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Prevalence of and Risk Factors for Substance Use Among Perinatally HIV-Infected and Perinatally Exposed but Uninfected Youth

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Abstract

Purpose—This study examines risk factors associated with recent substance use (SU) among perinatally HIV-infected (PHIV+) and perinatally exposed, uninfected (PHEU) youth and compares SU lifetime prevalence with the general population of United States (US) adolescents.

Methods—We conducted cross-sectional and longitudinal analyses of 511 PHIV+ and PHEU youth (mean age at study entry 13.2 years, 51% female, 69% PHIV+, 72% African American) enrolled in a US multi-site prospective cohort study between 2007–2009. SU data were collected by audio computer-assisted self interview. Youth Risk Behavior Surveillance System and Monitoring the Future data were used to compare SU lifetime prevalence to US samples.

Results—Perinatal HIV infection was not a statistically significant risk factor for alcohol or marijuana use. Risk factors for alcohol use among PHIV+ youth included higher severity of emotional and conduct problems and alcohol and marijuana use in the home by the caregiver/others. Risk factors for marijuana use among PHIV+ youth included marijuana use in the home, higher severity of conduct problems, and stressful life events. Similar SU risk factors among

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Implications and Contribution: This study looks at substance use in youth HIV infected since birth. It suggests having HIV since birth is not a strong risk factor for substance use and describes other reasons these youth might use substances.

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PHEU youth included SU in the home and higher severity of conduct and emotional problems. Overall lifetime prevalence of SU by age was similar to that in national surveys.

Conclusions—Although SU lifetime prevalence and risk factors for PHIV+ and PHEU adolescents were similar to national norms, the negative consequences are potentially greater for PHIV+ youth. Prevention efforts should begin before SU initiation and address the family and social environment and youth mental health status.

Keywords

HIV; perinatal HIV exposure; adolescents; substance use; adolescent risk behavior

By the time adolescents in the United States (US) reach young adulthood, the majority will initiate use of alcohol or other substances [1]. The most common substances used by adolescents are alcohol, marijuana, and tobacco, with the majority reporting alcohol use and almost half reporting marijuana and cigarette use by grade twelve [1]. Although some consider this experimentation normative for adolescents, for HIV-infected youth it may have greater consequences. For youth living with HIV since birth, substance use (SU) may further jeopardize a lifetime of compromised health by reducing adherence to antiretroviral therapy (ART) [2] and potentially increasing immune dysfunction. SU may also influence participation in sexual risk behaviors that increase the possibility of sexually transmitted infections and place partners at risk for HIV acquisition [3, 4].

Risk factors associated with SU in perinatally HIV-infected (PHIV+) youth are not well understood. Youth living with families affected by HIV, regardless of their own infection status, often experience a myriad of genetic, psychosocial, family, and environmental challenges that may contribute to SU [3, 5–9]. This population is further susceptible to SU due to high rates of maternal SU [10, 11] and SU by other primary caregivers [6], documented in other populations to increase SU risk in adolescent children [12, 13]. Moreover, high rates of mental health problems have been documented among HIV-infected and -affected youth [14] and have been associated with an increased risk for SU [15, 16]. These factors, coupled with greater access to illicit substances in US urban communities where the HIV epidemic is centered, increase the risk of SU in HIV-infected and -affected youth.

While studies have examined factors associated with SU in HIV-infected youth, few have focused exclusively on those perinatally HIV-infected [3, 6, 14]. These studies have mostly employed cross-sectional study designs which may limit the ability to identify factors associated with SU. Although longitudinal studies have focused on SU in youth with behaviorally-acquired HIV, these studies are likely not analogous as behaviorally-infected youth often initiate SU prior to the onset of HIV infection. Better understanding of risk factors associated with SU is critical to addressing physical and mental health outcomes.

This study is one of the first to examine SU, specifically alcohol, marijuana, and cigarette use, over time in a large, multi-site cohort of PHIV+ youth and a comparison group of perinatally exposed, uninfected youth (PHEU) living in similar environments. We examined behavioral, psychosocial, and family factors associated with recent SU. We also compared the prevalence of SU among these youth with the general population of US adolescents.

Methods

Study participants

This analysis utilized data from the Adolescent Master Protocol (AMP) of the Pediatric HIV/AIDS Cohort Study (PHACS), a prospective cohort study designed to determine the

impact of HIV infection and ART on PHIV+ youth. AMP eligibility criteria included perinatal HIV infection or exposure, age 7 to <16 years at enrollment, and engagement in medical care with available ART history. Participants enrolled from March 2007 through October 2009 at 15 US sites. Follow-up visits are ongoing. Eligible for this analysis were youth 10 years (SU measures begin at 10 years) completing at least one SU interview.

