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Predicting Arrest in a Sample of Youth Perinatally Exposed to HIV: The Intersection of HIV and Key Contextual Factors

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Abstract

We examined the role of youth HIV status and other key factors on past-year arrest in perinatally HIV-exposed but uninfected (PHIV-) and perinatally HIV-infected (PHIV+) youth using data from a multi-site study of psychosocial behaviors in PHIV-exposed urban youth (N=340; 61% PHIV+; 51% female; ages 9–16 at baseline). Youth and caregivers were administered 5 interviews, spanning approximately 7.5 years. Using longitudinal logistic mixed-effect models, we explored the association between past year arrest, internal (e.g. substance use disorder (SUD)) and external (e.g. neighborhood arrest rates) contextual factors, and social-regulation processes (e.g. in-school/work). Arrest rates increased from 2.6%–19.7% across follow-ups; there were no differences in arrest over time by HIV status. In the final model, odds of arrest were greater for youth who were male, with SUD, 18 years old, with high levels of city stress, and neither in school nor employed. PHIV-exposed, urban youth have much higher rates of arrest than national samples. Lack of differences in arrest by HIV status suggests key contextual factors are more important in promoting arrest.

Keywords

youth; adolescence; arrest; perinatal HIV; longitudinal

INTRODUCTION

In the US, children perinatally-infected with HIV (PHIV+) now survive into young adulthood (1). In this most challenging developmental transition period (2), patterns of positive and risky behaviors are established that carry through to adulthood (3). In particular,

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the adolescence-young adulthood transition period is one that coincides with an increase in crime and arrests (4, 5, 6). Adolescents and young adults (AYA) with PHIV are typically growing up in inner-city communities, affected by not only familial HIV, but also poverty, violence, community substance use and high crime rates (7). The family toll from these factors can decimate support systems, leaving PHIV+ AYA vulnerable to poor physical and behavioral health outcomes. As PHIV+ youth now move into young adulthood, they may experience even fewer social and financial supports (2). In the context of managing a chronic, stigmatized, sexually transmitted illness, this decrease in support may result in negative behavioral outcomes, including arrest.

In the US, populations that carry the burden of HIV are also those overly represented in the justice system: those with minority status (8, 9), who reside in impoverished neighborhoods with high crime rates and high community HIV viral load (10–13). Furthermore, risk for arrest among PHIV+ AYA may be increased because of limited parental monitoring, caretaking transitions, or the consequences of maternal physical or psychiatric illness (14–17). In addition to familial and community level factors, risk for arrest among PHIV+ AYA may be increased because of high rates of psychiatric and substance use problems (e.g. 61% and 57%, respectively (18,19)) as well as the neurocognitive effects of HIV. Several studies of PHIV+ infants and children have reported the effects of HIV on the central nervous system, resulting in developmental and cognitive deficits (22), including impaired executive functioning in adolescents (22, 23), which may have occurred among older PHIV+ youth as a result of early years of suboptimal medication and poorly controlled HIV infection and encephalopathy (24, 25). For example, a recent study found 25% PHIV+ youth with a previous AIDS-defining illness (CDC defined class C event) had impaired cognitive functioning compared to 8.6% without a class C event and 12.1% of PHIV-youth (22). Deficits in executive functioning have been associated with arrest, in both childhood and adolescence (26), thus, PHIV+ AYA with these deficits may be at increased risk for arrest.

Yet, it is also possible that youth or caregiver HIV status may offset other contextual, familial or individual risks for arrest and instead work as a protective mechanism. For example, some studies have found positive behavioral outcomes, such as *decreased* substance use and intentions to have sex, in youth with an HIV+ caregiver compared to those without (20, 21). Furthermore, given their HIV status, PHIV+ youth may be significantly cognitively and developmentally delayed and may experience greater monitoring and supervision from caregivers (e.g. have an earlier curfew), which may limit the opportunities for delinquent behavior and justice involvement (26). Finally, in the context of managing a stigmatizing illness, PHIV+ youth may limit peer networks, reducing opportunity for exposure to delinquent peer groups (27).

