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Mental health and functional competence in the Cape Town Adolescent Antiretroviral Cohort

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Abstract

Background—The impact of HIV and antiretrovirals (ART) on long term mental health in perinatally infected children has not been well studied in sub-Saharan Africa where HIV is most prevalent.

Setting—Cape Town, South Africa

Methods—We investigated mental health measures, including depression, anxiety, attention deficit hyperactivity disorder, motivation, disruptive behaviour and functioning in perinatally-infected adolescents (PHIV+) stable on ART within the Cape Town Adolescent Antiretroviral Cohort. 204 adolescents living with HIV (median age 10 years; mean CD4 953) and a sample of 44 uninfected adolescents were enrolled. The Beck Youth Inventories, Children's Motivation Scale, Conner's Parent's Rating Scale and Child Behaviour Checklist were administered. Among PHIV+, we explored independent associations between HIV-related stigma, recent life stressors, sociodemographic, clinical and caregiver-related variables and mental health measures.

Results—PHIV+ had poorer functional competence, self concept and motivation, higher levels of disruptive behaviour, depression and ADHD symptoms and clinically significant anger and disruptive behaviour. Within the PHIV+ group the loss of both biological parents was associated with higher levels of disruptive behaviour. Within the PHIV+, factors associated with mental health symptoms and poorer functioning were mostly sociodemographic factors, HIV related stigma and life stressors. Age of initiation of ART was associated with self concept, and failing first line ART with internalising and externalising behaviour problems.

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Conclusion—PHIV+ are likely to face future physical and psychological health consequences related to the functional competence challenges they face if mental health care is not made a priority in the fight against HIV

Keywords

HIV; adolescents; mental health; functioning; orphan

Introduction

In adolescents living with HIV (PHIV+), psychosocial development and behaviour are profoundly affected, with concerns related to functioning and mental health [1]. Functioning encompasses overall competencies, the ability to interact with their environment, fulfil role, social activities, relationships with friends and family and the ability to navigate problems constructively. A review of mental health of PHIV+ suggested that they experience emotional and behavioral problems, including psychiatric disorders, at higher than expected rates, often exceeding other high-risk groups [2]. The mental health of PHIV+ may be linked to HIV disease, to adolescence in general, or to psychosocial problems generated by the interaction between HIV, the adolescent and their environment [3]. AIDS-related mortality among PHIV+ has risen by 50% despite the scale up antiretroviral therapy (ART) [4]. Poor ART adherence is likely to play a role in the increase of AIDS-related deaths among adolescents and has shown to be associated with psychosocial and mental health difficulties [5]. Data from reviews, although based on very limited studies, suggest that attention deficit hyperactivity disorder (ADHD), anxiety and depression are all highly prevalent in PHIV + [6]. Apathy is a well-recognised neuropsychiatric symptom in adults with HIV [7] however, there is no literature on motivation/apathy in PHIV+ [8]. Apathy has been described in adults living with HIV without cognitive impairment and depression [7]. Apathy could be a cause of poor adherence and poor functioning in activities of daily living in PHIV+, as has been described in adult HIV.

Determinants of impaired adolescent health internationally are factors such as low household income and lack of education. Safe and supportive families and schools, together with positive and supportive peers are important in helping adolescents develop to their full potential and attain the best health in adulthood [9]. Low household income, overcrowding, family disruption; caregiver depression and school failure are all recognized risk factors for poor adolescent mental health [10,11]. Loss is frequently both recurrent and cumulative for PHIV+. Not only are they dealing with the possible loss of their own life, but in the case of perinatally acquired infection, they are also dealing with the loss of immediate family members [12]. Adolescents orphaned by AIDS are more likely to have depression, peer relationship problems, post-traumatic stress and conduct problems than adolescents orphaned by other causes [13]. The drivers of poor mental health in PHIV+ are understudied in South Africa and may include may structural factors such as family resources and assents, HIV related stigma and traumatic life events. Understanding the factors associated with poor mental health and functioning in PHIV+ living in South Africa, would be important to inform future holistic adolescent friendly ART services.

