Religious coping mechanism in reducing depression in PLWHA: Comparison of generalized structural equation modelling and logistic regression modelling.

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Science in Epidemiology in the field of Biostatistics.

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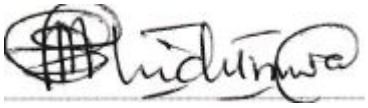
Declaration

I declare that this research report is my own work. It is being submitted in partial fulfilment of the requirements for the degree of Master of Science in Epidemiology in the field of Biostatistics at the University of the Witwatersrand, Johannesburg. This research has not been submitted previously for any degree or examination to any other institution.



Glory Chidumwa

November 2017

Dedication

To the **Chidumwa** family, **Esnath Gatawa** and my friends:

For your advice, unwavering support, belief in me, love and patience, the least I can say is thank you!

Abstract

Background

People living with HIV/AIDS (PLWHA) are at higher risk of depression compared to HIV uninfected individuals. In addition to pharmacological treatments for depression among PLWHA, psychosocial interventions may facilitate coping with depression. Religious coping is one example of a psychosocial intervention that may help PLWHA confront both health problems and life stressors. The association between religious coping and depression among PLWHA has been examined in higher income countries using regression analyses. To my knowledge, few studies have been conducted on the African continent examining the relationship between religious coping and depression in PLWHA. Further, no study has utilized the generalized structural equation modelling (GSEM) technique to examine the above relationship. Yet literature suggests that this technique is useful in its potential to explore potential mediators and latent confounders as well to quantify each of the factors' contribution to the covariance structure. This study contributes to the biostatistics literature and aims at addressing this gap. The study compares the GSEM approach to that of the logistic regression approach in exploring the relationship between religious coping and depression.

Methods and material

A secondary data analysis of a longitudinal study carried out at two specialized HIV clinics in Uganda was conducted. Data from the two sites were combined for analysis. To assess the factors associated with major depressive disorder, multivariable logistic regression and GSEM were utilized in Stata/IC version 14.1.

Results

Results of the logistic regression procedures suggested that stigma score (aOR = 1.08 95% CI (1.03-1.14) P = 0.002), childhood traumatic experience (aOR = 1.02 95% CI (1.00-1.05) P = 0.017), study site (aOR = 2.17 95% CI (1.48-4.98) P = 0.001), negative life events (aOR = 1.12 95% CI (0.99-1.28) P = 0.083), resilience score (aOR = 0.97 95% CI (0.95-0.99) P = 0.001), coping score (aOR = 1.04 95% CI (1.01-1.08) P = 0.003) and education (aOR = 0.69 95% CI (0.47-1.01) P = 0.054) were significantly associated with depression. However, when controlling for potential confounding factors, no significant association was found between depression and negative and positive religious coping among PLWHA (aOR = 1.12 95% CI (0.91-1.36) P = 0.282 and aOR = 1.01 95% CI (0.92-1.11) P = 0.784, respectively).On the other hand, results from fitting GSEMs showed that stigma score (aOR = 1.15 95% CI (1.10-1.20) P <0.001), childhood trauma score (aOR= 7.87 CI (3.88-15.95) P <0.001), study site, marital status, negative life events, social support score (aOR = 0.32 95% CI (0.21-0.48) P <0.001) and socio-economic status (aOR = 0.72 95% CI (0.50-1.04) P = 0.079) were significant in predicting depression. In addition, there was some evidence that negative religious coping was associated with depression among PLWHA (aOR = 1.18 95% CI (0.99-1.40) P = 0.061). Both modelling procedures thus suggest that stigma score, childhood trauma score, study site and negative life events were predictive of depression.

Discussion and conclusion

On comparing GSEM and logistic regression, the results obtained in this study suggest that the approaches differ only slightly. The GSEM approach found that negative religious coping was marginally significantly associated with depression. These findings, however, do not suggest superiority of either technique, but instead suggest that researchers should consider

utilizing GSEM in analyzing mental health data. While some of the factors associated with depression differed between the two techniques both approaches suggested consistently that stigma score, childhood trauma score, study site, marital status and negative life events are associated with depression.

Acknowledgements

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Nomenclature

HIV - Human Immunodeficiency Virus

PLWHA - People Living with HIV/AIDS

OR - Odds Ratio

aOR - Adjusted Odds ratio

CI - Confidence Interval

SEM - Structural Equation Modeling

GSEM - Generalized Structural Equation Modeling

WHO - World Health Organization

MDD - Major Depressive Disorder (Depression)

CHAPTER 1

INTRODUCTION

The introduction consists of the following sections:

1.1 Background

1.1.1 Global burden of HIV/AIDS

1.1.2 A description of the global burden of HIV/AIDS and co morbid depression

1.1.3 A description of HIV and comorbid depressive symptoms in Uganda

1.1.4 An explanation of the concept of religious coping

1.1.5 Treatment for depression in PLWHA

1.2 Literature review

1.3 Statement of the problem

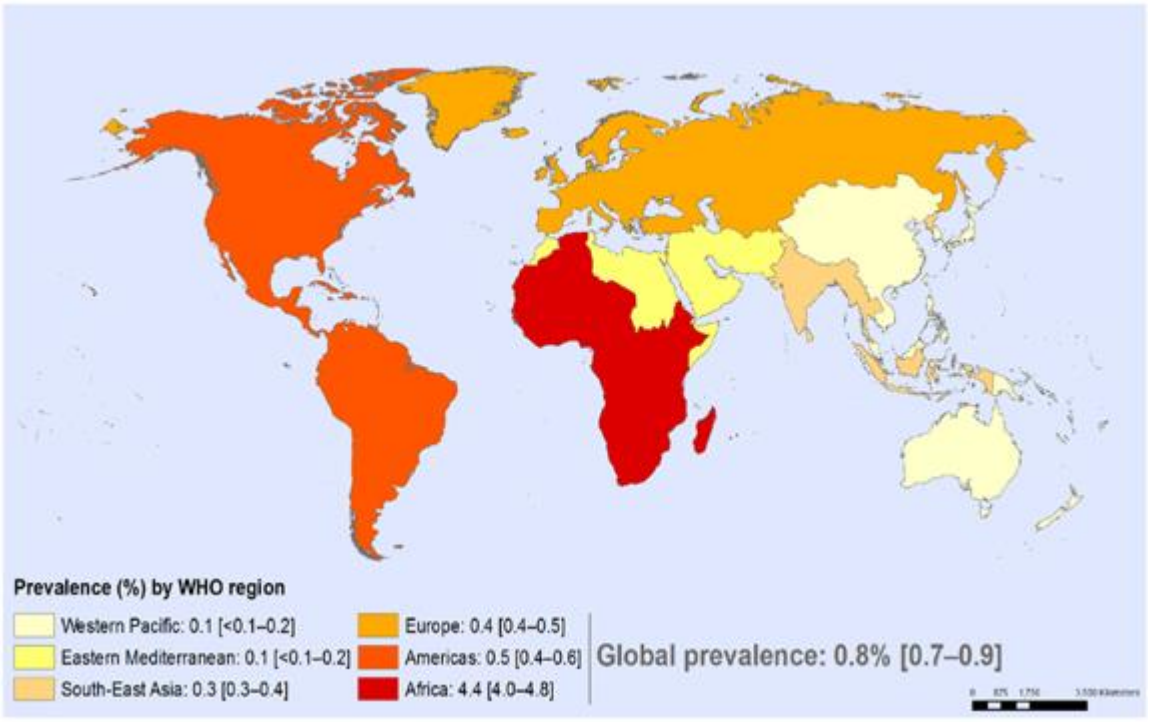
1.4 Study justification

1.5 Research question, aim and objectives

1.1 Background

1.1.1 Global burden of HIV/AIDS

Figure 1: *Adult HIV prevalence (15-49 years) by WHO region (2015).*



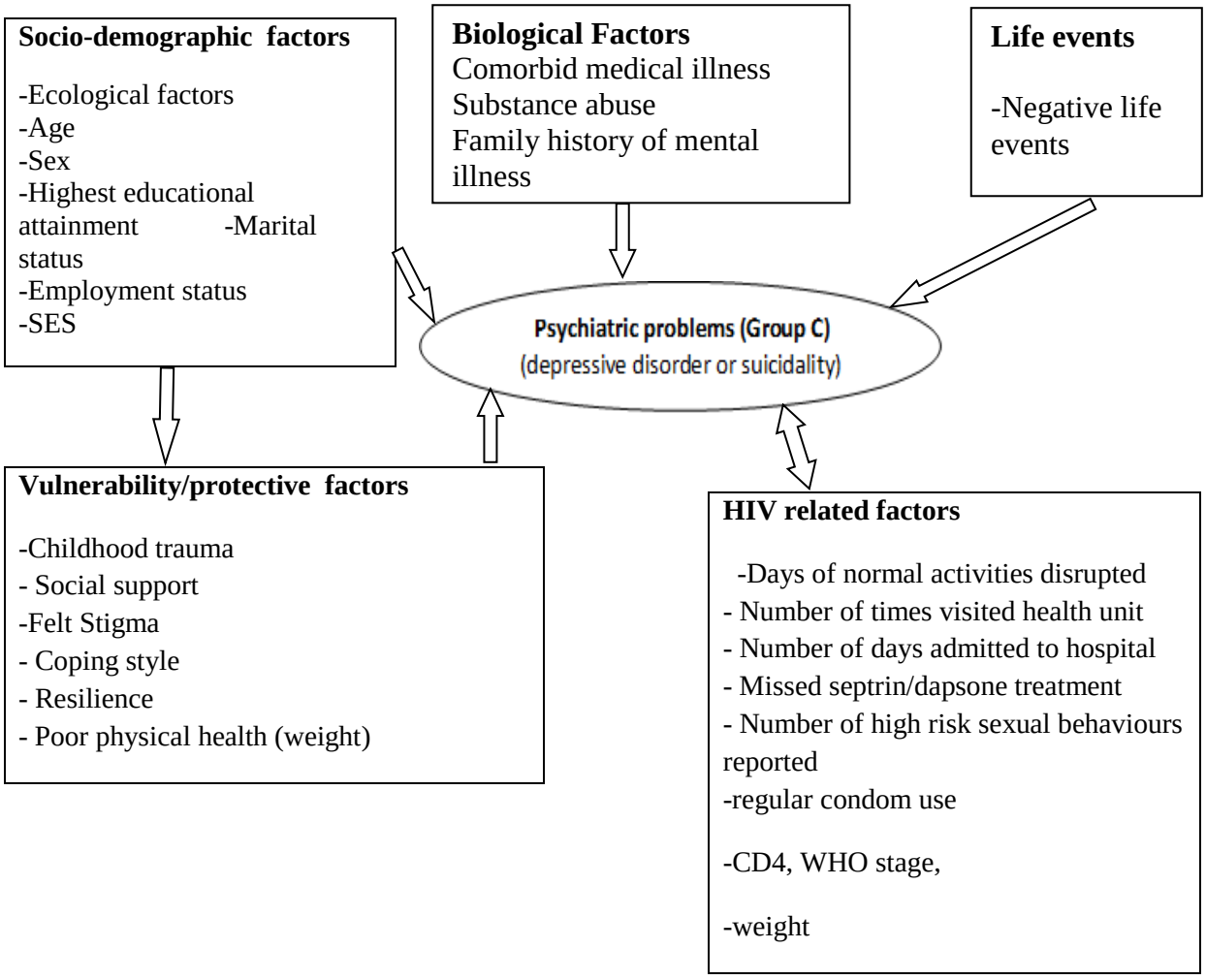
Source: WHO (Information Evidence and Research, IER)

Since HIV/AIDS was first discovered in 1981, approximately 70 million people have been infected by the virus. At the end of 2015, it was estimated that globally 0.8% [0.7-0.9%] of adults between the 15–49 years worldwide were living with HIV. The epidemic disproportionately affects the Sub-Saharan African region where approximately 1 in every 25 adults (15-49 years) (4.4%) are living with HIV. This is 70% of the global burden of people living with HIV (1-5).

1.1.2 Global burden of HIV/AIDS and co-morbid depression

In addition to comorbid infectious diseases, e.g. tuberculosis (TB), meningitis or pneumonia there is also a significant burden of co-morbid psychiatric conditions among PLWHA including neurocognitive impairment, substance use and depressive symptoms (6-8). PLWHA are more likely to experience symptoms of depression compared to the general population (9, 10). Figure 2 below summarizes mediators and moderator variables for depression and HIV to show the bidirectional nature of the relationship.

Figure 2: A diagrammatic representation of stress-vulnerability model of depression (11, 12)



Individuals who are HIV negative and who exhibit depression may be at high risk of HIV infection due to high risk sexual behaviour, loss of self-worth, interest and concentration (13-15). In addition, there are several risk factors for PLWHA associated with the onset of depression including psychosocial difficulties e.g. perceived stigma as well as HIV related neuropsychiatric complications (9, 16-18). Reports on the actual prevalence of depression in HIV-infected persons have varied widely, from 22 to 71% (19, 20). A growing body of evidence linking psychosocial factors to immune suppression suggests that depression or stress may accelerate HIV disease progression (21). Depression may alter immune function through a variety of mechanisms, including reductions in killer lymphocyte cell (21). Further, recent studies suggest psychosocial risk factors have important prognostic significance in HIV disease (22).

Adherence to HAART and MDD

Highly Active Antiretroviral Therapy (HAART) has resulted in PLWHA living for longer (23-25) so there is a need to target depression and other mental disorders (26, 27). Tate et al (2003) report that up to 85% of HIV-positive individuals report some depressive symptoms that may not reach the diagnostic threshold for a major depressive disorder (28). However, patients may experience impaired functioning even if they are below clinical diagnostic threshold (28, 29).

