Published in final edited form as:
AIDS Care. 2012 August ; 24(8): 953–962. doi:10.1080/09540121.2012.668174.

Prevalence and Change in Psychiatric Disorders Among Perinatally HIV-Infected and HIV-Exposed Youth

Claude A. Mellins[1], **Katherine S. Elkington**[1], **Cheng-Shiun Leu**[1], **E. Karina Santamaria**[1], **Curtis Dolezal**[1], **Andrew Wiznia**[2], **Mahrukh Bamji**[3], **Mary M. Mckay**[4], and **Elaine J. Abrams**[5]

[1]HIV Center for Clinical and Behavioral Studies, New York State Psychiatric Institute, and Columbia University, New York, USA

[2]Jacobi Medical Center, Albert Einstein College of Medicine, Bronx, New York, USA

[3]Department of Pediatrics, Metropolitan Hospital Center, New York Medical College, New York, USA

[4]Mount Sinai School of Medicine, New York, USA

[5]Department of Pediatrics, Harlem Hospital Center and ICAP, Mailman School of Public Health, Columbia University, New York, USA

Abstract

As the pediatric HIV epidemic in resource-rich countries evolves into an adolescent epidemic, there is a substantive need for studies elucidating mental health needs of perinatally HIV-infected (PHIV+) youth as they transition through adolescence. This article examines the role of perinatal HIV infection in influencing mental health by comparing changes in psychiatric disorders and substance use disorders (SUD) in perinatally HIV-infected (PHIV+) and perinatally HIV-exposed, but uninfected (PHIV−) youth over time. Participants were recruited from four medical centers in New York City. Individual interviews were administered at baseline and 18-month follow-up to 166 PHIV+ and 114 PHIV-youth (49% male, age 9–16 at baseline). Youth psychiatric disorder was assessed using the caregiver and youth versions of the Diagnostic Interview Schedule for Children (DISC-IV). Over two-thirds of participants met criteria for at least one psychiatric disorder at either baseline or follow-up, with few group differences. Among PHIV+ youth, there was a significant decrease in the prevalence of any psychiatric disorder, as well as anxiety disorders specifically over time, while prevalence of any psychiatric disorder among PHIV− youth remained the same and mood disorders increased. Rates of SUD were low in both groups, increasing slightly by follow-up. PHIV+ youth reported more use of mental health services at follow-up. CD4 count and HIV RNA Viral Load were not associated with presence or absence of disorder at either time point. In conclusion, among PHIV+ and PHIV− youth, rates of psychiatric disorder were high, even compared to other vulnerable populations, suggesting that factors other than perinatal HIV infection may be important determinants of mental health. PHIV+ youth were more likely to improve over the observation period. The data underscore the critical need for mental health interventions for both PHIV+ and PHIV− youth.

Keywords

pediatric HIV; adolescence; psychiatric disorder; substance use disorder

Corresponding author: Claude Ann Mellins, Ph.D., Box 15, 1051 Riverside Drive, NY, NY 10032, cam14@columbia.edu.

Introduction

The individual and public health consequences of mental health and substance use problems are significant for perinatally HIV-infected (PHIV+) youth. Psychiatric disorders, including substance use disorders (SUD), have been associated with sexual risk behaviors and non-adherence to medical treatment, behaviors that may be detrimental to the health of youth, and result in HIV transmission (Domek, 2009; Remien & Mellins, 2007). Studies in the United States (US) indicate that PHIV+ children exhibit high rates of mental health problems (Fielden et al., 2006; Havens & Mellins, 2008). However, few studies with appropriate comparison groups follow PHIV+ youth as they age through adolescence, a time when many psychiatric disorders and SUD may emerge (Kessler et al., 2007).

PHIV+ youth face stressors that may make adolescence difficult and increase the likelihood of mental health problems. These include HIV-related neurologic/developmental disabilities (Chiriboga, Fleishman, Champion, Gaye-Robinson, & Abrams, 2005; Nozyce et al., 2006), stigma, familial death, and negative environmental characteristics (e.g., poverty, urban violence, racism) (Kang, Mellins, Ng, Robinson & Abrams, 2008). Many PHIV+ youth experience multiple caretaking transitions due to illness, death or family disruption (Havens & Mellins, 2008). Earlier in the epidemic when most PHIV+ adolescents were born, HIV+ women showed high rates of psychiatric disorders and SUD (Mellins et al., 2002; Morrison et al., 2002), increasing their children's risk for these problems via genetic and environmental pathways (Beardslee, Versage & Gladstone,1998).

In a review of eight studies examining DSM-defined psychiatric disorders in HIV+ youth (age range 4–21 years), high disorder rates were found, including Attention Deficit Hyperactivity Disorder (ADHD; 29%), anxiety (24%) and depression (25%) (Scharko, 2006). However, the role of HIV in the development of psychiatric disorders as youth transition through adolescence was difficult to determine. All studies were cross-sectional, mode of HIV transmission (e.g., perinatal vs. behavioral) was not always considered, and most lacked adequate comparison groups, and had small samples with large age ranges.

