

EXAMINING MEASURES OF INSTABILITY, SEXUAL DEBUT, AND DEPRESSION
SCREENING AMONG ADOLESCENTS IN ZIMBABWE

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ABSTRACT

Erica Haney: Examining measure of instability, sexual debut, and depression screening among adolescents in Zimbabwe
(Under the direction of Kavita Singh)

The overall goal of this dissertation is to better understand early sexual debut and depression among adolescents living in Zimbabwe in order to avert the main causes of mortality among this age group – HIV and self inflicted harm.

Paper one highlights the effects household and individual measures of instability have on the timing of sexual debut among a sample of 2,374 Zimbabwean adolescents aged 15-19. Using multivariate cox regression, our results suggest that household instability (>50% membership changes in the past year), depression, and school dropout were significantly associated with earlier ages of sexual debut. Living in a household with a recent death decreased the rates of ever having sex with each year of age. Secondary education or higher was associated with lower rates of ever having sex with each year of age among females and higher rates of ever having sex with each year of age among males. These findings emphasize the importance of considering household vulnerability when assessing adolescent sexual risk.

Paper two uses cross-sectional survey data among a sample of 2,768 adolescents (aged 15-19) and 2,027 young adults (aged 20-24) living in Manicaland Province, Zimbabwe to calibrate the Shona Symptom Questionnaire (SSQ) against the Self Report Questionnaire (SRQ-20) and examine the performance indices of the SSQ based on various cut points for classification. A modified SSQ cut point of five or more substantially increases the depression estimates for both age groups to align more closely with the SRQ-20 estimates. The prevalence of depression increased from 3.5% to 13.2% among adolescents and from 5.1% to 16.2%

among young adults based on these revisions to the SSQ. Using a multivariate logistic regression model we isolated particular characteristics to test their association with the odds of being misclassified as non-depressed based on the conventional SSQ cut point. Findings suggest that adolescents who were orphaned or ever had sex had a significantly greater odds of being misclassified. When retested using the modified cut point of five or greater, associations with misclassification disappeared. This study stresses that not all depression scales are appropriate for use among adolescents given their unique developmental stage.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
AUC	Area under the curve
CIS-R	Clinical Interview Schedule - Revised
DIS	Diagnostic Interviewer Schedule
DHS	Demographic Health Survey
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders 4 th edition
HIV	Human Immune Deficiency Virus
HOH	Head of household
KM	Kaplan Meier
NPV	Negative predictive value
PPV	Positive predictive value
PSE	Present State Examination
ROC	Receiver operator curve
SRQ-20	Self-reported Questionnaire 20
SSA	Sub-Saharan Africa
SSQ	Shona Symptom Questionnaire
STI	Sexual Transmitted Infection
WHO	World Health Organization
YLD	Years lost due to disability

CHAPTER 1

INTRODUCTION

INTRODUCTION

The adolescent period (defined by the World Health Organization (WHO) as ages 10-19) is one of rapid growth and development- physical, mental, emotional, sexual, and social(1). There is a wide range of changes experienced during this time including hormonal changes and maturation, academic progression, increasing responsibilities within the home, and acquisition of new roles including romantic partnerships. Adolescents are beginning to learn that their behaviors have consequences, albeit at varying degrees. Many adolescents navigate this developmental stage with few problems, making the necessary adjustments and adaptations. Others do not. Adolescent maladjustment and instability are illuminated by two of the three leading causes of death among adolescents and young people in low and middle-income countries - HIV/AIDS and self-inflicted injury. Both are largely driven by behavioral choices and are completely preventable through 1.) early identification of those most at-risk and 2.) skill development to support healthy coping and maturation (2).

The overall goal of this dissertation is to better understand the timing of sexual debut and the incidence of depression among adolescents living in Zimbabwe, stratified by gender. This is essential since these health outcomes are antecedents to the top causes of mortality among adolescents. To this end Chapter two will examine the emotional, physical, and contextual measures of instability in order to assess how they contribute to sexual risk taking among adolescents (aged 15-19) living in Zimbabwe. By disentangling these risks we will be able to assess whether household measures of vulnerability or individual characteristics of instability are associated with the timing of sexual debut among the study sample. Gender

stratification of the adolescent sample will also allow us to determine how these key variables affect girls and boys sexual behaviors differently. Chapter three will assess the performance of the Shona Symptom Questionnaire (SSQ) – a depression screening tool - to determine if it is effectively capturing depression among Zimbabwean adolescents (15-19 years olds) and young adults (20-24 years old). It will also evaluate how key sociodemographic measures are associated with being incorrectly classified as not depressed among this population. Chapter four concludes with programmatic recommendations and policy implications for future adolescent health research based on findings from these analyses.

SPECIFIC AIMS

Study one

The conceptual model guiding study one is presented in Figure 1.1.

Aim 1: To describe and test for household level characteristics associated with the timing of sexual debut among a sample of 15-19 year olds living in Zimbabwe.

Hypothesis 1.1 Adolescents living in greater levels of household instability will sexually debut at earlier ages than adolescents living in lower levels of household instability.

Hypothesis 1.2 Adolescents living in households with a recent household death will sexually debut at earlier ages than adolescents living in a household without a recent household death.

Hypothesis 1.3 Adolescents living in a non-parent headed household will sexually debut at earlier ages than adolescents living in a parent-headed household.

Aim 2: To describe and test for individual level characteristics associated with the timing of sexual debut among a sample of 15-19 year olds living in Zimbabwe.

Hypothesis 2.1 Orphans will sexually debut at earlier ages than non-orphans.

Hypothesis 2.2 Adolescents who have recently migrated will sexually debut at earlier ages than adolescents who have not recently migrated.

Hypothesis 2.3 Adolescents classified as depressed based on the WHO Self-Reported Questionnaire (SRQ-20) will sexually debut at earlier ages than non-depressed adolescents.

Aim 3: To assess how the timing and pattern of sexual debut differs between adolescent girls and boys in Zimbabwe.

Hypothesis 3.1 Girls will sexually debut at earlier ages than boys.

Hypothesis 3.2 Girls experiencing any of the key household and individual variables will sexually debut at earlier ages than girls not experiencing any of the household or individual variables.

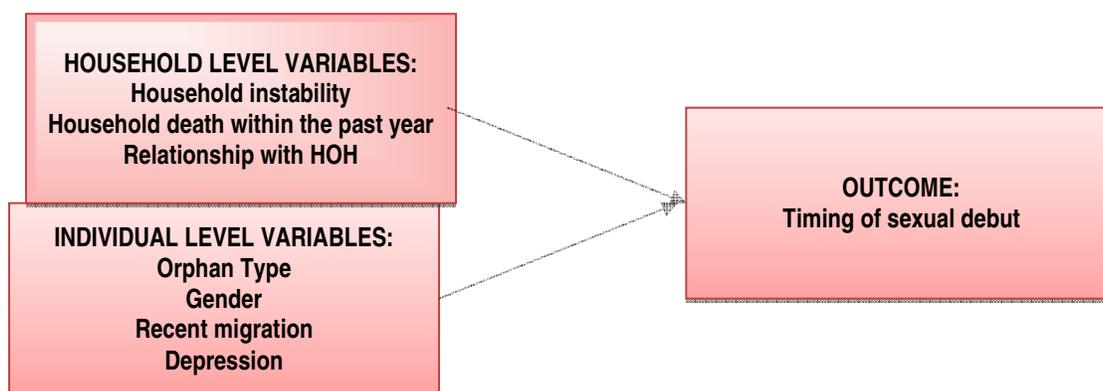


Figure 1.1. Conceptual Model for Aims 1-3

Study two

Aim 4: To assess the performance of the SSQ scale using SRQ-20 as the gold standard/criteria for defining depression among adolescents (15-19 year olds) and youth (20-24 year olds) in Zimbabwe and explore differences based on gender.

Hypothesis 4.1 The cut point for the SSQ will need to be refined to a lower level from its traditional cut point of eight or more positive responses out of 14 questions in order to improve the performance indices including the specificity, sensitivity, kappa value, and AUC score.

Hypothesis 4.2 The performance indices will provide evidence that revised cut points should be the same for both genders across both age groups.

Aim 5: To explore the influence of sociodemographic factors associated with being misclassified as false negatives using the SSQ with a cut point of eight or greater

positive responses for adolescents and young adults.

Hypothesis 5.1 There will be systematic misclassification of depression based on key variables using the SSQ compared to the SRQ-20 gold standard criteria among adolescents and young adults.

Aim 6: To explore the influence of sociodemographic factors associated with being misclassified as false negatives using the SSQ with a modified cut point of five or greater positive responses for adolescents.

Hypothesis 6.1 The systematic misclassification of adolescents will disappear using the revised SSQ cut point.

BACKGROUND

High-risk behaviors are common among adolescents, particularly those who are poorly adjusting to changes and evolving responsibilities. Desire for independence as well as expansion of identity are natural stages in adolescent development. The pubertal period can heighten sensitivities to external influences and social factors, including family cohesion and peer networks, which can significantly influence decision-making processes including relationship formation and sexual exploration. Adolescents who are adjusting poorly to rapid changes may adopt maladaptive behaviors to cope with life and to cultivate feelings of control. Common maladaptive behaviors include heightened risk-taking behaviors – particularly early sexual debut. Delaying age of sexual initiation and helping adolescents healthily cope with the unique challenges of this developmental period will protect them against one of the greatest health threats of their generation in sub-Saharan Africa (SSA) – HIV infection.

Everyday, more than 6,000 young people between 15 and 24 years of age are infected with HIV (3). Young people in SSA are hardest hit by the epidemic, experiencing some of the highest rates of HIV incidence in the world; over half of all new HIV infections occurring worldwide are among adolescents and young adults in this region (4). Early sexual debut has been shown to be one of the primary contributors to the high rates of HIV infection among and

has been shown to be associated with additional sexual risk-taking behaviors including poor condom utilization, high-risk partner selection, and sexual concurrency (5-9). This is primarily due to adolescents' lack of knowledge about HIV prevention as well as their low self-efficacy in negotiating both sex and condom use (10,11). Delaying sexual debut can allow adolescents the necessary time they need to obtain important prevention knowledge and to develop essential skills to sustain abstinence and other manifestations of sexual responsibility.

Depression is common among adolescents who feel they are not integrating into their social context, who have experienced multiple or significant stressful events, or who experience high levels of ambiguity about their future (9,12-18). Depression rates have been estimated at 4-8% among adolescents globally with substantial increases over time (19). Adolescents with depression are at greater risk for self-harm, conduct disorders and delinquency, and high-risk behaviors such as substance use and early sexual debut (20-22). Some estimates suggest that early-onset depression has a 60–70% risk of continuing into adulthood (23). Depending on the severity, chronic depression can challenge one's ability to maintain a job, support a family, and integrate fully into society. All of these downstream effects pose serious concerns as adolescents transition into adulthood. This is significant given that nearly one fifth of the world's inhabitants are adolescents (24).

Contextual factors are largely responsible for poor health outcomes among adolescents (9,13-17,25-34). As such, it is necessary to understand the social and environmental factors associated with risk taking behaviors during this turbulent period. Research has shown that adolescents around the world who live in a structured social environment with positive meaningful relationships and stability are less likely to experience depression and initiate sex early (9,14,15,17,18,25). Families and household-level influences can play a crucial role by helping adolescents develop skills to cope with new and compounding pressures so that they can safely navigate this life stage and avert the main causes of mortality among this age group - HIV infection and self-inflicted harm.

The Zimbabwean context of instability

Adolescents in regions of the less developed world are at risk for developmental maladjustment due to the volatile social, political, economic, and health climate. Zimbabwe, in particular, is a country that has recently undergone a severe economic decline, with exorbitant levels of inflation and high rates of unemployment (60%) (35). The country has suffered an outpouring of skilled health workers that has significantly affected the population's ability to obtain adequate health care, including access to necessary drugs. The erosion of the health care sector coupled with a rising poverty rate has caused a decline in many health indicators including malnutrition and communicable diseases (36). Increasing household dependency rates, political choices restructuring the agricultural sector, and drought have made food insecurity a reality for many families in Zimbabwe (37). As HIV rates slowly decline, Zimbabwe is still among the worst HIV/AIDS affected countries in SSA with 15% of the total population HIV positive. The country maintains a six percent HIV infection rate among 15-24 year olds. A gender-based risk disparity for HIV exists with adolescent females (15-24) almost twice as likely to be infected than adolescent males (15-24,32). Low national-level life expectancy rates (males: 53; females: 55) due in large part to HIV-related deaths, leave many youth without one or both parents (38). Approximately 1.4 million orphans reside in Zimbabwe, almost 80% of whom have lost one or both parents due to AIDS (39,40).

Many household-vulnerabilities are born out of these national level challenges. A majority of households in Zimbabwe are faced with the reality of death due to low life expectancies. The deceased often leave behind youth who are commonly absorbed into extended families and non-related households (39,41-46). Death affects not only the orphan who is left behind but also household members living in the receiving home. The absorption of new members can place financial strain on households caused by an increasing number of dependents and decreasing number of income providers. This hardship, coupled with poor

distribution of wealth and high rates of unemployment, catapult households into poverty or add strain to households that are already poor.

Adolescents are often transferred to extended families in rural areas where child-rearing costs are lower (45-47). Both out-migration and in-country migration have transformed traditional family structures and previous perceptions about who fulfills income-earning roles within households (48). Born from survival needs and intensifying household poverty, adolescents may be withdrawn from school to assume age-inappropriate roles such as becoming income earners for their family or to be caregivers for ill family members (48-54). The ubiquitous household instabilities across Zimbabwe including both in and out migration, poverty, and survival responses give rise to uncertainty and aggravating feelings of insecurity among adolescents who need a connected, stable environment where they can thrive developmentally and avert risk taking and psychosocial distress.

Study one

Key household measures of instability

Social, economic, and epidemiological factors in SSA have continued to influence family stability.

Household instability

Family structure influences how a child will grow up and the relationships they foster. US studies suggest children from non-divorced, intact families fair better in terms of sexual risk behaviors and outcomes than those from disrupted families (55-58). Due to the severity of the HIV/AIDS epidemic in Zimbabwe, the extended family safety net has weakened due to a greater number of under-age dependents, unemployed adults, and sick household members (41) and can result in greater household membership shifts. Membership instability has been shown to increase adolescents' stress due to the loss of familiar routines, situations, relationships, and/or responsibilities (59). Studies have found that multiple changes in family structure have more negative effects on a child's well-being than a single change or no change at all (55,60-62).

Relationship with head of household (HOH)

Cross-generational, extended, or foster families are common in Zimbabwe (46,50,63). US-based studies on this phenomenon have revealed that closer caregiver relationships create stable contexts that minimize adolescents' risk taking that include seeking out alternative intimate relationships (32,64-66). Adolescents in regions heavily burdened by the HIV-epidemic who are taken in by extended family members are often treated differently from the caregiver's biological children, especially when households were impoverished. Limited research in SSA suggests young people living with non-parental HoH reported poor caregiver-adolescent relationships and demonstrated higher risk sexual behaviors than those living with intact parent-headed households (51,67,68).

Recent household death

Some studies in Kenya and Zimbabwe speculated that sexual activity serves as an emotional outlet for adolescents coping with loss and subsequent hardships (21,69). A recent systematic review of risk and protective factors for adolescent reproductive health in developing countries found that the death of a parent was consistently associated with early sexual debut among adolescents in SSA (70). This is likely due to adolescents being faced with the reality of mortality, grief, feelings of uncertainty, and stress accumulation (13). Furthermore, caregivers within households with a recent death may experience high levels of stress due to caring for several dependents. This can cause emotional disconnection from adolescent household members during their grieving process. This is often seen among grandparents who suffer the loss of a child while being expected to contribute to both household productivity and childrearing (71).

