Cumulative Psychosocial Risk is a Salient Predictor of Depressive Symptoms among Vertically HIV-Infected and HIV-Affected Adolescents at the Kenyan Coast

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Abstract

Background—Little is known of mental health outcomes among vertically HIV-infected or HIV-affected adolescents in Africa.

Objectives—The current study set out to describe depressive symptoms and their correlates among vertically HIV-infected and HIV-affected adolescents at the Kenyan Coast.

Methods—130 adolescents (vertically HIV-infected [$n = 44$], HIV-affected [$n = 53$], and unexposed [$n = 33$]) and their caregivers participated in this cross-sectional study. An adapted version of the Beck Depression Inventory-11 (BDI) was administered to examine depressive

symptoms in both adolescents and caregivers, together with measures of sociodemographic, medical, and anthropometric characteristics.

Findings—Our analysis indicated a main effect of HIV status on mean BDI scores in HIV-infected (18.4 [$SD = 8.3$) and HIV-affected (16.8 [$SD = 7.3$]) adolescents compared to the community controls (12.0 [$SD = 7.9$]), $F(2, 127) = 6.704$, $P = .002$, $\eta^2 = .095$. Post hoc analysis showed that BDI scores of HIV-infected adolescents were higher than those of community controls ($P < .001$). Similarly, HIV-affected adolescents had BDI scores that were higher than those of community controls ($P = .007$). However, there was no difference in BDI scores between HIV-infected and HIV-affected adolescents ($P = .304$). A path analytic model indicated that cumulative psychosocial risk (orphanhood, family poverty, and caregiver depressive symptoms) were positive predictors of BDI scores among adolescents, while nutritional status had a limited role.

Conclusions—Both HIV-infected and HIV-affected adolescents are at a high risk of experiencing depressive symptoms, largely due to the multiple psychosocial risk factors in their environment. The provision of adequate psychosocial support and counseling needs to become an integral part of the care program for adolescents from families living with HIV/AIDS at the Kenyan coast and other similar settings.

Keywords

Introduction

Adolescents are becoming an increasingly important demographic group in the HIV epidemic in Africa.[1,2] The availability of antiretroviral (ARV) drugs has turned HIV/AIDS from an acute and fatal disorder to a chronic condition. Children vertically infected with HIV are more likely to survive to adolescence and adulthood.[3] With the decrease in mortality, focus has now shifted to understanding morbidity and HIV-associated disability in an effort to develop evidence-based programs aimed at enhancing the quality of life of vertically infected children and adolescents.

In an extensive review of literature,[4] it was noted that youth who were perinatally infected with HIV experience a higher-than-expected risk of mental health and behavioral problems. Although Africa is home to more than 90% of the HIV-infected children worldwide, of the 38 studies included in this review, only 3 were from Africa, with the remaining studies coming from North America ($n = 30$), Western Europe ($n = 3$), and Asia ($n = 2$). There is therefore a need to understand the impact of HIV/AIDS on the lives of these children, since evidence from North America cannot be easily extrapolated into the African context given the differences in drug use, cultural factors, health care, and social support systems.

The few studies investigating mental health outcomes among vertically HIV-infected adolescents in Africa present conflicting results. Three studies from Kenya,[5] Uganda,[6] and Tanzania[7] found that these adolescents experience high levels of mental health problems, particularly anxiety and depression. Another study from Zambia[8] did not find an elevated

risk of mental health problems in HIV-infected adolescents compared to uninfected peers randomly recruited in schools. These contradictory results may arise due to various methodological shortfalls in previous studies, including the use of tools that have not been adequately validated and lack of appropriate comparison groups. For instance, the recent study in Kenya by Kamau and colleagues[5] reported that 48% of the HIV-infected adolescents presented with psychiatric morbidity, which was much higher than the 20% observed in the general population. However, the comparison is problematic because the data from the general population was collected more than 20 years prior to that of the HIV-infected population. Such methodological shortfalls make it difficult to reach firm conclusions on the prevalence of mental health problems among HIV-infected children and adolescents in Africa.

Conceptual and Theoretical Framework Underpinning This Study

The current research is based on the tenets of the bioecological framework, which indicates that the course of human development is shaped by conjoint and interactive effects of individual characteristics [e.g., health, age, and personality] with contextual factors [e.g., parenting behavior and socioeconomic status].[9,10] According to this framework, developmental and behavioral outcomes are caused by ongoing reciprocal interactions between an individual's characteristics and the environment.[11,12] Contextual factors are hierarchically organized from the most distal macro- context (e.g., culture) to the most proximal micro-contextual factors (e.g., familial characteristics). Proximal micro-contextual factors exert relatively stronger influences in shaping outcomes than distal macro-contextual factors.[13]