However, to our knowledge, no studies have examined arrest risk among this population across adolescence and into young adulthood, or identified factors that confer greatest risk. Arrest with potential incarceration and deeper justice involvement is of particular concern for PHIV+ AYA, who manage a chronic health condition requiring considerable medical attention, adherence to treatment and care, all of which may be disrupted following arrest. As pediatric HIV in the US has become an adolescent and young adult epidemic, understanding the effects of youth HIV infection, the effects of having an HIV+ caregiver,

and other related contextual factors on youth arrest is an important first step in identifying salient risk and protective factors for arrest in PHIV+ youth. These data can inform the development of targeted interventions aimed at reducing delinquent behavior as well as inform the management of HIV for those PHIV+ youth involved in the justice system.

Using data from a longitudinal cohort study of PHIV+ AYA with a comparison group of perinatally HIV-exposed, but uninfected (PHIV-) AYA, the current study is guided by Social Action Theory (SAT) (28). The SAT model posits that behavioral health outcomes are influenced by (a) internal and external contexts, and (b) self- and social-regulation processes (e.g., youth motivation, capabilities and family functioning). The objectives of this analysis were to examine the role of youth's HIV status as well as other key internal contextual factors, external contextual factors, and social regulation on youth arrest across adolescence. Perinatally-exposed HIV-negative youth (seroreverters) are an adequate comparison group for PHIV+ AYA (29) as most sociodemographic and family characteristics, including perinatal exposure to maternal HIV disease, are similar (30, 31). Although there may be some maternal pregnancy characteristics that are different between these two groups, seroreverters provide a unique opportunity to examine the contribution of HIV infection to youths' risk of arrest.

METHODS

Participants and Procedures

Project CASAH participants were recruited between 2003 and 2008 from four NYC medical centers providing primary and tertiary care to HIV-affected families to complete two interviews 18 months apart. Participants included youth and his/her primary caregiver with the following inclusion criteria: (1) youth aged 9–16 years with perinatal exposure to HIV (confirmed by medical providers and charts), (2) cognitive capacity to complete interviews, (3) English- or Spanish-speaking, and (4) caregiver with legal ability to sign permission for child participation.

Of 443 eligible participants, 17% refused contact or could not be contacted by study coordinators. Of the 367 caregiver-youth dyads approached, most agreed to participate (93%); 340 were enrolled at baseline (BL), representing 77% of eligible families (206 PHIV+ and 134 PHIV- youth); and 82% of the 340 (166 PHIV+ and 114 PHIV-) were retained at the first follow-up (FU1).

Although not initially planned, additional funding supported following the cohort for three additional interviews (FU2, FU3, FU4); 84% of participants who completed BL and FU1 (179 PHIV+ and 105 PHIV-) were re-recruited. The median time interval between BL and FU1 was approximately 1.5 years (*interquartile range (IQR)*=1.4–1.7); between FU1 and FU2 interviews was 2.9 years (*IQR*=1.9–4.0), between FU2 and FU3 was 1.3 years (*IQR*=1.1–1.8), and between FU3 and FU4 was 1.2 years (*IQR*=1.0–1.4).

Data sources included caregiver and youth interviews and medical chart abstraction of HIV RNA viral load and CD4 cell counts. Caregivers and youth were interviewed separately in English or Spanish at the family's home, their medical clinic, or study research offices.

Institutional Review Board approval was obtained from all study sites and the principal investigator's home institution; written informed consent and assent was obtained. Monetary reimbursement for time and travel was provided.