Key individual measures

Also of interest is the association between individual measure of instability and HIV risk. The four key individual-level variables of interest are *gender* (male/female), *orphan status* (non-orphan, maternal orphan, paternal orphan, and double orphan), *migration from their prior*

homestead in the past year (yes/no), and *depression* (yes/no) characterized by a positive response to eight out of twenty questions on the Self Reported Questionnaire (SRQ-20).

Gender

The gender gap among adolescents infected by HIV is severe with females representing 75% of the infections worldwide (3). Studies focused on examining HIV infection among southern African adolescents aged 15-24 found girls were between two and ten times more likely to be HIV positive than their male counterparts (72-75). Zimbabwe also has a gender-based risk disparity for HIV with adolescent females (15-24) experiencing infection rates almost twice that of adolescent males (15-24,32).

Orphanhood

Several studies have shown that the death of a mother or father broadly affects adolescent emotional and behavioral well-being (41,67,76,77). Bereaved adolescent orphans display elevated sexual risk taking (21). Studies suggest that orphans report early ages of sexual debut (7,34,53,69,78-80) and have a heightened risk for HIV (46,69,70,78,81). This paper will disentangle some of the mechanisms responsible for this association and will determine if they are unique to orphanhood or pervasive among all adolescents.

Residential migration

Migration has been shown to have varying effects on adolescent sexual risk taking. Some studies suggest that it is the frequency and timing of the move that negatively impacts sexual risk taking and early sexual debut (82-84). Others suggest it is the reason for and type of migration (urban/rural) that is responsible for sexual risk taking (85). In highly mobile environments like Zimbabwe, adolescents who experience residential change are concurrently exposed to additional experiences of instability: family disruption; less parental monitoring; new living arrangements; and difficulties adapting to a new social environment (69). Adolescents living in households particularly strained by the added cost of a dependent may search for alternate housing options - doubling migration-related stress (51). Separation from siblings is a

frequent and important source of additional trauma (86). In addition, the serial loss of adult figures and caregivers such as parents, teachers, or mentors is likely to create a sense of insecurity or abandonment. Some studies suggest that early onset of intercourse may be a means of coping with the life changes such as migration or as a way to gain attention during difficult periods (82). Residential change can also include exposure to new ideas and social norms, which can increase negative peer influence regarding sex (87).

Depression

US-based studies of adolescents have documented that poor psychosocial well-being increases risky behaviors, including earlier sexual debut, higher numbers of lifetime sexual partners, concurrent partnerships, non-use of contraception, risky partner selection, and transactional sex (32,33,88-94). Only minimal attention has been given to this association within the context of the HIV epidemic in SSA (21,69,83). In three studies among adolescents and young adults (ages 12-26) living in SSA, authors found a strong linear correlation between psychosocial distress and sexual risk, including but not limited to early sexual debut (20,69,83).

Study two

Risk factors for depression

Depression has been shown to be a growing concern among adolescents living in SSA as the programmatic and research focus shifts from basic survival needs to broader aspects of psychosocial well-being. Depression is associated with a litany of poor health outcomes across the life span such as suicide, physical symptoms, behavioral problems, and a range of mental health disorders.

Several individual measures have been shown to be associated with depression among adolescents. Unequivocally, findings support the hypothesis that orphans experience greater rates of psychosocial stress including depression, anxiety, and hopelessness for the future than non-orphans due to the death of their parent, displacement, and other contextual changes that cause feelings of despair and uncertainty (13,25,27,28,34,69,95-99). Migration has been shown

to be particularly challenging for adolescents who are uprooted from their existing social systems and placed in an environment ridden with new elements to which they are unaccustomed (12).

Adolescent depression in Zimbabwe

Understanding psychosocial distress among adolescents is particularly relevant in Zimbabwe, where the burden of disease linked with depression is likely severe given its catastrophic economic and political situation, weakened healthcare infrastructure, chronic and widespread poverty, and reverberating effects of the HIV epidemic. Adolescents living in HIV-affected communities are often faced with multiple experiences of loss and hardship (8,47,76,100). In addition to the contextual and social effects of HIV, the threat of becoming infected can be a significant source of anxiety, depression, and hopelessness among adolescents and young adults, who are becoming infected with the disease at faster rates than any other age group (4,101). Long-term stress accumulation coupled with their unique developmental stage positions adolescents at risk for affective disorders including depression.

Selecting an appropriate depression screening tool

To date studies have utilized a litany of different scales to assess measures of emotional well-being, with each scale varying in their level of reliability and validation for the unique sub-population of adolescents (83,102,103). This inconsistency makes comparability across populations and settings a challenge. This dissertation addresses this gap by comparing two depression scales previously used in Zimbabwe – the 20-item World Health Organization (WHO) Self-Reporting Questionnaire (SRQ-20) and the 14-item Shone Symptom Questionnaire (SSQ) to determine how suitable these scales are for Zimbabwean adolescents (104-106).

Using data from Zimbabwe, Chapter 3 contributes to the literature by 1) assessing the functionality of the SSQ; and 2) highlighting individual characteristics associated with being misclassified as not depressed based on the SSQ using the SRQ-20 as the gold standard criterion. Findings from this comparison will provide researchers and clinicians alike with insight

into appropriately measuring the psychosocial health of this population. By obtaining a more complete understanding of the most commonly used depression screening tools and the risk characteristics for misclassification among this age group, we will be better equipped to develop interventions and refine existing psychosocial services for vulnerable adolescents by addressing the individual and contextual circumstances that contribute to long-term depression and by protecting against subsequent maladjustment behaviors.

THEORETICAL FRAMEWORK

This study draws from Lazarus and Folkman's theory of stress and coping and Cohen and Willis's concept of social support as a stress buffer (107,108). The model suggests stress and coping are bidirectional and arise during an individual's interaction with his/her contextual environment. Contextual and situational factors that define the predictability or normality of an event will either facilitate or restrain an individual's coping ability. Events that are perceived as highly severe cause adolescents to feel helpless, vulnerable, and unstable. Figure 1.2 outlines the interrelatedness of the main constructs from this framework.

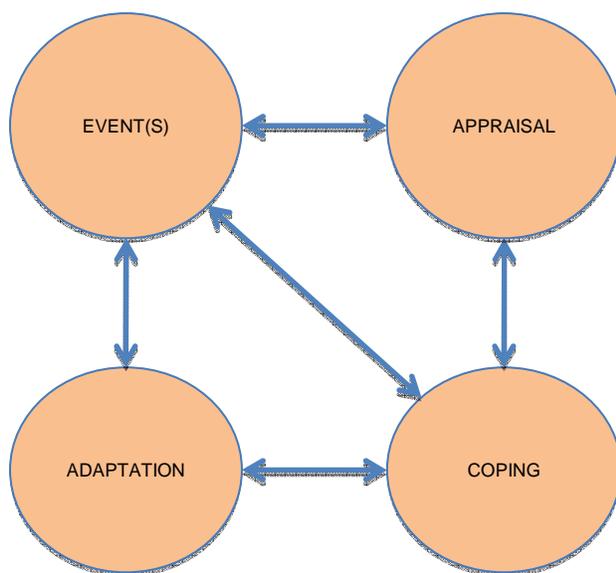


Figure 1.2. Diagram of Main Constructs of the Stress and Coping Theory

The model posits that a factor such as the loss of a parent, family turbulence and instability, or migration can lead to acute and chronic stress among adolescents. Compounding events such as school discontinuation, household composition changes or death in the home, and increased poverty are likely to decrease adolescents' feeling of control over an event(s), requiring increased efforts of personal coping in order to maintain a sense of internal and external equilibrium. Due to the incomplete psychological development of an adolescent, it is unlikely that he or she will be prepared to deal with severe life-changing events. It is expected that many adolescents will adopt maladaptive coping mechanisms such as early sexual debut and depression. If an adolescent feels that s/he is in a stable and supportive household, the more likely s/he will be able to effectively cope with life's challenges and avert risk-taking behaviors such as early sexual debut (109).

METHODS

The data source for this study is The Manicaland HIV Prevention Project, which began in 1998 as a population-based survey of adults (15-54 years) to investigate the dynamics of HIV transmission across socio-economic groups. The Manicaland Study was conducted in 12 locations in Manicaland Province, Zimbabwe comprising two small towns, two tea and coffee estates, two forestry plantations, two roadside trading settlements, and four subsistence farming areas. (See Figure 1.3 Map of Manicaland, Zimbabwe.) This study will use cross sectional data collected from October 2009 to July 2011 consisting of a household roster (n=67,879) and an adult survey (n=14,464). Surveys and rosters include information on socio-demographic and socio-economic characteristics, household composition, orphan status, sexual behaviors, migration, mortality, fertility, individual-level psychosocial determinants, knowledge about HIV, and availability of and access to HIV/AIDS treatment and services.



Figure 1.3. Map of Manicaland, Zimbabwe

Study Sample.

Two adolescent health outcomes were studied: timing of sexual debut and depression. The dataset used to assess the timing of sexual debut included 2,374 non-married adolescents (15-19 years old) across 1,986 households who had a complete data on the outcome and each of the key variables and covariates. The dataset for depression included a sample of 2,768 adolescents (15-19 years old) and 2,027 young adults (20-24 years old) who report complete data on both depression-screening items. For analysis of characteristics associated with a false negative depression score, the sample was reduced to 2,715 adolescents and 1,954 young adults due to missing data on key predictor variables.

Statistical analysis.

Methods utilized for both outcomes are defined below and within Chapters two and three.

Study one

We first examined the frequencies, means, and standard deviations of all independent variables, stratified by gender. We conducted Kaplan-Meier (KM) failure curve estimates to characterize trends in the timing of sexual debut by key variables, stratified by gender. We also conducted log rank tests of equality to test whether the difference in survival times between categories of key variables were statistically different or not, irrespective of other independent

variables. Multivariate cox regression was employed using STATA version 12 with the goal of finding the best fitting model to describe the relationship between the timing of sexual debut and the set of independent explanatory variables (110). The sample was stratified by gender to disentangle the differential effects of the key variables on the timing of sexual debut for boys and girls. Findings were reported as hazard rates (HR) accompanied by 95% confidence intervals (CI).

In some cases, multiple adolescents resided within the same household, violating the assumption of independence of error and homogeneity of slopes found in ordinary regression models. This violation results in autocorrelation, subsequently biasing the estimates of the true effect of the independent variables on the outcomes of interest. In order to correct for this, the `vce` command was used in STATA in order to cluster at the household level. This allowed us to provide accurate and efficient estimates on the extent by which the outcome varied across households.

Study two

Study two assessed the correlation between the two depression scales, stratified by age groups (15-19 years old; 20-24 years old) in order to determine how strongly the scales as a whole related to one another. The SSQ was calibrated against the SRQ-20 to examine the performance indices of the SSQ based on various cut points for classification using the SRQ-20 as the criterion measure. A multivariate logistic regression model was implemented using the key sociodemographic variables to test their association with the odds of being misclassified as non-depressed based on 1.) the conventional SSQ cut point of eight or greater positive responses and 2.) a modified cut point of five or greater positive responses to the 14 question scale.

CONCLUSION

Sexual and mental health are part of a holistic concept of overall well-being and are essential components of young people's ability to become well-adjusted, responsible and

productive members of society. Often individual behavior change programs overlook the contextual dilemmas that may perpetuate risk. For many years, adolescent-targeted prevention efforts largely focused on health education approaches. There is now increasing interest in interventions that target the social environments of adolescents. Findings from this dissertation can inform policies and guide the design of effective program interventions in order to maintain long-term, uninterrupted support for adolescents at risk of HIV. Study one will systematically support the currently scattered evidence that small, healthy, and stable homes can effectively support and prevent early sexual debut and delay risk for HIV infection. Study two will provide a more nuanced picture of the changing mental health profile of adolescents and young adults and will provide recommendations for use of these depression screening scales.

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CHAPTER 2

THE ROLE OF HOUSEHOLD AND INDIVIDUAL INSTABILITY ON THE TIMING OF SEXUAL DEBUT AMONG ZIMBABWEAN ADOLESCENTS

INTRODUCTION

Early sexual debut (i.e., vaginal intercourse) during adolescence leads to a wide range of adverse outcomes in sub-Saharan Africa (SSA), including unintended pregnancies, unsafe abortions, sexually transmitted infections (STIs), and HIV/AIDS (1-5). Everyday, more than 6,000 young people between 15 and 24 years of age are infected with HIV (6). Youth in SSA are hardest hit by the epidemic, experiencing some of the highest rates of HIV in the world. Over half of all new HIV infections occurring worldwide are among adolescents and young adults in this region (7). As such, early sexual debut remains a serious public health issue (8). This study intends to contribute to the literature by exploring household and individual stability measures thought to contribute to sexual debut among adolescents living in Zimbabwe. The 2010 Demographic Health Survey (DHS) reported a mean age of first sex of 18.9 among girls and 20.6 among boys (9). Therefore for the purposes of this paper we identified early sexual debut as having initiated sex at or before the age of 19.

Theoretical framework

This study draws from Lazarus and Folkman's (1984) theory of stress and coping and Cohen and Willis's (1985) concept of social support as a stress buffer (10,11). The model suggests stress and coping are bidirectional and arise during an individual's interaction with his/her contextual environment. Contextual and situational factors that define the predictability or normality of an event will either facilitate or restrain an individual's coping ability. In regions such as SSA, adolescents are faced with stressors such as parental death, migration, and changes in

household composition. Events that adolescents perceive as highly severe can cause feelings of being helpless, vulnerable, and unstable. Social support is thought to provide necessary resources (emotional, informational, or physical) to bolster one's ability to handle the stressful event (10-11).

The model posits that an event such as the loss of a parent, family turbulence and instability, or migration can lead to acute and chronic stress among adolescents. Compounding events such as school discontinuation, household composition changes or death in the home, and increased poverty are likely to decrease adolescents' feeling of control over the event(s), requiring increased efforts of personal coping in order to maintain a sense of internal and external equilibrium. Due to the incomplete psychological development of an adolescent, it is unlikely that he or she will be prepared to deal with severe life changing events such as a household death. It is expected that many adolescents will adopt negative coping mechanisms such as denial, avoidance, and behavior misconduct. Early sexual debut, our outcome of interest, is a likely maladaptive bi-product for individuals who have not developed positive coping techniques. We postulate that the presence of one or a combination of these household-level characteristics will negatively impact adolescents' abilities to cope with stress both in and out of their home environment. Alternatively, the presence of stability and household support will bolster their coping abilities and lessen their reliance on maladaptive and risky behaviors. The more integrated an adolescent is within his/her household, the more likely s/he will be able to effectively cope with life's challenges and avert risk taking behaviors such as early sexual debut (12).

Household-level risk factors

Social, economic, and epidemiological factors in SSA have continued to influence family stability. Most sexual health interventions have focused on the individual with little attention given to how household-level forces influence young people's sexual behaviors (13-15). While health researchers have examined an individual's broader context as a determinant of his/her

sexual behavior, household-level factors have been relatively neglected. This paper will examine how three household-level characteristics (*household instability, relationship with head of household, and recent household death*) relate to adolescent sexual risk.

