

RUNNING HEAD: Stigma, anxiety, and depression in HIV/AIDS-orphaned youth

Relationships among HIV/AIDS-orphanhood, stigma, and symptoms of anxiety and depression  
in South African youth: A longitudinal investigation using a path analysis framework

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Abstract

Cross-sectional research has demonstrated that HIV/AIDS-orphanhood is associated with anxiety and depression, and that HIV/AIDS-related stigma is a risk factor for these outcomes. This study used a longitudinal dataset to determine whether relationships between HIV/AIDS-orphanhood and anxiety and depression scores (measured at four year follow-up) operate indirectly via perceived stigma. Youths from poor communities around Cape Town were interviewed in 2005 ( $n = 1025$ ) and followed up in 2009 ( $n = 723$ ). HIV/AIDS-orphaned youth reported significantly higher stigma, anxiety, and depression scores than youth not orphaned by HIV/AIDS at both baseline and follow-up. However, HIV/AIDS-orphanhood was not *directly* associated with anxiety or depression. Instead, significant *indirect* effects (operating through perceived stigma) were obtained for both assessment periods. Results demonstrate that stigma persists across time and appears to account for relationships between HIV/AIDS-orphanhood and psychological distress. Interventions aiming to reduce stigma may help promote the mental health of HIV/AIDS-orphaned youth.

**Keywords:** stigma, HIV/AIDS, orphan, anxiety, depression, South Africa.

HIV/AIDS has resulted in a substantial increase in the number of orphans internationally and UNICEF estimate that by 2020 40 million youths may have lost one or both parents to HIV/AIDS (Maughan Brown, 2010). Sub-Saharan Africa has been most severely affected and accounts for over 80% of HIV/AIDS-orphaned youth. In South Africa alone an estimated 1.9 million youths were orphaned by HIV/AIDS in 2010 (UNAIDS, 2010). Importantly, HIV/AIDS is one of the most stigmatised diseases in history (Parker & Aggleton, 2003). Stigma refers to an attribute that is deeply discrediting and marks the person not only as different but as bad, dangerous, or weak (Goffman, 1963). South Africa has particularly high levels of HIV/AIDS-related stigma, ranging from subtle rejection to physical assault and even murder (Skinner & Mfecane, 2004). There is a growing body of research demonstrating that HIV/AIDS-orphaned youth are at elevated risk of internalising problems, such as anxiety and depression (Cluver & Gardner, 2007a) and that HIV/AIDS-related stigma is an important risk factor associated with mental health outcomes in this vulnerable population (Cluver, Gardner, & Operario, 2008; Cluver & Orkin, 2009; Wang et al., 2012). This study used longitudinal data from a four year follow-up study to examine relationships between HIV/AIDS-orphanhood, stigma, anxiety, and depression in a large sample of South African youth.

Multiple cross-sectional studies in sub-Saharan Africa have demonstrated that HIV/AIDS-orphanhood is associated with emotional distress – particularly with regard to symptoms of anxiety, depression, and posttraumatic stress (Atwine, Cantor-Graae, & Bajunirwe, 2005; Bhargava, 2005; Cluver, Gardner, & Operario, 2007; Nyamukapa et al., 2008). Similar findings have been obtained in China (Fang et al., 2009; Wang et al., 2012; Zhao et al., 2007) and the United States (Forehand et al., 1999; Pelton & Forehand, 2005). Recent research indicates that HIV/AIDS-orphaned youth are at greater risk of these internalising problems even when compared with youth orphaned by other causes (Cluver et al., 2007) and that these negative mental health outcomes are maintained longitudinally (over a four-year period) (Cluver, Orkin, Gardner, & Boyes, 2012). These findings have resulted in calls in the

international literature for a focus on the psychosocial support needs of orphans and vulnerable children (Skinner et al., 2006). Understanding the pathways through which HIV/AIDS-orphanhood impacts on youth mental health is crucial if appropriate services for HIV/AIDS-affected youth are to be developed and tested (Cluver & Orkin, 2009).