Institutional Review Boards (IRB) at clinical sites and Harvard School of Public Health approved the study. Parents or legal guardians provided written informed consent for their child's participation. Youth assented per local IRB guidelines. Research visits consisted of a physical examination, chart review, and structured interviews at entry and six to 12 months thereafter.

Data Collection

Data collection was staggered among visits to reduce participant burden. See Supplemental Table 1 for the evaluations schedule.

Sociodemographics—Information was obtained on race, ethnicity, age, sex, annual household income, caregiver education, and caregiver relationship to participant.

Substance Use—Data on SU were collected via audio computer-assisted self interview (ACASI). Participants responding positively to screening questions answered detailed SU questions. For the analysis comparing AMP to national cohorts, lifetime prevalence of alcohol, marijuana and cigarette use was defined as any self-reported use on any ACASI, including a sip of alcohol or single cigarette puff (to match the national survey definitions). Lifetime prevalence comparisons between PHIV+ and PHEU cohorts were conducted both with and without inclusion of single alcohol sips and cigarette puffs. Recent alcohol, marijuana, and cigarette use was defined as use within the past three months.

We compared AMP lifetime prevalence to data from the Youth Risk Behavior Surveillance System (YRBSS) [17] and Monitoring the Future (MTF) [1], ongoing national studies of SU. The YRBSS is conducted biannually with youth ages 12–17 years in a classroom setting. Data used in this analysis were collected in 2009 with a sample of approximately 15,800. MTF is conducted annually with youth in 8th-, 10th-, and 12th-grade as well as college students and young adults. We used data collected in 2010, which included about 46,500 youth in almost 400 secondary schools. Both are self-administered and completed by hand. The YRBSS is anonymous; MTF is anonymous for 8th and 10th-grade students and confidential thereafter.

HIV-Specific Characteristics—All data in the clinical chart on Centers for Disease Control (CDC) clinical classification (ever classified as class C), CD4 count (<350, 350–500, >500 cells/mm³), and HIV RNA viral load (<400 or >400 copies/ml) were abstracted. A one-year average was taken for all CD4 and RNA records dated before the first ACASI visit, and measurements between ACASI visits were averaged then categorized. Youth knowledge of HIV status (yes/no) was reported by the primary caregiver.

ART adherence data were collected via interview by non-clinical staff. The instrument was based on a questionnaire developed for adults [18] and adapted for pediatric trials [19]. We defined non-adherence as any caregiver- or participant-reported missed ARV dose within the past week. This measure has been strongly associated with detectable viral load [20].

Other Behavior and Psychosocial Variables

Measures for Youth: Youth and caregivers were interviewed separately by a psychologist using the Behavior Assessment System for Children- 2nd Edition (BASC-2) [21], a series of scales assessing youth's (Self-Report of Personality) and caregiver's (Parent Rating Scale) perceptions of the youth's emotional and behavioral health. Scales yield T-scores with a mean of 50 and standard deviation of 10. We included the parent-reported Behavioral Symptoms Index (BSI) and Conduct Problems Subscale and the youth-reported Emotional Symptoms Index (ESI). BSI scales measure hyperactivity, aggression, depression, attention problems, atypicality and withdrawal. ESI scales measure social stress, anxiety, depression, sense of inadequacy, self-esteem and self-reliance. The Conduct Problems Subscale contains items on multiple Diagnostic and Statistical Manual of Mental Disorders, 4th edition, criteria for a Conduct Disorder diagnosis. We considered continuous measures for all BASC subscales.

The Wechsler Individualized Achievement Test- 2nd Edition (WIAT-II) [22] Word Reading and Numerical Operations (Math) subscales were used to assess academic achievement. We considered these measures as continuous scales with a mean of 100 and standard deviation of 15.

A modification of the Family Stress and Trauma measure [23], assessing the child's exposure to 43 stressful life events, was administered to youth ages 8–15. Youth reported whether each event occurred in the past year and rated the experience good, bad or neutral. We considered continuous (total bad events) and binary (1 bad event, yes/no) measures.

Measures for Caregivers: Caregivers were interviewed by a centrally-trained psychologist using the Client Diagnostic Questionnaire (CDQ) [24] to screen for caregiver psychiatric and SU disorders. We used a dichotomous measure of any disorder (yes/no).

Caregivers were interviewed about the impact of physical symptoms and overall health on their daily living and SU in the home by the caregiver or others. We used a categorical measure of limitations in daily activities (0; 1–4; 4+ limitations) and binary measures (yes/no) of whether anyone in the home ever used alcohol, marijuana, or cigarettes.

Caregivers were interviewed using the Parent-Child Relationship Inventory (PCRI) [25] to assess the parent-child relationship and parenting disposition. Six scales (Support, Satisfaction, Involvement, Communication, Limit-Setting, Autonomy) were included, each with a mean of 50 and standard deviation of 10. A problematic caregiver-child relationship was defined as T-score <40.