Measures

Main Outcome: Youth Arrest—Past-year youth arrest was measured by self-report. First, at BL, FU1, FU2, and FU4 youth and caregivers completed the Conduct Disorder module of the Diagnostic Interview Schedule for Children-IV (DISC-IV) (32), which contains questions about youth's lifetime and past year arrest history. The DISC-IV is a well-validated diagnostic instrument that assesses the most common psychiatric and substance use disorders as defined by *Diagnostic Statistical Manual* (DSM) (33). Second, at FU2, FU3, and FU4, youth were asked whether they had been arrested in the last year using items from Monitoring the Future (34). Youth were categorized as arrested in the past year based on either youth or caregiver report. We computed kappa statistics to measure the observed level of agreement between 1) parent and youth report from the DISC-IV at BL, FU1, FU2, and FU4; 2) MTF youth self-report and the DISC-IV combined parent and youth report at FU2 and FU4; and 3) MTF youth self-report and DISC-IV youth self-report only at FU2 and FU4. Kappa values for the first comparison ranged from 0.31 to 0.52, which according to Landis and Koch (35), indicate fair to moderate agreement. Kappa values for the 2nd and 3rd comparison ranged from 0.69 to 0.77, indicating substantial agreement.

Contextual factors—All contextual and social-regulation factors were measured at each time point with the exception of youth HIV status and gender.

Internal context.: *Youth HIV status* was determined via youth enrollment in an HIV primary care clinic, verified by clinicians. *Youth demographics* included current age, gender and race/ethnicity. Presence (yes/no) of youth current *psychiatric disorder* or *substance use disorder* (SUD) was assessed using the DISC-IV. The most common DSM-IV adolescent disorders were examined: (a) any behavioral disorder (attention deficit/hyperactivity disorder, oppositional defiant disorder, conduct disorder); (b) any mood disorder (major depressive disorder, dysthymia, bipolar disorder); (c) any anxiety disorder (social anxiety disorder, separation anxiety disorder, specific phobia, agoraphobia, panic disorder, generalized anxiety disorder, obsessive-compulsive disorder); and (d) any SUD (alcohol, marijuana, and other substance use).

External context.: *Caregiver HIV status* was assessed via several questions about personal HIV-tests and the results. For data analysis, caregiver's HIV status was treated as a dichotomous variable (HIV infected vs. uninfected). *Caregiver demographics* included caregiver report of age, gender, current employment, and household income. Household income was categorized in ranges for below the New York State poverty line for a family of 4 (\$25,000 or less), and above (e.g., \$25,001-\$50,000; \$50,001-\$75,000; and over \$75,000). *Caregiver mental health* was assessed with the *Beck Depression Inventory* (BDI) (36) and the trait scale of the *State-Trait Anxiety Inventory* (STAI) (37). The BDI is a 21-item scale of depressive symptoms experienced in the past 2 weeks. The trait scale of the STAI is a 20-item scale measuring how the respondent feels in general. For each measure, a total score

was created. We found high internal consistency for the STAI trait scale ($\alpha = .92$) and the BDI ($\alpha = .89$). Additionally, *caregiver alcohol dependence/abuse*, *non-alcohol substance use dependence/abuse* and *Post-Traumatic Stress disorder (PTSD)* were measured using the related diagnostic modules from an adult psychiatric screening tool, the Clinical Diagnostic Questionnaire (CDQ), validated for use with HIV-affected adult populations (38). *Caregiver arrest* was determined by youth report on a “Life Events Checklist” which assessed whether various important events happened to the youth in the past year, including a “parent going to jail”. *City Stress* (39) is a 16-item measure of primarily urban stressful situations that youth may experience in their neighborhoods (e.g. seeing drug deals; witnessing gang fights). Youth report whether they have ever had the experience (yes/no). Higher scores indicate a higher level of experienced city stress. Finally, using publicly available data (40) *neighborhood felonies* and *misdemeanors* were determined by linking youths’ self-reported zip codes to the corresponding NYC precinct data, and assigning to each youth the total number of felony and misdemeanor charges reported in their neighborhood.

Social- and self-regulation factors.: Youth enrollment in school or current employment status (*in school/working*) was defined using youth self-report. *Learning problems* were assessed if either the youth or their caregiver reported that the youth experienced one of the following: had been in a resource room in the past year, had ever been in special education classes, or had an individualized education plan. Youth *self-concept* was measured using the Tennessee Self-Concept Scale:2 (41) that yields scores for personal self-concept (personal worth); family self-concept (feelings of worth as a family member); and social self-concept (sense of adequacy in social interactions). Items are answered on a 5-point Likert Scale (1=always false to 5=always true); higher scores indicate higher self-concept in those areas.