In refining the bioecological model to better suit risk and protective factors in the low- and middle-income countries, Wachs and Rahman[13] note 3 important points. First, most of these factors covary (cluster); that is, children who experience one risk factor (eg, poverty) are at a higher probability of experiencing another one (eg, exposure to pathogens) due to lack of access to clean water and adequate sanitation that in turn contributes to malnutrition due to wastage of consumed nutrients. Second, given this clustering of various risk factors, a single risk factor rarely predicts outcomes, but the accumulation of risk is what tends to be most adverse for childhood outcomes. Last, in the examination of the different hierarchical contexts, risk factors could be divided into biological and psychosocial risks within the same level. For instance, within the microsystem, biological risk would include infections and nutritional status, while psychosocial risk would include parental and caregiver characteristics.[13]

HIV typically occurs in a multiple risk environment.[14–16] Children born to HIV-infected mothers are at an increased risk of experiencing multiple losses, orphanhood, and parental mental health problems, among other psychosocial disadvantages.[17,18] This accumulation of risk factors has been observed to be predictive of poor outcomes both for HIV-infected and HIV-affected (those whose mother is HIV-infected but they themselves are not infected) children and adolescents. However, the influence of these factors on mental health outcomes among vertically infected African adolescents has so far not been examined. Studying mental health outcomes and their contextual influences in Africa is important because the

formal and informal support systems for adolescents infected or affected by HIV differ from those in the West. The evaluation of the potential impact of cumulative risk not only adds to the knowledge base but is likely to help us identify important points of intervention.

Based on theoretical and empirical evidence from the bioecological and the cumulative risk model, we developed a conceptual model to guide our study (see Figure 1). According to this model, both maternal and adolescent's HIV statuses are risk factors for elevated scores on a measure of depression. Maternal HIV status is expected to have an indirect effect through its influence on psychosocial risk, while adolescent HIV status is expected to have both a direct and indirect influence on adolescent development. Moreover, we expect that these risk factors will influence adolescent development both directly and indirectly. The indirect influence of maternal HIV infection is expected to result from the increase in the number of psychosocial risk factors that adolescents are likely to experience. Maternal HIV infection is expected to increase the risk of living with a caregiver who is experiencing high depressive symptoms, lower socioeconomic status (SES), and experiencing parental death and, hence, orphanhood.

Based on both empirical and theoretical work on cumulative risk, we used a factor analytic approach to develop an index of psychosocial risk.[19] As noted by Evans et al,[19] a factor analytic approach allows for the study of cumulative risk and avoids the problem of multiple correlated predictors (if the psychosocial risk factors were modeled individually) in a single model, which is likely to lead to unstable estimates and reduced statistical power. According to Evans et al,[19] another justification for a cumulative risk approach arises from the nature of the relationship between these factors. It has been observed that these risk factors are usually so closely correlated that sometimes identifying a single risk out of the larger context is likely to overestimate the harmful effects of that risk.

Adolescent HIV infection is expected to indirectly influence child mental health outcome through its influence on biomedical status. We expect that HIV-infected adolescents will experience more biomedical problems compared to HIV-uninfected peers. Earlier studies among HIV-infected children aged < 10 years report that advanced disease (as indicated by World Health Organization [WHO] clinical staging), high viral load, and poor nutritional status contribute to poor neurodevelopmental outcomes in children of this population.[20,21] In a path analytic model, the use of biomedical variables is limited by the fact that some of these risk factors, such as disease stage and viral load, are unique to the HIV-infected group. So, for this analysis we used the Height for Age Z-scores (HAZ) as an indicator of biomedical risk. HAZ was used as a proxy for nutritional status since it is an indicator of long-term chronic undernutrition and has been observed to be correlated to many other health outcomes.[22]

We extend the findings from Africa by using a cross-sectional study to describe depressive symptomatology and their correlates in vertically HIV-infected, HIV-affected, and community controls at the Kenyan Coast. The specific research questions we were interested in answering were:

I.   Are HIV-infected adolescents at an increased risk of experiencing depressive symptoms compared to HIV-affected adolescents and community controls?

II.   Does a partial mediational model where adolescent and maternal HIV status directly and indirectly influence the level of adolescent depressive symptoms fit well to our data?

III. Does HIV disease severity correlate with scores of depressive symptoms of HIV infected adolescents?

Methods

Study Site

The study was undertaken at the Centre for Geographic Medicine Research-Coast in Kilifi, Kenya. HIV-infected and HIV-affected participants were recruited from outpatient comprehensive care HIV clinics and public schools. Two comprehensive care clinics were involved; the Comprehensive Care and Research Clinic (CCRC) at the Kilifi County Hospital and the Vipingo Health Center, also within Kilifi County. Community controls were recruited from 4 randomly selected public schools within the same catchment area of the 2 comprehensive care clinics mentioned above—2 high schools and 2 primary schools, all in Kilifi County.

Study Design

This study employed a cross-sectional study design. Adolescents were eligible if they were 12-17 years of age, provided assent, and their caregiver provided informed consent.