Due to the historically high mortality rate in young children with perinatally acquired HIV in South Africa, in part due to the later rollout of ART around 2004, the first generation of perinatally-HIV infected children in South Africa are entering adolescence, and may face a number of mental health challenges, but there are limited data investigating a wide range of mental health outcomes including motivation and functioning. Psychosocial development and behaviour during adolescence are influenced by HIV, with concerns related to treatment adherence, stigmatization, risk taking, and the position of young people within family and social support systems. There are potentially complex - but still poorly understood - interactions between each of these factors; research across multiple domains is required to understand the health and development of PHIV+ in this context. The overall goal of Cape Town Adolescent Antiretroviral Cohort (CTAAC) is to investigate markers of chronic disease processes and progression in PHIV+ including mental health and functioning longitudinally over a three year period. The current study is a baseline descriptive study investigating a wide range of mental health measures and functioning in PHIV+ enrolled in CTAAC, including the effect of orphanhood on mental health measures, and the associations between demographic life stressors, HIV related stigma, treatment and clinical data with mental health measures.

Methods

A study of baseline mental health measures in a subgroup of PHIV+ enrolled in the Cape Town Adolescent Antiretroviral Cohort (CTAAC), a prospective cohort study to investigate HIV disease progression over 3 years. Adolescents were recruited from public sector health care service from across Cape Town Inclusion criteria were adolescents, aged 9–11 years, with perinatally transmitted HIV, who had been on ART for at least 6 months, knew their HIV status and where informed parental consent and participant assent was obtained. Controls were HIV negative, age, sex and ethnicity matched. Controls were recruited for the same public health care services as the PHIV+. Controls were excluded if they had known pre-existing disease or if informed consent and assent was not obtainable. All youth screened for the control cohort underwent rapid HIV testing prior to enrolment to confirm negative status.

Exclusion criteria were based on the inclusion of neuroimaging studies (not reported on here): an uncontrolled medical condition, such as poorly controlled diabetes mellitus, epilepsy, or active tuberculosis requiring admission; an identified CNS condition (other than HIV), such as TB meningitis or bacterial meningitis, documented cerebrovascular accident;, lymphoma; a history of head injury with of loss of consciousness greater than 5 minutes, or any radiological evidence of skull fracture; a history of perinatal complications such as hypoxic ischemic encephalopathy or neonatal jaundice requiring exchange transfusion, or neurodevelopment disorder not attributed to HIV.

Adolescents were enrolled from August 2013 to April 2015 at the Research Centre for Adolescent and Children Health at Red Cross Children’s Hospital, South Africa. Ethical approval was obtained from the University of Cape Town’s Faculty of Health Sciences research ethics committee.

Measures

Baseline demographic and clinical data were obtained at enrolment. A general physical examination was done by a medical officer, which included anthropometry and Tanners pubertal staging. Other covariates including medical history were extracted from medical records or measured at study visit. Questionnaires were administered by study staff to child/parent or guardian dyads at enrolment. Where appropriate, separate questionnaires were administered to an adolescent and their accompanying parent/guardian. Interviews were conducted in the participants home language, in private rooms by trained counsellors with extensive experience working with PHIV+ and a parent or guardian. We have used each of these measures in the local population, with evidence of good reliability in isi-Xhosa speaking populations[11,14]. Caregiver depression was measured using the Center for Epidemiological Studies-Depression (CES-D). The life events questionnaire (LEQ) focuses on recent stressful life events (ie. those occurring in the last 12 months). HIV-related stigma questions rated between 1=Not at all and 3=All the time.

Baseline health and sociodemographic

questionnaires were conducted to obtain general health information, medical history, and data on ancestry, language, education and treatment. PHIV+ and caregivers were asked to report on whether they had missed any ART doses in the last month. Updated routine CD4 and viral load results and ART regimen and date of initiation of ART were abstracted from routine care records.