Biomedical and chart data were collected within 2.42 months (with standard deviation 3.77 months) to the psychosocial interview date.

Statistical Analysis

Baseline contextual and regulation process factors were summarized by youth HIV status using means, standard deviations, counts, and percentages as appropriate. Medians and interquartile ranges are presented for characteristics with skewed distributions. Differences by youth HIV status were tested using chi-square tests for categorical variables and t-tests (or Wilcoxon rank sum test for non-normal distributions) for continuous variables.

To characterize past year arrest across the five waves of data collected from adolescence into young adulthood, the observed prevalence of past year youth arrest across age (range 9–26 years) was plotted for three birth cohorts (9 to 10, 11 to 13, and 14 to 16 years of age at baseline) and stratified by HIV status. Differences by HIV status in the pattern of arrests by age were tested using an age by HIV status interaction term in a logistic mixed effects model with a random intercept to account for repeated measures within individuals. A cubic spline curve using the truncated power function was used to account for the nonlinear relationship between age and past year arrest.

To identify predictors of past year arrest, separate longitudinal logistic mixed effect models with a random intercept to account for repeated measures were fit for each of the three steps

or groups of predictors according to the SAT model: (1) internal context factors: youth gender, youth HIV status, youth race/ethnicity (African American vs. Hispanic/White/other); and time-varying youth age (recoded into age groups: 9 to 12, 13 to 17, vs. 18 and over), youth psychiatric disorder (any vs. none) and youth substance use disorder (any vs. none); (2) external context factors: caregiver gender, caregiver HIV status, caregiver current employment, and household annual income (under \$25,000 vs. over \$25,000); time-varying caregiver PTSD (yes vs. no), caregiver mental health (BDI, STAI scores), caregiver substance use (alcohol or drug use vs. none), caregiver arrest in the past year; city stress and neighborhood crime rates (total felonies and misdemeanors), and (3) social- and self-regulation factors: time-varying youth, family, personal and social self-concept scores, youth learning problems, and youth productivity (in school/working vs. not). To assess for potential non-random missing, Little's test of missing completely at random (MCAR) (42) was performed on the repeated measures of past year arrest. Significant predictors at $p < .10$ were selected and included simultaneously in a final combined model, with youth HIV status included as a predictor regardless of significance. To avoid multicollinearity, highly correlated predictors were fit separately within each model step, and the predictor that was significant was used in the final model step. The moderation effect of youth HIV status on youth gender was explored by testing the significance of the interaction term in the final model.

Finally, separate logistic regression analyses examined whether the participants lost and retained at FU4 differed by key baseline characteristics: age, gender, HIV status, arrest, any psychiatric or substance use disorder. The only difference found was that youths with any psychiatric disorder at baseline were significantly more likely to be retained at FU4 (Wald $\chi^2(1)=6.56, p=.01$).

RESULTS

Contextual and Social Regulation Factors and Arrest by HIV Status

Table I presents baseline sample characteristics for PHIV+ and PHIV- youth by SAT constructs.

Internal Context factors—At baseline, there were no significant differences between PHIV+ and PHIV- youth in age, gender, or race/ethnicity, any psychiatric or any substance abuse disorder by HIV status.

External contextual factors—Significantly fewer PHIV+ youth were living with an HIV + caregiver (31.12% vs. 68.46%; $\chi^2=43.9; p<.0001$) and annual household income differed significantly by youth PHIV status ($\chi^2=13.0, p=.005$) with PHIV+ families reporting higher incomes; This difference may be attributable to additional assistance caregivers of PHIV+ youth receive; the majority of families in the sample regardless of youth HIV status lived below the poverty line in New York State. There were no significant differences between families of PHIV+ and PHIV- youth in caregiver gender and employment status.