Household instability

Family structure influences the development of relationships with household members. Changes in household membership are common in Africa where individuals move to obtain employment, marry, attend school, provide support to families in need, or as a result of family dissolution following the death of a household head. Shifts in household membership can increase adolescents' stress as they adjust to new routines, situations, relationships, and responsibilities (16). There is a litany of research exploring the effect of household composition on sexual risk of adolescents within the US, mostly pertaining to divorce, remarriage, and changes in the formation and termination of cohabiting relationships (17-19). Findings from these studies suggest that individuals from intact families fare better than those from disrupted families (20). Furthermore, research has shown that multiple changes in family structure have greater negative effects on a child's well-being (i.e. behavioral, emotional, and cognitive outcomes) compared to a single change or no changes at all (17,21).

In a recent study in Cameroon Dimbuene and Defo found that youth (ages 12-24) were 31% more likely to have premarital sex if they had experienced a change in family configuration during pre-adolescence (22). Using life history calendars, Goldberg found that Kenyan adolescents who had changes in their primary caregiver were more likely to initiate sex early (<18 years of age) (23). This correlation was weaker if the caregiver dissolution occurred at younger ages. This paper will build from these findings to assess how household membership stability affects adolescent sexual behaviors in Zimbabwe where the population is highly mobile. It is expected that Zimbabwean youth with a large proportion of household membership changes will have less caregiver support and oversight, giving rise to sexual debut at earlier ages.

Relationship with Head of Household (HoH)

Many youth throughout Zimbabwe, orphans and non-orphans alike, live with cross-generational, extended, or foster families (24-26). Studies reveal that young people living with non-parental HoH demonstrate riskier sexual behaviors than those who live with parents. The more distantly related the child is with the HoH the stronger this association (22,27-30). US-based studies on this phenomena have revealed that closer caregiver relationships, including higher levels of perceived support, create stable family contexts that minimize adolescents' risk taking that includes seeking out alternative intimate relationships from peers or unrelated adults (15,31-33).

Studies indicate that non-parent caregivers provide inadequate levels of guidance and communication about sex to non-biological children (20,34,35). Inadequate sex education can result in both low levels of knowledge about sexual risks and poor self-efficacy involving sexual decisions. A study by Rwenga et al. among a sample of Cameroon adolescents corroborates this hypothesis. Researchers found that youth who lived with only one parent, a distant relative, or non-relative caregiver were 1.6 times more likely than those in two-parent households to be sexually active (30). We expect based on these findings that Zimbabwean adolescents living in households with non-related or distantly related caregivers will sexual debut at younger ages.

Recent household member death

A recent systematic review of risk and protective factors for adolescent reproductive health in developing countries found that the death of a parent was consistently associated with early sexual debut among adolescents in SSA (36-38). Studies speculated that sexual activity acts as an emotional outlet for adolescents coping with loss and subsequent hardships. There is a paucity of research examining how the death of a non-parental household member affects adolescents' sexual behaviors. We expect to see similar, albeit weaker, psychological and behavioral effects resulting from a non-parental household member death compared to those who have lost a parent or those who live in a household with a chronically ill member.

Adolescents living in a household with a chronically ill member are faced with the reality of mortality, grief, feelings of uncertainty, and stress accumulation due to greater household responsibilities and potentially age-inappropriate care-taking duties (39). A study among South African youth found that girls living in a household with an HIV positive sick member in the past 12 months were significantly more likely to see themselves at risk of contracting HIV than those who did not live with a sick member (40). Opposing results were found in a study utilizing Kenyan Demographic and Health Surveys (KDHS) whereby adolescents ages 15-17 living with an HIV-infected household member had a 60% increased odds of initiating sex (41). These limited findings warrant further investigation on the effects a household member death has on adolescents' sexual debut patterns.

Individual-level risk factors

In this paper, we are also interested in individual-level factors and their association with HIV risk. The key individual factors of interest include *orphan status*, *gender*, *recent migration*, and *depression*. Orphan status and gender have been shown consistently in the literature to predispose adolescents to greater sexual risk taking (3,14,38,42-44). Less established, although of burgeoning interest, are measures of individual instability that can motivate adolescents to seek inclusion and emotional connectivity (18,23,45,46). We posit that early sexual debut is one way by which adolescents attempt to cope with these forms of instability.

Gender

The gender gap among adolescents infected by HIV is severe, with females bearing 75% of the infection rate (6). Studies among SSA youth found adolescent girls were between two and ten times more likely to be HIV positive than their male counterparts (47-50). Albeit lower than its regional neighbors, Zimbabwe maintains a 6% HIV infection rate among 15-24 year-olds with a gender-based risk disparity for HIV among females almost double that of males (9). Singh et al. examined gender differences in the age at sexual debut in 14 countries across multiple continents (51). The study reveals that Africa was the only region where females mean

age of sex tended to be lower than males. Based on this differential, we stratified the data in order to disentangle the unique risk factors for both male and female sexual debut patterns.

Orphan Status

In addition to gender, empirical evidence from several studies has repeatedly shown that the death of a mother or father can have varying effects on adolescent risk behaviors (27,52-54), including risk for early sexual debut. Early sexual debut among orphans has been linked with higher rates of STI infection, including HIV, often as a result of low condom use (1-5).

Migration

Very few SSA studies have examined the role of migration on adolescent sexual risk. Sambisa and Stokes reported that among Zimbabwean youth ages 15-24, migrants to rural areas were less likely to practice abstinence and monogamy than non-migrants, while urban migrants were less likely to use a condom during sex (55). In another study Luke et al. investigated how dimensions of residential change (timing, age at move, and number of moves) affected the timing of premarital sex among Kenyan youth. Luke found that migration during early adolescence (<13 years old) was a risk factor for early sexual debut (<18 years old), while moves among older adolescence was a protective factor (56). Both multiple moves and recent residential change protected older adolescents against debuting early, while those with the fewest number of residential changes had the earliest onset of sexual initiation. This paper will determine if the same pattern between residential mobility and timing of sexual debut seen among Kenyan young adults holds in Zimbabwe.

Depression

Research has indicated a link between depression and sexual risk among adolescents including early sexual debut, high numbers of sexual partners, non-use of contraception, risky partner selection, and transactional sex (57-63). However these findings come from studies based in developed countries that lack the contextual factors associated with a mature HIV

epidemic seen in SSA. In one of the few studies examining the association between depression and sexual debut in SSA, Nduna et al. found that depressed youth aged 15-26 living in South Africa were more likely to engage in sexual risk than non-depressed youth. Depressed females were more likely to have an older partner (> three years), to have two or more episodes of abuse (physical or sexual), and to engage in transactional sex at higher rates compared to non-depressed females (63). Nyamukapa et al. reported the same pattern linking depression and sexual debut among small sample of 12-18 year olds orphans in Zimbabwe with greater risk among girls compared to boys (64). This paper intends to refine this important but limited body of knowledge by utilizing a larger sample of 15-19 year old Zimbabwean adolescents to examine whether depression is associated with the timing of sexual debut.

Focus of this Study

This paper examines the emotional, physical, and contextual measures of instability in order to assess how they contribute to sexual risk taking among adolescent girls and boys (aged 15-19) living in Zimbabwe. A comprehensive understanding of how one's family and household influences relate to sexual behaviors has the potential to improve the scope and effectiveness of adolescent reproductive health interventions in SSA. This paper contributes to the literature by 1.) assessing the association of household measures of instability and individual characteristics on the timing of sexual debut among a sample of 15-19 year olds living in Zimbabwe, and 2.) determining how the timing and pattern of sexual debut differs between adolescents girls and boys in Zimbabwe.

METHODS

Sample selection and eligibility

The data source for this study is The Manicaland HIV Prevention Project, which began in 1998 as a population-based survey of adults (15-54 years) to investigate the dynamics of HIV transmission across socio-economic groups. This study used cross-sectional data collected from October 2009 to July 2011 consisting of a household roster (n=67,879) and an adult

survey (n=14,464). The sample for the present study was limited to 2,374 non-married adolescents ages 15-19 (males: 1297; females: 1077) with complete survey data across 1,986 households. Married adolescents were excluded since we could not determine the timing of the union and whether their first sex act occurred prior to marriage or following marriage. For this paper we are specifically interested in sexual risk outside of a marital union.

Surveys and rosters include information on socio-demographic and socio-economic characteristics, household composition, orphan status, sexual behaviors, migration, mortality, fertility, individual-level psychosocial determinants, knowledge about HIV, and uptake of HIV/AIDS treatment and services. Adolescents were linked to a unique household-level identification to allow analysis of household-level factors. Institutional Review Board approval for this analysis was obtained from the University of North Carolina at Chapel Hill.

Measures

Table 1 describes the derivation for each variable. To determine the timing of sexual debut, respondents were asked, "How old were you (in years) when you had sex for the first time?"

The three key household-level variables of interest were *household instability* (no changes in household membership in the past year, 1-25% of household members changed within past year, 26-50% of household members changed within the past year, > 50% of household members changed within the past year), *current relationship with head of household* (parents, other family members, non-related), and *recent household death* (yes, no).

The four key individual-level variables of interest were *orphan status* (non-orphan, maternal orphan, paternal orphan, and double orphan), *gender* (male/female), *recent migration from their prior homestead in the past two years* (yes/no), and *depression* as characterized by the Self Reported Questionnaire (SRQ-20) based on a positive response to eight out of twenty questions (yes/no). The SRQ-20 asks whether individuals experienced specific mental distress symptoms over the previous week. It has consistently shown high content validity with neurosis,

depression, anxiety, and psychosomatic complaints (65,66). Although initially intended for primary health care settings, the SRQ-20 has also been used as a screening tool within community settings.

Additional control measures include *household wealth* (poorest, poor, middle, wealthy, wealthiest), *the specific community where the respondent lived at the time of the survey* (n=12), *school enrollment* (yes/no), and *education level* (primary school or less, secondary school or beyond).

Statistical Analysis

We first examined the frequencies, means, and standard deviations of all independent variables, stratified by gender. Next, we provided Kaplan-Meier (KM) failure curve estimates to characterize trends in the timing of sexual debut by key variables, stratified by gender. These curves allow us to assess the cumulative probability of ever having sex over the period of 15-19 years old measured at one-year intervals. Next we conducted log rank tests of equality which allowed us to test whether the difference in survival times between categories of key variables were statistically different or not, irrespective of other independent variables. P-values for log rank tests are provided in the respective KM graphs. Lastly we built multivariate cox regression models to examine sexual debut hazard ratios based on different time-invariant household and individual-level variables, stratified by gender. All analyses were conducted in STATA version 12 (67). Findings were reported as hazard rates (HR) accompanied by 95% confidence intervals (CI). Exposure to the event (ever having sex) was defined in units of age. Adolescents in the sample were considered to have failed (achieved the outcome) when they had sex at 19 or below, justified by the high age of sexual debut reported by Zimbabwean adolescents in the most recent DHS (9). Those who reported never having sex at the time of the survey were right censored.

In some cases multiple adolescents resided within the same household, violating the assumption of independence of timing of sexual debut. This violation results in autocorrelation,

subsequently biasing the estimates of the true effect of the independent variables on the outcomes of interest. In order to correct for this, the vce clustering command was used in STATA, providing accurate and efficient standard error estimates of household-level influences.

RESULTS

Sample Characteristics

Table 2 provides summary statistics. A total of 2,914 adolescents were involved in the study (males: 1,596; females: 1,318). Six percent (n=159) of the total sample reported ever having sex (males: 5%; females: 6%). The mean age of the total sample was 16.6. The mean age of sex was 18.03 years of age (males: 18.1; females 17.9).

Nearly half of the total sample (42%) reported no household member changes (males 43%; females 41%) while 6% reported more than half of their household members changing since the prior survey (males 5%; females 6%). Of the total sample two-thirds (66%) lived with their parents (males 68%; females 64%), 32% lived with other relatives (males 31%; females 34%), and 2% lived with a non-relative (males 1%; females 2%). Nearly one quarter of the total sample reported a recent household death (males 23%; females 21%). Wealth was almost evenly distributed across quintiles with a slightly higher proportion of the sample in the wealthiest quintile (males 26%; females 29%).

Half the sample was orphaned with almost no differences observed between genders (males: 27% paternal 5% maternal and 19% double; females: 27% paternal 5% maternal and 16% double). A small percentage of the sample reported recent migration (7%) with more movement among females than males (males: 6%; females 10%). Depression incidence was low among the sample (males 6%; females 8%). Over two-thirds (71%) of the sample was currently enrolled in school at the time of the survey (males 70%; females 72%). More males than females completed secondary school (males 31%; females 21%).

Bivariate Analysis

KM curves and log rank test for equality of the survival function were reported for key

household and individual variables found to have significant associations with timing of sexual debut, stratified by gender. Figure 1 indicates that household instability was associated with a greater cumulative probability of ever having sex for females only (at age 17: no changes: 6%; >0-25% membership changes: 6%; >25-50% membership changes: 8%; >50% membership changes: 28%, $p < 0.01$). Figures 2 and 3 indicate depression was associated with a greater cumulative probability of ever having sex for both genders (at age 19: depressed female 20% vs. non-depressed females 13%, $p < 0.01$; depressed males: 20% vs. non-depressed males: 10%, $p < 0.05$). KM and log rank tests revealed non-significant differences in the timing of sexual debut based on living in a household with a recent death, relationship with HoH, orphan status, and recent migration for both males and females ($p > 0.05$).

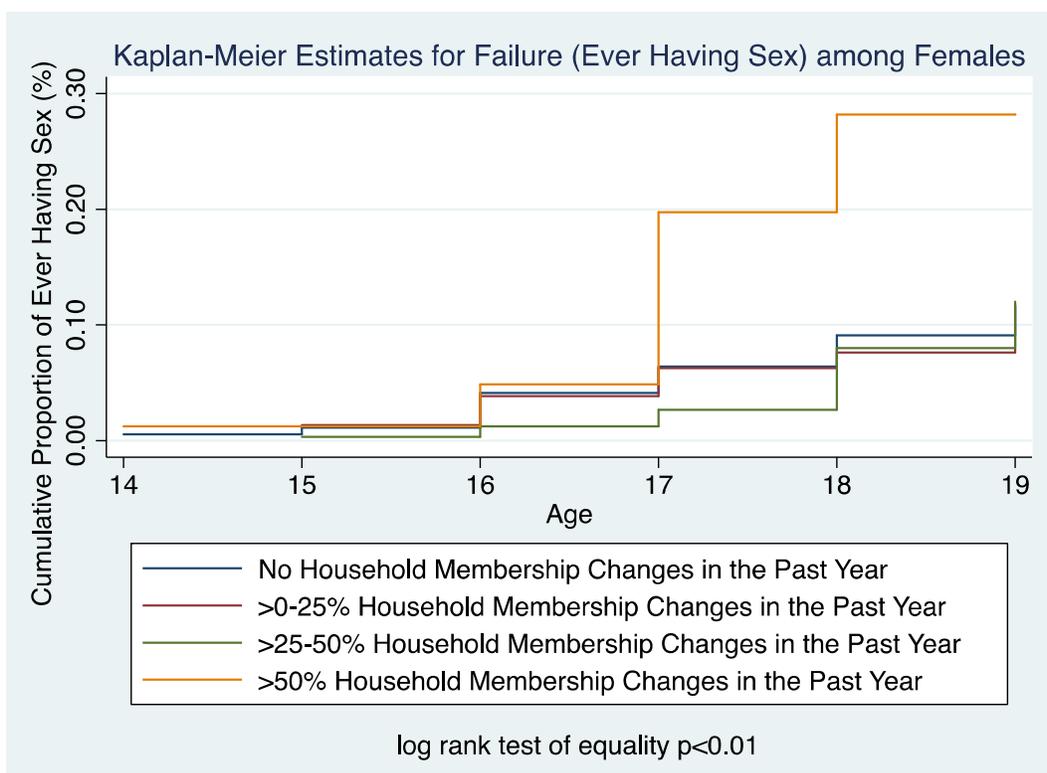


Figure 2.1. Kaplan Meier estimates for failure among females based on household instability