Recently a developmental psychopathology framework of the psychosocial needs of children orphaned by HIV/AIDS has been proposed to guide research (Li et al., 2008). This framework is based on the social-ecological theory of Bronfenbrenner (1979) and includes general risk factors such as poverty and lack of education (hypothesized to be important for all orphaned and vulnerable children). However, the experience of HIV/AIDS-related stigma is identified as a key *distinction* between HIV/AIDS-orphaned youth and youth orphaned by other causes. Using this framework as a theoretical rationale, the current study focuses specifically on HIV/AIDS-related stigma as a potential mediator of the relationship between HIV/AIDS-orphanhood and symptoms of anxiety and depression.

Research from both the developed world (Antle, Wells, Goldie, DeMatteo, & King, 2001; Ingram & Hutchinson, 1999) and sub-Saharan Africa (Campbell, Skovdal, Mupambireyi, & Gregson, 2010; Greef et al., 2010; Maughan Brown, 2006) has demonstrated that being HIV/AIDS-affected is associated with social rejection and exclusion. There is also qualitative evidence from South Africa that HIV/AIDS-orphaned youth experience bullying, discrimination, gossip, taunting, and verbal abuse referencing either deceased parents or sick caregivers (Cluver & Gardner, 2007b). Additionally, quantitative research has demonstrated that HIV/AIDS-related stigma is a significant risk factor for the development of internalising problems amongst HIV/AIDS-orphaned youth (Cluver et al., 2008; Cluver & Orkin, 2009; Wang et al., 2012). A South African study demonstrated that the proportion of HIV/AIDS-orphaned youth who scored in the clinical range for an internalising disorder (anxiety, depression, or posttraumatic stress) was nearly three times higher when youth were not only HIV/AIDS-orphaned but also experienced HIV/AIDS-related stigma (Cluver & Orkin, 2009).

Similarly, a recent Chinese study reported that HIV/AIDS-related stigma was positively associated with symptoms of depression in a sample of 755 HIV/AIDS-orphans. Finally, data from South Africa has demonstrated that HIV/AIDS-related stigma is a significant mediator of the relationships between HIV/AIDS-orphanhood and symptoms of depression, posttraumatic stress, and peer problems (Cluver et al., 2008). However, the above studies are all limited by their reliance on cross-sectional data which precludes interpretations regarding the direction of associations, as well as potential long term associations between HIV/AIDS-orphanhood, stigma, and mental health outcomes. There is thus a clear need for longitudinal data to clarify relationships between HIV/AIDS-orphanhood, stigma, and psychological distress over time.

The aim of this longitudinal study was to examine relationships between HIV/AIDS-orphanhood, HIV/AIDS-related stigma, and symptoms of anxiety and depression measured at four year follow-up (using a path analysis framework). The study aimed to extend the existing literature by 1) determining whether stigma experienced by HIV/AIDS-orphaned youth persists over time, and 2) empirically testing if relationships between HIV/AIDS-orphanhood and symptoms of anxiety and depression (measured four years later) operate indirectly through perceived stigma. If this is the case it would have important implications for intervention design in South Africa and would establish HIV/AIDS-related stigma reduction as a priority for future research; particularly in the context of severely constrained resources for child and adolescent mental health. Based on previous cross-sectional findings, a hypothesized model of associations between HIV/AIDS-orphanhood (at baseline), HIV/AIDS-related stigma (at both baseline and follow-up), and symptoms of anxiety and depression (at both baseline and follow-up) was developed and this is illustrated in Figure 1.

**(Insert Figure 1 approximately here)**

## Method

### *Participants*

In 2005, 1025 youth (540 male and 485 female) from poor peri-urban communities around Cape Town were interviewed in a study examining psychological distress in HIV/AIDS-orphaned children (Cluver et al., 2007). All youths were black African and 97% were of Xhosa ethnicity. Ages ranged between 10 and 19 years. Participants were sampled from households in 10 settlements, nine schools, 18 community-based organisations, and additional purposive sampling of street-children and youth-headed households, aiming to incorporate groups that are often excluded from surveys. The UN definition of orphanhood was used – i.e. the loss of one or both parents in children and adolescents prior to the age of 18 years. In order to exclude acute bereavement reactions, children orphaned in the previous six months were not interviewed. The baseline (2005) sample included 425 HIV/AIDS-orphaned youth (see Cluver et al., 2007, for a detailed description of the sample).