Two recent studies of PHIV+ youth with comparison groups showed mixed HIV-status effects. Among a sample of 340 9–16 year olds, including a comparison group of perinatally exposed, but uninfected (PHIV−) youth, 61% of PHIV+ compared to 49% of PHIV− youth met criteria for at least one disorder (Mellins et al., 2009). This difference was statistically significant, as were differences in rates of ADHD (18% PHIV+ vs. 8% PHIV−). Rates of SUD were low in both groups. The International Maternal Adolescent AIDS Clinical Trials (IMPAACT) 1055 Study compared rates of psychiatric symptoms in 319 PHIV+ youth to 256 HIV− youth (either PHIV− or in families with HIV) ages 6–18 years, finding high rates of disorders in both groups (61%) (Chernoff et al., 2009), but PHIV+ youth were almost twice as likely to have used illicit substances as PHIV− youth (SUDs were not measured) (Williams et al., 2010).

The above analyses were cross-sectional and the mean age of the youth was 12–13 years, an age at which SUD is rare and some psychiatric disorders may not have emerged (Kessler et al., 2007). Longitudinal studies are needed to examine the development of disorders as PHIV+ youth transition through adolescence as previous studies of other populations suggest considerable change during this time (Costello, Mustillo, Erkanli, Keeler & Angold, 2003). Such studies will inform effective interventions for the growing US population of PHIV+ youth, and for the much larger number of emerging adolescents in high HIV-prevalence countries (UNAIDS, 2010).

Using data from Project CASAH (Child and Adolescent Self Awareness and Health Study), one of the largest US-based longitudinal studies of behavioral outcomes in PHIV+ youth

that includes a comparison group of PHIV− youth from similar communities, this study examines 1) changes in prevalence and type of psychiatric disorders and SUD across two time-points and 2) the potential role of PHIV-infection and other critical contextual factors, such as family, demographic characteristics, and health markers (e.g. HIV RNA Viral Load) in influencing mental health outcomes.

Methods

Participants and Procedures

Data come from the baseline and 18-month follow-up interview of Project CASAH (Mellins et al., 2009). Participants were recruited from four New York City (NYC) medical centers that provide primary and tertiary care to HIV-affected families. Inclusion criteria were: 1) youth ages 9–16 years with perinatal exposure to HIV (as confirmed by medical providers and charts), 2) cognitive capacity to complete interview, 3) English or Spanish speaking, and 4) caregiver with legal capacity to sign consent for child participation. Among 443 eligible participants, 11% refused contact and 6% could not be contacted by the clinics. A total of 367 (83%) caregiver-youth dyads were approached, 340 enrolled, and 325 (196 PHIV+, 129 PHIV−) completed the full baseline interview; 280 participants (86%) completed the follow-up interview (166 PHIV+, 114 PHIV−), with a mean time interval of 18.5 months and no significant PHIV-status differences in rates of attrition. Among 60 participants lost to follow-up, 34 refused participation, 24 could not be contacted, and 2 youth died. There were no significant demographic differences, including HIV-status between the 60 youth with baseline data only and the 280 follow-up participants, with the exception of age. Youth lost to follow-up were significantly older (mean age=13.2 vs. 12.4, p=.01). There were also no differences in the baseline prevalence of psychiatric disorders between these two groups (data not shown).

Data sources included: 1) caregiver and youth interviews and 2) medical charts. Caregivers and youth were interviewed separately, but simultaneously by trained bachelor-level interviewers. Institutional Review Board approval was obtained from all sites; caregivers provided written consent for themselves and youth. Youth provided written assent (consent if ≥ 18 years). Monetary compensation for time and transportation was provided. Data were not collected on patients who refused baseline participation given HIV confidentiality.

Assessment

Child psychiatric disorder—was assessed using The Diagnostic Interview Schedule for Children (DISC-IV; generic parent/child versions; Shaffer et al., 1996), one of the most well-validated structured instruments to assess DSM diagnoses (American Psychiatric Association, 1994), that can be used by trained lay-interviewers. We focused on the most common DSM-IV child/adolescent disorders including anxiety, mood, disruptive behavior, and SUDs (Lewinsohn, Shankman, Gau & Klein, 2004). Caregivers and children were interviewed about child symptoms in the past year. DISC scoring algorithms combining parent and youth information apply an "or" rule (i.e., a criterion is considered present if reported by either informant). Our decision to use the “or” rule for combining informant information was based on previous DISC studies (Shaffer et al., 1996).

Demographics—included child and caregiver age, gender, ethnicity, and HIV-status; caregiver education, relationship to child (e.g., biological vs. adoptive parent or relative); income; and child placement changes.

Youth mental health treatment—Caregivers indicated if youth 1) saw a psychiatrist/psychotherapist or 2) received outpatient mental health services in the past year. A dichotomous variable was created (yes/no).

HIV+ youth health—CD4+ cell count (cells/mm^3) and HIV RNA viral load (VL) (copies/ml) values from within 3 months of the interview were obtained from medical records. Based on assay methodology variation, VL ≥ 100,000 copies/ml was coded as 100,000 and VL ≤ 400 copies/ml as undetectable.