Statistical Methods

Demographic characteristics were compared between PHIV+ and PHEU groups using t-tests for continuous variables and chi-square tests for categorical variables. Lifetime prevalence estimates at specific ages were calculated using generalized estimating equations (GEE). Age was treated as a continuous linear predictor and selected using Bayesian information criteria [26] with a natural cubic spline. GEE models accounted for repeated SU measurements over time in the same subject.

To compare AMP and YRBSS lifetime prevalence, YRBSS estimates were standardized to the AMP racial distribution using the law of total probability. The probability of lifetime SU for a given racial group (African American vs. Other) was estimated from YRBSS data, and the AMP racial groups were used for the marginal probabilities. Standardization was performed because AMP has a higher proportion of African American participants relative to the US population. This method is equivalent to post-stratification methods [27].

GEE models with a logistic link were used to estimate odds ratios (ORs) for recent SU. ORs for risk factors by HIV status were computed using GEE models with an interaction term. Age and caregiver relationship were treated as time-varying covariates, and all other variables as time-invariant. Adjustment variables were selected a-priori [28]. Risk factors were allowed to vary from visit to visit. To estimate the association between risk factors and SU, only risk factor measurements on or before ACASI visits were used. Risk factors with p -value ≤ 0.05 were considered statistically significant. Interaction p -values < 0.10 were taken as evidence of effect modification. No adjustments were made for multiple comparisons. R version 2.12.1 and SAS 9.2 were used.

Results

Six hundred and eighteen (422 PHIV+ and 196 PHEU) youth were expected to have completed an ACASI, and 511 (83%) (354 PHIV+ and 157 PHEU) completed one. Among this group, 154 (30%) completed a single ACASI; 170 (33%) completed two; 142 (28%) completed three; 44 (9%) completed four; and one subject (0.2%) completed five.

Sample Characteristics

Several demographic and caregiver characteristics differed by HIV-infection status. PHIV+ youth were on average older (13.58 years vs. 12.30, $p < .001$) and more likely African American (76% vs. 64%, $p = .007$) and non-Hispanic (75% vs. 63%, $p = .007$). Differences by HIV status in annual household income and caregiver relationship to youth were also observed.

Lifetime Prevalence of Substance Use in AMP

Table 2 provides lifetime prevalence estimates for AMP by cohort and adjusted and unadjusted ORs for the comparison of SU among cohorts. Two hundred and eight (60%) PHIV+ vs. 62 (42%) PHEU youth reported lifetime alcohol use; 101 (27%) PHIV+ vs. 29 (19%) PHEU youth reported lifetime marijuana use; and 92 PHIV+ (25%) vs. 21 PHEU (16%) youth reported lifetime cigarette use. Once adjusting for race, ethnicity, age, income, caregiver SU, and caregiver relationship to child there were no statistically significant differences in lifetime prevalence between groups for any substance. The confounder explaining most of the difference in SU by HIV status for the unadjusted models is age.

Recent alcohol use was reported by 117 (23%) youth; recent marijuana use by 101 (20%) youth; and recent cigarette use by 51 (10%) youth (data not shown).

Comparison of Lifetime Prevalence of Substance Use to National Cohorts

Figure 1 compares lifetime prevalence of alcohol, marijuana, and cigarette use among AMP PHIV+ and PHEU cohorts to the YRBSS and MTF cohorts. Data are reported in AMP by age and in YRBSS and MTF by school grade. Overall, reports of lifetime prevalence of alcohol, marijuana, or cigarette use by age were similar among AMP PHIV+ and PHEU cohorts and youth in these national surveys. Lifetime prevalence increased with age in all groups for all substances.

Risk Factors for Recent Alcohol Use

Table 3 presents the estimated adjusted odds ratios (aOR) and confidence intervals (CI) for risk factors associated with recent alcohol use for the full sample and by HIV status, adjusted for caregiver education, household income, caregiver relationship to youth, age, ethnicity, race, and sex. Models not stratified by HIV status or not pertaining to PHIV+ participants include statistical control for HIV status. With the exception of models estimating effects of alcohol, cigarette, marijuana, and SU in the home by caregivers/others,

models include an additional adjustment for caregiver SU. (See Supplemental Table 2 for unadjusted analyses.)

HIV-infection status was not a statistically significant risk factor for recent alcohol use in any model. Among PHIV+ youth, risk factors associated with higher odds of recent alcohol use included alcohol and marijuana use in the home by caregivers/others (aOR=1.72; 95% CI=1.00, 2.93; and, aOR=6.19; 95% CI=2.24, 17.06, respectively), higher severity of emotional problems (aOR=1.04; 95% CI=1.00, 1.07) and higher severity of conduct problems (aOR=1.03; 95% CI=1.00, 1.06). There was a marginally-significant association between higher HIV viral load (RNA level >400) and recent alcohol use (aOR=1.69; 95% CI=0.97, 2.95). Marijuana use in the home by caregivers or others was also a statistically significant risk factor for alcohol use among PHEU youth (aOR = 6.27, 95% CI = 1.75, 22.50). Alcohol use in the home by caregivers or others and higher severity of emotional problems were also more prevalent among PHEU youth, but the association was not statistically stable.