Depression has also been found to be associated with poor adherence to HAART in PLWHA (30). As such, many depressed persons may be unlikely to have adequate motivation and self-efficacy to attend clinic appointments and take their medication with the required regularity. Studies investigating adherence have demonstrated an inverse relationship between depression and ART adherence (31). Studies investigating several factors associated with adherence to antiretroviral therapy (e.g. The Swiss HIV Cohort Study on patterns and

predictors of changes in self-reported adherence to antiretroviral therapy) suggest that depression is predictive of poor adherence to HAART (32-34). The depressive symptoms such as fatigue and lack of motivation may have interfered with adherence (35, 36). In addition to interfering with adherence to medication, depression has been associated with increased prevalence of risky behaviors, including unprotected sexual activity and needle-sharing (26, 27).

1.1.3 HIV and comorbid depressive symptoms in Uganda

Currently, the prevalence of HIV/AIDS in Uganda is 7% (37). In 2012, there were 1 500 000 People Living with HIV/AIDS (PLWHA) (7.2%) an increase from 6.8% in 2001(38). Despite the growth of the Highly Active Antiretroviral Treatment (HAART) programme in Uganda, a number of people living with HIV (PLWHA) do not have access to treatment and may be at higher risk of comorbid illnesses. One such illness is depression (39, 40). Among HIV positive patients, in Uganda, the most common neuropsychiatric disorder is depression, with the risk estimated to be 2 to 3 times higher than among matched HIV negative controls (41, 42). Risk factors for depression among PLWHA include immunological (low CD4 counts), psychosocial (increased opportunistic infections and AIDS related stigma) and socio-demographic (gender, education, and employment) factors (43-46).

Chronic illness requires, in addition to HAART provision, measures to support treatment adherence and retention in care (47, 48). Some studies indicate that the risk of depression is increased by some ART drugs (49-51). Therefore there is a need to explore associations between non-pharmacological factors, including coping strategies, for MDD among PLWHA that complement an optimal HAART strategy. One example of such a coping strategy is that of religious coping described in more detail below.

1.1.4 Religious Coping

Religious coping is a broad concept. Some studies define the concept of religious coping as turning to a place of worship or prayer to cope with major life stressors, e.g. physical illness, crisis, trauma and change (52-54). Herbert and colleagues stressed that religious coping does not only measure the degree of religiosity or the extent to which people engage with prayer but also the extent to which individuals turn to religion in times of crisis (55, 56). Therefore, religious coping elements may include praying and seeking pastoral or congregational support (55, 57). In the context of this thesis, religious coping can be understood as "the use of religious beliefs or behaviors to facilitate problem-solving to prevent or alleviate the negative emotional consequences of stressful life circumstances" (58, 59).

Religious coping can be measured using a tool known as the RCOPE (60). The RCOPE scale measures two basic types of coping techniques namely positive and negative religious coping. In positive religious coping, individuals have a secure relationship with the Supernatural and feel connected with others. Negative religious coping, on the contrary, expresses "a less secure relationship with the Supernatural, a tenuous and ominous view of the world and a religious struggle in the search for significance" (52, 60). Such spiritual struggle is less common than positive religious coping although it is important to note that both forms of coping may not be mutually exclusive (60, 61).

1.1.5 Treatment for depression in PLWHA

Research from several countries suggests that PLWHA who are asked about their coping style with health problems and life stressors mention religion and spirituality frequently (52,

62, 63). Religion has been found to be a vital resource that is used by chronic disease patients including PLWHA (55, 64).

To my knowledge to date, far less is known about HIV related depression and the utility of religious coping in this regard. Moreover, research has examined the association between religious coping and depression using logistic regression and hierarchical regression analyses (52, 63, 65).

However, to my knowledge, none of the studies have employed the generalized structural equation modelling (GSEM) technique. GSEM is one of the extensions of the structural equation modelling (SEM), an extension of multiple regression models. The GSEM technique has the ability to fit multilevel structural equation models.
This refers to the ability to simultaneously handle nested or crossed group-level effects in a particular data set i.e. latent and observed variables that may vary at different levels can be concurrently modelled (66). Therefore, GSEM allows for the inclusion of unobserved and observed effects for subjects, subjects within group, group within subgroups. Wright first developed the SEM technique, largely for the field of psychometrics. However, by 1994, SEM had gained popularity in all fields. It allows introducing endogenous or exogenous latent variables in analyses. Endogenous variables are the variables that are caused by at least one variable in the causal hypotheses, while exogenous variables are not caused by another variable in the model (67, 68).

The distinction between SEM and GSEM is that in SEM, the outcome variable is continuous and the regression model is linear while GSEM is more general. The response variable may be continuous, binary, ordinal, or a count. Furthermore, non-linear link functions are allowed.

In medical research, SEM has gained popularity as a powerful multi-variate analysis tool due to its capability to handle the investigation of both simple and complex causal models (69, 70). Given this, there is a clear need to further explore the association between religious coping and depression using SEM. The present study aims at using the GSEM approach and comparing the findings to the results obtained by fitting multiple logistic regression models in investigating the use of religious coping mechanisms to reduce depression in PLWHA.