Family resources, support and assets.—The Family Resources Scale (FRS) and Family Support Scales (FSS) were used to gather information about the family's perceived access to resources and support. Higher scores on the scales indicate perceived better resources and better support. For our purposes, a composite asset index score was calculated based on access to household and financial resources, for a maximum score of 17.

Beck Youth Inventories (BYI-II).—This self-report scale has five inventories, which may be used separately or in combination to assess a child's experience of depression, anxiety, anger, disruptive behaviour, and self-concept. The inventories are intended for use with children and adolescents between the ages of 7 – 18 years. The inventories are structured in line with DSM-IV-TR criteria. The BYI-II has been used with success in only a few sub-Saharan African studies. Scores were standardized according to the manual reported norms for gender and age.

Children's Motivation Scale (CMS).—This 16-item instrument [15] was used to measure the adolescent's motivation levels, or tendency toward apathy. For each item, the parent was asked to state how often his/her child engaged in self-motived activities. For example, if a statement read "Starts playing (games, activities) on his/her own", the parent would select one of the following options: 0 (never or rarely occurs), 1 (1–3 times during a month), 2 (1–3 times per week), 3 (4–6 times per week), or 4 (1 or more times a day). The scale produces a raw score which is interpreted along a spectrum.

The Conner's Parent's Rating Scale (CPRS) is one of the most popular rating scales used by professionals today for parent rating scales to diagnose ADHD[16]. The CPRS addresses four factors: conduct problem, hyperactivity, inattentive-passive, and hyperactivity index. The scale produces a raw score which is interpreted along a spectrum.

Child Behaviour Checklist (CBCL).—This 113-item instrument [17] is one of the most widely used and psychometrically sound measures for assessing child behavioural and emotional problems and psychopathology. In this study, it was used to measure internalizing and externalizing problems experienced by the child. It was also used to measure total problems experienced by the child, as well as the child's total competence. Parents were asked to rate items according to how much each given statement applied to their children: 0 (*not true*), 1 (*somewhat or sometimes true*), or 2 (*very true or often true*). Examples of some statements are: "Acts too young for his/her age" and "Can't concentrate, can't pay attention for long." The Child Behaviours Checklist (CBCL) raw score was converted into the T-scores using the ABESA software for scoring the CBCL. The CBCL has been used successfully used to measure child behaviour problems in South African children.

Statistical analysis

Data were analysed using Stata 12 (StataCorp Inc, College Station, Texas, USA). Mann-Whitney U-tests were used to compare the HIV-infected group to controls for all baseline demographics and clinical characteristics, as presented in table 1. Like-wise, the Mann-Whitney U-test was used to compare the difference in clinical cut-off scores between the groups, as presented in table 3. We compared mental health measures between PHIV+ and HIV-uninfected adolescents in linear regression models adjusted for adolescent age, gender and current grade at school. Among PHIV+, we explored independent associations between sociodemographic HIV-related stigma, life stressors, clinical (CD4, viral load, hospitalisations and ART line) and caregiver-related variables and mental health measures in multivariable linear regression models, controlling for possible confounding variables.

A sample size of at least 40 adolescents in each group was based on detecting a significant difference in mean depressive symptoms; the proposed sample size would allow >80% power to detect differences of >0.05

Results

204 PHIV+ and 44 matched controls were enrolled. Age, gender, ethinicity, education and household income were similar between PHIV+ and uninfected adolescents, table 1. PHIV+ were more likely to have had repeated grades at school, have a caregiver with depression, have lost both biological parents, and have delayed breast development and shorter stature than the uninfected group. Most PHIV+ were on first line ART with a mean CD4 count of 953 cells/mm^3, median viral load of 0 IU/mL and duration of ART of 7 years. Of the data that are available from medical records (PHIV+ and controls; n=232), 97 participants (42%) have record of a prior hospitalisation. Noting that participants could have been hospitalised more than once for different reasons, these hospitalisations were documented as being for: asthma (5%), TB (32%), pneumonia (53%), heart problems (3%), kidney problems (1%), malnutrition (16%), psychiatric reasons (2%), meningitis (3%), and other reasons (25%). In

terms of mental health histories, 5% of those who have medical history data available have a recorded mental health issue.