Having a primary caregiver with a psychiatric diagnosis was a risk factor for recent alcohol use for the PHEU group (aOR=3.52; 95% CI=1.10, 11.25). The fact that this variable was a strongly associated with alcohol use among PHEU youth but not among PHIV+ youth (aOR=0.89; 95% CI=0.31, 2.57) suggests effect modification ($p=0.081$).

In the analysis using the full sample, higher academic achievement was a risk factor for recent alcohol use (aOR=1.03; 95% CI=1.00, 1.06; aOR=1.02; 95% CI=1.00, 1.05).

Risk Factors for Recent Marijuana Use

Table 4 presents estimated aORs for risk factors for recent marijuana use for the full sample and by HIV status. Similar adjustments to those described for Table 3 were applied to models estimating recent marijuana use. (See Supplemental Table 3 for unadjusted analyses.) HIV-infection status was not a statistically significant risk factor for recent marijuana use in any model. Risk factors for recent marijuana use among PHIV+ participants similar to those for recent alcohol use included marijuana use in the home by caregivers/others (aOR=11.42; 95% CI=3.52, 37.09) and higher severity of conduct problems (aOR=1.06; 95% CI=1.03, 1.10). A risk factor specific to marijuana use among PHIV+ participants was report of stressful life events (SLEs) (aOR=1.27; 95% CI=1.02, 1.58).

Similar to the PHIV+ group, marijuana use in the home by caregivers/others and higher severity of conduct problems were statistically significant risk factors for recent marijuana use among the PHEU group (aOR=9.19; 95% CI=3.39, 24.91; and aOR=1.04; 95% CI=1.00, 1.08, respectively). A marginally-significant association was observed between caregiver promotion of youth autonomy and recent marijuana use in PHEU participants (aOR=2.91; 95% CI=0.97, 8.71). Report of SLEs was not a statistically significant risk factor among PHEU participants. The difference in risk for SLEs among the PHIV+ (aOR=1.27) and PHEU (aOR=0.96) groups suggests effect modification (interaction $p=0.069$).

In the full-sample analysis, higher severity of youth behavioral problems (aOR=1.03; 95% CI=1.01, 1.06) was a risk factor for recent marijuana use. The association was similar to those observed by HIV-infection status.

No statistically significant risk factors for recent cigarette use were identified (Supplemental Tables 4 and 5).

Discussion

In this study of perinatally HIV-infected and HIV-exposed, uninfected youth we identified several risk factors for recent alcohol and marijuana use. HIV-infection status was not a statistically significant risk factor for use of either substance. As expected and consistent with previous studies [3, 6, 14], there was substantial overlap of factors among PHIV+ and PHEU participants. An important environmental risk factor common to both groups was SU in the home by caregivers/others, with a 6- to 11-fold increased risk of youth alcohol or marijuana use. The role of SU among caregivers, siblings and older relatives has been demonstrated to influence SU among general populations of adolescents [29–32] and adolescents living with an HIV-infected parent [33]. Discussions with care-providers regarding youth SU risk associated with environmental exposure should be part of routine care.

Consistent with other studies, multiple youth mental health characteristics were identified as risk factors for SU in both groups [6, 34]. All BASC scales were associated with recent SU among at least one subgroup, if not among all participants. Our results underscore that, given the high rates of psychiatric diagnoses among PHIV+ and PHEU youth [14], it is particularly important to document that mental health problems pose a significant risk for SU in these vulnerable groups and to proactively implement prevention strategies.

Factors unique to either the PHIV+ or PHEU groups were also identified, as has been observed in at least one study of this population [3]. Among PHIV+ youth, stressful life events were associated with marijuana use. Among the PHEU group, additional environmental risk factors for recent SU included caregiver psychiatric diagnosis and caregiver difficulty promoting their child's autonomy. It is possible that, given the supportive services available to families with children born with HIV, the effects of these risk factors on SU are mitigated among PHIV+ youth. Our analyses provide supportive evidence that family and social environment have a powerful influence at this time in adolescence when health- and risk-taking behaviors emerge.

In the full sample, the risk for recent alcohol use increased 30% for each ten-point increase on the WIAT-II Word subscale and 20% for each ten-point increase on the Math subscale. While the majority of literature on SU and academic achievement reinforces a negative relationship [35–37], in one study youth whose grades increased at a faster rate reported increasingly more frequent drinking [38]. The authors hypothesized that academic achievement can result in parents granting increasing levels of autonomy, leading to alcohol use.