Seven hundred and twenty three youth were followed up in 2009 (71% retention rate) and for the current paper the sample is limited to youths interviewed at both baseline and follow-up (see Table 1 for a summary of sample characteristics). A four-year follow-up period was chosen in order to assess the long-term impacts of HIV/AIDS-orphanhood on child mental health (Cluver et al., 2012). Challenges to follow-up included: an informal settlement (where 189 youth were interviewed in 2005) had been demolished, high mobility amongst orphaned youth, and the near impossibility of tracing street-children after four years. Twelve interviews were stopped due to participant's substance intoxication or police raids. Thirty youths were interviewed in provinces other than the Western Cape and three youths were interviewed in prison. Overall, 477 youths had moved homes and 111 had moved city or province.

*Measures*

*Determining cause of parental death:* In South Africa death certificates are an unreliable source of HIV/AIDS mortality and clinical diagnosis is rarely available. Therefore, cause of parental death was determined using the ‘Verbal Autopsy’ method (Lopman et al., 2006), based on youth responses at baseline assessment. This methodology has previously been validated for use in South Africa (Kahn, Tollman, Garenne, & Gear, 2000). Determination that parental death was HIV/AIDS-related required a conservative threshold of three or more HIV/AIDS defining illnesses (e.g. oral candidiasis, HIV wasting syndrome, Kaposi’s sarcoma). Cases in which the cause of death could not be determined ( $n = 81$ ) were excluded from the analyses.

*Sociodemographic information:* Information on age and gender of youths, as well as whether youths lived in informal (shack) housing, was collected so that analyses could control for this. Items were derived from the South African Census and were based on youth reports.

*Stigma:* In 2005 no validated instruments to measure stigma among orphans existed. Therefore, a brief four-item scale was devised – based on the HIV stigma-by-association scale for HIV+ adolescents (Berger, Ferrans, & Lashley, 2001). Participants reported the frequency (0: *Never*, 2: *Very often*) of being teased, treated badly, and being gossiped about because someone in their family was sick or had died. Additionally, youth reported on the extent to which these events caused distress (0: *Not at all*, 2: *Very much*). Responses to the four items were summed to give a total stigma score, which could range between zero and eight. Internal consistency for the scale was good:  $\alpha = .83$  for the three stigma items, and  $\alpha = .88$  when including the extent of distress (Cluver et al., 2008). An extended version of this stigma scale, which has recently been validated for use with South African youth (Boyes, Mason, & Cluver, 2013), was included in the 2009 follow-up data collection.

*Anxiety:* Anxiety was measured using the Revised Children’s Manifest Anxiety Scale (Reynolds & Richmond, 1978), which contains 28 anxiety-related items responded to on a *no/yes* scale. The scale shows good internal consistency ( $\alpha = .79 - .85$ ; Reynolds & Paget, 1981)

and has recently been validated for use in South Africa (Boyes & Cluver, in press). Due to time constraints, only the 14 highest loading items (after factor analysing the 2005 data) were administered at follow up in 2009 ( $\alpha = .82$ ).

*Depression:* Depression was measured with the Child Depression Inventory – Short Form (Kovacs, 1992). This scale contains 10 items representing a range of depressive symptoms. For each item the participant was asked to choose one statement that best reflected their feelings in the past two weeks. Items are summed to give a total depression score. The Children’s Depression Inventory (Short Form) is highly correlated with the full version (Kovacs, 1992), has good psychometric properties ( $\alpha = .71 - .94$ ; Saylor, Finch, & Spirito, 1984), and has been used previously in South Africa.

### *Procedure*

Ethical approvals were obtained from the University of Oxford, the University of Cape Town, and the Western Cape Department of Education. Participation was voluntary and informed consent was obtained from all youths and primary caregivers, but other than consenting to child participation no information was collected from caregivers. All measures were translated from English to Xhosa by two Masters level researchers and independently back-translated by a Xhosa speaking research psychologist. Due to low literacy rates (Mulis, Martin, Kennedy, & Foy, 2007) questionnaires were administered verbally by five interviewers. Interviewers were all local community health or social workers who had received training in working with children from poor communities and in administering standardised questionnaires. The design of the overall questionnaire package was assisted by a Teen Advisory Group of 14 HIV/AIDS-affected children. The questionnaire booklet was designed in the style of a teen magazine, and included pictures of popular music stars and cartoons. Confidentiality was maintained unless children requested assistance or were at risk of significant harm. No



incentives to participate were provided and in total participation took 40-60 minutes at both baseline and follow-up assessment.