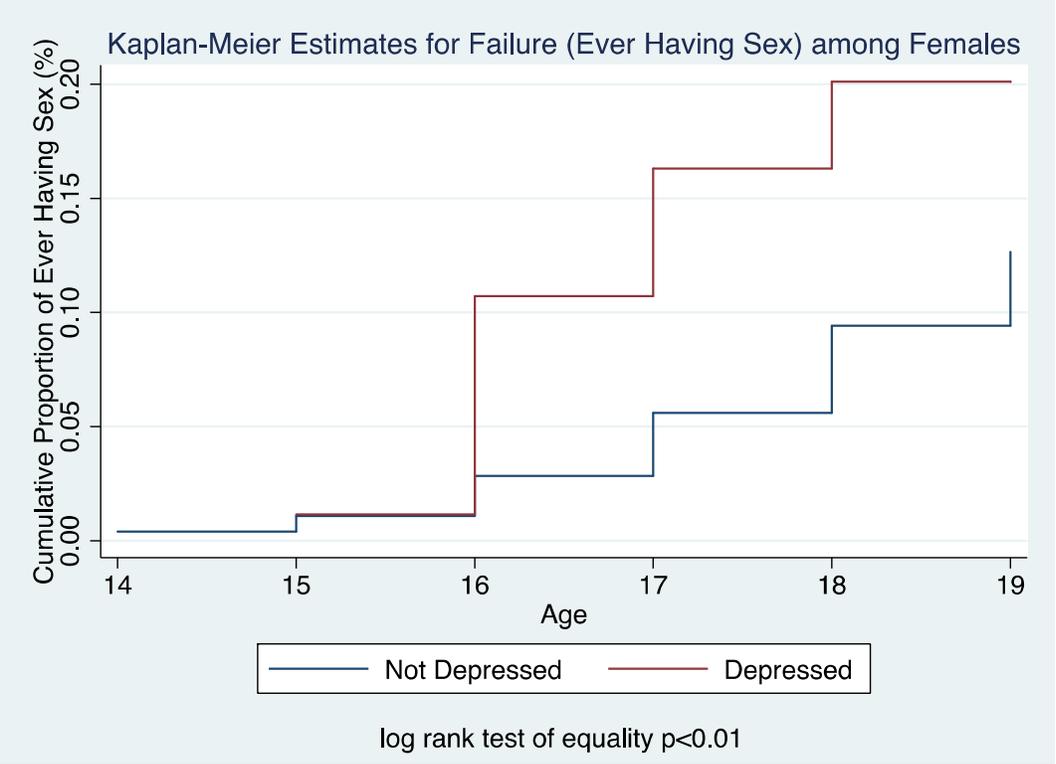


Figure 2.2. Kaplan Meier estimates for failure among females based on depression

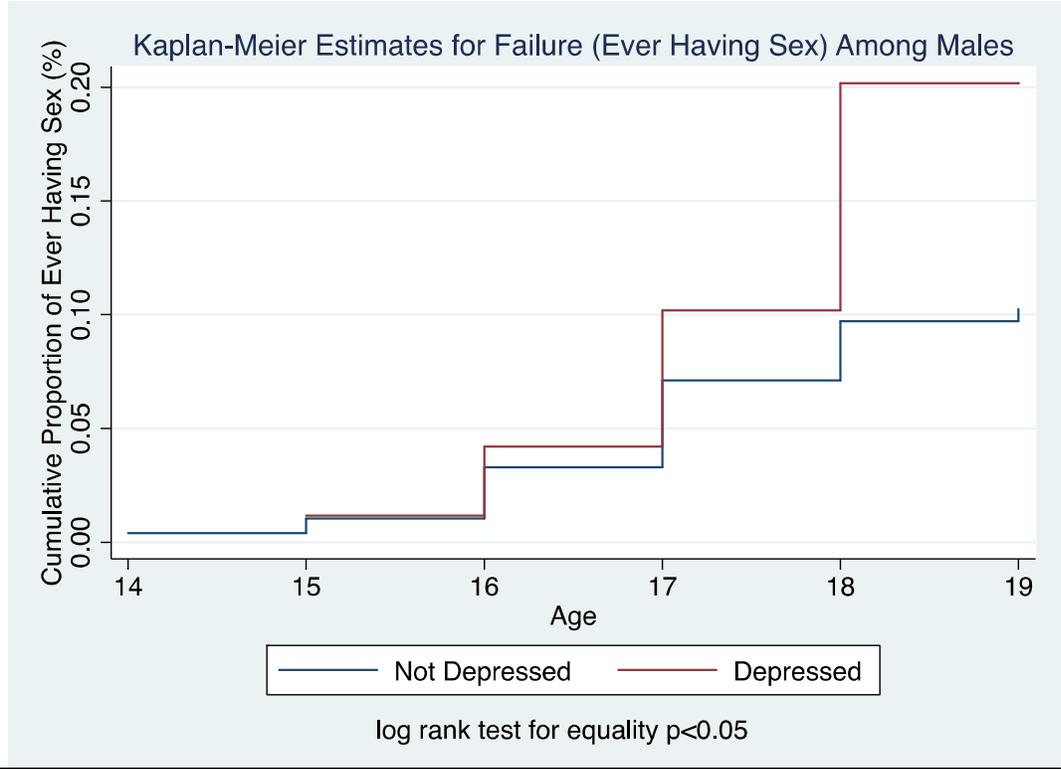


Figure 2.2. Kaplan Meier estimates for failure among males based on depression

Multivariate Cox Regression

Table 3 presents the multivariate cox regression analysis of household and individual-level characteristics associated with timing of sexual debut, stratified by gender. Looking at household-level variables, having more than 50% of household membership changes in the past year was significantly associated with increasing rate of ever having sex within each year of age for the entire sample (Hazard Ratio (HR) 1.93, 95%CI: 1.06-3.50) and for females (HR 2.63, 95%CI: 1.13-6.15). Interestingly, living in a household with a recent death was protective against ever having sex: adolescents with a recent household death had a 36% lower hazard rate of ever having sex within each year of age compared with adolescents without a recent household death. When stratified by gender the significance of this association disappeared but remained in the same direction.

Examining the association of the timing of sexual debut and key individual-level variables, we found adolescents who reported being depressed had significant increases in the rate of ever having sex with each year of age (HR 1.98, 95%CI 1.19-3.29). Again, this association disappeared among gender-stratified groups possibly due to shrinking sample size and rarity of the event. School enrollment was the strongest predictor of timing of sexual debut and the only predictor that was significant across both genders. Among the full sample adolescents not enrolled in school had higher rates of ever having sex with each year of age (HR: 5.41, 95% CI 3.49-8.38). Not being enrolled in school had a greater effect on females (HR 13.92, 95% CI 6.01-32.27) than males (HR 3.10, 95%CI 1.91-5.01), although it was highly significant for both groups. Lastly, education level had opposing but significant effects on the timing of sexual debut for males and females. Compared to their counterparts with lower levels of education males with a secondary education had a 74% (HR 1.74, 95% CI 1.06-2.85) higher hazard rate, while females with a secondary education or higher had an 83% (HR 0.17, 95% 0.08, 0.37) lower hazard rate of ever having sex with each year of age. Orphan status, gender,

and migration were not significant predictors for the timing of sexual debut for the sample as a whole or for the stratified groups.

DISCUSSION

Decades of research exist on the impact of individual-level vulnerabilities on adolescent health and risk-taking behaviors in the US and other developed countries. Only recently researchers have begun to focus on the effects household measures of instability have on adolescents living in SSA. Our study contributes to this growing body of research by suggesting that multiple household factors are associated with the timing of adolescent sexual debut but not always in the expected direction or at the expected strength. Our research reveals that high levels of household membership changes and depression (among the full sample and female sample), and school discontinuation (among all groups) were factors positively associated with earlier ages of sexual debut, while a recent household death and a secondary education or higher was associated with later ages of sexual debut (among the full sample and female sample respectively). These findings suggest that emotional, social, and household instabilities among adolescents living in HIV-affected regions have wide-reaching implications to health and risk behaviors with particularly negative effects among girls.

Looking first at household-level variables, we find support for our hypothesis that household membership changes are associated with earlier ages of sexual debut. The pattern, however, was nonlinear. A significant correlation was seen only among households with high levels of instability (> 50% membership changes). This suggests that youth are resilient to small levels of household changes, while larger levels of membership volatility negatively impact sexual behaviors. Less supervision and less connected relationships are expected among youth who live in a household with fluctuating members. As a result, adolescents may spend less time at home, and seek alternative relationships in order to fulfill their desire for belonging. This can manifest in the development of intimate relationship and sexual exploration. The association between household instability and sexual debut was stronger and remained significant for

females but not males. This may be due to the developmental differences between genders that could influence the effect household instability has on sexual choices. Females have been shown to have greater needs for emotional connectivity and intimacy during the adolescent period than males (68). Furthermore adolescent girls have also been shown to have both lower levels of self-esteem and self-efficacy in sexual negotiations than adolescent boys placing them at greater risk for sexual coercion (69). A US study found that accumulated risk factors such as low self-esteem, poor parental relationships, and living in a non-intact household increase adolescent girls risk for early sexual debut (70). Girls living in households with high levels of instability therefore may be not only more deeply affected by constant changes in household members but also be at greater risk for sexual pressures within their community.

There is limited evidence suggesting adolescents cared for by non-parental caregivers fare worse in terms of love and support and may seek emotional intimacy through sexual debut (23,35,71-73). Our findings are inconclusive. A child's appraisal of non-parent caregiving likely depends on the broader family context. In situations where a non-parent caregiver is functioning well in his or her role, the child may feel equivalent levels of support and supervision as those who are cared for by a parent.

Additional studies examining the caregiver-child relationship suggest that adolescents living in nonparent-headed households are likely attended to by multiple caregivers and therefore obtain adequate levels of monitoring regardless of who serves as HoH (22,36,71,74). In Zimbabwe where fluidity in family formation and fostering is common, adolescents may more easily adapt to changes in caregivers compared to US adolescents who less commonly live in cross-generational and extended family homes.

Lastly, experiencing a recent household death was found to delay sexual debut among the entire sample, although this association disappeared among the stratified samples. Given the high prevalence of HIV in Zimbabwe, a large proportion of recent household deaths were HIV-related. We expect that HIV-related deaths may cause adolescents to more critically

consider and assess their HIV risk and subsequently alter their sexual risk-taking intentions or behaviors. In general, being exposed to mortality during the adolescent period may promote critical thinking about survival, safety, and behaviors that promote longevity.

Some researchers argue that change creates resiliency and that vulnerable children can often rebound from negative events (i.e. changes in household membership, change in caregivers, and household death) and perform as well as a child with fewer changes (75,76). This is particularly relevant in Zimbabwe where most adolescents are faced with multiple disadvantages – leveling the field for exposure to and behavior towards risk. Because studies on the protective effects of family environment in SSA are sparse, no definitive conclusions can be drawn here. These findings can serve as the inception of in-depth research on how these household stability measures and others influence sexual risk among adolescents within this context.

Turning to individual-level factors, our study supports findings from other studies that demonstrate a link between depression with sexual risk (44,58,62,63,77-80). This link highlights the importance of early depression screening and support for adolescents who face psychosocial, structural, and developmental challenges in a context where HIV infection is a common risk (57,62,63). Determining how to minimize duress and maximize healthy coping techniques for youth has the potential to improve how they handle changes in their environment and manage their sexual choices.

Surprisingly, our findings differ from other studies that suggest migration increases sexual risk. In the US, adolescent migration is most often driven by divorce or parental unemployment, and has been shown to increase maladjustment including the short-term heightening of risk-taking behaviors. Adolescent migration in settings like Zimbabwe is less easy to classify because of the high mobility of the society at large. Zimbabwean adolescents may move for positive events such as school attendance, marriage, or to accompany a parent who

has obtained employment. As a result, risk-taking behaviors (i.e., early sexual debut) seen among US adolescents may not as readily occur in this population.

Results suggest education - vis a vis school enrollment (among both males and females) and secondary school completion education level (among females) are the strongest predictors of delayed sexual debut among this population, As seen in the literature, school provides a safe haven for adolescents (43,81-83). It situates them in a peer network and provides life skills. In a context ridden with instability, school enrollment is one means of ensuring consistency and structure for this age group. A study by Jukes et al. in southern Africa suggest that adolescents who lack this day-to-day structure are more likely to be exposed to a wider social network and to have greater social and economic vulnerabilities, both of which increase the threat for sexual risk behaviors including early debut (84). Keeping adolescents in school will help ensure greater HIV prevention knowledge and confidence in sexual decision-making (81,85,86).

Female adolescents who advance their education will likely experience greater feelings of support among peers and will be more inclined to select romantic partnerships with boys who are the same age placing them at lower risk for sexual abuse, HIV infection, and sexual concurrency. Age appropriate partnerships will level the playing field for greater sexual negotiation including delaying the age of sexual debut. Furthermore, educational advancement will help girls cultivate a greater self-confidence and self-efficacy that will allow them to more easily navigate their sexual future (87). Interestingly an inverse association was seen among males, whereby those who had higher levels of education had higher rates of ever having sex. This association may be a function of older age rather than school given that the male sample was older than the female sample. Alternatively, it may point to the power of education in positioning males as more desirable partners. The most recent DHS suggests that Zimbabwe has the highest level of age-disparate unions (> 5 years age difference) among 15-24 year old females than any other regions of SSA (9). This suggests that at younger adolescent girls (15-

16 years old) who are sexually active are debuting with older partners (>18 years old) rather than their male peers.

There are several noteworthy limitations. Endogeneity caused by missing variables limited our ability to explore a greater range of household-level factors possibly associated with the outcome such as child-caregiver communication about sexuality, whether someone in the household is living with HIV, and level of caregiver oversight and monitoring. Relatedly, incomplete responses restricted our ability to refine several key variables. We were unable to measure the reasons for migration due to high levels of missing data, which could have allowed us to unpack how perception of migration and different movement patterns affect sexual behavior. Our measure of relationship with HoH fails to capture the strength of the caregiver-child relationship and overlooks potentially strong relationships with other non-head of household caregivers. A child may live in grandparent-headed household but still be cared for by a parent. Similarly, a child may live with a parent but be overseen primarily by a sibling or aunt.

The cross-sectional dataset inhibits our ability to assess causation. This is an issue to consider when assessing the significant association between depression and timing of sexual debut. Longitudinal studies have shown that early sexual debut was the cause for depression in some adolescent populations (78), although our discussion here leans towards reverse causation.

Sexual debut among this sample was rare causing small sample sizes and low power among the stratified samples. Low power limits the ability to show significance in the stratified groups despite significant levels in the full sample. Depression and recent household death were found to be significantly associated with the timing of sexual debut among the entire sample, yet no association was seen among the stratified groups.

A vast literature questions the consistency and reliability of self-reported age at first sex in surveys from developing countries. This is particularly relevant in regions where sexual

relationships outside of marriage are discouraged among girls. In this vain, underreporting among girls and over-reporting among boys due to gender-specific social norms and expectations in Zimbabwe could undermine the accuracy of the outcome and potentially skew our results (88). These differential biases increase the difficulty of accurately comparing the experiences of males and females.

