specific substances. We found greater frequency of marijuana use by caregiver to be associated with youth engaging in penetrative sex, although not unprotected sex. Youth who see their caregivers engaging in risky or illegal behaviors may themselves model similar behaviors;[70] or caregivers using substances may provide less supervision and monitoring, a key factor associated with increased opportunity for youth sexual activity.[71]

Social-regulation processes examined in this study, including youth–caregiver relationship factors (involvement, communication, and autonomy) were not associated with sexual activity or condom use. Findings in the literature have been mixed with respect to the importance of family social-regulation processes in youth sexual risk behavior,[72] and prior studies have noted that the effect of family processes diminished after considering influence of other factors, particularly peer influences.[10,68] Some studies suggest that for families residing in impoverished urban environments, other factors such as caregiver substance use may be more important predictors of youth sexual risk than the caregiver-youth relationship.[24,26] Alternatively, youth–caregiver relationship factors were based on caregiver and not youth response, and may not accurately reflect the quality of the relationship.

Within youth self-regulation processes, we found youth self-concept to be associated with sexual activity and unprotected sex. Youth who felt alienation from or disappointment about their families were more likely to be sexually active at follow-up, indicating that a youth's perceived value within their own families is important in determining sexual behavior. This finding, based on youth report, further suggests the lack of an association between parent-reported family processes and sexual behavior may be due to parental perspective. Also, youth who reported academic confidence were more likely to be sexually active and report unprotected sex. Competence in school settings is associated with social competence and success with peers,[73] which in turn can translate into greater opportunities for sexual activity.[74]

Our findings have several limitations deserving mention. These are secondary data analyses involving data from two studies of youth who were recruited at different times with different lengths of time between study follow-ups. Differences in outcomes may reflect historical or cohort differences between the two study samples; the impact of study data collection on the association between caregiver HIV status and youth sexual development is unclear. In both studies, our attrition analyses suggested that we lost older youth who had engaged in higher rates of sexual behavior at baseline. The attrition of older, sexually active, and HIV− participants may have led us to underestimate the magnitude of the observed relationships and/or masked other findings. Consequently, replication of these findings with other samples of PHIV− infected, affected, and uninfected youth may be warranted. The sample is a convenience sample, largely recruited from either HIV primary care clinics or medical clinics that may not reflect the larger population of urban youth, either infected or affected by HIV, particularly those outside NYC and not followed in HIV care or medical clinics. Thus, study findings may reflect a form of selection bias whereby HIV+ caregivers and their youth who were functioning less well were less likely to be found seeking medical services of any kind or to provide consent, and thus are not enrolled in the study. As HIV status for non-infected caregivers and noninfected, nonexposed youth was based on self-report, the HIV negative caregiver and non-exposed youth groups may have included those who were HIV+ but either undiagnosed or refused to endorse their own seropositivity. Finally, certain factors that may have confounded findings in prior studies, such as pubertal delays, neurological/cognitive difficulties, associated with HIV infection and long-term ART, are not addressed in the current study and require further examination.

These limitations notwithstanding, the current study represents an important step in understanding how living with perinatal HIV infection, in addition to other key contextual and regulation factors, influence youth sexual behavior. In the absence of HIV prevention interventions developed for an aging cohort of PHIV+ adolescents, our findings have implications for HIV programming for these youth.

First, PHIV+ youth appear to be less likely to engage in sexual behavior or unprotected sex and may be delaying sexual behavior compared to uninfected peers from similar communities, including youth with HIV+ caregivers. A recent study of PHIV+ adolescent females suggests that these youth are delaying sex in part to avoid infecting a partner but also to avoid potential disclosure of their status to a partner.[16] One interpretation of our data suggests that interventions that promote the development of a healthy sexual self-concept, addressing decisions about sexual debut and sexual relationships in the context of their own HIV infection, as well as promoting other aspects of PHIV+ youth identity, including school competence, may be important avenues for treatment in this population. Second, at follow-up, almost half of PHIV+ youth who were sexually active had engaged in unprotected sex, warranting prevention efforts. Following the current emphasis in "prevention for positives" among adults, new strategies for interventions for PHIV+ youth that are integrated into ongoing medical or psychiatric care could be particularly beneficial and reach a wide proportion of PHIV+ youth. Interventions that have proven effective with other populations that begin early, and focus on condom negotiation with partners, alcohol use, as well as interventions that address fears around stigma, rejection, or abandonment associated with disclosure to partners may be particularly effective.[3,16] Taken together, our findings underscore the importance of examining the individual and contextual factors influencing the sexual development of HIV infected and

affected youth in order to develop adequate HIV interventions for these youth and their partners.

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