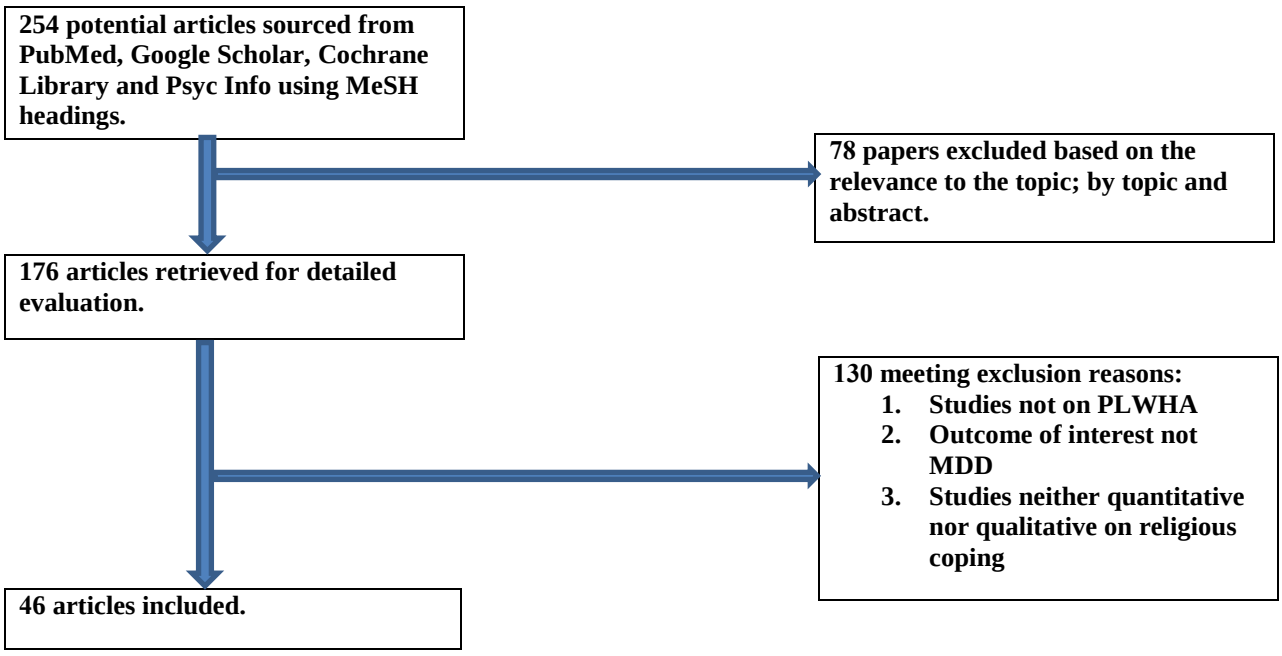
1.2 Literature Review

1.2.1 Introduction

This literature review discusses and compares scientific studies of the relationship between religious coping, depression and HIV/AIDS. The following key words were employed to search for studies in the literature: religious coping mechanisms, depression/major depressive disorder, PLWHA and permutations thereof. I searched the following databases: Pub Med, the Cochrane Library and Psych info.

Inclusion criteria were quantitative or qualitative studies of religious coping, depression and/or HIV/AIDS. With my supervisors, I decided to stipulate road entry criteria as we believed as a team that there is very little information on the topic of religious coping in HIV related depression. It was therefore necessary to generate as broad a knowledge base as possible on the subject.

Figure 3: *Flow diagram for literature search.*



1.2.2 HIV and Coping

Several studies have examined if coping or poor coping strategies mediate or moderate the relationship between HIV related social circumstances and several outcomes (52, 71, 72). For example, Moskowitz conducted a meta-analysis of 63 studies published between 1990 and 2005 investigating which types of coping are related to psychological and physical well-being among people with HIV (73). Their analysis demonstrated that direct action and positive reappraisal were consistently associated with better outcomes in people coping with HIV across behavioural and physical health categories. In addition, they found that disengagement forms of coping, such as behavioral disengagement and alcohol or drugs use for coping were associated with poorer outcomes.

More recent studies on the effects of coping on psychological adaptation in individuals with HIV consistently reported that approach coping strategies such as Seeking Support and Acceptance are associated with lower levels of depression, whereas avoidance coping strategies such as Behavioral Disengagement and Denial are associated with higher levels of depression (74). In addition, cognitive coping strategies such as Positive Refocusing and Positive Reappraisal served as predictors of low depressive symptoms while Catastrophizing and Other-Blame were associated with high depressive symptoms (75).

There is a growing interest in investigating the impact of specific coping strategies on depression among PLWHA through psychotherapeutic interventions (76, 77). Lutgendorf and colleagues found that cognitive coping skills such as reframing, active coping, and acceptance during cognitive behavioral stress management intervention were consistently associated with lower depressive symptoms (78).

In a meta-analysis conducted by Crepaz and colleagues aimed at evaluating cognitive behavioral interventions (CBIs), equipping PLWHA with adaptive coping methods such as low emotion based coping was found to be protective against major depressive disorder symptoms (79).

1.2.3 Religious coping in PLWHA

In Sub-Saharan Africa, there has been increased attention given to the psychosocial management of HIV/AIDS (80-82). Individuals with HIV have been reported to rely on religiosity and spirituality as a source of comfort and hope (83, 84). Kaldjian reported that 98% of hospitalized patients with HIV indicated belief in a divine being called God and 84% expressed a personal relationship with God (85). According to Lorenz and colleagues who carried out a survey on a sample of 2266 HIV-infected adults receiving care in the US, 85% of their sample reported that spirituality was "somewhat" or "very" important in their lives (86). The study also reported that a majority of the sample indicated that they "sometimes" or "often" rely on religious or spiritual means when making decisions (72%) or confronting problems (65%). Specific coping methods reported by people with HIV include spiritual transformation, church attendance and prayer/meditation, believing in a higher power, and collaboration with God (87).

1.2.4 Religious coping and depression among PLWHA

PLWHA all over the world are faced with life stressors such as questioning their purpose of life, hope and discrimination (87, 88). In the study by Lorenz and colleagues(86), religious coping was found to play a central role among PLWHA in providing them with comfort as well as a sense of meaning in their life (86). Several studies exploring HIV and other illnesses have found a possible association between spirituality and coping with depression (63, 65, 89, 90). In the United States of America (USA), a cross-sectional survey was conducted by Simoni and colleagues on 230 African-American and Puerto-Rican low-income women living with HIV/AIDS. Findings suggest that indicators measuring how the women coped with HIV/AIDS were significantly associated with spirituality and religiosity. In this survey spiritually based coping was found to be protective against depression, controlling for other types of coping (56).

Further, in a cross-sectional study by Damilda and colleagues (91), it was found that among HIV positive African–American women who were interviewed, spiritual wellbeing, existential wellbeing, and religious wellbeing predicted protection from symptoms of depression. Interestingly, CD4 counts were higher among those who reported the religious components described above. These findings emerged after controlling for demographic factors, adherence to HIV medication, and viral load (91). In another study conducted in 3 cities in the USA, it was also found that among PLWHA, lower spiritual wellbeing is one of the factors that increased the risk of depression (92).

The relationship between religious coping and psychological outcomes across diverse populations has been increasingly addressed by researchers for the last decade. Few studies, however, have investigated the psychological adaptation of people with HIV/AIDS.

Before the roll-out of HAART, religiousness/spirituality in PLWHA was mostly studied qualitatively. Findings from these studies indicated that individuals with HIV/AIDS often found deeper meaning in life through a spiritual perspective after the diagnosis, and also experienced enhanced quality of life. After HAART became available, religious coping such as praying, reading religious materials, and taking problems to God have been reported to be associated with decreased emotional distress and increased quality of life among women with HIV (93).

In their study of 230 predominantly African American and Puerto Rican women with HIV, Simoni and colleagues found that spiritually-based coping, for instance praying, involving oneself in spiritual activities, rediscovering what is important in life, and finding new faith, was positively associated with psychological adaptation, even after controlling for other types of coping such as constructive cognitions, realistic acceptance, community involvement, and avoidance (56). In addition, elevated psychological distress predicted prayer practices and spiritual beliefs in another study that included sixty five individuals with HIV (94).