CONCLUSION

These findings shed light on the importance of expanding the lens that examines adolescent risk taking such that it includes youths' broader social and household context. Future health program discussions should target the place where adolescents spend a large portion of their time – their home. Change is inevitable, particularly in countries such as Zimbabwe that have been burdened with social, economic and epidemiological hardship. Nevertheless, adolescents are particularly vulnerable to the effects of intrinsic and extrinsic changes as they mature into adulthood. This study shows that sexual risk within this sample is driven by emotional, social, and contextual turbulence. Factors like school enrollment and higher levels of education can mitigate some of the negative effects of multiple experiences of instability, particularly for females.

Household circumstances play a major role in youths' emotional development and may predict the ways and means by which they learn skills to navigate a new arena of their life – one with intimate sexual relationships. These findings underscore the need to provide caregivers with the skills and confidence to promote responsible sexual behaviors and abstinence among adolescents in their care. Without a safe and supportive family network, adolescents may be susceptible to external influences. It is crucial that parents and caregivers 1.) recognize the importance of their role in ensuring adolescents make healthy sexual choices and 2.) feel empowered to begin open communication about sexual issues with their children.. Involving parents, caregivers, teachers, and other influential members of adolescents' social and

household atmospheres is crucial to ensuring healthy beliefs and behaviors among youth transitioning to adulthood.

Table 2.1: Variable derivation

Variables	Survey Questions	Coding
OUTCOME VARIABLE		
Ever had sex	Has begun sexual activity at time of survey	no; yes
Timing of sexual debut	Age at time of first sex	14-19
KEY HOUSEHOLD-LEVEL VARIABLES		
Household instability	<p>Percentage of non-visitor household members who moved in to or out of the household within the past year. (excluding those who died since last wave of data and excluding adolescents 15-19 who have migrated in the prior year)</p> $\frac{\text{\# of unstable members}}{\text{\# unstable members} + \text{\# of stable members}}$ <p>this ratio is based on two questions about each individual reported on the household roster from the previous wave of data:</p> <ul style="list-style-type: none"> • Was he/she staying here the same month last year? (y/n) • Does he/she still stay in this HH on a regular basis? (y/n) <p>Visitor = responded yes to both questions; excluded Stable member = responded yes to both questions; included Unstable member = responded yes to either questions; included</p>	no moves, >0-25% of household members moved, >25-50% of household members moved, >50% of household members moved
Relationship with head of household	Relationship with head of household	parents, other family member, non-related
Recent household death	Adult death (>=18 years old) within the household since the prior wave of data (< two years ago)	no, yes
HOUSEHOLD-LEVEL CONTROL VARIABLES		
Wealth quintile	Households were divided into wealth quintiles based on summed score of household asset ownership based on the following: source of drinking water (piped into residence, private tap in yard or plot, communal tap, private well or borehole, other well or borehole, protected spring, other); access to electricity (yes or no); type of toilet facility (flush, blair, pit latrine, other, none); type of house (pole and dagga structure, brick house with thatched roof, brick house with tiled/sheeting roof, cabin/other); type of floor in the main dwelling (natural floor (earth/sand/dung); rudimentary (planks/palm/bamboo), finished (wood/cement/carpet)); ownership of a radio, a television, a motorbike or a car.	poorest, poor, middle, wealthy, wealthiest
Community	12 community sites: two small towns, two tea and coffee estates, two forestry plantations, two roadside trading settlements, and four subsistence farming areas	1-12
KEY INDIVIDUAL-LEVEL VARIABLES		

Orphan status	Type of orphan determined by the following two questions: <ul style="list-style-type: none"> • Is your natural biological father still alive? • Is your natural biological mother still alive? <p>“Don’t know” responses were counted as dead</p>	non-orphan; paternal orphan; maternal orphan; double orphan
Gender	Sex	male, female
Recent migration	Moved to a homestead since the prior survey (< two years ago)	no, yes
Depression	Value based on summation of yes responses to the following 20 questions in SRQ-20 depression scale: <i>In the past week...</i> <ol style="list-style-type: none"> 1. Were you having headaches? 2. Was your appetite poor? 3. Were you having problems sleeping? 4. Were you easily frightened? 5. Did your hands shake? 6. Did you feel tense, nervous or worried? 7. Were you having digestion (tummy) problems? 8. Did you have trouble thinking clearly? 9. Did you cry more than usual? 10. Did you feel more unhappy than usual? 11. Did you have trouble enjoying your daily activities? 12. Did you find it difficult to make decisions? 13. Was your daily work suffering? 14. Were you able to play a useful part in life? (reverse coded) 15. Did you lose interest in things? 16. Did you feel a worthless person? 17. Has the thought of ending your life been on your mind? 18. Did you have uncomfortable feelings in your stomach? 19. Were you feeling tired all the time? 20. Did you feel able to cope with most of the problems in your life? (reverse coded) 	no (<=7), yes (>7)
INDIVIDUAL-LEVEL CONTROL VARIABLES		
School enrollment	Enrolled in school full-time	no, yes
Education level	Highest level of schooling completed	<=primary, >=secondary

Table 2.2: Household and individual summary statistics associated with ever having sex (N=2,914)

Variable	Non-married males (n=1,596)		Non-married females (n=1,318)		Total sample (n=2,914)	
	N	%/Mean (SD)	N	%/Mean (SD)	N	%/Mean (SD)
OUTCOME VARIABLE						
Ever had sex					2,914	0.15 (0.36)
no	1,504	93.9%	1,251	94.6%	2755	94.5%
yes	91	6.1%	67	5.4%	159	5.5%
Age at first sex						
<15	8	0.5%	5	0.4%	13	0.4%
15	9	0.6%	9	0.7%	18	0.6%
16	24	1.6%	22	1.7%	46	1.6%
17	31	2.1%	16	1.2%	47	1.6%
18	18	1.2%	11	0.8%	29	1.0%
19	1	0.01%	3	0.2%	4	0.1%
KEY HOUSEHOLD-LEVEL VARIABLES						
Household instability	1,577		1,308		2,885	1.9 (0.93)
no moves	680	43%	541	41%	1,221	42%
>0-25% of household members moved	481	31%	378	29%	859	30%
>25-50% of household members moved	339	22%	307	23%	646	22%
>50% of household members moved	77	5%	82	6%	159	6%
Relationship with HOH	1,587		1,310		2,897	0.35 (0.51)
parents	1,082	68%	843	64%	1,925	66%
other family member	486	31%	441	34%	927	32%
non-related	19	1%	26	2%	45	2%
Recent household death	1,596		1,318		2,914	0.22 (0.41)
no	1,233	77%	1,037	79%	2,270	78%
yes	363	23%	281	21%	644	22%
HOUSEHOLD-LEVEL CONTROL VARIABLES						
Wealth quintile	1,589		1,313		2,902	2.16 (1.44)
poorest	286	18%	194	15%	480	17%
poor	333	21%	263	20%	596	21%
middle	321	20%	288	22%	609	21%
wealthy	232	15%	188	14%	420	14%
wealthiest	417	26%	380	29%	797	27%
Community	1,596		1,318		2,914	7.32 (3.40)
Site 1	104	7%	64	5%	168	6%
Site 2	50	3%	37	3%	87	3%
Site 3	150	9%	125	9%	275	9%
Site 4	151	9%	120	9%	271	9%
Site 5	132	8%	88	7%	220	8%
Site 6	50	3%	54	4%	104	4%
Site 7	111	7%	104	8%	215	7%
Site 8	126	8%	110	8%	236	8%

	Site 9	208	13%	177	13%	385	13%
	Site 10	153	10%	139	11%	292	10%
	Site 11	175	11%	154	12%	329	11%
	Site 12	186	12%	146	11%	332	11%
KEY INDIVIDUAL-LEVEL VARIABLES							
Orphan status		1,592		1,318		2,910	1.90 (1.12)
	non-orphan	787	49%	670	51%	1,457	50%
	paternal	436	27%	361	27%	797	27%
	maternal	74	5%	70	5%	144	5%
	double	295	19%	217	16%	512	18%
Recent migration		1,593		1,315		2,908	0.07 (0.26)
	no	1,509	95%	1,190	90%	2,699	93%
	yes	84	5%	125	10%	209	7%
Depression		1,331		1,095		2,426	0.07 (0.26)
	no	1,245	94%	1,008	92%	2,253	93%
	yes	86	6%	87	8%	173	7%
INDIVIDUAL-LEVEL CONTROL VARIABLES							
Age		1,596		1,318		2,914	16.6 (1.35)
	15	389	24%	385	29%	774	27%
	16	350	22%	366	28%	716	25%
	17	266	17%	266	20%	532	18%
	18	374	23%	188	14%	562	19%
	19	217	14%	113	9%	330	11%
School enrollment		1,596		1,318		2,914	0.71 (0.45)
	no	481	30%	363	28%	844	39%
	yes	1,115	70%	955	72%	2,070	71%
Education level		1,593		1,318		2,911	0.27 (0.44)
	primary school or less	1,094	69%	1,035	79%	2,129	73%
	secondary schooling or more	499	31%	283	21%	782	27%

Table 2.3. Hazard ratios of ever having sex among non-married adolescents ages 15-19, by gender

	Non-married males n=1297			Non-married females n=1077			Total Sample n=2374		
	HR	(95% CI)	p	HR	(95% CI)	p	HR	(95% CI)	p
KEY HOUSEHOLD-LEVEL VARIABLES									
Household Instability									
No changes in household membership in the past year	Ref			Ref			Ref		
1-25% of household members changed within past year	1.32	(0.79, 2.19)		0.91	(0.43, 1.92)		1.11	(0.75, 1.66)	
26-50% of household members changed within past year	1.06	(0.57, 1.97)		0.76	(0.35, 1.62)		0.87	(0.55, 1.38)	
> 50% of household members changed within past year	1.70	(0.79, 3.66)		2.63	(1.13, 6.15)	*	1.93	(1.06, 3.50)	*
Relationship with HoH									
Parents	Ref			Ref			Ref		
Other family members	1.79	(0.97, 3.31)		1.02	(0.54, 1.93)		1.24	(0.79, 1.97)	
Non-related	1.10	(0.17, 7.02)		0.22	(0.03, 1.77)		0.53	(0.12, 2.41)	
Recent household death									
No	Ref			Ref			Ref		
Yes	0.58	(0.31, 1.09)		0.67	(0.34, 1.22)		0.64	(0.42, 0.97)	*
HOUSEHOLD-LEVEL CONTROL VARIABLES ²									
Household wealth									
Poorest	0.46	(0.19, 1.12)		0.97	(0.37, 2.58)		0.67	(0.37, 1.22)	
Poor	0.91	(0.49, 1.68)		1.23	(0.56, 2.71)		1.09	(0.68, 1.74)	
Middle	Ref			Ref			Ref		
Wealthy	0.54	(0.26, 1.20)		0.80	(0.31, 2.07)		0.61	(0.33, 1.28)	
Wealthiest	0.75	(0.42, 1.33)		0.88	(0.39, 1.99)		0.80	(0.50, 1.28)	
KEY INDIVIDUAL-LEVEL VARIABLES									
Orphan Status									
Non-orphan	Ref			Ref			Ref		
Paternal orphan	0.94	(0.52, 1.70)		1.76	(0.91, 3.42)		1.17	(0.78, 1.76)	
Maternal orphan	0.83	(0.30, 2.31)		1.14	(0.50, 2.78)		1.10	(0.55, 2.20)	
Double orphan	0.76	(0.38, 1.69)		0.50	(0.18, 1.40)		0.81	(0.46, 1.45)	
Gender									
Male	--			--			Ref		
Female	--			--			0.92	(0.66, 1.28)	
Depression ¹									
No	Ref			Ref			Ref		
Yes	1.89	(0.92, 3.89)		1.45	(0.68, 3.10)		1.98	(1.19, 3.29)	***
Recent migration									
No	Ref			Ref			Ref		
Yes	1.14	(0.49, 2.65)		0.82	(0.36, 1.91)		1.02	(0.54, 1.92)	

INDIVIDUAL-LEVEL CONTROL VARIABLES										
School enrollment										
	No	3.10	(1.91, 5.01)	***	13.92	(6.01, 32.27)	***	5.41	(3.49, 8.38)	***
	Yes	Ref			Ref			Ref		
Education level										
	Primary school or less	Ref			Ref			Ref		
	Secondary school of higher	1.74	(1.06, 2.85)	*	0.17	(0.08, 0.37)	***	0.71	(0.48, 1.06)	

*p < 0.05; ** p < 0.01, *** p < 0.001

¹ depression defined as a positive response to 8 or more out of 20 questions using SRQ-20 scale

² output for community was not provided

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CHAPTER 3

ONE SIZE DOES NOT FIT ALL: PSYCHOMETRIC PROPERTIES OF THE SHONA SYMPTOM QUESTIONNAIRE (SSQ) AMONG ADOLESCENTS AND YOUNG ADULTS IN ZIMBABWE

INTRODUCTION

Though largely overlooked, depression is the leading cause of disability worldwide with an estimated 350 million people affected (1,2). Depression is a central measure of one's psychosocial well-being and is associated with a litany of poor health outcomes across the life span such as suicide, somatic symptoms, and behavioral problems (3). In 2010 depression accounted for over eight percent of global years of life lived with a disability (YLDs) (3).

Most mental disorders have their onset during the adolescent period (4). Depression rates have been estimated at 4-8% among adolescents with substantial increases over time (5). Some estimates suggest that early-onset depression has a 60–70% risk of continuing into adulthood (6). Adolescents suffering from depression are at greater risk for self-harm, conduct disorders, delinquency, and high-risk behaviors such as substance use and early sexual debut (7-9).

This is particularly relevant in Zimbabwe, where the burden of disease due to depression is likely to be severe given the catastrophic economic and political situation in the country, coupled with the weakened healthcare infrastructure, chronic and widespread poverty, and reverberating effects of the HIV epidemic. Adolescents living in HIV-affected communities are often faced with multiple experiences of loss and hardship such as the death of parent, family dissolution or migration, and caring for the sick (10-13). In addition to the contextual and social effects of HIV, the threat of becoming infected can be a significant source of anxiety,

depression, and feelings of hopelessness among adolescents and young adults who are becoming infected with the disease at faster rates than any other age group (1,14). Long-term stress accumulation coupled with their unique developmental stage puts adolescents at elevated risk for affective disorders such as depression.

Depression in developing countries has received little international attention despite evidence that suggests the epidemiological patterns of mental illness are comparable worldwide (15-17). A majority of the world's population lives in resource-poor countries and yet mental health research has been concentrated elsewhere. The dearth of mental health specialists in resource-poor countries like Zimbabwe make obtaining treatment for depression a major obstacle for most people. This can be particularly challenging for adolescents who may be less confident in their ability to navigate the health system. While there is growing evidence that community lay health providers can begin to fill this treatment gap, more needs to be done to strengthen mental health services throughout much of sub-Saharan Africa (SSA) (18-21).

Having a simple, validated screening tool is the first step to strengthening community-level mental health services in SSA (19-22). Studies have shown that a good instrument does a far better job in identifying and correctly classifying cases of depression than general practitioners who often lack training in mental health (23). A good depression screening instrument utilized by lay health advisors can help identify depressed individuals, monitor symptom changes over time, and support overburdened, ineffective health systems by serving as the first point of contact. Continued efforts are needed in Zimbabwe to raise awareness about the symptoms of depression, those who at risk for early onset, and sources of care in the community. By understanding the appropriateness of depression screening tools among different age groups and settings, mental health advocates will have a stronger platform to encourage both the integration of mental services into primary healthcare as well as the training of providers in the symptomology, diagnosis, and treatment of affective disorders.