As found in other studies [3, 6], HIV-infection status was not a statistically significant risk factor for SU. While proportions of use were higher among the PHIV+ group for all substances, the difference in mean age between the PHIV+ (14.5 years) and PHEU (13.2 years) groups complicates a direct comparison. Indeed the adjusted analyses reveal no increased risk due to HIV. This observation was supported by similarities in SU lifetime prevalence in our cohorts to national data. SU was rarely reported before 13.5 years of age; by 17.5 years, the majority of AMP youth reported alcohol use and half reported marijuana use, similar to YRBSS and MTF. Compared to other studies of PHIV+ youth, AMP lifetime prevalence was, not surprisingly, higher than reported among two younger PHIV+ cohorts [3, 6] and lower than reported more recently among an older PHIV+ cohort [8].

The lack of association between HIV-infection status and risk of SU contrasts with other studies that have found associations between SU and a range of chronic conditions and disability [39]. This difference may reflect protective factors associated with HIV-infection status in children versus other chronic illnesses. As previously mentioned, services available

to children with HIV to address their social and emotional needs may mitigate their risk for SU. It will be important to follow these youth as they age to determine if the lack of elevated risk endures or is merely delayed to a time when access to these protective supports is diminished. Among PHIV+ youth we observed a marginally-significant 69% increased risk for recent alcohol use for those with HIV RNA levels >400 copies/ml. This observation may be related to ART adherence, as non-adherence has been associated with both SU [2] and, in our cohort, detectable viral load [20].

Our study has limitations. We were unable to adjust for some known risk factors for SU such as peer influence. Also, our clinic-based convenience sample may not be representative of the broader PHIV+ youth population. Additionally, because of low SU rates relative to sample size, particularly for PHEU participants, we estimated effects of risk factors by HIV status using an interaction model, which assumes covariate effects are the same for PHIV+ and PHEU participants. For similar reasons, our study lacked power to detect small but possibly clinically-relevant effect modification by HIV status. Likewise, the lack of significant associations between multiple known risk factors for cigarette use and recent cigarette use may be attributed to inadequate power to test associations due to low rates of cigarette use in our sample. Lastly, caregiver-reported SU in the home could have included use by the participating youth since the question did not instruct the caregiver to exclude such use. While this may partially account for the strong association observed, the finding is firmly supported by the research literature [29–33].

Conclusions

These data suggest that risk factors for recent SU by PHIV+ and PHEU youth are multifaceted, encompassing individual and environmental factors. While SU rates and risk factors for these youth are similar to the general population of US adolescents, SU among PHIV+ youth can lead to risky behaviors with greater consequences. Ongoing dialogue between health care providers and families are necessary to monitor for the onset of risk factors for SU and to facilitate intervention. Prevention efforts should start early before SU initiation, as early intervention has proven to reduce SU and associated negative behavioral outcomes among adolescents [40], and should include consideration of the home and social environment and youth mental health status.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of abbreviations

HIV	Human Immunodeficiency Virus
SU	Substance use
PHIV+	Perinatally HIV-infected
PHEU	Perinatally HIV-exposed, uninfected
AMP	Adolescent Master Protocol
PHACS	Pediatric HIV/AIDS Cohort Study
IRB	Institutional review board
ACASI	Audio computer-assisted self interview
YRBSS	Youth Risk Behavior Surveillance System
MTF	Monitoring the Future
CDC	Centers for Disease Control
ARV	Antiretroviral
BASC-2	Behavior Assessment System for Children- 2 nd Edition
BSI	BASC Behavioral Symptoms Index
ESI	BASC Emotional Symptoms Index
PCRI	Parent-Child Relationship Inventory
WIAT-II	Wechsler Individualized Achievement Test- 2 nd Edition
CDQ	Client Diagnostic Questionnaire
SLE	Stressful Life Events
GEE	Generalized estimating equations
US	United States
OR	Odds ratio
aOR	Adjusted odds ratio
CI	Confidence interval
ART	Antiretroviral therapy

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Figure 1. Lifetime Prevalence of Substance Use: Adolescent Master Protocol, Monitoring the Future, and Youth Risk Behavior Surveillance System Cohorts^{1, 2}

CI Confidence Interval, *PrbEst* Probability Estimate, *PHIV+* Perinatally HIV-Infected, *PHEU* Perinatally HIV-Exposed but Uninfected, *MTF* Monitoring the Future, *YRBSS* Youth Risk Behavior Surveillance System

¹AMP *PHIV+* and *PHEU* cohorts reported by age; *MTF* and *YRBSS* cohorts reported by school grade.

²Estimates of lifetime prevalence of SU at specific ages were calculated with prevalence modeled as a continuous function of age. Therefore (for model-fitting purposes only), the model includes subjects older than 17.5 years.