Ano and Vasconcelles reviewed potential differential effects of positive and negative religious coping on psychological adjustment in their meta-analysis of 49 studies using the Brief RCOPE (95). This is a 14-item scale which is divided into two subscales each consisting of seven items, which identifies clusters of positive and negative religious coping methods (60, 96). The authors found that positive forms of religious coping were associated with positive psychological outcome (a cumulative effect size= 0.33) and less emotional distress (effect size = -0.12), while negative forms of religious coping were related to poor psychological adjustment (effect size = 0.22). On the other hand, greater use of negative religious coping strategies, such as attributions of situations to a punishing God and

dissatisfaction with clergy, tended to be associated with more psychological distress, such as greater depression and anxiety, and ineffective resolution of negative life events (97).

To date, however, there are only a few studies that have investigated the effects of both positive and negative religious coping on psychological outcomes among people with HIV. One longitudinal study that used the Brief RCOPE enrolled 450 individuals with HIV from four clinical sites in three different cities and resulted in several publications (63, 92).

Specifically, Yi and colleagues examined the cross-sectional effects of different aspects of religiosity, including positive and negative religious coping, religious well-being, and religious activities, on symptoms of depression (92). They found that negative religious coping strategies, decreased attendance of religious meetings, and low spiritual well-being (sense of meaning, purpose, and peacefulness in life) were all associated with significant depressive symptoms in bivariate analyses. However, positive religious coping, prayer or meditation, and intrinsic religiosity were not related to depressive symptoms. More recently, Trevino and colleagues investigated the cross-sectional and longitudinal relationships between positive religious coping and negative religious coping versus biological (CD4 and HIV symptoms), psychological (quality of life, depression, and self-esteem), social, and spiritual well-being (63). It was found that positive religious coping was associated with greater self-esteem, spiritual well-being, and the life satisfaction subscale of quality of life, but not with depression or overall quality of life. However, negative religious coping was consistently associated with higher levels of depressive symptoms and poor CD4 count symptoms at baseline and follow-up.

1.2.5 Comparison of SEM and logistic regression

In a study aimed at modelling relationships between pulmonary function, fatty acids and oxidation in cystic fibrosis (CF), Maud and colleagues illustrated the advantages of structural equation models in biomedical research using the complex example of cystic fibrosis (98). This was the first study to illustrate the ability of SEM to simultaneously evaluate relationships between pulmonary function, lipid oxidation status, essential fatty acids, arachidonic acid and several antioxidant markers in a large cohort of CF patients at different key moments of the disease. In their study, they dealt with highly correlated covariates by considering seven latent variables namely: pulmonary function, lipid oxidation status, essential fatty acids, arachidonic acid, carotenoids, fat-soluble vitamins and glutathione. This further enabled the study of the influence of BMI adjusted for age, on all latent variables as well as the influence of age, adjusted for BMI, on all the latent variables, which could not have been achieved using a logistic regression model.

Similarly, Sik-Yum Lee and colleagues illustrated the usefulness of SEM in quality of life, a multidimensional concept, by evaluating a number of latent constructs through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (99). Further, Craig A. Wendorf illustrated the flexibility of SEM in that it allows for more appropriate model specification and for more complex error structures (100). In his study, he estimated the factor loadings, rather than assume them all to be equal as was the case with the HLM specification.

1.3 Problem Statement

From my literature search, it appears that few studies have been done in Africa to explore the association between religious coping and depression in PLWHA and the impact of religious coping on HIV/AIDS treatment outcomes (41). Most studies on religious coping in relation to major depressive disorder were done in the United States (101). Therefore, understanding the distribution of religious coping in patients with HIV/AIDS and exploring the factors influencing depression among PLWHA within the African context is of great importance.

In response to this knowledge gap, my study which is nested within a larger study of mental disorders among PLWHA in Uganda, provides an opportunity to look at the burden of major depressive disorder, its risk factors and health consequences, and seeks to elucidate the association between religious coping and lessening the burden of depressive symptoms.

In the parent study where PLWHA were interviewed with regard to their psychiatric outcomes, logistic regression was utilized (11). Alternatives to logistic regression modelling such as Generalized Structural Equation Modelling (GSEM) might offer additional insights into complex inter-relationships. In neuropsychology studies, where there are a number of sources of error, SEM's (including GSEM's) have been widely utilized due to the capability for adjusting for the measurement errors that arise from using different measurement tools (52, 102). Moreover, some studies have employed SEM techniques to analyze interconnections between potential predictors of HIV treatment adherence more efficiently in a single model (103).

1.4 Justification

This study will utilize Generalised Structural Equation Modelling (GSEM) to further investigate the association between religious coping and depression among PLWH and compare the results to those found using logistic regression. GSEM methodology has been suggested as being superior to logistic regression by some authors for a number of reasons. Firstly, GSEM models all equations simultaneously. This provides a flexible and general framework to test several potential relationships between a number of variables in the model (104). This extends to exploring potential mediators and latent confounders. Moreover, GSEM is preferred due to its capability to quantify each of the factors' contribution to the covariance structure. This caters for the limitation of logistic regression to control for confounding among continuous variables and interaction among categorical variables (70). Fitting GSEM in addition to fitting multiple logistic regression models will enable us to get a better understanding of religious coping; its distribution, the association with socio-demographic characteristics and psychosocial variables and the association with unfavorable outcomes such as depression, poor adherence to HIV/AIDS treatment and engaging in risky sexual behavior. These findings might have implications for the management of people with HIV/AIDS.

1.5 Research Question, Aim and Objectives

1.5.1 Research question

Does the use of GSEM give more insight than multiple logistic regression into the use of religious coping mechanisms to reduce depression in adult HIV patients in Uganda in 2009?

1.5.2 Aim

The overall aim of this study is to compare GSEM and logistic regression approaches to explore the relationship between religious coping and depression among patients with HIV/AIDS in Uganda in 2009.

1.5.3 Specific objectives

1. To examine the prevalence of major depressive disorder among patients with HIV/AIDS in two sites in Uganda in 2009.
2. To examine the distribution of positive and negative religious coping among patients with HIV/AIDS in two sites in Uganda in 2009.
3. To determine the association between religious coping and depression among patients with HIV/AIDS using logistic regression, controlling for potential confounding factors.
4. To determine the association between religious coping and depression among patients with HIV/AIDS using GSEM, controlling for other factors.
5. To compare the findings from GSEM and logistic regression approaches.

CHAPTER 2

METHODOLOGY

2.1 Study Design

This study is a cross sectional study nested within a longitudinal study on mental health among PLWHA (people living with HIV/AIDS).The main aim of the original, parent study was to describe the incidence and chronicity of MDD among PLWHA (11). Further details of the original study from which the data for this secondary analysis has been obtained are given below.