With the development of multiple depression screening tools in recent decades, it is

becoming increasingly important to select a measure that is reliable, valid, and appropriate for the targeted age group and their context. Scales that may be appropriate in settings of the developed world may be less suitable in resource-poor countries. Diagnostic labels of depression and other mental health disorders anchored in Western settings may not always be easily conveyed in other cultures (21). Studies of depression in non-western settings should carefully consider the impact of emic understandings of health and illness on the validity of the scales in order to ensure cross-cultural equivalence. Similarly, symptom measures based on individual questions within a depression screening scale developed for adults may be less useful among adolescents who have different behaviors and internalized symptoms due to their developmental stage.

The two depression screening tools of interest for this paper include the Self-Reported Questionnaire (SRQ-20) and the Shona Symptom Questionnaire (SSQ). The SRQ-20 has been translated into several languages and validated in many different cultural settings and age groups including but not limited to regions of SSA (24-37). The SSQ is a more recently developed tool intended for Shona-speaking countries including Zimbabwe, Botswana, and Mozambique. Much remains unknown about the validity of the SSQ, particularly among adolescent populations.

To date only one study has compared the SSQ to the SRQ-20. This was done among a sample of adults living in Wales with the goal of measuring if emic and etic depression screening instruments function differently among the same population (30). The authors found that both scales functioned well among their study sample with less than a 10% misclassification rate. However, the authors lowered the SSQ cut point for classification of depression in order to achieve optimization for the sample. Based on the lack of data validating the SSQ, this paper will be the first to explore how the SSQ functions among a sample of Zimbabwean adolescents and young adults using the SRQ-20 as the gold standard criterion. This analysis will provide evidence to help mental health researchers determine the strengths

and drawbacks of these two scales for use both in SSA countries as well as among adolescents and young adults. Closer examination of these depression screening instruments provides a platform for researchers to scrutinize the nuances of various scales as they pertain to their study setting and population.

The following sections provide a more complete overview of both scales and their use in various populations.

Self-Reported Questionnaire (SRQ-20)

The Self-Reported Questionnaire (SRQ) was developed in the 1970's by an expert panel within the World Health Organization (WHO) to detect depression in developing countries (38,39). It was partially derived from the Present State Examination (PSE) – a 140-question tool used by British clinicians for diagnosis of mental disorders (30). The original format of the SRQ included 25 yes-no questions asking whether individuals experienced specific mental distress symptoms over the previous week. Two questions were reverse coded (“Were you able to play a useful part in life?” and “Did you feel able to cope with most of the problems in your life?”).

The 25-item SRQ questionnaire is rarely used in its entirety and typically limited to a shorter subset of 20 questions shown to have high content validity with neurosis, depression, anxiety, and psychosomatic complaints (38,39). Although initially intended for primary health care settings, the SRQ-20 has also been used as a screening tool within community settings. Studies have used various cut points based on the discriminate ability of the SRQ-20 to capture cases and non-cases of depression within their sample based on a clinical criterion tool (28,31,36,39). The most common cut point used to determine depression, and one recommended by the WHO, is a positive response to eight or more of the twenty questions (38). It is recommended that this screening scale be used in tandem with more formalized clinical diagnosis by physicians.

Criterion validity of the SRQ-20 has been established in various studies across continents and assessed against gold-standard diagnostic tools including the Clinical Interview

Schedule - Revised (CIS-R), the Diagnostic Interviewer Schedule (DIS), and the Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV) (28,35,36). This suggests that the SRQ-20, while not specifically designed for one country, is culturally adaptable, easy to use and administer, and is consistently valid in measuring psychiatric symptoms across various populations (24-37). Based on our confidence in the SRQ-20 and its validation across several studies we will use it as the gold standard criterion for assessing the functionality of the SSQ among adolescents and young adults.

Shona Symptom Questionnaire (SSQ)

The Shona Symptom Questionnaire (SSQ) is a more recent depression screening tool intended for Zimbabwe and neighboring regions of SSA (40). Validated among a sample of adults by nurses and traditional medical practitioners, the SSQ was developed as a shorter, culturally-relevant tool for this region. The tool consists of 14 yes-no questions, nine of which overlap with the SRQ-20. The tool adopted indigenous idioms used by patients for the five culturally-specific measures not captured by the SRQ-20.

The SSQ was originally validated against two criteria – a clinical diagnosis based on the CIS *and* judgment by a clinical care provider. Based on the classification of cases, the SSQ was analyzed using a receiver-operating curve (ROC) for an optimal cut point of 8 or more positive responses out of fourteen questions. This cut point yielded a sensitivity of 67%, specificity of 83%, and misclassification rate of 22% among a sample of 302 patients aged 16-65 (mean age 30.9) (40).

To date only two studies have used the SSQ among adolescents exclusively (41,42). Langhaug et al. used the SSQ to assess the prevalence of affective disorders among 1495 adolescents 15-23 years old in rural Zimbabwe validated against the CIS-R with a score of 12 or more. The questionnaire was altered to include “always”, “sometimes” and “never” as response options rather than yes/no. The authors classified individuals as depressed for those who gave affirmative response of always or sometimes to eight out of 14 questions. This alteration to the

questionnaire inflated the summative individual scores and depression prevalence (52%) among the sample. The authors' use of categorical versus dichotomous response options limits our ability to make comparisons with our own study sample. In a separate study, Mayhu et al. reported a depression prevalence of 63% among a sample of 229 HIV positive youth 6-18 years old living in Harare, Zimbabwe based on the SSQ cut point of eight or more. No gold standard was used to validate these findings. This prevalence should be interpreted with caution given the unique challenges and psycho-social needs among this group, which are not generalizable to HIV negative adolescents.

Focus of this Study

As mental health research in SSA grows, it is imperative that researchers and mental health professionals select high-functioning, validated scales based on the specific population of interest. While there is value in having culturally-relevant scales such as the SSQ that measure mental distress in SSA settings, it is prudent for researchers and programmers to think critically about how well these novel tools function for various ages. While more concise questionnaires such as the SSQ may reduce response fatigue among participants, they may fail to capture the necessary measures important in distinguishing those who are depressed from those who are not. Using data from Zimbabwe, this paper contributes to the literature by 1.) assessing the functionality of the SSQ in comparison with the SRQ-20 among adolescents and young adults in Zimbabwe, and 2.) highlighting individual characteristics associated with depression misclassification based on the SSQ scale with the SRQ-20 serving as the gold standard.

METHODS

Setting population and data collection

The data source for this study was the Manicaland HIV Prevention Project, which began in 1998 as a population-based survey of adults (15-54 years) investigating the dynamics of HIV transmission across socio-economic groups (43). This study used cross sectional data collected from October 2009 to July 2011 consisting of a survey of 15-64 year olds (n=14,464). The

sample for the present study was limited to adolescents ages 15-19 and young adults ages 20-24 with complete survey data. There was a 90.6% response rate for all items in both depression questionnaires among adolescents and young adults, resulting in a final sample of 4,795 participants.

The survey was translated into the local language (Shona) prior to administering interviews and included questions regarding psychosocial health, socio-demographic characteristics, orphan status, sexual behaviors, and migration. Both depression scales were designed to be self-administered, however due to the broader survey goals of the Manicaland HIV Prevention Project, interviewers administered both tools verbally as part of the entire individual survey.

Scales were not asked separately but rather overlapping items were only asked once to minimize redundancy and interview time. In the case of the nine overlapping questions, questionnaire administrators utilized SRQ-20 phrasing. The phrasing differences were minor, albeit noteworthy. For example, the SRQ-20 asked, "Do you cry more than usual?", while the SSQ asked, "Were there moments when you felt life was so tough that you cried or wanted to cry?". The final composite questionnaire contained 25 unique questions that maintained the chronological order of the SRQ-20 intermixed with items from the SSQ that were inserted non-chronologically throughout the assessment.

Statistical Analysis

Objective 1: We assessed the correlation between the two scales, stratified by age groups (15-19 years old; 20-24 years old) in order to determine how strongly the scales as a whole related to one another. Next, we calibrated the SSQ against the SRQ-20 and examined the performance indices of the SSQ based on various cut points for classification using the SRQ-20 with a cut point of eight or more as the gold standard criterion measure. Performance indices of interest included sensitivity, specificity, positive predictive value, negative predictive value, percent of cases overall screened correctly, kappa statistic, SSQ prevalence based on a

particular cut point value, and area under the curve (AUC) obtained through a receiver operator characteristics (ROC) curve. Performance indices were assessed for both adolescents and young adult and were stratified by gender between both groups.

Objective 2: Using a multivariate logistic regression analyses we isolated particular characteristics to test their association with the odds of being misclassified as non-depressed by the SSQ using the recommended cut point of eight or greater and a modified cut point of five or greater despite being classified as depressed based on the SRQ-20 gold standard criterion.

Although previous studies worldwide vary greatly in their methodology, sufficient convergence has emerged to implicate several sociodemographic variables captured in this data set as potential risk factors for misclassification of depression (17,28,31,36,41,42,44-48). Studies have shown that gender, education and wealth levels, orphan status and age can have varying effect on depression misclassification (28,49-52). Social roles and cultural norms have been shown to affect the reporting of depression symptoms among different groups (men vs. women, orphans vs. non-orphans, married vs. non-married) (51,53,54). Furthermore, scales may be more or less meaningful for different groups depending on their position in society and past experiences. For example an individual who has lived through multiple hardship may perceive depression as a normal experience and consequently underreports the severity of their symptomology. Premarital sex, taboo in Zimbabwean culture, may result in underreporting of depression symptoms in an attempt to mask feelings of guilt for acting outside of one's cultural expectations. Lastly, recent migration is likely associated with short-term grief due to changing circumstances, and could be misclassified as depression - a longer-term derivative of grief.

Denial of depression symptoms may be another manifestation among any of these characterized groups (i.e., the poor, married adolescents, orphans, adolescents who moved as a result of external events). Denial is a common response among individuals who feel they lack control over their circumstances. While denial is often a stage of both depression and grief, it is hard to capture as a symptomology and may therefore exacerbate misclassification rates (55).

Based on supporting literature and these linkages the key independent variables of interest were *orphan status* (non-orphan, maternal orphan, paternal orphan, and double orphan), *gender* (male/female), *age* (15-24), *marital status* (yes/no), *ever had sex* (yes/no), *recent migration* (yes/no), *school enrollment* (yes/no), *level of education* (primary school or less/secondary school or beyond), and *wealth* (poorest, poor, middle, wealthy, wealthiest). Table 3.1 provides the derivation of all key variables.

Ethical Approval

IRB approval for this secondary data analysis was obtained from the University of North Carolina at Chapel Hill.

RESULTS

Sample Characteristics

Table 3.2 present the summary statistics for the SRQ-20 and the SSQ depression scales, stratified by age groups (15-19 year olds and 20-24 year olds). The SRQ-20 had a mean of 2.59 and a median of 2 positive responses out of 20 questions for the full sample (*mean*: adolescents 2.48; young adults 2.74; *median*: adolescents 1; young adults 2). The SSQ had a mean of 1.90 and a median of 1 positive response out of 20 questions for the full sample (*mean*: adolescents 1.76; young adults 2.07; *median*: adolescents 1; young adults 1). The Cronbach's alpha coefficient was 0.79 or higher for both the SRQ-20 and SSQ indicating good internal consistency.

Table 3.3 presents the summary statistics of the sample characteristics, stratified by age groups. Slightly over half of the sample was orphaned (15-19 year olds: 28% paternal 5% maternal and 18% double; 20-24: 28% paternal 6% maternal and 20% double). There were slightly more females (54.9%) than males (45.1%) in the sample. The mean age was 18.8 with the largest one-year age group comprised of 18 year-olds (14%) and the smallest one-year age group comprised of 24 year-olds (8%). Only 12% of the younger cohort were married, compared to over half of the older age group (55%). A similar pattern was seen when examining those

who reported ever having sex (15-19 year olds: 18%; 20-24 year olds: 77%). Fifteen percent of the sample reported recent migration, with minor differences between age groups (15-19 year old: 13%; 20-24 year old: 18%). Nearly two-thirds of the younger age group were enrolled in school (60%), with less than 5% of the older group enrolled at the time of the survey. Just under half of the sample (43%) completed secondary school or higher with a larger portion of young adults having completed compared to adolescents (61% vs. 30%). The largest portion of the sample was in the wealthiest quintile (29%) while between 15-20% of the sample fell into the remaining quintiles.

Factors Associated with Risk of Depression

Table 3.4 provides bivariate associations for each predictor variable on the two depression outcomes (SRQ-20 and SSQ), stratified by age group. Eight percent (n=224) of adolescents reported enough symptoms to be classified as depressed using the SRQ-20, while only 3.8% (n=106) reported depression using the SSQ. Slightly over 9% (n=188) of young adults were classified as depression using the SRQ-20, while only 5.1% (n=103) reported depression using the SSQ. For both depression scales, those who were male, married, ever had sex, and recently migrated had a statistically higher percent of depression than their counterparts. Orphan types were statistically different for both age groups using the SRQ-20 but not for the SSQ. There were statistically different associations with depression based on school enrollment for 20-24 year olds across both scales, and for 15-19 year olds using only the SRQ-20 measure of depression. Young adults with a primary education only had statistically higher levels of depression based on the SRQ-20 only. There were statistically significant differences in depression based on wealth quintiles for adolescents only using the SSQ but not the SRQ-20.

Depression Prevalence

Among the entire sample of adolescents and young adults the two scales showed a Spearman correlation of 0.66. Correlation was lower among the younger age group (0.62) and slightly higher among the older age group (0.71). Using the conventional cut point of eight or

above for both scales, Table 3.5 compares prevalence rates across scales. Among the full sample, the SRQ-20 reported a prevalence of 8.6% (n=412) while the SSQ reported a prevalence of 4.4% (n=209). T-test reveals non-significant differences in percentages between age groups for the SRQ-20 [mean (SD): 15-19 year olds 8.1% (27.3); 20-24 year olds 9.3% (29.0); P= 0.15] however, significant differences between groups were observed using the SSQ [mean (SD): 15-19 year olds 3.8% (19.2); 20-24 yr. olds 5.1% (22.0); P= 0.04].

SSQ performance using SRQ as gold standard

Table 3.6 shows the performance indices of the SSQ at various cut points for both age groups using the SRQ-20 with a cut point of eight or higher positive responses as the gold standard criterion. The kappa statistic was highest with a cut point of six (15-19 year olds: 0.71; 20-24 year olds: 0.76). There was an inverse relationship between both AUC scores and cut points, whereby the AUC was highest at the five cut point (15-19 year olds: 0.83; 20-24 year olds: 0.88) with only slight decreases at the six cut point among 20-24 year olds (AUC 0.83). Sensitivity was 0.89 and above for both age groups at cut points of five or lower, while specificity remained above 0.90 for all cut points of five and higher. The positive predictive value (PPV) was the most variable performance index, falling at or below 0.55 with a cut point of five or lower. The negative predictive value (NPV) performed well (>0.95) at all cut points for both age groups. The percent of cases screened correctly ranged from 85.5-95.2%. SSQ prevalence rates ranged from 3.5% to 18.4% among 15-19 year olds and 5.1% to 23.6% among 20-24 year olds. Performance indices for the SSQ were maximized with a cut point between four and six with slightly higher performance indices seen among 20-24 year olds compared to their younger counterparts. In addition to age stratification, performance indices were assessed by gender based on data that suggests that females are more severely affected and studies that have recommended different cut point for the men and women (49,53). The performance indices among gender-stratified subsamples did not reveal any significant differences and as such does not warrant alternative recommendations for the two genders.