Table 1

Demographic and caregiver characteristics by HIV-infection status of 511 youth in the PHACS AMP protocol, 2007–2011

	PHIV+ (N=354)	PHEU (N=157)	Total (N=511)	P-value [*]
Age at entry visit (mean, s.d.)	13.58 (2.12)	12.30 (1.87)	13.19 (2.13)	<.001
Male	172 (49%)	81 (52%)	253 (50%)	0.53
Black ^A	254 (76%)	98 (64%)	352 (72%)	0.007
Hispanic ^A	89 (25%)	57 (37%)	146 (29%)	0.007
Caregiver HS education	262 (74%)	107 (68%)	369 (72%)	0.17
Annual household income ^A				
<20k	148 (42%)	97 (63%)	245 (49%)	<.001
20k–50k	135 (39%)	46 (30%)	181 (36%)	
>50k	66 (19%)	12 (8%)	78 (15%)	
Primary caregiver relationship ^A				
Biological parent(s)	151 (44%)	120 (78%)	271 (55%)	<.001
Other biological relative	87 (25%)	16 (10%)	103 (21%)	
Non-biological relative	104 (30%)	18 (12%)	122 (25%)	

PHACS Pediatric HIV/AIDS Cohort Study, AMP Adolescent Master Protocol, PHIV+ perinatally HIV-infected, PHEU perinatally HIV-exposed but uninfected, SD standard deviation, HS high school

^{*} P-value by t-test for age and by chi-square test for all other measures

^A 23 participants missing information on black race, 4 missing Hispanic ethnicity, 7 missing household income, 15 missing primary caregiver relationship to participant

Table 2

Lifetime prevalence rates for alcohol, cigarette, and marijuana use by HIV-infection status and unadjusted and adjusted comparisons of lifetime prevalence between groups for youth participating in the PHACS AMP protocol, 2007–2011

Type of Use	PHIV+ lifetime prevalence (95% CI) [*]		PHEU lifetime prevalence (95% CI) ^{**}		Comparison between PHIV+ and PHEU groups			
	Events (count)		Events (count)		OR (95% CI)	P-value	aOR (95% CI) ^d	P-value ^d
<i>Alcohol</i>								
Any alcohol use	208	0.60 (0.55, 0.65)	62	0.42 (0.35, 0.50)	2.00 (1.40, 3.00)	<.001	1.43 (0.88, 2.33)	0.15
Alcohol (excluding just a sip)	127	0.36 (0.31, 0.42)	37	0.27 (0.20, 0.34)	1.57 (1.02, 2.43)	0.042	1.26 (0.72, 2.20)	0.42
<i>Marijuana use (any)</i>	101	0.27 (0.23, 0.32)	29	0.19 (0.13, 0.26)	1.59 (0.98, 2.60)	0.061	0.86 (0.45, 1.64)	0.65
<i>Cigarettes</i>								
Any cigarette use	92	0.25 (0.21, 0.31)	21	0.16 (0.10, 0.23)	1.84 (1.06, 3.20)	0.031	1.27 (0.61, 2.65)	0.52
At Least One Cigarette	59	0.17 (0.14, 0.22)	13	0.08 (0.05, 0.14)	2.32 (1.19, 4.54)	0.014	1.65 (0.65, 4.20)	0.29
At Least Two Cigarettes	41	0.12 (0.09, 0.17)	11	0.08 (0.04, 0.14)	1.72 (0.83, 3.55)	0.14	0.83 (0.29, 2.41)	0.74

PHACS Pediatric HIV/AIDS Cohort Study, AMP Adolescent Master Protocol, PHIV+ perinatally HIV-infected, PHEU perinatally HIV-exposed but uninfected, CI Confidence Interval, OR odds ratio, ^aOR adjusted odds ratio

* Average age across visits: 14.5 years

** Average age across visits: 13.2 years

^a Adjusted for race, ethnicity, age at visit, income, caregiver substance use, sex, and caregiver type.

Risk factors for past three month alcohol use for youth participating in the PHACS AMP protocol, 2007–2011; adjusted odd ratios for full sample and by HIV status