2.2 Study Site

The original longitudinal study was carried out at two specialized HIV clinics run by the AIDS Support Organization (TASO) at two sites, TASO Entebbe (a semi-urban region) and TASO Masaka (a predominantly rural setting) (11). The MRC/UVRI Unit in Uganda collaborates with these clinics. At the time of the study, TASO Entebbe had about 7000 active clients. Of these, approximately 3000 were ART naive. TASO Masaka had 6000 active clients of whom about 2500 were ART naive. This study, on which my research report is based, combined the data over the two sites for analysis, following the original study.

2.3 Study Population

The study population consists of the PLWHA respondents in the longitudinal mental health study carried out in the two centers as described above. All respondents who attended the second study visit were included in my secondary analysis. Respondents were males and females attending that study (105).

2.4 Sampling

In the original study, 1100 participants were sampled to participate in the longitudinal study, i.e. participants were sampled from the patient populations at the two clinics. A register had been developed at each study site of all clients who had not begun their treatment. For the original sample, a random sample of 550 PLWHA was selected at each site (11). Participants who met the inclusion criteria were i) ART naïve and registered at either of the two clinics clinics; ii) 18 years of age and older at enrolment; iii) conversant with the Luganda language; iv) those who gave informed consent to participate in the study (11). Participants who were either too sick or could not understand the study instruments were excluded from the study (11). This study is a cross sectional study nested within the longitudinal study.

2.5 Data Collection

Measurement tools

The measuring instruments for the original study were validated tools previously employed in the Ugandan setting (106, 107). They were translated and back translated by mental health professionals fluent in English and Luganda, the local language of the region (11). The translators translated independently and then met to then reach consensus on translated items.

Questionnaires for this sub-study were administered by trained study psychiatric nurses (11). They were supervised by Professor Kinyanda, the principal investigator (PI) who is a qualified psychiatrist (11). In addition to socio demographic variables, several domains were examined including psychiatric disorders and resilience. Items examining religious coping were incorporated into the questionnaire by the study investigators of the longitudinal study.

Measurement

Outcome Variable

The primary outcome variable is major depressive disorder (MDD) which was diagnosed using the Mini International Neuropsychiatric Interview (M.I.N.I.). This diagnosis tool classified the participants who met the inclusion criteria as having or not having MDD. The M.I.N.I is a short but accurate tool that is used to diagnose symptoms of psychiatric disorders (108). The validation of the M.I.N.I. in Uganda was carried out in previous years.

Exposure Variables

These will include:

1. Religious Coping: This was measured using a shortened version of the RCOPE. This Brief RCOPE questionnaire is known to measure religious coping efficiently while retaining the functional foundation of the RCOPE (96). In this study, we considered positive religious coping and negative religious coping separately. These were all continuous variables.

2. Religiousness: The Duke Religion Index (DUREL) was used to assess religiousness, or how religious people are (109). This tool assesses intrinsic and extrinsic religious involvement. Intrinsic involvement is the view of religion as "proto-point" and a devoted attempt to live life entirely as religion teaches. On the contrary, extrinsic involvement refers to the use of religious comfort and social convention in order to self-serve non-religious goals e.g. politics, status and self-justification (110, 111). This five-item measure of religious involvement was designed for both cross-sectional and prospective observational studies. This tool assesses the three major dimensions of religiosity namely intrinsic religiosity, organizational religious activity and non-organizational religious activity.

The scale has been used in several studies and has been shown to have a high internal consistency with the Cronbach's alphas ranging between 0.78-0.86 (112-114).

The RCOPE questionnaire and the DUREL are attached as Appendix 3.

3. *Socio-demographic factors*: gender, age, religion, weight, employment status, marital status, highest educational attainment, socio-economic index (This was calculated by carrying out a Principal Components Analysis (PCA) on 8 variables denoting presence (1) or absence (0) of the following items: electricity, car, bicycle, radio, telephone, refrigerator, cupboard and flask. This resulted in a score between 0 (for those who had none) to 2.33 for those who had all (115).

6. *Clinical variables:* CD4 counts and HIV clinical stage (WHO, 2007), family history of psychiatric illness, childhood trauma score (based on sexual and physical abuse before the age of 17), stigma score, coping scale score, resilience score and social support score.

Further details on how socio-demographics and clinical variables were measured are attached as Appendix 4 (11).

2.6 Data Analysis

For my research report, I have conducted secondary data analysis of both males and females attending the primary study.

2.6.1 Data management

In the primary study, there was a dedicated data manager for the study. Data were double entered by independent data clerks into an MS ACCESS database and any discrepancies corrected. The data manager addressed any queries in consultation with the study PI.

In this study, data were rechecked for incompleteness, inconsistences and range of values for each of the variables using the statistical software Stata/IC, version 14.0.

2.6.2 Descriptive analysis

The prevalence of major depressive disorder was described using descriptive statistics. The frequencies and percentages are given. Further, the distribution of positive and negative religious coping was summarized by study site as shown in the results section (Chapter 3).

2.6.3 Inferential analysis

Multivariable analyses were performed using logistic regression and GSEM. These models were based on the stress-vulnerability model of depression. The conceptual framework for the stress-vulnerability model is summarized in Figure 1 and Figure 4.

2.6.3.1 Logistic regression

To assess the factors associated with MDD, multivariable logistic regression was utilized in Stata/IC version 14.1. The choice of candidate variables to be considered in the logistic regression models was based on plausibility and prior knowledge. We used a p-value of 0.20 for removal so as to ensure that all possible confounding effects are incorporated.

2.6.3.2 Structural equation modelling

A conceptual framework was used (See Chapter 3) to show the hypothesized associations between the variables used in the model. From this framework, the application of GSEM was illustrated in Stata/IC version 14.1 in estimating the associations in the different pathways between religious coping and depression. Structural equation modelling (SEM) is a comprehensive statistical tool that is employed to represent, estimate and test a network of relationships between observed (measured) variables and latent variables (67).

Steps in SEM

According to Lei Pui-Wa, SEM as a procedure includes the following steps (67, 116):

I. Specification of the model

II. Fitting the model

III. Evaluating the model

IV. Modifying the model

V. Interpreting and reporting the results

I. *Specification of the model*

Based on literature and field of expertise model specification includes hypothesizing relationships among the variables that will be analyzed. The conceptualized model is often represented in graphical form (See Figure 4). The relationship among the variables that will be analyzed may either be direct, indirect or non-directional. Covariance between variables is depicted by two-headed arrows while single-headed arrows depict a direct causal effect (116).

II. Model Estimation

Model estimation refers to the process of estimating of identified parameters (regression estimates, variances and covariance among predictors) in the specified structural model. This estimation process can be done using one of three possible iterative procedures namely maximum likelihood, maximum likelihood with missing values and asymptotic distribution free. In this study, parameters were estimated by maximum likelihood.

III. Evaluating the model

The difference between the observed data and the hypothesized model is minimized by model estimation (117). However, a dichotomous decision has to be made on whether the proposed model is rejected or retained. This can be done objectively to assess whether the model under

consideration fits the observed data through statistical model fit tests such as the Chi-squared test as well as calculating the Standardized Root Mean Square Residual (SRMR). This process is known as model evaluation.