Symptom Profile

Table 3.7 provides the symptom profile with the three most prevalent items for each scale in bold for the entire sample, stratified by age (15-19 year olds and 20-24 year olds) and depression status (yes/no) based on the standard cut point of eight or higher for both scales.

Factors Affecting Misclassification

False negatives were identified as depressed using the SRQ-20 and not depressed using the SSQ. Table 3.8 provides a multivariate logistic regression for key characteristics associated with being classified as a false negative. Model 1 uses the conventional cut point of eight or greater for the classification as depressed by the SSQ. (We were unable to analyze associations with false positives because of the rareness of the event.) Of the 4,795 subjects, 4.7% (n=223) were misclassified. Of those who were misclassified, a majority (95.6%) were false negatives (n=213), while only 4.6% of the misclassified sample were false positives (n=10). In the present study, the statistically significant associations between socio-demographic variables and false negative misclassification for adolescents included orphan status (OR 1.48, $p<0.05$; paternal: OR 1.48, $p<0.05$), being married (OR 0.47, $p<0.05$) and ever having sex (OR 2.13, $p<0.05$). Secondary education or higher was associated with misclassification among young adults (OR 1.35, $p<0.01$).

Based on performance indices and our recommendation of a revised cut point of five or greater for the SSQ, we conducted an additional multivariate logistic regression for key characteristics associated with being classified as a false negative using this modified cut point for the classification as depressed by the SSQ. Results are provided in Model 2.

Misclassification of the full sample declined to less than 1%. None of the socio-demographic variables presented statistically significant associations with being systematically misclassified. This indicates an improvement in the SSQ's functionality and correct identification of the depression.

DISCUSSION

Adolescence is a period of rapid change and development. It is a period full of new experiences, including sexual initiation, school completion, and growing obligations. Ensuring that adolescents integrate well into society is essential for them to be able to meet the variety of demands that they will face. Being able to correctly identify those who are suffering from depression will allow services to reach those in need and enable a safe transition into adulthood.

This paper adds to the existing literature by comparing the performance of two depression screening instruments and provides suggestions on modifications to the SSQ cut point in order to improve its ability to capture depression among adolescents in Zimbabwe. This paper highlights adolescents who are most at-risk of being overlooked for depression by the SSQ as it currently stands. This information can be used among providers of social services, teachers, clinicians, and parents to understand the characteristics of adolescents who may fall through the cracks. Overall, this paper aims to convince researchers and mental health service providers to think critically about their use of depression screening instruments and how they function within their study's relative context.

SSQ Performance as a Depression Screening Tool Among Youth

In evaluating scales, the most appropriate cut point score is a compromise between high sensitivity and acceptable specificity. A high rate of misclassified false negatives was a shortcoming among the tool's conventional cut point and sample (sensitivity: 0.67), which was exacerbated among our sample of adolescents and young adults (sensitivity: 0.44-0.54). Given the tool's low ability to capture potential cases, we choose to err on the side of caution by giving preference to high sensitivity over high specificity. This may result in a higher chance of false positive classification, but will ensure more potential cases are being identified within the population. Given the two-step process of screening and diagnosis, clinicians are likely to detect false positives.

We were careful to avoid the kappa paradox when recommending a modified cut point given the rareness of the event. Research has shown that rare events can produce low kappa values even when there are higher levels of agreement among other performance indices (56). For this reason, we recommend a modified cut point of five, where sensitivity, specificity and AUC were collectively highest despite a slightly lower but substantial kappa value. This alternate cut point substantially increases the functionality of the SSQ in capturing depression cases among youth. Alternatively, the performance indices make a strong case for identifying those with a cut point of five to seven as potentially depressed while those with a score of eight or more as severely depression. Given the overloaded health system, this distinction may help triage those with the greatest needs to support first, while requiring further assessment among those with a score of between five and seven out of 14.

Since the SSQ was originally piloted only among adults, it may be that adolescents have different symptom profiles than adults requiring a modified cut point. We however are not extending this recommendation to included 20-24 year olds since young adults are more akin to adults in their behaviors, daily activities, and social roles. In addition to the recommended cut point changes, we suggest that adolescents are screened across multiple time points in order to more accurately assess their depression scores. The adolescent period is known as a time of turbulent and changing emotions. By obtaining scores across multiple times, researchers and health care providers will be able to feel confident that they are correctly classifying an adolescent 's disposition rather than a fleeting emotion.

Patterns of Misclassification

Systematic patterns of misclassification using the recommended cut point of eight or greater exist among 15-19 year olds with particular characteristics. This pattern of misclassification among adolescents disappeared using a modified cut point of five or higher. For young adults, classification was consistent between the current SSQ scale and the SRQ-20 with the exception of education levels.

Compared against the SRQ-20, the current SSQ scale falls short in capturing 15-19 year old orphans who may be depressed, despite evidence that orphans experience elevated rates of depression, anxiety, and negative views about the future compared to non-orphans (45,57-63). This is of particular concern in Zimbabwe, a country that has one of the largest numbers of AIDS orphans per capita in the world (64). Studies reveal that adolescents with major life changes, particularly parental death, feel they lack control over their lives and have feelings of helplessness and hopelessness (62,65-67). As such it is important that tools intended to capture affective disorders among this subgroup are functioning well. By adequately screening and attending to adolescent orphans' emotional needs, they will be better able to cope with the continued challenges they will confront in adulthood including but not limited to risks associated with HIV infection.

Equally important is the association between misclassification and early sexual debut, especially in communities with high HIV prevalence rates. Studies have shown a strong association between early sexual debut and depression (8,45,47,68), yet the SSQ in its current form underperforms in its ability to correctly screen depression among sexually active adolescents. Adolescent depression has also been shown to be a strong predictor for additional sexual risk-taking behaviors such as intergenerational partnerships, transactional sex, and poor condom use – all of which increase one's susceptibility for contracting HIV (7,8,45,47). Consequently it is essential that interventionists screen adolescents who become sexually active at early ages. This will ensure that they are able to access necessary psychosocial support - one step toward addressing risk predictors of HIV infection.

Our findings suggest higher levels of education among 20-24 year olds are associated with a higher likelihood of being false negatives. Other studies in Africa among same aged post-secondary students produced similar findings, suggesting that test-taking and performance-based stress can increase young adults' odds for depression (44,69). Students in the later stages of their education are likely to be undertaking competitive examinations that determine

admission to highly competitive tertiary institutions. In order to avoid missing students who may be suffering from depression, teachers must be educated on common depressive signs and symptoms. By recognizing relevant mood and behavior changes over time, teachers can serve as effective conduits for depression screening and support efforts.

Limitations

There are several noteworthy limitations to this study. A national estimate of depression for Zimbabwean adolescents remains unknown, which limits our ability to compare our sample to the broader population. Studies among adolescents in similar regions suggest that our depression estimates based on the SRQ-20 are appropriate for this age group (35). While there is a movement towards the development and use of culturally sensitive tools, this study finds that the standardized SRQ-20 does a better job in capturing depression than the unrevised SSQ. However, scales were not administered separately or in their entirety but rather overlapping items were only asked once, utilizing exclusively SRQ-20 phrasing rather than the culturally-emic language in the SSQ. These deviations from the intended format of the scales have the potential to compromise the integrity of each individual scale and bias depression rates to favor the SRQ-20. However the five questions unique to the SSQ did remain as stated using the original Shona-specific idioms.

Also noteworthy are the differences in wording between the two scales. Several of the SSQ questions had greater ambiguity than the SRQ-20 and were doubled barreled. Despite having been previous piloted during the scale's development, the SSQ lacks clarity which may result in misunderstanding among younger participants. Furthermore, interviewers administered both tools verbally despite their design for self-administration. This has the potential to create social desirability bias, especially among younger as well as more educated participants (70). Lastly, the multivariate regression used to assess the odds of misclassification failed to include several important variables such as interviewer identification and other scale development measure that bias estimates and overlook additional causes for misclassification.

CONCLUSION

With a conservative estimate of 9% depression among this sample, there is a clear need for psychosocial interventions to prevent, screen, diagnose, and treat mental health problems among adolescents and young adults in Zimbabwe. Having an instrument that can correctly screen for depression is the first step to ensuring that young people move healthily into adulthood.

While the SSQ may appropriately meet the need for an emic depression diagnostic tool in Zimbabwe, our findings suggest a strong recommendation towards either 1.) revising the SSQ cut point to five or greater to ensure it is both appropriate for and effective in capturing potential adolescent depression cases with recognition that those with a score of eight or greater are severely depressed or 2.) to continue utilizing the standardized SRQ-20.

Traumatic events can contribute to the emotional difficulties and increase depression symptomology. Individuals with characteristics including orphan status, being married, and early sexual debut must be carefully observed to ensure they are not falling through the cracks in an environment with underdeveloped mental health services. By better understanding the depressive symptoms affecting this population, mental health services and community-centered social programs can be tailored to address the immediate psychosocial concerns of this growing population and aid in the development of mental health interventions. In conclusion, researchers who are currently using the SSQ in regions of SSA should carefully consider the age of their study population and make adjustments according to our findings for better identification of depressed adolescents.

Table 3.1. Variable Derivation

Variables	Survey Questions	Coding
Orphan status	type of orphan determined by the following two questions: <ul style="list-style-type: none"> • Is your natural biological father still alive? • Is your natural biological mother still alive? “Don’t know” responses were counted as dead	non-orphan; paternal orphan; maternal orphan; double orphan
Gender	Sex	male, female
Age	Age at most recent birthday	15;16;17;18;19;20;21;22;23;24
Marital status	Reporting being married, in a long-term, or cohabitating relationship at the time of survey	no; yes
Ever had sex	Has begun sexual activity at time of survey	no; yes
Recent migration	moved to a homestead since the prior survey (< two years ago)	no, yes
School enrollment	enrolled in school full-time	no, yes
Education level	highest level of schooling completed	<=primary, >=secondary
Wealth quintile	households were divided into wealth quintiles based on summed score of household asset ownership based on the following: source of drinking water (piped into residence, private tap in yard or plot, communal tap, private well or borehole, other well or borehole, protected spring, other); access to electricity (yes or no); type of toilet facility (flush, blair, pit latrine, other, none); type of house (pole and dagga structure, brick house with thatched roof, brick house with tiled/sheeting roof, cabin/other); type of floor in the main dwelling (natural floor (earth/sand/dung); rudimentary (planks/palm/bamboo), finished (wood/cement/carpet)); ownership of a radio, a television, a motorbike or a car.	poorest, poor, middle, wealthy, wealthiest

Table 3.2. Summary statistics for the SRQ-20 and SSQ depression-scales among adolescents (15-19 year olds) and young adults (20-24 year olds)

	Mean	Median	SD	α	Range
Adolescents					
SSQ scale	1.76	1	2.36	0.79	0-13
SRQ-20 scale	2.48	1	3.05	0.82	0-18
Young adults					
SSQ scale	2.07	1	2.58	0.81	0-14
SRQ-20 scale	2.74	2	3.21	0.83	0-19
Total Sample					
SSQ scale	1.90	1	2.46	0.80	0-14
SRQ-20 scale	2.59	2	3.12	0.82	0-19

Table 3.3. Summary statistics of key variables among adolescents (15-19 year olds) and young adults (20-24 year olds)

Variable	Adolescents ages 15-19 years (n=2,768)		Young adults ages 20-24 years (n=2,027)		Total Sample ages 15-24 years (n=4,795)	
	N	%	N	%	N	%
Orphan status						
non-orphan	1346	48.7	895	44.3	2241	46.8
paternal	778	28.2	543	26.9	1321	27.6
maternal	139	5.0	150	7.4	289	6.0
double	500	18.1	433	21.4	933	19.5
Female	1426	51.5	1204	59.4	2630	54.9
Age						
15	591	21.4			591	12.3
16	575	20.8			575	12.0
17	461	16.7			461	9.6
18	675	24.4			675	14.1
19	466	16.8			466	9.7
20			426	21.0	426	8.9
21			401	19.78	401	8.4
22			410	20.2	410	8.6
23			412	20.3	412	8.6
24			378	18.7	378	7.9
Married	338	12.2	1114	55.1	1452	30.3
Ever had sex	490	17.7	1566	77.3	2056	42.9
Recent migration	358	13.0	368	18.3	726	15.2
School enrollment	1653	59.7	96	4.7	1749	36.5
Secondary school completion	2764	30.3	1241	61.4	4786	43.4
Wealth quintile						
poorest	480	17.4	399	19.8	879	18.7
poor	569	20.6	365	18.1	934	19.8
middle	587	21.3	333	16.5	920	19.5
wealthy	380	13.8	306	15.2	686	14.6
wealthiest	741	26.9	610	30.3	1352	28.7

Table 3.4. Comparison of proportions of adolescents (15-19) and young adults (20-24) with depression by socio-demographic characteristic based on the SRQ-20 and SSQ scales¹: Bivariate analysis

Variables	Adolescents ages 15-19				Young adults ages 20-24			
	SRQ-20	p	SSQ	p	SRQ-20	p	SSQ	p
	n=2,763 (8.1%)		n=2,768 (3.8%)		n= 2,027 (9.3%)		n=2,027 (5.1%)	
	%		%			%		
Orphan status		*				*		
non-orphan	6.76		3.27		8.04		3.75	
paternal	10.03		4.76		8.10		4.62	
maternal	10.07		5.04		12.67		5.19	
double	8.20		3.60		12.01		5.14	
Gender		**		***		***		***
female	9.68		2.83		12.21		5.78	
male	6.41		4.77		4.98		2.63	
Age								
15	7.78		4.06				--	
16	8.17		4.87				--	
17	6.72		1.95				--	
18	8.74		4.89				--	
19	8.80		2.58				--	
20					7.51		3.99	
21					10.97		5.49	
22					11.22		5.85	
23					7.52		4.13	
24					9.26		6.08	
Married		***		***		***		***
no	7.13		3.22		7.11		3.39	
yes	14.79		7.99		11.98		6.54	
Ever had sex		***		***		***		***
no	6.72		3.12		6.50		3.14	
yes	14.49		7.14		11.38		5.98	
Recent migration		***		**		**		*
no	7.29		3.42		8.07		4.08	
yes	13.41		6.70		11.57		5.92	
School enrollment		***						*
no	10.22		4.48		9.69		4.86	
yes	6.65		3.39		6.63		3.43	
Education level						*		
primary or less	8.35		4.10		11.78		5.89	
secondary or more	7.54		3.23		7.57		4.59	
Wealth quintile				**				
poorest	10.83		6.04		11.03		5.51	
poor	9.31		4.75		8.49		4.11	
middle	6.98		2.56		7.81		4.80	
wealthy	6.58		2.11		9.15		5.23	
wealthiest	7.14		3.64		9.67		5.57	

* p < 0.05; ** p < 0.01; ***p < 0.001

¹ using the common cut point of 8 or more positive answers for each scale, independently

Table 3.5. Comparison of depression classification using the SRQ-20 and SSQ scales¹

Shona SSQ	WHO SRQ-20		Total n (%)
	Depressed n (%)	Not Depressed n (%)	
Adolescents ages 15-19			
Depressed	98 (3.5)	8 (0.3)	106 (3.8)
Not Depressed	126 (4.6)	2536 (91.7)	2662 (96.2)
Total	224 (8.1)	2544 (91.9)	2768
Young Adults ages 20-24			
Depressed	101 (5.0)	2 (0.1)	103 (5.1)
Not Depressed	87 (4.3)	1837 (90.6)	1924 (94.9)
Total	188 (9.3)	1924 (90.7)	2027
Total sample ages 15-24			
Depressed	199 (4.2)	10 (0.2)	209 (4.4)
Not Depressed	213 (4.4)	4373 (91.2)	4586 (95.6)
Total	412 (8.6)	4383 (91.4)	4795

¹ For both scales, depression is classified based on the standard cut point of eight or more positive responses.