### *Statistical Analyses*

Analyses were conducted in three stages. First, we checked for any differences in sociodemographic and mental health variables between youths lost and retained at follow-up. Second, univariate ANCOVAs (controlling for age, gender, and formal/informal housing) were conducted to determine whether HIV/AIDS-orphaned youth experienced more stigma and reported more symptoms of anxiety and depression than youth not orphaned by HIV/AIDS at both baseline and follow-up. Third, path analysis was employed to test the hypothesized models specifying relationships between being HIV/AIDS-orphaned at baseline and stigma, anxiety, and depression measured at both baseline and follow-up (Figure 1). Analyses were performed in AMOS 19 using maximum likelihood estimation. Standardised regression coefficients ( $\beta$ ) were estimated for all paths (adjusted for age, gender, and formal/informal housing), as well as direct and indirect effects. Model fit was evaluated using the chi-square statistic ( $\chi^2$ ), which should be non-significant. Additionally, root mean square error of approximation (RMSEA) and the comparative fit index (CFI) are reported. For RMSEA a value of .05 or less indicates good fit and a value of .08 or less indicates acceptable fit. For CFI a value of .95 or greater indicates good fit, a value of .90 or greater indicates adequate fit (Blunch, 2008).

## Results

### *Youths lost and retained at follow-up*

First, we checked for differences between youths lost and retained at follow-up. The former were more likely to be male [ $\chi^2(1) = 4.18, p = .042$ ], older [ $F(1, 1022) = 17.81, p < .001$ ; partial  $\eta^2 = .02$ ], and living in informal housing [ $\chi^2(1) = 6.24, p = .01$ ]. Moreover, youths lost to

follow-up had higher depression [ $F(1, 1022) = 26.52, p < .001$ ; partial  $\eta^2 = .03$ ] and anxiety [ $F(1, 1016) = 7.20, p = .013$ ; partial  $\eta^2 = .01$ ] scores in 2005. Although follow-up of 71% was relatively high after four years for this highly mobile and at-risk population, results must be interpreted in light of the fact that some of the most vulnerable children were among those unable to be traced. Analyses in the current study were limited to the 723 youth who were assessed at both time points.

### *Stigma, anxiety, and depression at baseline and follow-up*

Second, mean stigma, anxiety, and depression scores (using both baseline and follow-up data) were calculated for youth who were either HIV/AIDS-orphaned or not in 2005. After controlling for age, gender, and formal/informal housing, HIV/AIDS-orphaned children reported significantly higher levels of stigma and obtained significantly higher depression scores at both time points. The difference in anxiety scores was not significant at baseline, but HIV/AIDS-orphaned youth obtained significantly higher anxiety scores at follow-up (Table 2).

**(Insert Table 1 approximately here)**

### *Path analyses*

The initial hypothesized model is illustrated in Figure 1. This model was tested independently for anxiety and depression as outcomes. The hypothesized anxiety and depression models both fit the data well. *Anxiety*:  $\chi^2 = 17.09, p = .105$ , RMSEA = .028 (95% CI = .000 - .052), CFI = .990. *Depression*:  $\chi^2 = 5.12, p = .276$ , RMSEA = .020 (95% CI = .000 - .062), CFI = .998. However, the hypothesized direct links from HIV/AIDS-orphanhood to anxiety and depression (at both baseline and follow-up) were non-significant. Additionally, the hypothesized direct links between baseline stigma and anxiety and depression measured at follow-up were

non-significant. These non-significant links were eliminated and the revised models were retained. These models have been adjusted for age, gender, and formal/informal housing.

The final path models were identical for anxiety and depression (Figure 2) and accounted for 27% of the variance in anxiety scores and 19% of the variance in depression scores measured at follow-up. Fit statistics for both final models were good. *Anxiety*:  $\chi^2 = 19.78$ ,  $p = .137$ , RMSEA = .024 (95% Confidence Interval = .000 - .046), CFI = .991. *Depression*:  $\chi^2 = 9.74$ ,  $p = .204$ , RMSEA = .023 (95% CI = .000 - .055), CFI = .995. There was no direct effect of HIV/AIDS-orphanhood on anxiety or depression measured at either baseline or follow-up; however, significant indirect effects of HIV/AIDS-orphanhood on baseline anxiety ( $\beta = .11$ , 95% CI = .08 - .15,  $p = .002$ ) and depression ( $\beta = .11$ , 95% CI = .08 - .14,  $p = .002$ ) were obtained (operating via baseline stigma). Additionally, significant longitudinal indirect effects of HIV/AIDS-orphanhood (operating via stigma experienced at both baseline and follow-up, as well as baseline anxiety/depression) were obtained for both anxiety ( $\beta = .12$ , 95% CI = .08 - .16,  $p = .001$ ) and depression ( $\beta = .09$ , 95% CI = .06 - .13,  $p = .001$ ) scores measured at follow-up