Statistical Analysis

To ensure group comparability on demographic variables, PHIV+ and PHIV− adolescents were compared using t-test and chi-square tests for continuous variables and categorical variables, respectively, for each time point. Summary scores were created based on either caregiver or youth report of the presence or absence of a) any (non-substance abuse) psychiatric disorder, b) mood disorder, c) anxiety disorder, d) behavioral disorder (as well as sub-category of ADHD), and e) SUD. The association between youth HIV-status and disorder outcomes was examined separately at baseline and follow-up. Generalized linear models with logit link were used to compare the odds of having disorders between time points by HIV-status, and to examine whether the change over time on the odds of having disorders differed by HIV-status. As several caregivers provided data on multiple children in the study (n=44), and the outcomes between baseline and follow-up from the same subject were correlated, we used generalized estimating equations (GEE; Liang & Zeger, 1986) to account for the effects of clustering. We also evaluated the association between psychiatric disorder and sociodemographic characteristics as well as health markers and treatment status using the same analytic approach. P-values ≤ .05 were considered statistically significant. Group differences for SUD were not examined given the low prevalence for both groups.

Results

Demographics and Health

PHIV+ and PHIV− participants were comparable for most variables, with few statistically significant differences (Table 1). Compared to PHIV+ youth, PHIV− youth were more likely to have lived in only one home, with a caregiver who was a biological parent and HIV+ (most biological parents were mothers) and with slightly lower household incomes. Among PHIV+ youth, the majority knew their HIV-status (69.9% baseline; 81.3% follow-up) and were taking medication for HIV (86.5% baseline; 82.9% follow-up). Over 50% of youth had VL ≥ 400 copies/ml at both time points, although only a small percentage (≤ 10%) showed signs of severe immune compromise (CD4% < 200).

HIV-Status and Psychiatric Disorders

The prevalence of any (non-substance use) psychiatric disorder was high for all youth with no significant HIV-status group differences in the overall summary variables (Table 2); 68.7% of PHIV+ youth and 69.3% of PHIV− youth met criteria for any psychiatric disorder at either time point. Any psychiatric disorder was indicated for 60.2% of PHIV+ youth and 57.0% of PHIV− youth at baseline and 44.0% of PHIV+ youth and 53.5% of PHIV− youth at follow-up. Among youth with any psychiatric disorder, 22% met criteria for two or more disorders at baseline and 14% at follow-up, with no significant HIV-status group differences in co-morbidity. Anxiety and behavioral disorders were the most frequent co-morbidity.

Anxiety disorders, including social and specific phobias, separation anxiety, agoraphobia, generalized anxiety, panic, and obsessive-compulsive disorders were the most prevalent disorder category for both groups at both time points, followed by behavioral disorders.

There were no significant group differences by HIV-status for anxiety disorders at baseline or follow-up. However, at baseline, PHIV+ youth were three times more likely to report a mood disorder (OR=3.16; 95% CI=1.17, 8.52, p=0.02) and two times more likely to report ADHD (OR=2.13; 95% CI=0.98, 4.61, p=0.06) compared to PHIV− youth, although this latter difference was just shy of statistical significance. SUD prevalence was low at baseline and follow-up (< 5%) for PHIV+ and PHIV− youth.

Table 3 presents the change in prevalence of psychiatric disorders across time points by HIV-status. Between baseline and follow-up, the odds of having any psychiatric disorder decreased significantly among PHIV+ youth (OR=.52, 95% CI=.38, .73, p <0.001), but remained relatively unchanged among PHIV− youth. Anxiety disorders, specifically decreased over time among PHIV+ (OR=.46, 95% CI=.32, .67, p<0.001) and PHIV− youth (OR=.54, 95% CI=.36, .81, p=.003). However, mood disorders increased among PHIV− youth only (OR=2.10, 95% CI=1.02, 4.29, p=.04).

We also compared the likelihood of change in prevalence of disorders between baseline and follow-up by HIV-status. PHIV+ youth had significantly greater reduction in the odds of having any psychiatric disorder between baseline and follow-up (Ratio of OR [ROR] =.60, 95% CI=.36, 1.00, p=.051) (just shy of statistical significance) and of having a mood disorder (ROR=.38, 95% CI=.15, .96, p=.04). The change in prevalence of other disorders did not differ between the two groups.

Age and Gender Differences

Given few HIV-status differences, we also examined in the total sample, two factors associated with presence of a psychiatric disorder in previous studies of adolescents, age and gender (Table 4). At baseline, a number of gender differences emerged. The odds of having any psychiatric disorder (OR=.62, 95% CI=.38, .99, p=.050) and anxiety disorders (OR=.56, 95% CI=.35, .89, p =.015) were significantly higher in girls than boys. Conversely, although shy of significance, the odds of having any behavioral disorder (OR = 1.60, 95% CI=.94, 2.72, p=.083), and more specifically ADHD (OR=1.73, 95% CI=.93, 3.12, p=.082) were higher in boys than girls. At follow-up, similar patterns were found, although differences were not statistically significant (data not shown).

We examined age differences comparing youth ≤ 13 years to youth ≥14 years. At baseline, older youth were more likely to report mood (OR=2.31, 95% CI=1.02, 5.20, p =.044) and behavioral disorders (OR=1.92, 95% CI=1.17, 3.16, p=.010) and less likely to report anxiety disorders (OR = .58, 95% CI=.37, .92, p=.020), while at follow-up, no statistically significant age differences were found.