Recruitment and Sampling Procedures

HIV-Infected Adolescents (n = 44)—HIV-infected adolescents were recruited from the comprehensive care clinics, where they were being followed up for HIV care and treatment. The attending clinicians and the health workers identified eligible families and introduced them to the study recruitment officer. The recruiting officer took informed consent from the caregiver (mother or legal guardian where the mother was deceased) and assent from the HIV-infected adolescents in the local languages (Kigiriama and Kiswahili).

HIV-Affected Adolescents (n = 53)—These are HIV-uninfected adolescents whose mothers were HIV-infected. We choose to use the term HIV-affected as opposed to HIV-infected as we did not have any data to indicate whether or not there was any prenatal exposure to HIV or ARVs. However, we did anticipate that they may have been exposed to all the psychosocial stressors associated with having a mother who is or was HIV-infected. These adolescents were identified either through the attending clinicians at the comprehensive care clinics or through community health workers who knew families with adolescents eligible for recruitment into the study. The recruiting officer took informed consent from the care-giver (mother or legal guardian where the mother was deceased) and assent from the HIV-affected adolescents in the local languages (Kigiriama and Kiswahili).

Community Controls (n = 33)—To our knowledge, these are participants who are neither HIV-infected, nor born from HIV-infected parents, and were recruited randomly from selected public schools. Teachers from the schools were initially requested to identify 20 eligible adolescents. Caregivers were invited to come to the schools to give consent and

for adolescent to assent to the study. Participation was low because parents frequently did not come to school to give consent. Only one mother who came for the session out of 34 mothers declined to have her child participate. Students were only recruited into the study if their parents came to the school and filled in the informed consent forms and the student gave assent to participate. In total, 33 controls were recruited. We did not test to rule out HIV infection among the community controls for various reasons, including cultural and ethical reasons. However, we expected that the likelihood of randomly selecting a vertically infected youth in this setting would be negligible. At the time of their birth, ARVs were not readily accessible. Estimates available indicated around 9% of mothers were HIV positive; without ARVs, 25%-40% of HIV-positive mothers vertically infected their children. In addition, and in the absence of ARVs, up to 50% of HIV-positive children would have died by their second birthday; 80% by their fifth birthday.[23] We also have no estimates for adolescents infected through sexual activity so we cannot adequately estimate the potential impact in our results. However, data from other parts of Kenya indicates that the prevalence is 3.4%. Thus, it is possible that we could have sampled 1 or 2 sexually acquired HIV-infected adolescent(s) among the HIV-affected and community-control participants, whose impact on the overall results is likely to be negligible.

Measures

Measure of Depressive Symptoms

Beck Depression Inventory-11 (BDI-11) for Adolescents—A locally adapted version of the BDI-11[24] was administered.[25] The adolescent version has 20 items. The item on loss of sexual interest was excluded because of cultural sensitivity of the question. The details relating to the adapted version can be found elsewhere.[25] The main adaptation from the published scale is the Likert scoring where the 4-point option had been found difficult to administer as an oral interview. An oral interview was preferred for this study to avoid difficulties arising among younger adolescents who may not be literate or among adolescents who are out of school. Additionally, administration procedures for the BDI were changed (based on earlier reports and pilot work) to a staged response format with 2 stages. We first asked the participants if they had experienced any changes in a specific item in the last 2 weeks (eg, "Have you experienced any changes in your appetite in the last 2 weeks?"). If they said "no," then we would give the lowest score (0). If they said "yes," we would ask them which change they experienced (eg, "So, what kind of change did you experience; for example did you eat more or did you eat less?") When they said they ate more, we would then present one of the two response options, looking at the extent of the change (ie, "Was it a small change or a big change in appetite?") and ask the respondents to pick the one that describes their condition best. In this population the alpha was .80 for the 20-item set, considered to be very good based on the suggested psychometric criteria.[26]

Measure of Cumulative Psychosocial Risk

Three measures were administered to collect data that was used to compute cumulative psychosocial risk:

Beck Depression Inventory-11 (BDI-11) for Parents—A locally adapted version of the BDI-11 was administered.[25] The parent version included all the 21 items. Among the adults in Kilifi, it has been observed to have good construct validity, and the alpha was .79, which is considered to be very good.[26]

Socioeconomic Status—to assess the families' socioeconomic conditions, an asset index was administered. In this index, the adolescents were requested to indicate whether they possessed at home 12 different items or services such as a car, computer, radio, farm ownership, running water, and flushable toilet. We used a factor analytic approach (principal component analysis) to provide a single index of SES. We evaluated whether all the items form a single construct to justify the computation of a total score. Results indicated that all the items positively loaded on a single factor except for owning a farm, which had a negative loading. The item on farm ownership was excluded, and the final SES score had 11 items that loaded on one factor explaining approximately 32% of the variance, with an alpha of .73. We computed the total score of the listed items to come up with an asset index for each child. The use of an asset index to estimate family wealth has been recommended as an alternative approach to estimating SES in settings where reliable data on family income may not be available.[27]

Orphanhood—This was coded based on a question on whether the child's parents were still living. Any child who had lost a parent had a score of 1 while the child whose parents were both still living scored 0. The study did not differentiate between maternal, paternal, or complete orphans.