IV. Modifying the model

Model modification includes the following; based on the outcome of the model fit tests, if the proposed SEM model does not fit the observed data, the researchers often re-specify the model. This improvement is substantively informed by literature to avoid theoretical modification (118).

V. Interpreting and reporting the results

When the SEM researcher is satisfied with the steps described above, the final step would be to interpret and report the estimates obtained from the model.

The SEM methodology has been widely used in behavioral sciences due to its generality and flexibility (67, 119). SEM, as an extension of general linear model (GLM) procedures, has been preferred over other GLM methods for a number of reasons that include its allowance for estimation of direct, indirect, total as well as path specific effects; the ability to quantify each factor's contribution to the covariance structure and understanding patterns of covariance among variables; exploration of potential mediators and latent confounders and its ability to model all the equations simultaneously (67). Furthermore, SEM explicitly recognizes and measures measurement error and resolves collinearity by describing multiple measures using a latent variable. Lastly, SEM provides a convenient way to present complex relationships pictographically (67).

The comparison between the results from logistic regression and GSEM was qualitative, that is, we looked at the conclusions and estimates of effect size for each method and commented on the extent to which they differ or are similar, to see at whether GSEM offered us any additional insights into the data (See Chapter 4).

2.7 Ethical Considerations

The original study obtained ethical clearance from the Uganda Virus Research Institute's Science and Ethics Committee and the Uganda National Council of Science and Technology. Study participants were given adequate information on the study prior to the invitation to consent. Before commencing this secondary analysis, I received ethical approval from the Wits Human Research Ethics Committee (M170114).

CHAPTER 3

RESULTS

This chapter presents the results of the secondary analyses.

3.1 Prevalence of Major Depressive Disorder (MDD)

Table 1 below summarizes the prevalence of major depressive disorder presented by explanatory factors.

Table 1: *Prevalence of major depressive disorder (MDD) presented by explanatory factors.*

Characteristic	Level	Depression (N= 59)	No Depression (N= 991)
		n (%)	n (%)
Study site			
	Entebbe	11 (2.13)	506 (97.87)
	Masaka	48 (9.01)	485 (90.99)
Sex			
	Male	13 (5.46)	225 (94.54)
	Female	46 (5.67)	766 (94.33)
Education			
	None	6 (5.31)	107 (94.69)
	Primary	40 (6.20)	605 (93.80)
	Secondary or more	13 (4.50)	276 (95.50)
Marital Status			
	Currently married	32 (5.99)	502 (94.01)
	Widowed	12 (7.69)	144 (92.31)
	Divorced / separated	14 (5.41)	245 (94.59)
	Single	1 (1.01)	98 (98.99)
Religion			
	Catholic	37 (6.57)	526 (93.43)
	Protestant	9 (4.00)	216 (96.00)
	Moslem	8 (5.10)	149 (94.90)
	SDA	0 (0.00)	16 (100.00)
	Born Again	5 (5.88)	80 (94.12)
	Other	0 (0.00)	4 (100.00)
Employment Status			
	Farmer / Fisher	24 (7.57)	293 (92.43)
	Professional / clerical	1 (2.38)	41 (97.62)
	Trader / artisan / transport	18 (4.68)	367 (95.32)
	Unemployed / retired / housewife	7 (5.60)	118 (94.40)
	Student / other	9 (5.23)	163 (94.77)

Characteristic	Level	Depression (N= 59)	No Depression (N= 991)
		n (%)	n (%)
Socioeconomic Status Index			
	< 1.5	53 (6.69)	739 (93.31)
	>= 1.5	6 (2.33)	252 (97.67)
Age (years)			
	18 – 29	14 (4.39)	305 (95.61)
	30 – 34	14 (5.67)	233 (94.33)
	35 – 39	13 (6.95)	174 (93.05)
	40 – 49	15 (6.98)	200 (93.02)
	>= 50	3 (3.66)	79 (96.34)
Family history of psychiatric illness			
	Yes	24 (8.33)	264 (91.67)
	No	34 (4.52)	719 (95.48)
WHO stage			
	I	35 (6.92)	471 (93.08)
	II	20 (4.15)	462 (95.85)
	III/IV	4 (6.45)	58 (93.55)
CD4 counts (cells / µl)			
	250 – 349	7 (6.60)	99 (93.40)
	350 – 499	15 (4.66)	307 (95.34)
	500 – 749	16 (5.26)	288 (94.74)
	>=750	11 (6.36)	162 (93.64)
Weight (kg)			
	<50	11 (9.82)	101 (90.18)
	50 – 59	13 (3.53)	355 (96.47)
	60 – 69	18 (4.86)	352 (95.14)
	>=70	17 (8.50)	183 (91.50)
Childhood trauma score			
	<=83	33 (6.47)	477 (93.53)
	84 – 89	8 (2.87)	271 (97.13)
	90 – 99	10 (6.17)	152 (93.83)
	>=100	8 (8.08)	91 (91.92)
Stigma Score			
	10 – 19	6 (3.06)	190 (96.94)
	20 – 24	18 (4.01)	431 (95.99)
	25 – 29	23 (7.80)	272 (92.20)
	>=30	12 (10.91)	98 (89.09)
Religious Involvement (DUKE)	<25	24 (5.30)	429 (94.70)
	>=25	35 (5.86)	562 (94.14)
Negative religious coping	<=8	15 (5.45)	260 (94.55)
	8 – 15	22 (4.66)	450 (95.34)
	>15	22(7.26)	281 (92.74
Positive religious coping	<28	22 (4.82)	434 (95.18)
	>=28	37 (6.23)	557 (93.77)
Coping Scale Score			
	<=49	13 (5.51)	223 (94.49)
	50 – 54	8 (4.12)	186 (95.88)
	55 – 59	5 (2.50)	195 (97.50)
	60 – 69	25 (7.79)	296 (92.21)
	>=70	8 (8.08)	91 (91.92)

Characteristic	Level	Depression (N= 59)	No Depression (N= 991)
		n (%)	n (%)
Resilience Score			
	<=49	0 (0.00)	10 (100.00)
	50 – 59	14 (8.05)	160 (91.95)
	60 – 69	13 (5.08)	243 (94.92)
	70 – 79	7 (3.17)	214 (96.83)
	>=80	9 (3.86)	224 (96.14)
Social Support Score			
	<=27	11 (9.40)	106 (90.60)
	28 – 37	18 (4.77)	359 (95.23)
	38 – 48	29 (5.23)	526 (94.77)

Out of the 1050 PLWHA, 5.6 % had major depressive disorder. The proportion of depressed PLWHA was lower in Entebbe compared to Masaka, 2.13 % and 9.01 % respectively. Widowed PLWHA had the highest proportion of depression (7.69 %), followed by the married (5.99 %), followed by the separated (5.41 %), with the least proportion among the single (1.01 %). The proportion of PLWHA who had MDD was higher (6.69 %) among those with lower socio-economic status index compared to those who were in the higher socio-economic status category (2.33%). For descriptive purposes, PLWHA were divided into five different age groups ranging from 18-50 years. The proportion of PLWHA with MDD increased with increasing age from 18-25 years age group down to 40-49. The lowest proportion was however observed in the >= 50 age group (3.66 %). PLWHA with family history of psychiatric illness had a higher proportion of MDD relative to those who did not have family history of psychiatric illness, 8.33 % and 4.52 % respectively.