**(Insert Figure 2 approximately here)**

## Discussion

The aim of the current study was to examine relationships between HIV/AIDS-orphanhood, HIV/AIDS-related stigma, and symptoms of anxiety and depression measured in the context of a four year follow-up study. HIV/AIDS-orphaned youth reported significantly higher stigma and depression scores when measured baseline and significantly higher stigma, depression, and anxiety scores at follow-up assessment. Additionally, significant effects of HIV/AIDS-orphanhood on mental health outcomes were obtained in path analyses; however, results clearly reveal that being HIV/AIDS-orphaned is not directly associated with anxiety or

depression scores measured at either baseline or follow-up. Rather, the impact of HIV/AIDS-orphanhood on baseline anxiety and depression is operates indirectly through stigma experienced at baseline. This is consistent with previous cross-sectional research (Cluver et al., 2008); however, the current study extends the literature by demonstrating that the longitudinal link between HIV/AIDS-orphanhood and anxiety and depression also operates indirectly via stigma (measured at both baseline and follow-up) and baseline mental health scores.

Importantly, the current findings offer the first evidence (to our knowledge) that the stigma experienced by HIV/AIDS-orphaned youth is maintained over long periods and mediates relationships between HIV/AIDS-orphanhood and internalising symptoms, both cross-sectionally and longitudinally. Moreover, the models linking HIV/AIDS-orphanhood to longitudinal mental health outcomes were strikingly similar for both anxiety and depression scores – demonstrating that the mediating effect of stigma is consistent across the two mental health domains measured in the current study.

The current findings, elucidating clear links between perceived stigma and long term mental health outcomes amongst HIV/AIDS-orphaned children, suggest a number of priority areas for future research. Here we focus on two key areas that we believe should be pursued simultaneously. First, the current findings highlight the potential of stigma reduction programmes to mitigate the psychological impacts of HIV/AIDS-orphanhood in both the short and long term; however, experimental intervention studies are clearly needed to demonstrate this empirically. Reducing HIV/AIDS-related stigma at a community level is complex and difficult (Cluver et al., 2008). A 2002 literature review highlighted the dearth of high quality research on stigma reduction, but did report positive impacts of community interventions (including provision of HIV-related information, group desensitisation, and increasing contact with HIV + people) (Klein, Karcher, & O'Connell, 2002). In general research has focused on stigma directed at HIV-infected adults and children and no studies to date have evaluated the impact of stigma reduction on HIV/AIDS-orphaned children. Research examining causes of HIV/AIDS-related

stigma (and stigma-by-association) within communities is needed to inform stigma reduction interventions, and resulting programmes require rigorous evaluation – in terms of both capacity to reduce community stigma and potential associated benefits to the wellbeing of HIV/AIDS-affected individuals and families.

Second, given the difficulty of stigma reduction at a community level and the lack of high quality research in this area (Cluver et al., 2008; Klein et al., 2002), understanding factors associated with the promotion of resilience in the context of HIV/AIDS-related stigma should also be a priority for future research. Previous research with children exposed a range of adversities has demonstrated considerable individual variation in outcomes with some children appearing remarkably resilient even when exposed to chronic or severe stress (Rutter, 2006). Identifying modifiable individual, familial, and community level factors that promote resilience in the context of HIV/AIDS-related stigma will have important implications for intervention design and should be an important research focus. Theoretical models that postulate the individual to be at the centre of multiple interacting levels of influence (e.g. Bronfenbrenner, 1979) may be particularly useful in framing this research. Key to these frameworks is the notion of cumulative and counterbalancing effects of risk and protective factors. From this perspective, the impacts of adversity in particular spheres of an individual's life can be mitigated by positive factors in another sphere (Bronfenbrenner, 1979).