Psychiatric disorders and VL, CD4 count (PHIV+ youth only)

At baseline and follow-up, CD4 count ≥ 200 cells/mm^3, VL ≥ 100,000, or undetectable VL (yes/no) were not associated with presence or absence of any category of psychiatric disorders (data not shown) with one exception. At follow-up, those with undetectable VL were less likely to have behavioral disorders (OR=.41, 95% CI=.19, .92, p=.031).

Mental Health Services, HIV-status, and Psychiatric Disorders

Both PHIV+ and PHIV− youth had similar rates of mental health services at baseline (31.3% vs. 26.8% respectively; OR=1.24, 95% CI=.71, 2.17, p=.440). However, PHIV+ youth had significantly higher rates of mental health services at follow-up (37.9% vs. 23.1% respectively, OR=2.03, 95% CI=1.06, 3.88, p=.032). The change in prevalence of any disorder category over time did not differ by receipt of mental health services (data not shown).

Discussion

As the pediatric HIV epidemic in resource-rich countries evolves into an adolescent epidemic, there is a substantive need for studies elucidating the mental health needs of PHIV + youth as they transition through this vulnerable developmental stage and enter adulthood. This study is one of the first to examine longitudinally psychiatric disorders and SUD in PHIV+ adolescents, and the association of HIV infection and mental health outcomes through the inclusion of a comparison group from similar backgrounds.

Overall, both PHIV+ and PHIV− youth in our sample had extremely high rates of any psychiatric disorder, close to 70% in both groups met criteria at one time point or the other. Although different assessment time-frames, the 12-month disorder prevalence appears substantially higher than those seen among youth in the general population, that range from 20% in the past 6- months to 49% lifetime (Kendall et al., 1997; Costello, 2010; Merikangas et al., 2010) and similar to youth within the juvenile justice system (Teplin, Abram, McClelland, Dulcan & Mericle, 2002). Our rates are also similar to those reported in the IMPAACT study in which 61% of both PHIV+ and HIV− youth (from HIV-affected families) presented with a psychiatric disorder at one time point (Chernoff et al., 2009). Taken together, our findings suggest that PHIV+ youth and HIV− youth affected by familial HIV are at high risk for mental health problems, although pediatric HIV infection per se may not be the primary mechanism.

Overall, we found that the prevalence of any psychiatric disorder significantly decreased in PHIV+ youth, while for PHIV− youth, the prevalence of any disorder remained the same and mood disorders increased over time. These data suggest that perinatal HIV infection may not increase the risk of psychiatric disorder as these youth age. Access to treatment may be one explanation for the decrease in disorders. Consistent with our analyses, several previous studies suggest that PHIV− youth or unexposed, uninfected youth with HIV+ caregivers are equally if not more vulnerable to mental health problems than PHIV+ youth (Chernoff et al., 2009; Malee et al., 2011), yet their access to services is more limited. Most PHIV+ youth have been engaged in comprehensive HIV programs throughout their lifetime, typically attending clinics every 1–3 months, interacting with a large variety of providers. This may in turn result in better identification and treatment of mental health needs, including psychopharmacologic and psychotherapeutic interventions, greater support, and counter balance any additional vulnerability that might be present due to the effects of HIV, difficulties of coping with a chronic, stigmatized illness (Malee et al., 2011; Mellins et al., 2011) or the presence of environmental risks. PHIV+ youth were more likely in our study to receive mental health services at follow-up. Similar services are typically not available to PHIV− youth who are seen for preventive care yearly and then on an emergent basis. To our knowledge, there are no specialized services systems for PHIV− youth, particularly those that provide the medical home available to PHIV+ youth.

In addition to HIV, we also examined sociodemographic and health factors. The majority of sociodemographics characteristics were not associated with psychiatric disorders. However, there were gender and age differences, corresponding with studies in other populations, suggesting some similar risks (Cohen et al., 1993). Girls were more likely to present with any psychiatric disorder and anxiety disorders, while boys were more likely (although marginally significant) to present with behavioral disorders, specifically ADHD. Mood and behavioral disorders were more likely in older youth and anxiety disorders in younger youth (Brent, Baugher, Bridge, Chen & Chiapetta, 1999; Loeber & Keenan, 1994; Roza, Hofstra, van der Ende & Verhulst, 2003). We also examined changes in biomedical markers for HIV + youth. None of these factors at baseline were significantly related to increases/decreases in presence of psychiatric disorders over time.

Finally, although the youth in our study come from high-risk backgrounds for substance use, our data suggest that they are not at increased risk for early onset of alcohol and drug use disorders, although there may be experimentation ("use" vs. "disorder") that we did not examine. The prevalence of SUD was low at both time points, but comparable to data from a national probability sample, in which rates of SUD ranged from 1% in 9 year-olds to 9% among 17 year-olds (Kendall et al., 1997).