Table 3

Risk Factor	Full sample			PHIV +			PHEU		
	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	Interaction P-value
Alcohol use in home	1.81 (1.13, 2.89)	0.013	1.72 (1.00, 2.93)	0.048	2.08 (0.78, 5.51)	0.14			0.74
Cigarette use in home	0.81 (0.45, 1.46)	0.48	0.82 (0.42, 1.60)	0.56	0.77 (0.21, 2.81)	0.70			0.93
Any substance use in home	1.82 (0.79, 4.23)	0.16	1.41 (0.59, 3.39)	0.44	5.18 (0.51, 53.01)	0.17			0.30
Marijuana use in home	6.23 (2.75, 14.09)	<0.001	6.19 (2.24, 17.06)	<0.001	6.27 (1.75, 22.50)	0.005			0.99
Caregiver physical health	0.78 (0.36, 1.73)	0.55	0.80 (0.31, 2.09)	0.65	0.74 (0.18, 3.07)	0.68			0.92
Caregiver psychiatric diagnosis	1.44 (0.66, 3.12)	0.36	0.89 (0.31, 2.57)	0.83	3.52 (1.10, 11.25)	0.034			0.08
Behavioral symptoms index (BASC)	1.00 (0.97, 1.02)	0.85	1.01 (0.98, 1.04)	0.56	0.96 (0.91, 1.02)	0.21			0.17
Conduct problems subscale (BASC)	1.02 (0.99, 1.04)	0.14	1.03 (1.00, 1.06)	0.04	0.98 (0.93, 1.03)	0.41			0.09
Emotional symptom index (BASC)	1.04 (1.01, 1.08)	0.007	1.04 (1.00, 1.07)	0.038	1.08 (0.99, 1.16)	0.07			0.39
Stressful life events: at least one bad event	1.79 (0.77, 4.16)	0.18	1.53 (0.58, 4.08)	0.39	3.29 (0.55, 19.63)	0.19			0.45
Stressful life events: total bad events	1.03 (0.91, 1.16)	0.68	1.02 (0.85, 1.21)	0.85	1.04 (0.89, 1.21)	0.62			0.85
WIAT word score	1.03 (1.00, 1.06)	0.036	1.02 (0.99, 1.05)	0.13	1.05 (0.99, 1.12)	0.09			0.37
WIAT math score	1.02 (1.00, 1.05)	0.06	1.02 (0.99, 1.05)	0.12	1.03 (0.98, 1.08)	0.26			0.77
Parent-child communication < 40	0.96 (0.46, 1.98)	0.91	1.04 (0.44, 2.46)	0.92	0.77 (0.22, 2.75)	0.69			0.70
Parent-child involvement < 40	0.62 (0.30, 1.28)	0.20	0.57 (0.23, 1.41)	0.22	0.75 (0.23, 2.45)	0.63			0.72
Parent-child relationship autonomy < 40	1.14 (0.57, 2.31)	0.71	0.95 (0.39, 2.34)	0.92	1.60 (0.53, 4.84)	0.40			0.47
Parent-child relationship limit setting < 40	2.51 (0.89, 7.09)	0.08	3.29 (0.80, 13.48)	0.09	1.73 (0.33, 9.09)	0.52			0.57
Parent-child relationship support < 40	1.28 (0.48, 3.40)	0.62	1.49 (0.43, 5.25)	0.53	0.92 (0.20, 4.28)	0.92			0.63
Parent-child relationship satisfaction < 40	2.35 (0.84, 6.56)	0.10	2.44 (0.62, 9.59)	0.20	2.17 (0.54, 8.66)	0.27			0.91
Parent-child relationship composite score	0.85 (0.45, 1.61)	0.62	0.92 (0.43, 1.99)	0.83	0.70 (0.23, 2.10)	0.52			0.69
HIV status	0.93 (0.49, 1.78)	0.84							
PHIV+ Only									
CD4 >500 cell/mm ³			0.80 (0.47, 1.37)	0.42					
HIV RNA >400 copies/mL			1.69 (0.97, 2.95)	0.06					
Ever had a CDC Class C diagnosis			0.98 (0.32, 2.98)	0.97					

Risk Factor	Full sample		PHIV +		PHEU	
	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value
Missed ART dose in last 7 days			1.25 (0.70, 2.25)	0.46		
Knows HIV status			2.93 (0.66, 13.04)	0.16		

PHACS Pediatric HIV/AIDS Cohort Study, AMP Adolescent Master Protocol, PHIV+ perinatally HIV-infected, PHEU perinatally HIV-exposed but uninfected, aOR adjusted odds ratio, CI confidence interval, BASC Behavioral Assessment System for Children, WIAT Wechsler Individual Achievement Test, ART antiretroviral therapy

^aAdjusted for caregiver education, household income, caregiver type, age, race, ethnicity, and sex. Models not stratified by HIV status or not pertaining to PHIV+ subjects include statistical control for HIV status. With the exception of models used to estimate the effects of alcohol, cigarette, marijuana, or any substance use in the home, the models include an additional adjustment for caregiver substance use.