PHIV+ had poorer funtional competence when compared to well matched uninfected adolescents. There were a number of significant differences in mental health measures with PHIV+ having poorer self concept and motivation (table 2), higher levels of depressive, disruptive behaviour and ADHD symptoms (see table 2). ADHD symptoms were no longer significant after adjusting for age, gender and current grade at school. The CBCL and BYI-II have clinical cut off scores above or below which the symptoms are thought to be clinically significant. Table 3 presents the numbers and percentages of adolescents with clincally significant symptoms on the various subscales of the CBCL and the BYI-II. PHIV+ had higher rates of clinically significant poorer functional competence, poor self concept, depression, anger and disruptive behaviour. Within the PHIV+ group orphanhood was significantly associated with higher levels of disruptive behaviour on a chi-squared analysis ($F = 22.22$, $p = 0.08$, Cramer's $V = 0.180$).

Within the PHIV+, factors associated with mental health symptoms and poorer functioning were mostly sociodemographic factors such as male gender, repeating a grade at school, caregiver not being a biological parent, poorer caregiver quality of life, less family resources, less family support and less family assets, table 4. More stressful life events was associated with more anxiety, depression,anger and disruptive behaviour and ADHD symptoms, internalising, externlising and total problems. More HIV related stigma was associated with depression, anger and disruptive behaviour. Current CD4 cell count and viral load were not associated with any of the mental health symptoms. Previous hospitalisations were not associated with any of the mental health outcomes. Having had an HIV related illness was associated with poorer total competence. Age of initiation of ART was associated with self concept, and failing first line ART (currently being on 2nd or 3rd line ART) was associated with internalising and externalising behaviour problems.

Discussion

Our descriptive study of CTAAC baseline functioning and mental health measures found adolescents living with HIV to have poorer funtional competence when compared to uninfected peers. There were also number of significant differences in mental health measures with PHIV+ having poorer self concept and motivation and higher levels of disruptive behaviour, depression and ADHD symptoms. However the ADHD symptoms were no longer significant after adjusting for age, gender and current grade at school. When examining the mental health and functioning measures which provide clinical cut off scores, PHIV+ had higher rates of clinically significant poorer functional competence, poor self concept, depression, anger and disruptive behaviour. Within the PHIV+ group the loss of both biological parents was associated with higher levels of disruptive behaviour. Within the group of PHIV+, factors associated with mental health symptoms and poorer functioning were mostly sociodemographic factors and stressful life events. More HIV related stigma was associated with depression, anger and disruptive behaviour. Age of initiation of ART was associated with self concept, and failing first line ART was associated with internalising and externalising behaviour problems.

Chronic illness can interfere with the functional competence of adolescents and make them more vulnerable to psychological and social problems [19]. We found significant problems in functional competence using the CBCL total competence sub-scale in our PHIV+ cohort. The impact of HIV surpasses that of virtually all other chronic conditions, and may be compounded by the stigma associated with HIV infection [20]. Stigma, living with chronic illness, bereavement and caretaker changes are well documented challenges facing perinatally HIV infected youth. With high rates of neurocognitive disorders, despite treatment with ART, youth may have multiple challenges to negotiating life problems [14]. Assessing functioning in adolescents has yielded mixed results with some studies finding no differences in adaptive functioning between infected and non-infected adolescents [21]. Ideally a better measure of functioning would be individual school and home based assessments conducted by an occupational therapist, however in a resource limited setting we rely on self report measures.