There are several study limitations. Although, we interviewed 77% of eligible participants from study clinics, this sample of convenience may not reflect the larger population of perinatally HIV-exposed adolescents. It is possible our group of PHIV- youth may have participated due to parental concerns about mental health, biasing our comparison sample or we may not have recruited those PHIV+ youth most at risk due to severe health and mental health complications. Although we recruited both groups from the same clinics and attempted to recruit both groups from similar communities, other unknown factors may have altered the group effects. Also, caregiver substance use and psychiatric disorder, which may account for group differences, were not examined. Moreover, the data are self-reported, subject to issues of social desirability. Our measure of mental health services was limited and we had no data on psychopharmacological treatments. Finally, we did not have the power to examine group differences over time in specific subcategories of disorders (e.g. different types of anxiety, including separation anxiety and panic) or in SUD.

Conclusion

The high rates of psychiatric disorders in both PHIV+ and PHIV− youth, a population at risk due to familial HIV infection and other environmental factors, are cause for concern. Given previous work indicating that mental health problems are associated with sexual and drug risk behavior in adolescence (Mellins et al., 2009; Ramrakha, Caspi, Dickson, Moffitt & Paul, 2000) and adulthood (Stiffman, Doré, Earls & Cunningham, 1992), and HIV treatment non-adherence in adulthood (Remien & Mellins, 2007), mental health services for PHIV+ and PHIV− youth is an urgent public health priority. Despite decreasing rates of psychiatric disorders over time, PHIV+ youth still present with high rates of disorders across both time points. Also of significant concern are the mental health needs of PHIV− youth who are typically not connected to services and are difficult to identify, but represent the much larger population. Our data indicate that the high rates of disorders do not appear, for the most part, to be associated with PHIV− infection, but rather other factors, warranting continued examination of the mental health problems of PHIV+ and PHIV− youth to further understand the complex individual, family, environmental and system-level effects on psychiatric disorders in this population and develop appropriate interventions. A few efficacy-based, family-focused programs are being developed for PHIV+ youth that target multiple risks, such as Multisystemic Therapy (Ellis et al., 2005) and CHAMP+ (Collaborative HIV/AIDS Mental Health Project for Positive Youth) (Mckay et al., 2006) as well as for HIV− youth with HIV+ caregivers (Rotheram-Borus, Lee, Gwadz, Draimin, 2001). However, efficacy and effectiveness studies are limited, as are resources for uninfected youth in HIV-affected families.

Acknowledgments

This work was supported by two grants from the National Institute of Mental Health: 1) R01-MH069133 (PI: C.A.Mellins, Ph.D.), 2) P30 MH43520 (Center PI: A.A. Ehrhardt, Ph.D.). Dr. Elkington was also supported by Career Development Award from the National Institute of Mental Health (K01MH089832; PI: K.S. Elkington, Ph.D.).

REFERENCES

American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-IV. 4th ed.. Washington, DC: American Psychiatric Association; 1994.

Beardslee WR, Versage EM, Gladstone TRG. Children of affectively ill parents: A review of the past 10 years. Journal of the American Academy of Child and Adolescent Psychiatry. 1998; 37:1134–1141. [PubMed: 9808924]

Brent DA, Baugher M, Bridge J, Chen T, Chiapetta L. Age- and sex-related risk factors for adolescent suicide. Journal of the American Academy of Child and Adolescent Psychiatry. 1999; 38:1497–1505. [PubMed: 10596249]

Chernoff M, Nachman S, Williams P, Brouwers P, Heston J, Hodge J, …Gadow KD. for the IMPAACT P1055 Study Team. Mental health treatment patterns in perinatally HIV-infected youth and controls. Pediatrics. 2009; 124:627–636. [PubMed: 19596734]

Chiriboga CA, Fleishman S, Champion S, Gaye-Robinson L, Abrams EJ. Incidence and prevalence of HIV encephalopathy in children with HIV infection receiving highly active anti-retroviral therapy (HAART). Journal of Pediatrics. 2005; 146:402–407. [PubMed: 15756229]

Cohen P, Cohen J, Kasen S, Velez CN, Hartmark C, Johnson J, …Streuning L. An epidemiological study of disorders in late childhood and adolescence- age- and gender- specific prevalence. Journal of Child Psychology and Psychiatry. 1993; 34:851–867. [PubMed: 8408371]

Costello EJ. Grand challenges in child and neurodevelopmental psychiatry. Frontiers in Psychiatry. 2010; 10:14. [PubMed: 21423425]

Costello EJ, Mustillo S, Erkanli A, Keeler G, Angold A. Prevalence and development of psychiatric disorders in childhood and adolescence. Arch. Gen Psychiatry. 2003; 60:837–844. [PubMed: 12912767]

Domek GJ. Facing adolescence and adulthood: The importance of mental health care in the global pediatric AIDS epidemic. Journal of Developmental Behavioral Pediatrics. 2009; 30:147–150.

Ellis DA, Frey MA, Naar-King S, Templin T, Cunninhgam P, Cakan N. Use of multisystemic therapy to improve regimen adherence among adolescents with type 1 diabetes in chronic poor metabolic control: A randomized controlled trial. Diabetes Care. 2005; 28:1604–1610. [PubMed: 15983308]

Fielden SJ, Sheckter S, Chapman GE, Alimenti A, Forbes JC, Sheps S, …Frankish JC. Growing up: Perspectives of children, families and service providers regarding the needs of older children with perinatally-acquired HIV. AIDS Care. 2006; 18:1050–1053. [PubMed: 17012099]

Havens, JF.; Mellins, CA. Psychiatric aspects of HIV/AIDS in childhood and adolescence. In: Rutter, M.; Taylor, E., editors. Child and Adolescent Psychiatry. 5th ed.. Oxford, UK: Blackwell; 2008.