Table 4

Risk factors for past three month marijuana use for youth participating in the PHACS AMP protocol, 2007–2011; adjusted odd ratios for full sample and by HIV status

Risk Factor	Full sample			PHIV +			PHEU		
	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	Interaction P-value
Alcohol use in home	1.21 (0.76, 1.95)	0.42	1.02 (0.59, 1.75)	0.96	1.98 (0.75, 5.23)	0.17			0.24
Cigarette use in home	0.89 (0.49, 1.61)	0.70	0.77 (0.38, 1.55)	0.46	1.35 (0.46, 3.96)	0.59			0.39
Any substance use in home	1.06 (0.51, 2.22)	0.88	0.93 (0.39, 2.22)	0.87	1.63 (0.48, 5.48)	0.43			0.46
Marijuana use in home	10.3 (4.76, 22.27)	<0.001	11.42 (3.52, 37.09)	<0.001	9.19 (3.39, 24.91)	<0.001			0.78
Caregiver physical health	1.19 (0.55, 2.59)	0.66	1.13 (0.44, 2.91)	0.80	1.33 (0.34, 5.27)	0.68			0.85
Caregiver psychiatric diagnosis	1.22 (0.60, 2.48)	0.59	0.92 (0.35, 2.41)	0.86	1.97 (0.70, 5.57)	0.20			0.29
Behavioral symptoms index (BASC)	1.03 (1.01, 1.06)	0.011	1.03 (1.00, 1.06)	0.027	1.03 (0.98, 1.08)	0.21			0.89
Conduct problems subscale (BASC)	1.06 (1.03, 1.08)	<0.001	1.06 (1.03, 1.10)	<0.001	1.04 (1.00, 1.08)	0.038			0.44
Emotional symptom index (BASC)	1.02 (0.99, 1.05)	0.27	1.03 (0.99, 1.07)	0.10	0.97 (0.88, 1.06)	0.48			0.21
Stressful life events: at least one bad event	1.80 (0.66, 4.95)	0.25	2.17 (0.71, 6.64)	0.18	1.04 (0.16, 6.81)	0.97			0.16
Stressful life events: total bad events	1.14 (0.96, 1.35)	0.12	1.27 (1.02, 1.58)	0.036	0.96 (0.79, 1.18)	0.73			0.06
WIAT math score	1.01 (0.98, 1.04)	0.49	1.01 (0.98, 1.04)	0.63	1.02 (0.97, 1.07)	0.41			0.61
WIAT word score	1.02 (1.00, 1.05)	0.07	1.02 (0.99, 1.05)	0.12	1.02 (0.97, 1.06)	0.48			0.78
Parent-child communication < 40	1.05 (0.50, 2.20)	0.89	1.06 (0.46, 2.44)	0.90	1.05 (0.28, 3.91)	0.95			0.99
Parent-child involvement < 40	0.74 (0.37, 1.49)	0.40	0.53 (0.23, 1.20)	0.13	1.37 (0.41, 4.57)	0.61			0.19
Parent-child relationship autonomy < 40	1.42 (0.72, 2.80)	0.31	0.91 (0.37, 2.25)	0.83	2.91 (0.97, 8.71)	0.05			0.11
Parent-child relationship limit setting < 40	1.31 (0.35, 4.91)	0.69	0.84 (0.10, 7.27)	0.87	1.85 (0.31, 11.12)	0.50			0.58
Parent-child relationship support < 40	0.48 (0.13, 1.76)	0.27	0.27 (0.03, 2.68)	0.26	0.85 (0.17, 4.30)	0.84			0.42
Parent-child relationship satisfaction < 40	1.16 (0.39, 3.40)	0.79	1.06 (0.25, 4.46)	0.94	1.35 (0.31, 5.90)	0.69			0.81
Parent-child relationship composite score	0.75 (0.39, 1.44)	0.38	0.59 (0.27, 1.29)	0.19	1.24 (0.40, 3.88)	0.71			0.28
HIV status	0.73 (0.37, 1.46)	0.37							
PHIV+ Only									
CD4 >500 cell/mm ³			1.56 (0.85, 2.83)	0.15					
HIV RNA >400 copies/mL			1.17 (0.66, 2.05)	0.59					
Ever had a CDC Class C diagnosis			0.69 (0.18, 2.67)	0.59					

Risk Factor	Full sample			PHIV +			PHEU		
	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	aOR ^a (95% CI)	P-value	Interaction P-value
Missed ART dose in last 7 days			1.65 (0.92, 2.97)	0.09					
Knows HIV status			0.96 (0.49, 1.78)	0.84					

PHACS Pediatric HIV/AIDS Cohort Study, AMP Adolescent Master Protocol, PHIV+ perinatally HIV-infected, PHEU perinatally HIV-exposed but uninfected, aOR adjusted odds ratio, CI confidence interval, BASC Behavioral Assessment System for Children, WIAT Wechsler Individual Achievement Test, ART antiretroviral therapy

^aAdjusted for caregiver education, household income, caregiver type, age, race, ethnicity, and sex. Models not stratified by HIV status or not pertaining to PHIV+ subjects include statistical control for HIV status. With the exception of models used to estimate the effects of alcohol, cigarette, marijuana, or any substance use in the home, the models include an additional adjustment for caregiver substance use.