Nutritional Status

Height and weight measures were taken. Standing height was measured. Weights were taken on a Seca Digital Scale. Height-for-Age (HAZ) scores were generated using the WHO software for assessing growth and development.[28] All anthropometric measures were taken by 2 trained assistants. HAZ was used as a proxy for nutritional status since it is an indicator of long-term chronic undernutrition.

Disease Progression

Medical Review—For HIV-infected adolescents, a review of their medical records was carried out to establish the degree of disease progression. We checked for the WHO disease stage in the 6 months within our assessment period. Records indicated that 38 of the 44 HIV-infected adolescents had WHO disease staging carried out within this period.

Data Analysis

The data were analyzed in 3 ways to be able to answer the research questions. First, Analysis of Variance (ANOVA) was carried out to evaluate group differences to determine whether HIV-infected adolescents are at an increased risk of experiencing depressive symptoms compared to HIV-affected adolescents and community controls. Second, to be able to investigate the conceptual model earlier postulated, we conducted a path analysis using STATA 15.[29] A partial mediation analysis was conducted (see Figure 1). The relationship between child HIV status and maternal HIV status in the path model is sample

specific and not useful for interpretation. We fixed this path based on the correlation coefficient of the bivariate analysis (.417). To answer the third research question (does HIV disease severity correlate with scores of depressive symptoms?), we carried out an analysis involving only the vertically infected HIV positive adolescents. In this analysis, to evaluate the relative impact of disease progression in the HIV-infected adolescents, we performed an ANOVA with BDI scores as dependent and WHO clinical staging as independent variable.

Ethics Statement

The Kenya Medical Research Institute National Scientific and Ethical Committees approved the study (SSC No. 2211). Parents/caregivers and adolescents provided written informed consent and assent respectively prior to participation.

Results

Characteristics of Study Participants

We recruited 134 adolescents but excluded 4 due to missing data. Among those included in the final analysis, 44 were HIV-infected, 53 were HIV-affected, and 33 were community controls (Table 1). Of the HIV-infected adolescents, the majority ($n = 38$) were on antiretroviral therapy at the time of study recruitment. The mean age at study recruitment was 14.3 years ($SD = 1.8$). Overall, most of the participants were male (55%). Orphanhood was highest in the HIV-infected adolescents (76%) compared to the HIV-affected adolescents (55%) and community controls (9%). Moreover, HIV-infected and HIV-affected adolescents were significantly more likely to come from families with lower SES, be more malnourished, and have caregivers who experienced higher levels of depressive symptoms, compared to the community controls (Table 1). Among the HIV-infected adolescents, 7 (18%) of the adolescents were in (WHO) stage I (meaning they were asymptomatic); 18 (48%) were in stage II, 8 (21%) were in stage III, while 5 (13%) were in stage IV.

Between-Group Differences in Rates of Depressive Symptoms

HIV-infected and HIV-affected adolescents were more likely to experience psychosocial disadvantage compared to the community controls. Our analysis indicated a main effect of HIV status on mean BDI scores in HIV-infected (18.4 [$SD = 8.3$]) and HIV-affected (16.8 [$SD = 7.3$]) adolescents compared to the community controls (12.0 [$SD = 7.9$]), $F(2, 127) = 6.704$, $P < .002$, $\eta^2 = .095$ (see Figure 2). Post hoc analysis showed that scores of HIV-infected adolescents were higher than those of community controls ($P < .001$). Moreover, HIV-affected adolescents had scores that were higher than those of the community controls ($P = .007$), but there was no difference between HIV-infected and HIV-affected adolescents ($P = .304$). These results indicate that children from families affected by HIV are likely to present with higher scores on a measure of depressive symptoms compared to community controls.

Correlates to Scores on Depressive Symptoms: Sources of Variability

The results indicated that age and sex were not signifiantly correlated to the outcome variables. Consequently, they were not included in any further analysis. Our factor analysis included SES, orphanhood, and caregiver depression as cumulative psychosocial risk. These

variables strongly loaded on 1 factor (factors loadings ranged from −.662 to .787) with SES having a negative loading (see Table 1 for the means of the psychosocial risk score, which indicated HIV-infected and HIV-affected adolescents had the highest scores).

Based on the hypothesized model, we tested the mediational effects of biomedical (nutritional) and cumulative psychosocial risk factors (see Figure 1). Our results indicated that the hypothesized model had a good fit to the data as can be seen from the following fit indices: χ^2 (4, N = 130) = 4.37, P = .316, the Tucker Lewis Index (TLI) = .983; (recommended .90), Comparative Fit Index (CFI) = .993, and the Root Mean Square Error of Approximation (RMSEA) = .037 (90% C.I., .000-.142) (recommended .06). Figure 3 presents standardized path coefficients while Table 2 presents the estimates from the path analytic model. We tested for indirect effects and we observed that the indirect effects of maternal HIV status on BDI scores were significant (P = .006), indicating a mediation effect. The results of our path analytic model showed that the high scores for depression of the adolescents could largely be attributed to the level of cumulative psychosocial risk experienced. The impact of maternal HIV status was fully mediated by psychosocial risk, while the impact of the adolescent's HIV status was partially mediated by psychosocial risk. Nutritional status did not have a significant role in predicting BDI scores.