Table 3.6. Performance indices for the SSQ against the SRQ-20, stratified by age groups

“Yes” responses for SSQ	Sensitivity	Specificity	PPV	NPV	k	% Cases (TP + FP)	AUC
Adolescents ages 15-19 (n=2768)							
8	.44	.99	.92	.95	.57	3.5	.44
7	.58	.99	.82	.96	.66	5.7	.57
6	.77	.97	.70	.98	.71	8.9	.75
5	.89	.94	.45	.99	.64	13.2	.83
4	.96	.89	.42	1.00	.53	18.4	.84
Young Adults ages 20-24 (n=2027)							
8	.54	.99	.98	.95	.67	5.1	.53
7	.69	.99	.87	.97	.75	7.4	.68
6	.86	.97	.73	.99	.76	11.0	.84
5	.95	.92	.55	1.00	.66	16.2	.88
4	.99	.84	.39	1.00	.49	23.6	.83

Table 3.7. Symptom profile based on depression status, stratified by age groups and depression scale

	Adolescents ages 15-19			Young adults ages 20-24			Total Sample ages 15-24		
	Total (n=2768)	Dep. based on SRQ-20 (n=224)	Dep. based on SSQ (n=106)	Total (n=2027)	Dep. based on SRQ-20 (n=188)	Dep. based on SSQ (n=103)	Total (n=4795)	Dep. based on SRQ-20 (n=412)	Dep. based on SSQ (n=209)
	%	%	%	%	%	%	%	%	%
WHO SRQ 20 Items									
Were you having headaches?	26	81.3	--	27.7	72.9	--	26.7	77.4	--
Was your appetite poor?	15.8	70.1	--	17.3	58.0	--	16.4	64.6	--
Did your hands shake?	6	34.4	--	5.0	26.1	--	5.6	30.6	--
Did you feel tense nervous or worried?	9	57.1	--	9.8	54.8	--	9.3	56.1	--
Did you have trouble thinking clearly?	12.2	70.1	--	13.4	66.0	--	12.7	68.2	--
Did you have trouble enjoying your daily activities?	12.2	65.2	--	13.9	67.6	--	12.9	66.3	--
Were you able to play a useful part in life?	29.4	48.7	--	31.4	47.9	--	30.3	48.3	--
Did you lose interest in things?	11	50.9	--	12.6	62.2	--	11.7	56.1	--
Did you feel a worthless person?	8	47.8	--	11.4	62.0	--	9.5	54.3	--
Did you have uncomfortable feelings	13.7	54.0	--	15.2	63.8	--	14.3	58.5	--

in your stomach?									
Did you feel able to cope with most of the problems in your life?	22.6	41.7	--	22.3	38.8	--	22.4	40.4	--
Overlapping Items									
Were you having problems sleeping?	9.4	49.6	71.7	11.6	47.3	55.3	10.3	48.5	63.6
Were you easily frightened?	8.2	45.1	60.4	7.1	35.6	47.6	7.7	40.8	54.1
Were you having digestion (tummy) problems?	13.0	59.4	67.9	14.5	58.5	69.9	13.6	59.0	68.9
Did you feel more unhappy than usual?	12.9	64.7	79.3	13.7	64.4	77.7	13.2	64.6	78.5
Did you cry more than usual?	6.9	42.0	56.6	6.6	37.8	52.4	6.8	40.1	54.6
Did you find it difficult to make decisions?	8.1	46.0	62.3	10.3	59.6	76.7	9.1	52.2	69.4
Was your daily work suffering?	11.9	52.2	64.2	15.7	66.0	73.8	13.5	58.5	68.9
Has the thought of ending your life been on your mind?	2.4	16.5	25.5	3.3	23.4	30.1	2.8	19.7	27.8
Were you feeling tired all the time?	9.7	54.0	65.1	11.5	58.5	68.9	10.4	56.1	70.0
SSQ Items									
Did you have nightmares or bad dreams?	21.1	--	74.5	21.9	--	81.6	21.4	--	78.0

Did you sometimes think deeply or think about many things?	22.5	--	87.7	33.1	--	93.2	27	--	90.4
Did you sometimes see or hear things which others could not see or hear?	3.9	--	39.6	3.5	--	32.0	3.8	--	35.9
Did you find yourself sometimes failing to concentrate?	18.7	--	95.9	21.9	--	91.3	20.1	--	88.5
Did you lose your temper or get annoyed over trivial matters?	27.8	--	79.3	32.9	--	92.2	29.9	--	85.7

Table 3.8. Parameter estimates (odds ratio) of being classified as a false negative by the SSQ, stratified by age group

Variables	MODEL 1						MODEL 2		
	Adolescents ages 15-19 n=2715			Young adults ages 20-24 n=1957			Adolescents ages 15-19 n=2715		
	OR	(95% CI)	p	OR	(95% CI)	p	OR	(95% CI)	p
Orphan status									
non-orphan	Ref			Ref			Ref		
orphan	1.48	(1.01, 2.18)	*	1.35	(0.83, 2.19)		0.77	(0.35, 1.67)	
paternal	1.48	(1.08, 2.46)	*	1.17	(0.64, 2.11)		0.83	(0.33, 2.12)	
maternal	1.56	(0.72, 3.37)		1.89	(0.89, 4.04)		1.21	(0.27, 5.47)	
double	1.46	(0.87, 2.45)		1.39	(0.77, 2.53)		0.54	(0.15, 1.83)	
Gender									
male	Ref			Ref			Ref		
female	1.11	(0.74, 1.66)		1.44	(0.83, 2.48)		0.82	(0.34, 1.93)	
Age									
15	Ref						Ref		
16	0.87	(0.47, 1.61)					1.43	(0.40, 5.11)	
17	1.05	(0.57, 1.94)					0.85	(0.19, 3.84)	
18	0.93	(0.49, 1.78)					1.04	(0.27, 4.10)	
19	1.11	(0.55, 2.26)					1.42	(0.30, 6.68)	
20				Ref					
21				1.49	(0.74, 3.03)				
22				1.41	(0.71, 2.80)				
23				0.79	(0.36, 1.71)				
24				0.70	(0.31, 1.59)				
Married									
no	Ref			Ref			Ref		
yes	0.47	(0.22, 1.00)	*	1.02	(0.56, 1.83)		1.07	(0.20, 5.62)	
Ever had sex									
no	Ref			Ref			Ref		
yes	2.13	(1.09, 4.13)	*	1.47	(0.66, 3.28)		1.32	(0.28, 6.17)	
Recent migration									
no	Ref			Ref			Ref		
yes	1.29	(0.73, 2.27)		1.04	(0.58, 1.86)		1.48	(0.40, 5.50)	
School Enrollment									
no	1.27	(0.76, 2.13)		1.35	(0.30, 6.07)		1.94	(0.56, 6.68)	
yes	Ref			Ref			Ref		
Education level									
primary or less	Ref			Ref			Ref		
secondary or more	1.12	(0.70, 1.80)		2.11	(1.29, 3.47)	**	1.97	(0.72, 5.50)	
Wealth quintile									
poorest	1.06	(0.57, 1.94)		1.24	(0.58, 2.65)		0.53	(0.12, 2.36)	
poor	1.13	(0.66, 1.95)		1.29	(0.58, 2.85)		0.67	(0.18, 2.53)	
middle	Ref			Ref			Ref		
wealthy	1.08	(0.56, 2.08)		1.14	(0.50, 2.61)		1.51	(0.48, 4.73)	
wealthiest	0.82	(0.48, 1.42)		1.27	(0.62, 2.61)		0.82	(0.28, 2.43)	

* p < 0.05; ** p < 0.01

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CHAPTER 4

CONCLUSION

Over one-fifth of the Zimbabwean population is between the age of 15-24 and nearly one-half of the national population of children (<15 years of age) will be approaching adolescence in years to come (1) . As such this dissertation aims to address two of the upstream causes for the top two worldwide killers among this age group (HIV and self-inflicted harm). By understanding individual and household patterns associated with both early sexual debut and depression, we will contribute to ensuring adolescent health and success for years to come.

This dissertation uniquely examines the association of several innovative measures of instability on early sexual debut, both from the household-level perspective and from the individual perspective. Further, it disentangles how these measures differ by gender. This is valuable given the gender disparity in both sexual risk and HIV infection documented throughout the region (2-4) . Finally, this is the first study to compare the SSQ scale with another validated measure of depression (SRQ-20) among adolescents in sub-Saharan Africa (SSA). This dissertation both assesses the performance indices for the SSQ scale at various cut point and highlights characteristics of instability that contribute to misidentifying adolescents who may be at risk depression.

PROGRAMMATIC IMPLICATIONS

This research has several important programmatic implications. First, paper one findings suggest household changes have varying effects on sexual debut for adolescents. We found that high levels of household membership changes were associated with early sexual debut

among adolescents, irrespective of gender. Interestingly however, living in a household with a recent death was a protective factor against early sexual debut. Based on these findings, it is important that caregivers and other household adults are attentive to how household turbulence may affect youth during this period already ridden with personal challenges and transitions.

These findings imply that measures of instability have varying effects on early sexual debut, therefore requiring a more nuanced examination of the lives of adolescents situated in the unique context of Zimbabwe. As HIV prevention activities and sexual health programs continue to refine their approach, household members, including but not limited to caregivers, must be central players in HIV prevention efforts. With this goal in mind, programs need to work in close concert with families to determine how best to maintain a nurturing environment where adolescents can feel safe and secure despite contextual uncertainties.

Paper two findings suggest that the SSQ as it stands does not function well in capturing cases of depression among adolescents. Based on its poor performance indices when compared to the SRQ-20, the SSQ cut point for defining potential depression cases should be lowered from eight to five or more positive responses and recognize those with a score of eight or greater as severely depressed. This will increase the tool's sensitivity in turn decreasing the number of cases that are currently being missed with this tool. However, if researchers feel concerned about the integrity of using a new cut point for this population, then they should use a higher function tool such as the SRQ-20. The trade-off being that the SSQ tool was developed for global use while the SSQ was designed specifically for Shona-speaking populations.

Lastly, study two reveals that adolescents who have lost a father and who have engaged in sexual intercourse, and young adults who have a secondary education or higher are at risk for being misclassified as not depressed by the SSQ with the original cut point. This evidence can inform youth-centered social programs and aid in more vigilant screening efforts to ensure that at-risk individuals do not fall through the cracks for mental health support. However screening efforts should not be limited to social programs but should also extend to

areas where adolescents spend most of their time – at home and at school. With this in mind, teachers and caregivers are the first point of contact and need to be engaged in the developmental process of adolescents to ensure happy and healthy maturation.

With limited international attention being given to mental health in the developing world, this study has wide reaching implications for future programs and policies. This paper provides detailed evidence that adolescent depression is globally widespread, yet services are not. Valid and accurate tools are critical in order to convince health officials that there is a need for a national agenda on mental health in Zimbabwe. By improving the scales that are used to measure depression among this population, researchers and advocates can begin to compile data to support their goals. Continued efforts are needed in Zimbabwe to raise awareness about the symptoms of depression, those who are at risk for early onset, and sources of care in the community. By understanding the appropriateness of depression screening tools among different age groups and settings, mental health advocates will have a stronger platform to encourage both the integration of mental services into primary healthcare as well as the training of providers in the symptomology, diagnosis, and treatment of affective disorders.

METHODOLOGICAL IMPLICATIONS

Several methodological implications warrant further discussion. Study one demonstrates the importance of looking beyond individual-level factors to determine the timing of sexual debut. The broader context plays an important role in an adolescent's decision-making process. Including household-level indicators that measure instability help us understand more clearly how adolescents are affected by their changing environment and by people in their life.

It is important when using household-level dependent variables to acknowledge that there are some cases where multiple adolescents resided within the same household, and therefore their responses are not necessarily independent. As this non-independence violates the principle of homoscedasticity required by ordinary regression models, we adjusted for clustering (within households) in our models, controlling for autocorrelation induced by

adolescents sharing the same household. In doing so, we were able to derive a less biased estimate of individual-level associations between household-level influences and early sexual debut.

Study two calibrated the SSQ against the SRQ-20 and examined the performance indices of the SSQ based on various cut points for classification using the SRQ-20 as the criterion measure. This approach has not been undertaken for these two specific scales, nor have they been explored for the particular age group of interest. Too often, combining adolescent data with other age cohorts minimizes the specific health changes across the life span. This study stratifies age groups to address this concern and disentangle the specific details associated with depression among adolescents aged 15-19 as well as young adults aged 20-24.

STUDY LIMITATIONS

This dissertation has several limitations. The cross sectional nature of the data limits our ability to determine causation between the key individual and household factors on the timing of sexual debut. This is of particular concern with individual level variables such as depression, whereby we are unable to determine if depression causes early sexual debut or if early debut causes depression.

Second, incomplete responses restricted our ability to refine several key variables. We were unable to measure the reasons for migration due to high levels of missing data, which could have allowed us to unpack how perception of migration and different movement patterns affect sexual behavior. Relatedly, our measure relationship with HoH fails to capture the strength of the caregiver-child relationship and overlooks potentially strong relationships with other non-head of household caregivers. A child may live in grandparent-headed household but still be cared for by a parent. Similarly, a child may live with a parent but be overseen primarily by a sibling or aunt. Future research examining contextual factors associated with sexual risk would be improved upon by including information about the adolescent's relationships,

measuring both the type and strength of important relationships.

Turning to the limitations of paper two, it is important to acknowledge that the depression screening scales were not administered separately or in their entirety but rather overlapping items were only asked once. In instances where an item was only asked one, administrators utilized the SRQ-20 phrasing rather than the culturally-emic language in the SSQ. This approach has the potential to compromise the integrity of each individual scale and bias depression rates to favor the SRQ-20. However the five questions unique for the SSQ did remain unchanged, utilizing the original Shona-specific wording. Also noteworthy is that interviewers administered both tools verbally despite the scales being designed for self-administration. This has the potential to create social desirability bias, especially among younger participants.

Lastly, it is critical to acknowledge that though eight or more positive responses is the most common cut point used across studies, this is based on the score recommended by the WHO for use among adults, no specific cut point recommendations have been made for adolescents. Adult and adolescents studies alike have used a range of SRQ-20 cut points based on their particular study interests. We opted for conservative estimations by selecting the most commonly used cut point based on previous validation work on the latent trait depression, prior item response modeling, and reasonable depression estimates in our sample when compared to rates among adolescent in other studies. Nevertheless, using an alternate SRQ-20 cut point for depression could significantly alter our findings as well as our recommendations for using the SSQ among adolescents. Given these limitations and rationales, further comparisons of these two depression scales based on alternate SRQ-20 criterion standards would be prudent, as would cross-checking findings against formalized psychiatric evaluations.

CONCLUDING REMARKS

Taken together, results from this dissertation provide insight into factors that influence adolescent emotional and physical health as well as their behaviors. Maintaining a wide lens for

examining the adolescent health landscape not only provides a greater understanding for contextual influences but also suggests a larger arena for points of intervention and program development. Understanding how to measure and minimize these stressful events and to help adolescents develop healthy coping skills are two ways of protecting at-risk adolescents.

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