Neither caregiver depressive symptoms nor trait anxiety symptoms differed significantly by youth PHIV status. For all youth, caregivers met criteria for mild depression (median (m)

PHIV₊ = 5, IQR = 2–10, median (m)_{PHIV-} = 7, IQR = 2–12) and low anxiety (m_{PHIV+} = 31, IQR = 24–39, m_{PHIV-} = 33, IQR = 26–44). Among caregivers, the proportion of PTSD diagnoses, alcohol and or drug use disorder diagnoses, past year arrest, city stress or total neighborhood felonies did not differ significantly by youth PHIV status.

Social- and self-regulation factors—Youth variables in this domain did not differ significantly by youth PHIV status. At baseline, most youth were currently in school or working (99.4%) and over half reported learning problems: 62.05% and 51.59% for PHIV₊ and PHIV₋ youth respectively. Youth self-concept did not differ by PHIV status: on average both groups scored high (3.96–4.24) on family, personal and social self-concept scales.

Past Year Arrest—Figure 1 presents the prevalence of longitudinal past year arrest by age and PHIV status across three birth cohorts (Baseline ages 9–10; 11–13; 14–16 years). Rates of arrest increased by age: 0% arrest at ages 10–12 in all youth and up to a peak of 38.5% by ages 18–19 in the PHIV₋ youth, and a peak of 25.0% by ages 21–22 in the PHIV₊ youth. However, there was no significant effect of youth PHIV status ($F_{5,1036}=1.67$, $p=.14$) on past year arrest across age.

SAT model predictors of past year arrest

Table II presents the associations of fitting both the initial separate and final combined longitudinal logistic regression models to identify key contextual and social-regulation factors as predictors of youth past year arrest. There was no significant effect of youth HIV status on past year arrest in either the separate initial models (odds ratio (OR)=0.87, 95% confidence interval (CI): 0.50, 1.50) or the combined final model (OR=0.93, 95%CI:0.53, 1.64). Little's test of MCAR was found not significant ($\chi^2(28, N = 340) = 39.8$, $p = .068$), supporting the assumption that no non-random patterns exist in the missing data.

Internal Context—Males had over three times the odds of being arrested in the past year compared to females (OR=3.46, 95%CI:1.97, 6.06). The odds of past year arrest were lower for youth younger than 13 (OR=0.02, 95%CI:0.002, 0.13) and between 14 and 17 (OR=0.52, 95%CI:0.32, 0.84) compared to youth older than 18 years of age. Any psychiatric disorder (OR=1.76, 95%CI:1.05, 2.93) and any SUD (OR=6.07, 95%CI:3.41, 10.81) were also significant predictors of past year arrest.

External context—Of the external contextual factors examined, only city stress significantly predicted past year arrest over time. For each one-point increase on the city stress scale, the odds of past year arrest increased by a factor of 3.29 (95%CI: 2.03, 5.33). The total number of neighborhood misdemeanors was highly correlated with neighborhood felonies and was omitted from the model step.

Social- and self-regulation factors—Of the youth self-concept factors assessed, only higher family self-concept was significantly associated with lower odds of past year arrest (OR=0.58, 95%CI: 0.40, 0.84). Personal self-concept was highly positively correlated with family self-concept and was not significantly associated with past year arrest, and was

therefore omitted from the model step. Youth either in school or currently employed were significantly less likely to report past year arrest (OR=0.23, 95%CI: 0.15, 0.35).

Final SAT model predictors of past year arrest

All factors significant at $p < .10$ from the initial separate SAT domain models were combined into a final model (Table II); youth HIV status, a key variable of interest, was retained in the final model, despite non-significance in the internal context model. In the final model, the odds of past year arrest were higher for males compared to females (OR=3.36, 95%CI: 1.86, 6.09) and for youth with any SUD (OR=5.14, 95%CI: 2.75, 9.62). Compared to youth 18 years old or over, the odds of past year arrest were significantly lower for youth aged 9 to 13 (OR=0.05, 95%CI: 0.006, 0.38) but was no longer significantly different for youth aged 14 to 17 (OR=0.75, 95%CI: 0.43, 1.30). Youth reporting high levels of experienced city stress (OR=2.33, 95%CI: 1.52, 3.58) and youth neither in school nor employed (OR=0.44, 95%CI: 0.26, 0.75) had significantly higher odds of past year arrest. The effects of any psychiatric disorder (OR=1.33, 95%CI: 0.75, 2.33) and family self-concept (OR=0.83, 95%CI: 0.54, 1.27) were no longer significant in predicting past year arrest in the final model. The moderation effect of youth HIV status on youth gender tested with an interaction term was not significant in the final model ($F_{1,73} = 0.25, p = .618$); male youth had higher odds of past year arrest, regardless of HIV status.