Within-Group Differences among HIV-Infected Adolescents

To be able to investigate the impact of disease progression among HIV-infected adolescents, we carried out an analysis on this sub-group alone. A bivariate correlation indicated that disease stage was not significantly correlated to BDI scores, r (36) = .06, P = .721.

Discussion

We set out to answer 3 main questions. First, are HIV-infected adolescents at a higher risk of mental health problems? Our results indicate that HIV-infected adolescents experienced significantly more depressive symptoms than community controls, both because of being infected and the influence of cumulative psychosocial risk. Moreover, HIV- affected adolescents also experienced mental health problems resulting from cumulative risk associated with living in a family affected by HIV. It is difficult to compare our results directly with earlier studies in Africa since none of the studies among adolescents involved a comparison of these three key groups. However, the findings that HIV-affected adolescents are at risk is consistent with earlier studies in Africa focusing on orphans or parental HIV illness, where orphans have been observed to experience post-traumatic disorders, depression, and anxiety problems among others.[30–32] Of note is that HIV-affected children and adolescents are usually not actively followed up or monitored in the health care system. The present data indicates that the lack of psychosocial support for HIV-affected adolescents, which is usually available for the HIV-infected adolescents, needs to be addressed. Living in families affected by HIV has adverse effects for the mental health of adolescents in our setting; consequently, there is a need to provide services to such children and adolescents.

Consistent with the theoretical and empirical work involving children in multiple risk environments, we observed that cumulative risk was an important explanatory factor. Our

results indicated that the single most important factor in shaping poor outcomes is the level of psychosocial risk that is experienced by the adolescents of HIV-infected parents. To the best of our knowledge, there are no studies among adolescents in Africa reporting the contribution of cumulative psychosocial risk in predicting mental health outcomes among perinatally infected adolescents. A study with preschool children in Uganda presents a similar pattern of results as ours. In the study by Busman and colleagues[33] involving HIV-infected preschool children, it was observed that caregiving context was associated with mental health outcomes. In this study, children of caregivers who experienced high levels of anxiety and depression and low quality of home environment had high scores on the child behavior checklist (CBCL). These patterns of results indicate that in understanding the impact of HIV on childhood outcomes, an ecological perspective needs to be taken, and efforts to understand the child's environment and how it shapes their psychosocial adjustments are salient.

We observed that HIV-infected adolescents were at greater risk of experiencing nutritional deficits (ie, growth retardation) compared to HIV-affected and community controls. The HIV-affected adolescents were also at a higher risk of showing growth restrictions compared to community controls. The poor nutritional status in this group is consistent with earlier fiindings involving younger children in Africa.[20] These results indicate that nutritional deficiencies experienced in earlier years persist into puberty.

Our third research question was: Does HIV disease severity correlate with scores of depressive symptoms among HIV-infected adolescents? Our results indicate that in our sample, both nutritional status and disease stage had limited association with depressive symptoms. While other studies have indicated that these 2 biomedical factors are likely to influence developmental outcomes among HIV-infected adolescents, the same effects. This may have resulted from 2 potential factors. First, for disease stage, where the analysis involved only HIV-infected adolescents who were further divided into 4 groups, our sample size may have been too small to detect small effects within the groups. Future studies with larger samples could further examine this hypothesis. The second potential factor is a differential impact of risk factors on functional domains. Earlier studies that guided our hypothesis on the impact of nutrition and disease stage on outcomes were based on cognitive and psychomotor outcomes.[20,21] There is a possibility that neurocognitive outcomes are more influenced by biomedical factors whereas mental health outcomes are more environmentally shaped. Again, with the current sample size we cannot draw firm conclusions, yet this would be an important line of research to explore.

A noteworthy point is the high level of depressive symptoms among caregivers of HIV-infected and HIV-affected adolescents. These results are consistent with what has been reported elsewhere in Africa. For instance, a recent study from South Africa noted that "poorer psychological functioning in children was signifiantly associated with depressive symptoms in caregivers. This relationship existed whether or not the child was raised by a biological or non-biological caregiver as well as for both genders" (p. 771).[34] This is a major source of concern given the impact of caregiver mental health in shaping parenting behavior, which in turn shapes childhood outcomes. Public health workers need to be alert to the fact that caregivers of HIV-infected adolescents may themselves experience a high level of stress

arising from dealing with the cumulative risk associated with HIV infection in the family. Our results indicate that psychosocial support to caregivers needs to be a core aspect of a comprehensive care package for children and adolescents with HIV.