A number of limitations of the current study should be noted. First, although follow-up of 71% was relatively high, results must be interpreted in light of the fact that some of the most vulnerable children were among those unable to be traced. Second, the Children's Depression Inventory (Short Form) (Kovacs, 1992) has not been psychometrically validated in South African samples; however, it has been used extensively in South African studies and the reliability of the scale in the current study approached traditional guidelines for acceptability ( $\alpha = .67$  at baseline;  $\alpha = .69$  at follow-up). Third, the current study was unable to conduct HIV testing and the HIV-status of the participants is unknown. There is evidence that HIV-infection

is associated with emotional distress; however, most distress occurs after a diagnosis has been made (Rochat et al., 2006) and due to the low testing rates in South Africa most participants would be unaware of their HIV-status. Future research should collect information on HIV-status in order to determine whether this has an impact on relationships obtained between stigma and psychological distress in HIV/AIDS-orphaned youth. Finally, designs relying exclusively on self-report are at risk of method overlap bias. Specifically, youth who are anxious or depressed may feel more isolated and threatened and thus perceive higher levels of stigma (Cluver et al., 2008). However, perceived stigma is inherently subjective and can only be measured by self-report. In order to limit method overlap bias, stigma items focussed as much as possible on specific acts (e.g. being teased) (Cluver et al., 2008). Additionally, the use of longitudinal data reduces this problem to an extent, as baseline mental health and stigma scores are controlled for when predicting stigma, anxiety, and depression measured at follow-up.

Bearing these limitations in mind the current study provides the first longitudinal evidence that the associations between HIV/AIDS-orphanhood and both anxiety and depression operate indirectly via HIV/AIDS-related stigma (at both baseline and follow-up) and baseline mental health. These findings are consistent with previous research (Cluver et al., 2008; Cluver & Orkin, 2009; Wang et al., 2012) but overcome the limitations of cross-sectional data. It is crucial that attempts are made to address the psychological problems of HIV/AIDS-orphaned youth and the current findings have implications for policy and practice. HIV/AIDS-orphaned youth experience substantial levels of stigma, which persists over long periods. Interventions attempting to reduce stigma directed at HIV/AIDS-orphaned youth need to be designed and rigorously tested, as this may potentially improve the mental health of HIV/AIDS-affected youth. However, there is a growing body of literature demonstrating that HIV/AIDS-orphanhood is associated with negative outcomes across a variety of domains (including poverty and education) and that risk factors may operate in a cumulative manner (Cluver & Orkin, 2009). This complexity suggests that multi-level strategies are required to support HIV/AIDS-

affected youth; however stigma reduction should be an essential component of future intervention efforts.

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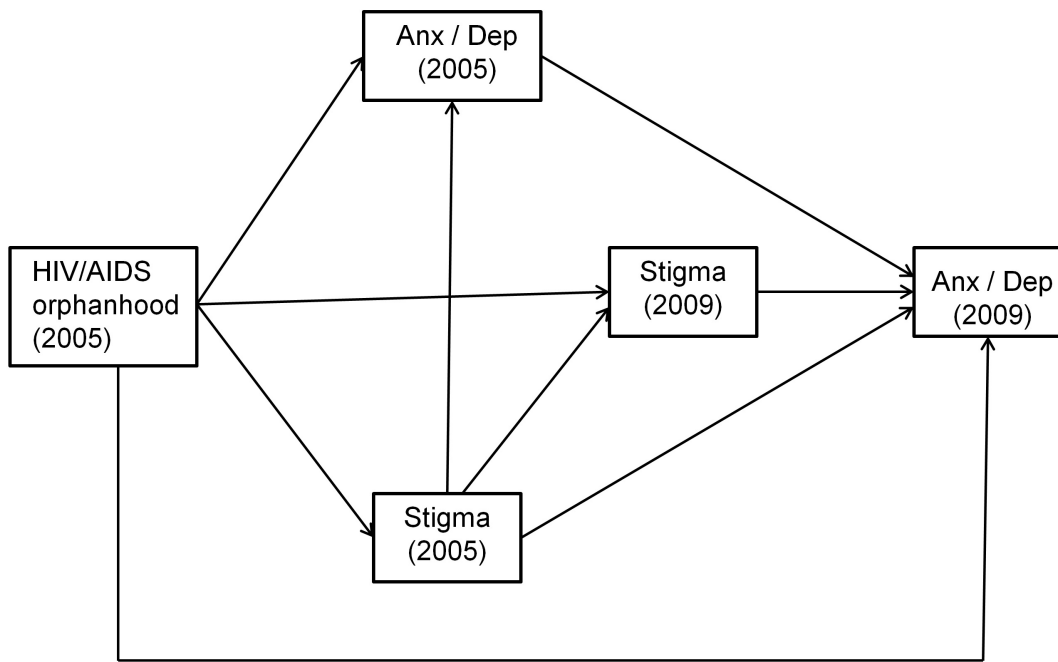
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*Table 1.* Sample characteristics and mean stigma, anxiety, and depression scores in 2005 and 2009 (standard deviations in parentheses) as a function of being HIV/AIDS-orphaned in 2005