DISCUSSION

This is the first study that we know of to examine prospectively rates of arrest among PHIV+ and PHIV- youth, exploring the role of youth and caregiver HIV status as well as other key social-regulation and contextual factors. Across study waves, past year rates of arrest ranged between 2.6%–19.7%, *substantially* higher than national rates (0.7–6.1%) (43) but similar to other studies of past-year arrest of same-aged high risk/delinquent youth (44). Overall, rates of arrest peak across study time points for both groups, with rates peaking during the late teens and then decreasing in the early twenties, a pattern found in the FBI crime report (45) and in prior studies of youth (6). There were no differences in arrest over time by HIV status, even after adjusting for other key contextual and social regulation variables, suggesting that despite all the risks conferred by HIV infection described previously, these vulnerabilities do not promote risk of arrest. It is possible that the current sample size was insufficient to detect an HIV-effect. It is also possible that key contextual factors – impoverished communities of color with histories of economic and structural factors, including considerable police presence/surveillance – are more important in promoting the risk of arrest in these youth. Many of these same contextual factors also promote the risk of acquisition and transmission of HIV.

In our SAT model, we examined whether internal and external contextual factors, in addition to social regulation factors, would influence youth arrest. With respect to internal contextual factors, we found that males and older youth (18) reported a greater likelihood of past year arrest over time. Having a substance use disorder was the strongest predictor of arrest, even after accounting for other social-regulation and contextual factors. These findings are

consistent with the literature examining predictors of delinquency, crime or arrest in youth (46, 47).

Examination of external contextual and social/self-regulation factors showed that neighborhood disorder and social disorganization, as well as youth unemployment/school dropout were strongly associated with increased risk of arrest. These results are consistent with previous research (48, 49) on employment or school enrollment, particularly in the context of neighborhood disorder and disorganization, and highlight the importance of structured activity (50), and improved educational and vocational opportunities for urban ethnic minority communities, and minimization of unsupervised time for youth (51).

Existing theories developed to understand the mechanisms through which neighborhood characteristics influence youth crime have identified critical mediators within caregiver/family domains (52). Caregiver and family variables were not associated with youth arrest in our final model. Lack of observed associations with respect to caregiver/family domains compared to prior studies may reflect the nature of offending examined (e.g. type of crime, arrest vs report of behavior). Furthermore, family processes (e.g. warmth, supervision) not directly captured in the current study may be more critical predictors of youth arrest than feeling valued as a family member, caregiver psychiatric problems, criminal behavior or illness. Future research examining key family variables as well as peer variables is warranted to more carefully understand the role of potential pathways through which neighborhood characteristics may influence youth behavior/arrest.

Limitations

Several limitations of this study should be noted. Participants were recruited from HIV primary care clinics in NYC, and findings may not generalize to PHIV+ and PHIV- youth in other settings. It is possible that youth who were lost to follow-up may be at differential risk of arrest, though the result from our test of missing data found no evidence for this. We could not determine if arrest and key variables from the SAT model are causally related. In our analyses, we found differences between PHIV+ and PHIV- youth in follow-up length of time from baseline to FU1, and FU1 to FU2. Therefore, the analyses focused on current youth age instead of the follow-up time point. The data are self-report and subject to issues of social desirability. We did not verify self-report of arrest by official records, although self-report is largely consistent with official records (53), nor did we examine differences by type of arrest due to limitations of statistical power. We did not capture data on childhood maltreatment or sexual abuse, or on peer norms and behaviors, and so could not examine the influence of these variables on the arrest rate over time.