Kang E, Mellins CA, Ng WYK, Robinson LG, Abrams EA. Standing between two worlds in Harlem: A developmental psychopathology perspective of perinatally acquired Human Immunodeficiency Virus and adolescence. Journal of Applied Developmental Psychology. 2008; 29:227–237.

Kendall PC, Flannery-Schroeder E, Panichelli-Mindel SM, Southam-Gerow M, Henin A, Warman M. Therapy for youths with anxiety disorders: A second randomized clinical trial. Journal of Consulting and Clinical Psychology. 1997; 65:366–380. [PubMed: 9170760]

Kessler RC, Amminger P, Aguilar-Gaxiola S, Alonso J, Lee S, Ustun TB. Age of onset of mental disorders: A review of recent literature. Current Opinion in Psychiatry. 2007; 20:359–364. [PubMed: 17551351]

Lewinsohn PM, Shankman SA, Gau JM, Klein DN. The prevalence and comorbidity of subthreshold psychiatric conditions. Psychological Medicine. 2004; 34:613–622. [PubMed: 15099416]

Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. Biometrica. 1986; 73:13–22.

Loeber R, Keenan K. Interaction between conduct disorder and its comorbid conditions: Effects of age and gender. Clinical Psychology Review. 1994; 14:497–523.

Malee KM, Tassiopoulos K, Huo Y, Siberry G, Williams PL, Hazra R, …Mellins CA. for the Pediatric HIV/AIDS Cohort Study Team. Mental health functioning among children and adolescents with perinatal HIV infection and perinatal HIV exposure. AIDS Care. 2011; 23:1533–1544. [PubMed: 21702707]

McKay, M.; Block, M.; Mellins, CA.; Traube, D.; Brackis-Cottt, E.; Minott, D.; …Abrams, EJ. Adapting a family based HIV prevention program for HIV infected preadolescents and their families: Youth, families and health care providers coming together to address complex needs. In: McKay, M.; Paikoff, R., editors. Community Collaborative Partnerships: The Foundation for HIV Prevention Research Efforts. New York, NY: Haworth Press; 2006.

Mellins CA, Brackis-Cott E, Leu CS, Elkington KS, Dolezal C, Wiznia A, …Abrams EJ. Rates and types of psychiatric disorders in perinatally human immunodeficiency virus-infected youth and seroreverters. Journal of Child Psychology and Psychiatry. 2009; 50:1131–1138. [PubMed: 19298479]

Mellins CA, Havens JF, McCaskill EO, Leu CS, Brudney K, Chesney MA. Mental health, substance use and disclosure are significantly associated with medical treatment adherence of HIV infected mothers. Psychology, Health & Medicine. 2002; 7:451–460.

Mellins CA, Tassiopoulos K, Malee K, Moscicki B, Patton D, Smith R, …Seage G. Behavioral Health in perinatally HIV-infected youth: Co-occurrence of mental health problems, sexual and drug use behavior, and non-adherence. AIDS Patient Care and STDs. 2011; 25:413–422. [PubMed: 21992620]

Merikangas KR, He J, Brustein M, Swanson S, Avenevol S, Cui L, …Swendsen L. Lifetime prevalence of mental disorders in US Adolescents: Results from the National Comorbidity Survey Replication- Adolescent Supplement (NCS-A). Journal of the American Academy of Child and Adolescent Psychiatry. 2010; 49:980–989. [PubMed: 20855043]

Morrison MF, Petitto JM, Have TT, Gettes DR, Chiappini MS, Weber AL, …Douglas SD. Depressive and anxiety disorders in women with HIV infection. American Journal of Psychiatry. 2002; 159:789–796. [PubMed: 11986133]

Nozyce ML, Lee SS, Wiznia A, Nachman S, Mofenson LM, Smith ME, …Pelton S. A behavioral and cognitive profile of clinically stable HIV-infected children. Pediatrics. 2006; 117:763–770. [PubMed: 16510656]

Ramrakha S, Caspi A, Dickson N, Moffitt TE, Paul C. Psychiatric disorders and risky sexual behavior in young adulthood: cross sectional study in birth cohort. British Medical Journal. 2000; 321:263–266. [PubMed: 10915126]

Remien R, Mellins C. Long-term Psychosocial Challenges for People Living with HIV: Let's Not Forget the Individual in our Global Response to the Pandemic. AIDS. 2007; 21:S55–S63. [PubMed: 18090270]

Rotheram-Borus MJ, Lee MB, Gwadz M, Draimin B. An intervention for parents with AIDS and their adolescent children. American Journal of Public Health. 2001; 91:1294–1302. [PubMed: 11499122]

Roza SJ, Hofstra MB, van der Ende J, Verhulst FC. Stable prediction of mood and anxiety disorders based on behavioral and emotional problems in childhood: A 14-year follow-up during childhood, adolescence, and young adulthood. American Journal of Psychiatry. 2003; 160:2116–2121. [PubMed: 14638580]