Limitations

The current study adds to our knowledge base on the impact of HIV infection on adolescents in Africa. It is the first study to model the possible contribution of both biomedical and psychosocial risk on outcomes among HIV-infected, HIV-affected, and unexposed adolescents. However, the study has 3 main limitations. First, although our sample size was sufficient for identifying practically meaningful effects, we could not look in great detail at some other factors, especially as they related to impact of disease progression among HIV-infected adolescents. Second, some of the HIV-infected and HIV-affected adolescents were from the same household. This may create some dependency in the data. However, as this is the reality in many instances, it was important to generate data from each of these groups. Third, the recruitment approach for community controls was strongly influence by parental willingness to come to school for consenting process. This may have contributed to a self-selection bias with caregivers more willing to leave their duties to attend school session being potentially different from those who did not come to school.

Conclusion

We observed that both HIV-infected and HIV-affected adolescents are at an elevated risk of experiencing depressive symptoms, and these problems are largely associated with the numerous psychosocial risk factors within their home environment. The provision of adequate psychosocial support and counseling needs to become an integral part of the care program for both HIV-infected and HIV-affected adolescents in Africa.

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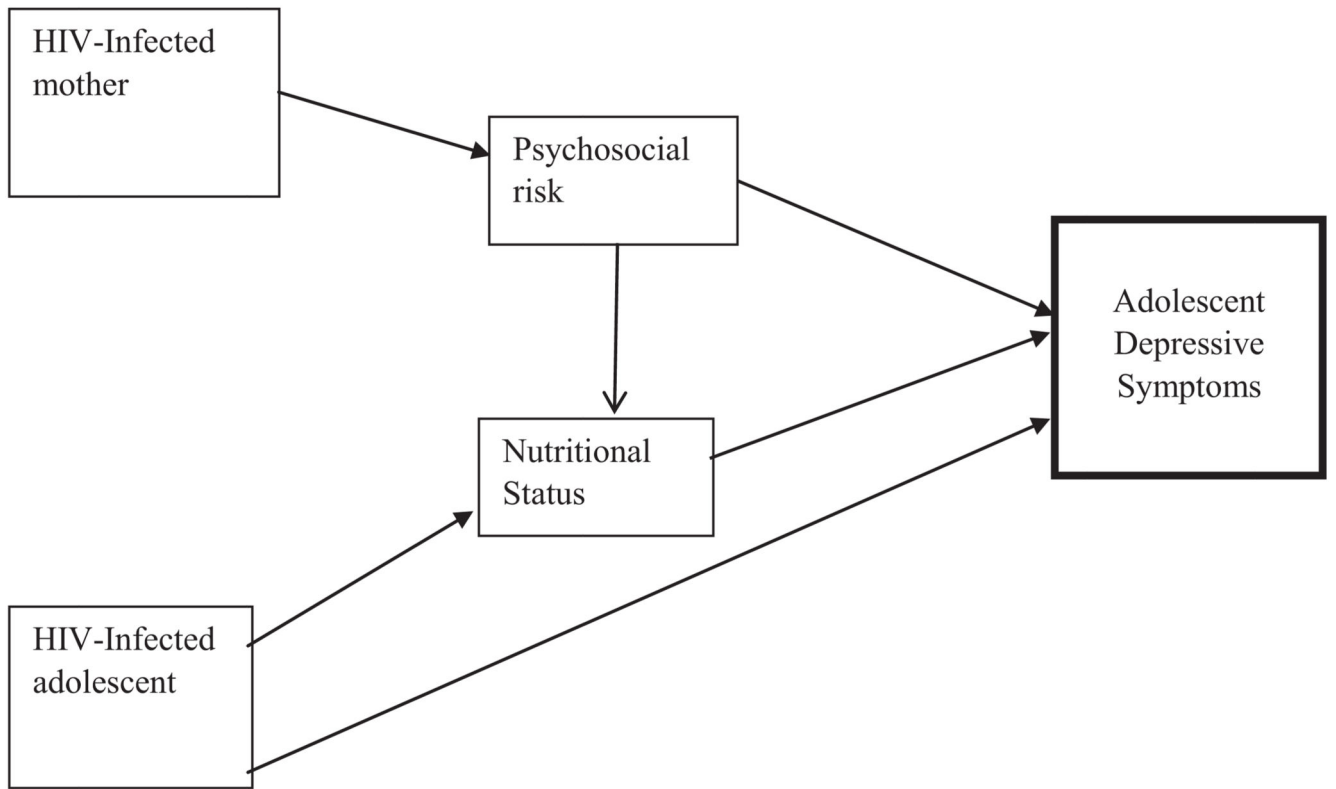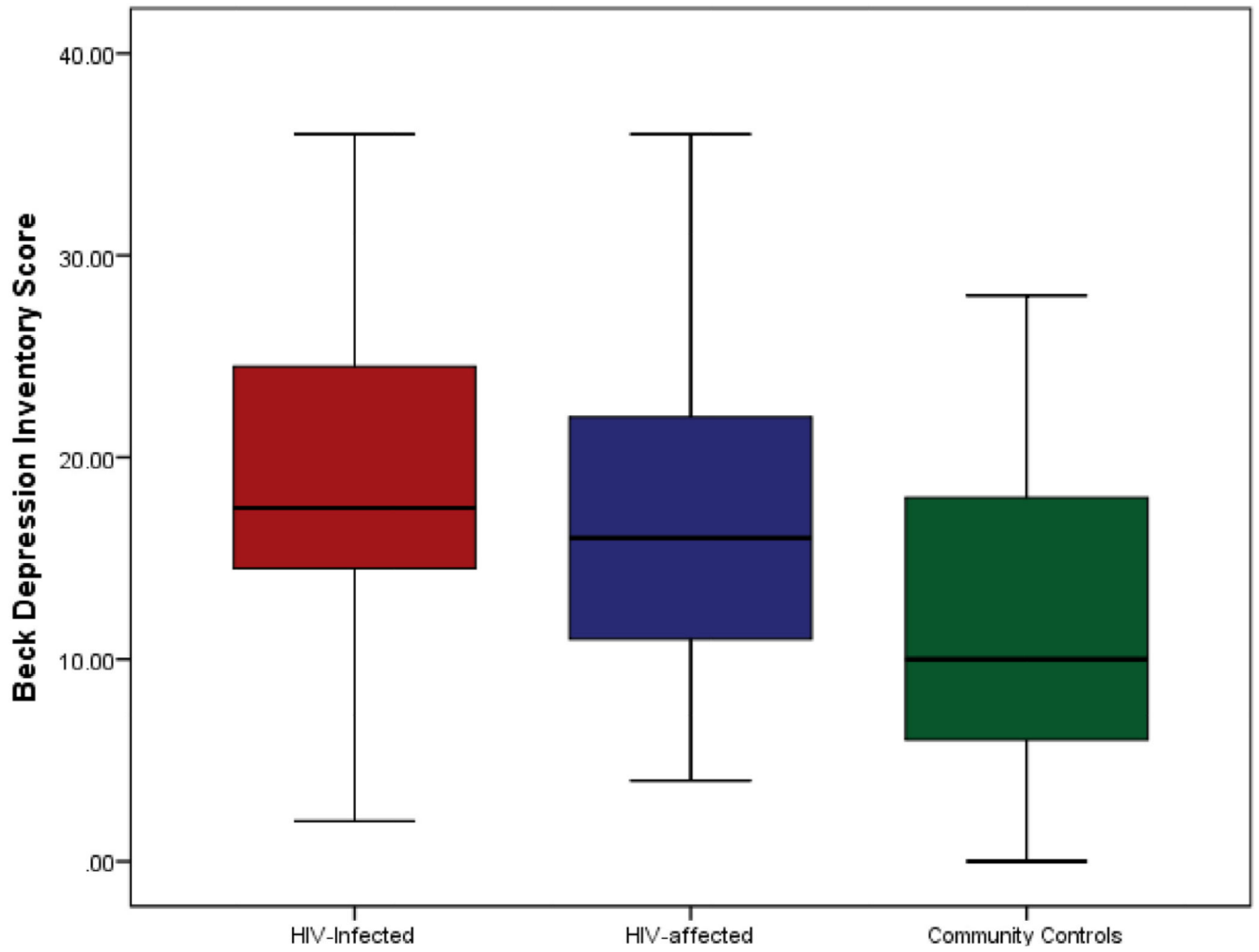
Figure 1. Hypothesized path analytic model.
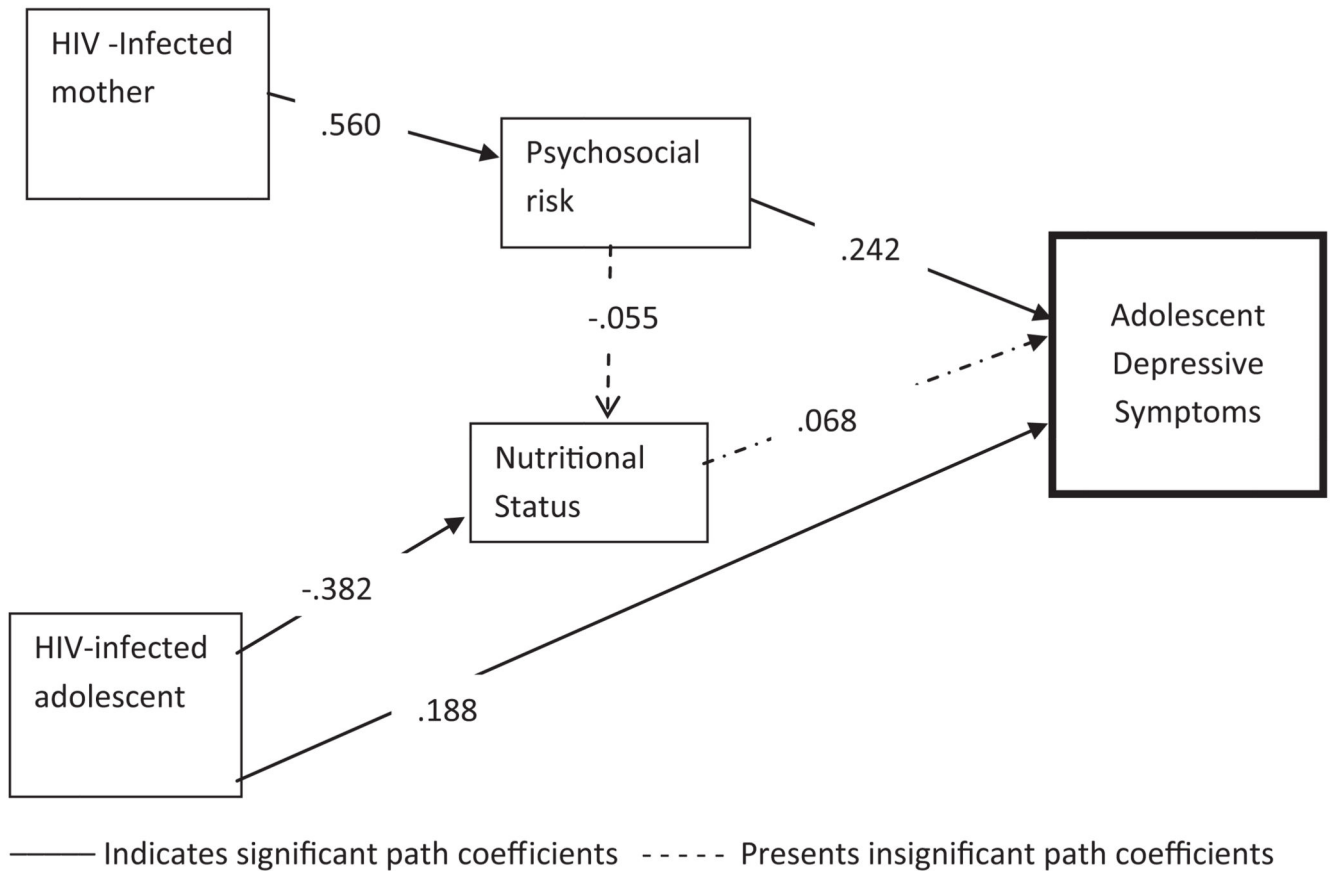
Figure 2. BDI Mean Scores from the Different Study Groups.