Adolescence is a period in which mental health problems if present are likely to emerge [22]. Previous studies have reported higher rates of depression and anxiety in youth living with HIV than found in our study [23]. A review found average prevalence's of 28.6% for ADHD, 24.3% for anxiety disorders and 25% for depression [6]. Higher rates of ADHD have previously been described in HIV infected youth [24] in developing countries and children with other types of chronic illnesses [25]. The CTAAC baseline cohorts are young adolescents (9–11yrs old), which may account for the lower levels of mental health problems reported here. The CTAAC cohort included measures of mental health problems less commonly investigated such as anger, disruptive behavior, self-concept and motivation, with more problems reported in the PHIV+. Self-concept is defined as an individual's beliefs and knowledge about his/her personal attributes and qualities [26]. It has been found that a positive self-concept has direct protective effects on the development of depressive symptoms in the chronically ill [27]. Poor self-concept has previously been linked to problem behavior, depression and anxiety [26], symptoms reported with increased rates in the adolescents living with HIV in this study. Less youth depression has been associated with more social support seeking, higher youth self-esteem and lower internalized stigma [28]. Worryingly higher levels of depression in PHIV+ have been associated with increased risk behavior [29]. The emergence of mental health problems and sexual risk behavior can be detrimental to the health and well-being of HIV infected youth and may place others at risk for secondary HIV-transmission, creating a significant public health challenge [30]. In PHIV+ higher levels of anger have been directly associated with elevated psychological distress and avoidant coping, and indirectly associated with greater HIV disease severity [37]. Poor mental health may also lead to denial of infection, apathy/low motivation, and hopelessness, resulting in medication refusal. Apathy has been shown to impact on everyday function, medication adherence, and treatment outcome in adults [31–33]. It may manifest even without significant cognitive impairment [33] possibly a sign of early HIV-related CNS disease. In adolescents low motivation may impact on school and daily functioning, and influence later quality of life.

Within the CTAAC PHIV+ cohort loss of both biological parents was significantly associated with higher levels of disruptive behaviour. Loss of parent/s living with HIV has previously been associated with significantly more emotional distress and problem behaviors

[34]. Exposure to violence in the home and the community is high in South Africa. Orphaned children living with HIV have been found to experience more violence than children unaffected by HIV. Interpersonal violence in the home has predicted child depression, lower self-esteem and behavioral problems [35].

The specific role of HIV in relation to mental symptoms remains unclear. In this study current CD4 cell count and viral load were not associated with mental health outcomes. CD4 count and HIV RNA viral load have in previous studies not been associated with the presence or absence of mental health problems [36]. Factors associated with mental health symptoms and poorer functioning in this study were mostly sociodemographic factors such as repeating a grade at school, caregiver not being a biological parent, poorer caregiver quality of life, less family resources, less family support and less family assets. In addition stressful life events and HIV related stigma were associated with mental health symptoms. Although studies are limited with mixed findings, a review found that parental health and mental health, stressful life events and community disorder have been associated with worse mental health outcomes, while parent–child involvement and communication, peer, parent and teacher social support have been associated with better function [2]. Failing first line ART was associated with internalising and externalising behaviour problems. The direction of the relationship due to the cross-sectional nature of this study is unclear. A limitation of this study is that reasons for switching to second or third line treatment were not always possible to obtain. Whether this was due to drug resistance or chronic poor treatment adherence is unkown.

Limitations of the current study are that we cannot determine the causality of mental health symptoms. It is likely that multiple factors are involved, including variables such as adolescence, the progression of NeuroHIV disease, the effects of ART, or other environmental or psychosocial effects on behavior, including the stress of having a stigmatized, chronic, and potentially fatal illness. There may also be physical and psychosocial characteristics of HIV infected mothers who transmitted the virus to their babies that may influence long-term youth mental health. However this study reports on a wide range of mental health symptoms, including the first report of significant apathy in PHIV+. While the current paper reports on cross-sectional data only, CTAAC is a longitudinal study, which will be able to provide information on mental health 3 years later, such as predictive factors, stability of diagnosis, duration of diagnosis and the association of mental health with HIV disease progression.