Scharko AM. DSM psychiatric disorders in the context of pediatric HIV/AIDS. AIDS Care. 2006; 18:441–445. [PubMed: 16777635]

Shaffer D, Fisher P, Dulcan MK, Davies M, Piacentini J, Schwab-Stone ME, …Regier DA. The NIMH Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3): Description, acceptability, prevalence rates, and performance in the MECA Study. Methods for the Epidemiology of Child and Adolescent Mental Disorders Study. Journal of the American Academy of Child and Adolescent Psychiatry. 1996; 35:865–877. [PubMed: 8768346]

Stiffman AR, Doré P, Earls F, Cunningham R. The influence of mental health problems on AIDS-related risk behaviors in young adults. Journal of Nervous and Mental Disorders. 1992; 180:314–320.

Teplin LA, Abram KM, McClelland GM, Dulcan MK, Mericle AA. Psychiatric Disorders in Youth in Juvenile Detention. Archives of General Psychiatry. 2002; 59:1133–1143. [PubMed: 12470130]

UNAIDS. UNAIDS report on the global AIDS epidemic. 2010. Retrieved from http://www.unaids.org/globalreport/Global_report.htm

Williams PL, Leister E, Chernoff M, Nachman S, Morse E, Di Poalo V, Gadow KD. Substance use and its association with psychiatric symptoms in perinatally HIV-infected and HIV-affected adolescents. AIDS and Behavior. 2010; 14:1072–1082. [PubMed]. [PubMed: 20725774]

Table 1

Baseline Demographic characteristics of PHIV+ and PHIV− youth (N=280)

	Baseline		Statistic[a]	Follow-up		Statistic[a]
	PHIV+	**PHIV−**	**X^2/t-test**	**PHIV+**	**PHIV−**	**X^2/t-test**
Youth characteristics	**N (%)**	**N (%)**		**N (%)**	**N (%)**	
Female	87 (52.4)	57 (50.0)	0.08	87 (52.4)	57 (50.0)	0.08
African-American	81 (48.8)	54 (47.4)	0.30	85 (51.2)	55 (48.2)	0.02
Latino	59 (35.5)	47 (41.2)		56 (33.7)	39 (34.2)	
Age[b]	12.6 (2.2)	12.2 (2.4)	−1.48	14.3 (2.3)	13.8 (2.4)	−1.97 *
Lived in same home	101 (62.3)	85 (75.2)	4.47 *	90 (62.1)	80 (73.4)	3.11
HIV-status disclosed	116 (69.9)			135 (81.3)		
Take medication for HIV	141 (86.5)			121 (82.9)		
Caregiver characteristics						
Female	144 (86.7)	100 (87.7)	0.00	129 (87.2)	95 (87.2)	0.00
HIV+	50 (30.7)	75 (66.4)	32.89 ***	46 (31.5)	72 (66.1)	28.59 ***
Biological parent	56 (33.7)	79 (69.3)	32.83 ***	50 (33.8)	75 (68.8)	29.44 ***
Lives with a partner	66 (40.5)	47 (41.6)	0.00	56 (38.6)	47 (43.1)	0.35
Employed	48 (29.4)	26 (23.0)	1.10	47 (32.2)	35 (32.1)	0.00
Education[b]	11.8 (3.4)	11.6 (3.1)	−0.57	11.9 (3.0)	11.4 (3.5)	−1.16
Household income[b,c]	5.9 (2.9)	5.1 (2.5)	−2.35 *	5.9 (2.9)	4.8 (2.5)	−3.11 **
Household size[b]	4.3 (1.7)	4.6 (1.8)	1.21	4.3 (1.9)	4.5 (1.7)	0.81
HIV + youth health						
CD4+ cell count[d]	577			486		
CD4+ < 200	14 (8.4)			17 (10.3)		
HIV RNA VL[d]	3120			1100		
VL ≤ 400	60 (36.1)			70 (42.4)		
VL ≥ 100,000	7 (4.2)			10 (6.1)		

[a] *p < .05; **p < .01; *** p < .001; based on chi-square tests for dichotomous variables and t-tests for continuous variables comparing PHIV+ and PHIV−.

[b] Mean (standard deviation).

[c] Income assessed using a categorical variable for which a score of 5=$20,001–25,000 and a score of 6=$25,001–30,000.

[d] Median.

NOTE: percentages are of those who have data. Several are missing caregiver data at follow-up.