Figure 3. Standardized Estimates from the Path Analysis.

Table 1

Sample Descriptive by HIV Status

	HIV-Infected (*n* = 44)		HIV-Affected (*n* = 53)		Community Control (*n* = 33)		Group comparison
Age in Months							
Min—Max	143.90-212.96		134.57-212.27		128.03-202.45		
Mean (*SD*)	169.29	(18.70)	177.06	(22.56)	166.81	(22.86)	$F(2, 127) = 2.775, P = .065$
Sex							
Male	23	(52.3%)	30	(56.6%)	18	(54.5%)	$\chi^2 (2, N = 130) = .182, P = .913$
Female	21	(47.7%)	23	(43.4%)	15	(45.5%)	
Caregiver BDI scores							
Min—Max	10-43		13-44		1-39		
Mean (*SD*)	24.00	(6.89)	26.71	(6.94)	17.89	(7.37)	$F(2, 127) = 16.08, P < .001, \eta^2 = .202$
Orphanhood							
Orphan	33	(75.6%)	29	(54.7%)	3	(9.4%)	$\chi^2 (2, N = 130) = 33.29, P < .001$
Non-orphan	11	(24.4%)	24	(45.3%)	29	(90.6%)	
SES							
Min—Max	0-10.00		0.0-7.00		1.0-9.0		
Mean (*SD*)	2.30	(2.02)	1.80	(1.52)	3.22	(2.05)	$F(2, 127) = 6.12, P < .003 \; \eta^2 = .088$
HAZ							
Min—Max	−4.37-0.81		−3.90-2.04		−2.73-2.56		
Mean (*SD*)	−2.08	(1.26)	−1.14	(1.16)	−.860	(1.06)	$F(2, 127) = 12.20, P < .001 \; \eta^2 = .161$

Table 2

Estimates from the Path Analytic Model

		Estimate	S.E.	Est./S.E.	P
Psychosocial Risk					
	Maternal HIV Status	0.560	0.055	10.14	0.000
HAZ					
	Child HIV Status	0.382	0.075	−5.06	0.000
	Psychosocial Risk	−0.055	0.119	−0.68	0.498
BDI Score					
	Psychosocial Risk	0.242	0.081	2.98	0.003
	HAZ	0.068	0.090	0.76	0.448
	Child HIV Status	0.188	0.089	2.12	0.034
R-Squared					
	BDI score	0.106			
	Psychosocial Risk	0.313			
	HAZ	0.159			
	Child HIV Status	0.174			