CONCLUSIONS

By young adulthood, 38.5% of PHIV- youth, and 25.0% of PHIV+ youth reported past-year arrest, suggesting a substantive need for prevention efforts with this population. A large body of research has determined that there is no single path to justice system involvement (54) but presence of several specific risk factors increases a youth's likelihood of arrest (55). To date, arrests and other conduct-related factors have been minimally addressed in the pediatric HIV literature. The results from the current study provide an important opportunity

for medical providers, families of adolescents with HIV and those with HIV exposure to become aware of risks associated with arrest during older adolescence/young adulthood and to initiate mechanisms to identify and ameliorate risk as they provide care for these young people. In particular, the importance of counselling regarding the value of education/employment and support services to foster ongoing successful educational outcomes and engagement in employment may serve to reduce the likelihood of arrest among these youth. Similarly, careful, early assessment of risk for substance use and early intervention to reduce such risk is possible for providers of PHIV+ youth who see these youth multiple times a year. The challenge for the field, however, lies in preventing arrest for PHIV- youth, many of whom may *not* be connected to clinical services like their PHIV+ counterparts. While schools and community centers are possibilities for reaching and educating these youth, anecdotal evidence suggests that PHIV+ youth are not consistently in school or connected to community programs to receive these interventions. Finally, although not significant in the final model, findings suggest that the family may play a crucial role in reducing risk of arrest for these youth. Supporting families of youth infected and affected by HIV through family-based prevention programming may help these families scaffold children in high-risk environments so as to reduce the influence of neighborhood disorder and social disorganization. In particular family members who are aware of or have been educated about symptoms/characteristics associated with risk for substance use can provide early intervention and prevention as they recognize these signs in their youth.

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Figure 1.
Development of Youth Past Year Arrest by Baseline Age Cohorts by HIV Status

Table I.

Baseline Sample Characteristics by HIV Status among a Sample of Perinatally Exposed Youth (N=340)

Characteristics	HIV+ (n=206)		HIV- (n=134)		Test statistic ^d	p-value
	n	%	n	%		
<i>Youth Internal context</i>						
Gender					0.002	.963
Male	102	49.51	66	49.25		
Female	104	50.49	68	50.75		
Age ^b	12.7	(2.16)	12.4	(2.37)	−1.23	.218
Race / Ethnicity					4.54	.209
Latino	73	35.44	61	45.52		
African American	98	47.57	58	43.28		
Black Hispanic	26	12.62	10	7.46		
Other	9	4.37	5	3.73		
Any psychiatric disorder	69	33.50	49	36.57	0.34	.561
Any SUD	4	1.94	7	5.22	2.79	.095
HIV Characteristics						
Viral Load ^b	605.67 (318.4)					
CD4 ^e	3.5 (0.84)					
ART	133	68.7				
<i>External context</i>						
Caregiver Gender					0.274	.600
Male	27	13.11	15	11.19		
Female	179	86.89	119	88.81		
Caregiver HIV+ ^a	61	31.12	89	68.46	43.87	<.0001
Caregiver employed ^a	59	30.10	27	20.93	3.36	.067
Household Income ^a					13.02	.005
\$25,000 or less	92	49.73	85	70.25		
\$25,001-\$50,000	67	36.22	24	19.83		
\$50,001-\$75,000	16	8.65	8	6.61		
\$75,001-\$150,000	10	5.41	4	3.31		
Caregiver PTSD ^a	36	18.37	35	27.13	3.50	.061
Caregiver BDI score ^{a,c}	5	(2–10)	7	(2–12)	21615	.130
Caregiver STAI score ^{a,c}	31	(24–39)	33	(26–44)	22507	.060
Caregiver alcohol or drug use ^a	9	4.59	11	8.53	2.09	.149
Caregiver past year arrest ^a	10	5.10	5	3.88	0.27	.606
Youth City Stress Inventory ^{b,c}	0.56	(0.25–0.875)	0.69	(0.25–1.07)	22229	.150