	Youth orphaned by HIV/AIDS at baseline ( <i>n</i> = 295)	Youth not orphaned by HIV/AIDS at baseline ( <i>n</i> = 428)	<i>F</i> / $\chi^2$	Effect size (partial $\eta^2$ )
Mean age in 2005	14.26 (2.41)	13.38 (1.98)	29.09***	.04
Male (2005)	48%	52%	.92	--
Lives in informal dwelling	39%	27%	2.17	--
Stigma (2005)	2.42 (2.61)	.76 (1.75)	85.61***	.11
Stigma (2009)	4.64 (5.07)	2.33 (3.61)	36.69***	.05
Anxiety (2005)	11.81 (5.36)	10.92 (5.22)	1.90	.00
Anxiety (2009)	6.04 (3.67)	4.94 (3.46)	8.76**	.01
Depression (2005)	3.27 (2.71)	2.20 (2.36)	19.69***	.03
Depression (2009)	3.86 (3.44)	2.89 (2.91)	9.00**	.01

*Notes:* *F* and *p* values associated with univariate ANCOVAs (controlling for age, gender, and formal/informal housing) or chi-squared test. Significant *p* values are bolded. \* *p* < .05, \*\* *p* < .01, \*\*\* *p* < .001. Anxiety scores in 2005 are based on all 28 items of the Revised Children's Manifest Anxiety Scale. Anxiety scores in 2009 are based on the 14 highest loading items (identified after factor analysing the 2005 data) administered at follow-up. Stigma scores in 2005 are based on four items. Stigma scores in 2009 are based on an extended scale (10 items) that has recently been validated (Boyes et al., 2013).



*Figure 1:* Hypothesized model of associations between HIV/AIDS-orphanhood, stigma, and mental health outcomes. Arrows represent associations hypothesized to be statistically significant. Anxiety and depression to be modelled independently.

## Stigma, anxiety, and depression in HIV/AIDS-orphaned youth 24

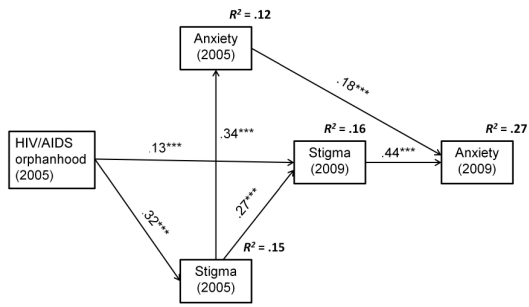


Figure 2a: Final path model for anxiety scores

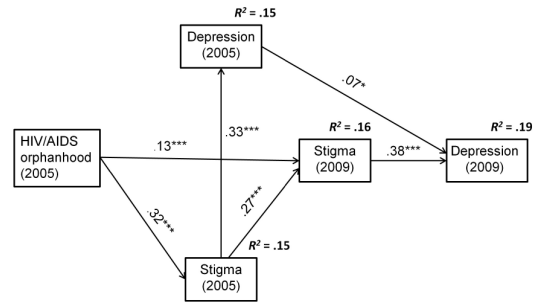


Figure 2b: Final path model for depression scores

Figure 2: Final models of relationships between HIV/AIDS-orphanhood, stigma, and anxiety and depression scores. Arrows represent significant associations (\*  $p < .05$ , \*\*\*  $p < .001$ ). Standardised regression weights are reported. Models control for age, gender, and formal/informal housing.