Conclusion

Mental health problems are commonly associated with PHIV+. These findings emphasizing the importance of mental health symptoms and associated functional impairment in children and adolescents with perinatally acquired HIV. They provide an important foundation for addressing additional questions such as how mental health influences the various components of adherence to treatment and risk taking behaviour over time. Psychosocial function has been given relatively limited attention; however, these issues may be just as critical as biomedical and socioeconomic factors for the success of treatment [38]. These findings highlight the importance of screening for mental health symptoms, HIV related

stigma, sociodemographic risk factors and recent life stressors in ART clinics. Mental health, and ART services should be intergrated into one adolescent friendly service as PHIV + are likely to face future physical and psychological health consequences related to the cognitve and functional competence challenges they face if mental health care is not made a priority in the fight against HIV [1]. This care may need to take into account that parents or caregivers share the infection. Adolescents with behaviourally acquired HIV in South Africa are likely to be exposed to similar sociodemographic and recent life event risk factors for the development of mental health problems. It is not clear if PHIV+ are at higher or silimar risk for the development of mental health problems is comparison to behaviourally/recently acquired HIV. Factors unique to PHIV+ would be longer duration of illness and ART exposure, increased risk of orphanhood and exposeure to the HIV during critical developmental periods.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

Baseline demographic and clinical characteristics of CTAAC cohort

Variable	HIV-infected (N = 204)	Controls (N = 44)	t	p
Age in years: Mean (SD)	10.38 (0.88)	10.38 (1.09)	−.01	.99
Gender: Male/Female	100/104	20/24	.43	.67
Ethnicity: Black African/Other	187/17	44/0	−1.99	.05
Home language: isiXhosa/Other	182/20	42/2	1.12	.26
Education in years: Mean (SD)	3.20 (1.13)	3.39 (1.35)	.96	.34
Repeated grades: YES/NO	121/83	18/26	−2.24	.02*
Annual household income <R5000[a]	20.3%	27.3%	−.72	.47
Ophanhood[b]	71 (35%)	6 (14%)	3.13	.00*
Anthropometry				
Weight in kg	30.79 (7.26)	36.79 (11.26)	4.45	.00
Height in cm	133.82 (7.72)	138.59 (8.76)	3.62	.00*
Head circ in cm	52.93 (2.14)	53.61 (3.07)	1.78	.08
Tanner's staging				
Breast develop.	1.53 (.74)	1.87 (.61)	2.11	.04*
Pubic hair	1.29 (.58)	1.58 (.93)	1.99	.05
Testes growth	1.11 (.34)	1.15 (.37)	.53	.60
Caregiver depression	16.7 (12.44)	11.18 (10.900)	−2.41	.01*
Family Resources	79.94 (21.76)	77.20 (18.41)	−.77	.44
Family Support	30.18 (14.97)	28.63 (10.72)	−.65	.52
Family Assets	9.5 (2.9)	7.9 (2.7)	−3.36	.00*
LEQ[c]	8.28 (6.06)	9.03 (6.93)	−.49	.63
HIV-related stigma: Mean (SD; n=185)[d]	1.08 (0.23)			
ART regimen: First/Second/Third line	163/32/9			
Duration of ART: mean years (SD)	7.18 (2.46)			
Age of initiation: mean years (SD)	3.41 (2.53)			
Adolescent report of missed ART dose(s) during previous 30 days (n=182)	49 (27%)			
Caregiver reports that adolescent missed ART dose(s) during previous 30 days	38 (19%)			
Viral load median (copies/mL)	0(40)			
CD4 count mean (cells/mm3)	953			

NOTES:

a: annual household income brackets: R0-R5000 / R5001+. The percentage presented above represents the percentage of participants who earn less than R5000 per annum. The Dollar exchange rate on 04/08/2017 is $1 = R13.33.

b: For this study orphanhood was defined as the loss of both biological parents.

c: Life Events Questionnaire.

d: HIV-related stigma questions rated between 1=Not at all and 3=All the time.

e: Adherence-related difficulties rated between 1=Extremely hard and 5=Not hard at all.