Table 2

Prevalence of psychiatric disorders at baseline and follow-up by HIV-status[1]

	Baseline			Follow-up		
	PHIV+ (n=166)	PHIV− (n=114)		PHIV+ (n=166)	PHIV− (n=114)	
	N (%)	N (%)	OR 95%CI	N (%)	N (%)	OR 95%CI
Any Disorder	100 (60.2)	65 (57.0)	1.1 (0.7–1.9)	73 (44.0)	61 (53.5)	0.7 (0.4–1.1)
Any Mood	21 (12.7)	5 (4.4)	3.2 (1.2–8.5)*	17 (10.3)	10 (8.8)	1.2 (0.5–2.8)
Any Anxiety	80 (48.2)	56 (49.1)	1.0 (0.6–1.6)	50 (30.1)	39 (34.2)	0.8 (0.5–1.4)
Any Behavioral	48 (28.9)	31 (27.2)	1.1 (0.6–1.9)	38 (23.0)	28 (24.6)	0.9 (0.5–1.6)
ADHD	36 (21.8)	13 (11.6)	2.1 (1.0–4.6)¶	26 (15.8)	12 (10.5)	1.6 (0.7–3.7)
Any SUD	3 (1.8)	4 (3.5)	0.5 (0.1–2.3)	7 (4.2)	5 (4.4)	1.0 (0.3–3.1)

[1] all numbers rounded to one decimal place

* $p<0.05$

¶ $p<0.1$

OR= Odds Ratio; CI = Confidence Interval

Table 3

Change in prevalence of psychiatric disorders across baseline and follow-up by HIV-status[1]

	PHIV+			PHIV−			Comparison of two ORs[a]
	Baseline	Follow-UP		Baseline	Follow-UP		
Disorder	**N (%)**	**N (%)**	**OR 95%CI**	**N (%)**	**N (%)**	**OR 95%CI**	**ROR[a] 95% CI**
Any Disorder	100 (60.2)	73 (44.0)	0.5 (0.4–0.7)¶	65 (57.0)	61 (53.5)	0.9 (0.6–1.3)	0.6 (0.4–1.0)
Mood	21 (12.7)	17 (10.3)	0.8 (0.5–1.4)	5 (4.4)	10 (8.8)	2.1 (1.0–4.3)*	0.4 (0.2–1.0)*
Anxiety	80 (48.2)	50 (30.1)	0.5 (0.3–0.7)¶	56 (49.1)	39 (34.2)	0.5 (0.4–0.8)¶	0.9 (0.5–1.0)¶
Behavioral	48 (28.9)	38 (23.0)	0.7 (0.5–1.1)	31 (27.2)	28 (24.6)	0.9 (0.6–1.4)	0.8 (0.5–1.5)
ADHD	36 (21.8)	26 (15.8)	0.7 (0.4–1.1)	13 (11.6)	12 (10.5)	0.9 (0.5–1.7)	0.8 (0.3–1.6)
SUD	3 (1.8)	7 (4.2)	2.4 (1.0–5.8)*	4 (3.5)	5 (4.4)	1.3 (0.6–2.8)	1.9 (0.6–6.2)

[1] all numbers rounded to one decimal place

* $p<0.05$

¶ $p<0.1$

[a] Test statistic represents the difference by HIV-status between the likelihood of change in prevalence of disorder between baseline and follow-up, it is the ratio of two odds ratios (ROR).

OR = Odds Ratio; CI = Confidence Interval

Table 4

Prevalence of psychiatric disorders at baseline and follow-up by gender and age[1]

	Baseline			Follow-up		
	Males (n=136)	**Females (n=144)**		**Males (n=136)**	**Females (n=144)**	
Disorder	**N (%)**	**N (%)**	**OR 95%CI**	**N (%)**	**N (%)**	**OR 95%CI**
Any Disorder	72(52.9)	93(64.6)	0.6(0.4,1.0)*	63(46.3)	71(49.3)	0.9(0.6,1.4)
Mood	15(10.4)	11(8.1)	0.8(0.3,1.8)	9(6.7)	18(12.5)	0.5(0.2,1.2)
Anxiety	56(41.2)	80(55.6)	0.6(0.4,0.9)*	36(26.5)	53(36.8)	0.6(0.4,1.0)
Behavioral	45(33.1)	34(23.6)	1.6(0.9,2.7)	36(26.7)	30(20.8)	1.4(0.8,2.4)
ADHD	29(21.8)	20(13.9)	1.7(0.9,3.2)	23(17.0)	15(10.4)	1.8(0.9,3.5)
SUD	3(2.2)	4(2.8)	0.8(0.2,3.6)	4(3.0)	8(5.6)	0.5(0.2,1.8)
	Age 9–13 (n=160)	**Age 14+ (n=120)**		**Age 9–13 (n=107)**	**Age 14+ (n=173)**	
Any Disorder	96(60.0)	69(57.5)	0.9(0.6,1.5)	55(51.4)	79(45.7)	0.8(0.5,1.3)
Mood	10(6.3)	16(13.3)	2.3(1.0,5.2)*	6(5.6)	21(12.2)	2.3(0.9,6.0)
Anxiety	87(54.4)	49(40.8)	0.6(0.4,0.9)*	38(35.5)	51(29.5)	0.8(0.5,1.3)
Behavioral	36(22.5)	43(35.8)	1.9(1.2,3.2)¶	24(22.4)	42(24.4)	1.1(0.6,2.0)
ADHD	25(15.7)	24(20.3)	1.4(0.7,2.5)	16(15.0)	22(12.8)	0.8(0.4,1.6)
SUD	0(0.0)	7(5.8)	NA	0(0.0)	12(7.0)	NA

[1] all numbers rounded to one decimal place

* $p<0.05$

¶ $p<0.1$

OR= Odds Ratio; CI = Confidence Interval