Characteristics	HIV+ (n=206)		HIV- (n=134)		Test statistic ^d	p-value
	n	%	n	%		
Neighborhood total felonies ^{a,b}	3020.3	926.37	2980.2	954.15	-0.25	.801
Neighborhood total misdemeanors ^{a,b}	6103.7	2436.22	6429.2	2615.98	0.77	.443
<i>Social- and Self- regulation factors</i>						
Family self-concept ^a	4.20	0.61	4.24	0.63	0.51	.612
Personal self-concept ^a	3.96	0.56	4.06	0.60	1.52	.131
Social self-concept ^a	3.99	0.70	3.98	0.79	-0.17	.862
Learning problems ^a	121	62.05	65	51.59	3.44	.064
Currently in school/working ^a	194	98.98	129	100	1.32	.250

SUD=substance use disorder; BDI=Beck Depression Inventory; PTSD=posttraumatic stress disorder; STAI=State Trait Anxiety Inventory

^aDue to missing data, means or percent are not generated based on the total for each group

^bMean (standard deviation)

^cMedian (interquartile range)

^dChi-square test statistics are displayed for categorical characteristics, independent t-test statistics are displayed for normally distributed continuous characteristics, and Wilcoxon rank sum Z-statistics are displayed for non-normally distributed continuous characteristics.

^elog₁₀ mean

Table II.

Longitudinal Logistic Regression models predicting past year arrest across adolescence in youth perinatally exposed to HIV (N=340)

Characteristics	Initial Separate Models			Final Combined Model		
	F-value	OR	95% CI	F-value	OR	95% CI
<i>Step 1: Internal Context</i>						
Youth HIV+	0.27	0.87	(0.50, 1.50)	0.06	0.93	(0.53, 1.64)
Youth male	18.8	3.46***	(1.97, 6.06)	16.0	3.36***	(1.86, 6.09)
Youth age (ref: 18 years)	9.83			4.19		
9 to 13 years		0.02***	(0.002, 0.13)		0.05**	(0.006, 0.38)
14 to 17 years		0.52**	(0.32, 0.84)		0.75	(0.43, 1.30)
African American	0.05	1.07	(0.62, 1.82)		--	--
Any psychiatric disorder	4.64	1.76**	(1.05, 2.93)	0.96	1.33	(0.75, 2.33)
Any SUD	37.6	6.07***	(3.41, 10.81)	26.2	5.14***	(2.75, 9.62)
<i>Step 2: External Context</i>						
Caregiver male	0.34	1.35	(0.49, 3.77)		--	--
Caregiver HIV+	0.19	1.17	(0.58, 2.37)		--	--
Caregiver currently working	0.01	1.04	(0.46, 2.34)		--	--
Household income under \$25,000	0.13	0.87	(0.40, 1.88)		--	--
Caregiver PTSD	0.52	1.27	(0.66, 2.43)		--	--
Caregiver BDI score	0.03	1.00	(0.96, 1.05)		--	--
Caregiver STAI score	0.73	1.02	(0.98, 1.06)		--	--
Caregiver alcohol / drug use	0.08	1.19	(0.36, 3.93)		--	--
Caregiver past year arrest	0.31	0.70	(0.20, 2.48)		--	--
Youth City Stress Inventory	23.3	3.29***	(2.03, 5.33)	15.0	2.33**	(1.52, 3.58)
Neighborhood total felonies ^a	0.002	1.01	(0.71, 1.43)		--	--
<i>Step 3: Social- and Self-regulation factors</i>						
Family self-concept	8.25	0.58**	(0.40, 0.84)	0.75	0.83	(0.54, 1.27)
Social self-concept	1.21	0.99	(0.68, 1.44)		--	--
Learning problems	0.01	0.97	(0.63, 1.51)		--	--
Currently in school / working	45.52	0.23***	(0.15, 0.35)	9.12	0.44**	(0.26, 0.75)

SUD=substance use disorder; BDI=Beck Depression Inventory; PTSD=posttraumatic stress disorder; STAI=State Trait Anxiety Inventory

p<.001,

**
p<.05,

*
p<.10.

^aTotal felonies scaled by 1000.