Table 2.

CTAAC cohort baseline functional competence and mental health meassures, association with living with HIV

Mental Health Outcome variable	Unadjusted β [95% CI][1]	P-value	Adjusted β [95% CI][2]	P-value
CBCL[a] total competence	−3.47 [−6.05, −0.89]	0.009*	−2.97 [−5.49, −0.45]	0.021*
CBCL internalizing problems	2.22 [−1.17, 5.61]	0.199	2.18 [−1.22, 5.59]	0.208
CBCL externalizing problems	2.46 [−0.94, 5.85]	0.155	1.99 [−1.36, 5.34]	0.243
CBCL total problems	2.94 [−0.51, 6.38]	0.095	2.55 [−0.87, 5.97]	0.143
BECK[b] self-concept	−3.79 [−6.70, −0.87]	0.011*	−3.59 [−6.47, −0.70]	0.015*
BECK anxiety	0.28 [−3.78, 4.33]	0.894	0.07 [−4.01, 4.15]	0.974
BECK depression	5.55 [1.80, 9.30]	0.004*	5.08 [1.35, 8.82]	0.008*
BECK anger	2.94 [−1.08, 6.95]	0.151	2.47 [−1.54, 6.48]	0.226
BECK disruptive behaviour	3.87 [0.46, 7.27]	0.026*	3.44 [0.07, 6.81]	0.046*
CMS[c]	−5.07 [−7.81, −2.34]	<0.001*	−4.71 [−7.41, −2.01]	0.001*
Conner's ADHD	4.81 [0.30, 9.31]	0.037*	3.85 [−0.52, 8.22]	0.084

NOTES:

a: CBCL = Child Behaviours Checklist parent rated version.

b: Beck Youth Inventory scale.

c: CMS = Children's Motivation Scale.

[1] β: regression coefficient, 95% CI: 95% confidence interval;

[2] Model of association with HIV-status adjusted for age, gender and current grade at school

* indicates significance at the .05 level.

Table 3.

Number of adolescents with clinically significant mental health disorders within the CTAAC cohort and differences between the groups.

Outcome variable	HIV-positive (N = 204)	Controls (N = 44)	T	p
CBCL[a] total competence	81 (39.7)	11 (25)	−2.401	.019*
CBCL internalizing problems	62 (30.4)	8 (18.2)	−1.815	.074
CBCL externalizing problems	32 (15.7)	4 (9.1)	−.950	.346
CBCL total problems	46 (22.5)	4 (9.1)	−2.125	.039*
BECK[b] self-concept	46 (22.5)	4 (9.1)	−2.296	.025*
BECK anxiety	24 (11.8)	4 (9.1)	−0.513	.610
BECK depression	13 (6.4)	1 (2.3)	−3.860	.00*
BECK anger	13 (6.4)	1 (2.3)	−2.016	.047*
BECK disruptive behaviour	8 (3.9)	0 (0)	−3.160	.00*

NOTE: For the HIV-infected and Controls columns the number of clinical range cases are presented as a whole number and the percentage of the sample in parentheses.

a: CBCL = Child Behaviours Checklist parent rated version.

b: Beck Youth Inventory scale.

Table 4.

Factors associated with mental health outcomes among adolescents living with HIV

Variable	Unadjusted β [95% CI][1]	P-value	Adjusted β [95% CI][2]	P-value
Conner's ADHD				
Male gender (versus female)	4.31 [0.44, 8.19]	0.029	3.21 [−0.69, 7.11]	0.106
Ever repeated a grade at school (versus never repeated a grade)	6.25 [2.36, 10.15]	0.002	5.82 [1.87, 9.78]	0.004
Life Events	0.54 [0.21, 0.86]	0.001	0.49 [0.17, 0.81]	0.003
Children's Motivation Scale				
Male gender (versus female)	−3.41 [−5.76, −1.05]	0.005	−3.36 [−5.81, −0.91]	0.008
Ever repeated a grade at school (versus never repeated a grade)	−2.85 [−5.27, −0.44]	0.021	−2.74 [−5.25, −0.23]	0.033
Caregiver is not a biological parent (versus a biological parent)	−2.63 [−5.22, −0.04]	0.046	−2.83 [−5.35, −0.30]	0.028
CBCL Internalising Problems				
Currently on 2nd or 3rd line ART regimen (versus 1st line)	4.57 [0.90, 8.24]	0.015	4.66 [0.91, 8.42]	0.015
Caregiver is not a biological parent (versus a biological parent)	−2.66 [−5.76, 0.44]	0.092	−3.35 [−6.48, −0.22]	0.036
Caregiver quality of life	−0.11 [−0.21, −0.01]	0.037	−0.13 [−0.24, −0.03]	0.014
Life Events	0.37 [0.13, 0.62]	0.003	0.33 [0.06, 0.60]	0.017
CBCL Externalising Problems				
Currently on 2nd or 3rd line ART regimen (versus 1st line)	5.02 [1.45, 8.59]	0.006	5.73 [2.24, 9.22]	0.001
Life Events	0.32 [0.09, 0.56]	0.007	0.34 [0.11, 0.57]	0.004
CBCL Total Problems				
Family resources	−0.09 [−0.16, −0.02]	0.010	−0.07 [−0.14, 0.00]	0.038
Life Events	0.49 [0.24, 0.73]	<0.001	0.42 [0.17, 0.67]	0.001
CBCL Total Competence				
Current grade at school	1.52 [0.57, 2.46]	0.002	1.53 [0.25, 2.80]	0.019
Ever repeated a grade at school (versus never repeated a grade)	−5.21 [−7.29, −3.12]	<0.001	−3.15 [−5.50, −0.81]	0.009
Adolescent has had HIV-related illnesses (versus no illnesses)	−2.75 [−4.94, −0.55]	0.015	−2.14 [−4.18, −0.09]	0.041
Family support	0.10 [0.03, 0.17]	0.005	0.09 [0.03, 0.16]	0.006
Beck Self-Concept Inventory				
Male gender (versus female)	2.15 [−0.39, 4.69]	0.097	2.77 [0.28, 5.25]	0.030
Current grade at school	1.75 [0.65, 2.85]	0.002	1.44 [0.03, 2.85]	0.046
Age at ART initiation	0.69 [0.19, 1.19]	0.007	0.63 [0.14, 1.13]	0.012
Beck Anxiety Inventory				
Life Events	0.72 [0.44, 1.01]	<0.001	0.72 [0.44, 1.01]	<0.001
Beck Depression Inventory				
Life Events	0.91 [0.66, 1.16]	<0.001	0.83 [0.57, 1.08]	<0.001
HIV-related stigma	9.72 [2.21, 17.24]	0.012	9.93 [2.88, 16.98]	0.006
Beck Anger Inventory				
Family assets	−0.81 [−1.41, −0.20]	0.009	−0.71 [−1.30, −0.11]	0.021
Life Events	0.79 [0.51, 1.07]	<0.001	0.71 [0.41, 1.01]	<0.001
HIV-related stigma	7.89 [−0.27, 16.06]	0.058	8.18 [0.24, 16.13]	0.044
Beck Disruptive Behaviour Inventory				
Life Events	0.60 [0.35, 0.85]	<0.001	0.55 [0.29, 0.80]	<0.001

Variable	Unadjusted β [95% CI][1]	P-value	Adjusted β [95% CI][2]	P-value
HIV-related stigma	10.67 [3.77, 17.57]	0.003	11.13 [4.27, 17.99]	0.002

[1] β: regression coefficient, 95% CI: 95% confidence interval;

[2] Models are adjusted for all covariates shown as well as age and gender.