Table 2: *Prevalence of major depressive disorder (MDD) by continuous explanatory variables.*

Characteristic	Depression (N= 59) Mean (sd)	No Depression (N= 991) Mean (sd)
Socioeconomic Status Index	0.91 (0.54)	1.19 (0.59)
Age (years)	35.73 (8.61)	35.02 (9.20)
CD4 counts (cells / µl)	517.75 (298.45)	518.45 (266.63)
Weight (kg)	60.39 (11.52)	60.33 (10.01)
Childhood trauma score	87.29 (10.95)	86.30 (9.01)
Religious Involvement (DUKE)	24.20 (2.77)	23.80 (2.95)
Positive religious coping	26.50 (2.74)	26.35 (2.73)
Negative religious coping	13.15 (5.47)	12.73 (5.37)
Stigma Score	24.72 (4.86)	23.08 (4.70)
Coping Scale Score	59.41 (10.63)	56.67 (9.11)
Resilience Score	59.38 (16.79)	66.38 (15.63)
Social Support Score	35.84 (7.68)	37.36 (7.46)

3.2 Distribution of Religious Coping

Individuals from Masaka scored higher on the DUKE scale (religious involvement) than individuals from Entebbe. Higher positive religious coping and lower negative religious coping, as measured by the RCOPE scale, were observed in participants from Masaka compared to those from Entebbe.

Table 3: *Distribution of religious involvement of the participants by study site.*

	Entebbe			Masaka		
Characteristic	**Mean**	**SD**	**Frequency**	**Mean**	**SD**	**Frequency**
Religious Involvement	23.1	3.34	512	47.59	6.38	506
Negative religious coping	13.66	5.37	513	11.91	5.27	534
Positive religious coping	26.23	2.92	511	26.48	2.53	531

3.3 Factors Associated with Major Depressive Disorder (MDD)

Table 4: *Results of fitting multiple logistic regression models for factors associated with depression.*

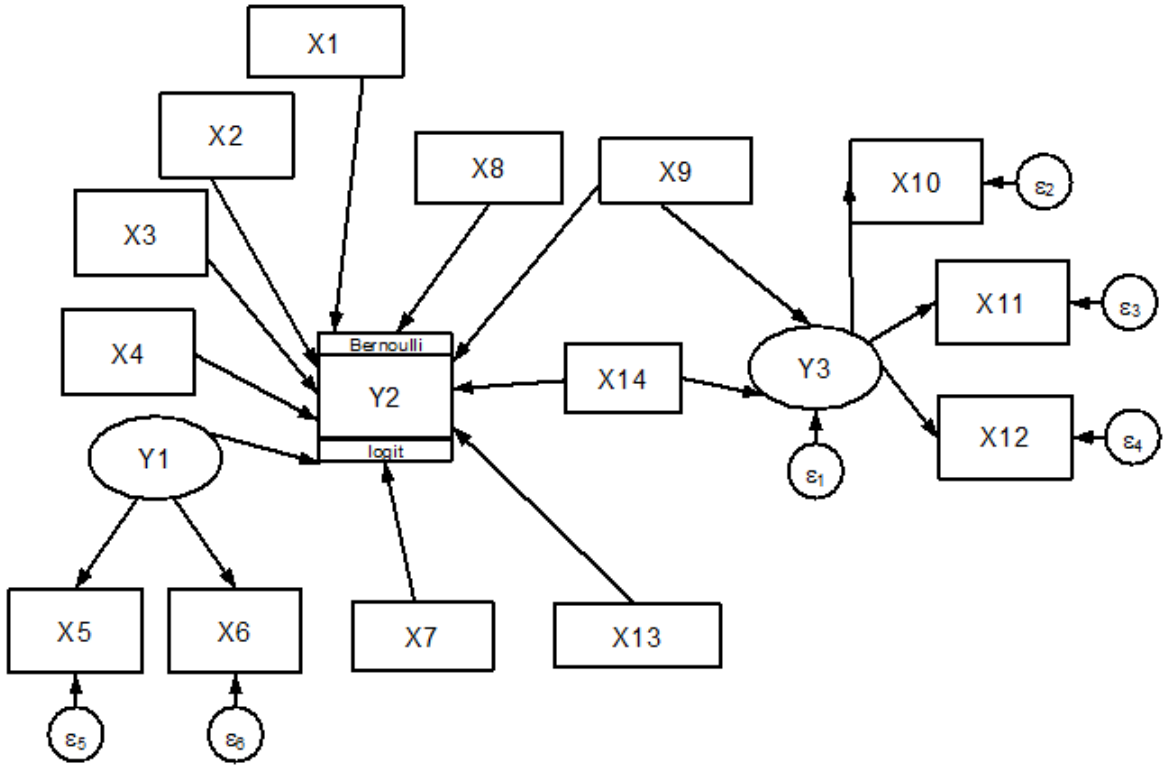
Characteristic	Level	Adjusted Odds Ratio (95% Confidence Interval)	Likelihood Ratio P-value
Study site	Entebbe	1(reference)	0.001
	Masaka	2.87 (1.52,5.39)	
Marital status	Currently married	1(reference)	0.256
	Widowed	2.90 (1.50;5.60)	
	Divorced / separated	1.23 (0.70;2.17)	
	Single	1.77 (0.77;4.09)	
Age (years)	Per year increase	0.99 (0.96;1.02)	0.623
Negative life events	Per one SD increase	1.12 (0.99;1.27)	0.083
Sex	Male	1(reference)	
	Female	1.05 (0.57;1.96)	0.868
Employment	Farmer / Fisher	1(reference)	
	Professional / clerical	1.40 (0.36;5.51)	0.161
	Trader / artisan / transport	1.38 (0.77;2.47)	
	Unemployed / retired / housewife	1.92 (0.91;4.07)	
	Student / other	1.33 (0.65;2.74)	
Education	None	1(reference)	
	Primary	0.67 (0.36;1.25)	0.054
	Secondary	0.43 (0.20;0.93)	
Childhood trauma score	Per one SD increase	1.03 (1.00;1.05)	0.017
Stigma score	Per one SD increase	1.08 (1.03;1.14)	0.002
Coping scale score	Per one SD increase	1.04 (1.01;1.08)	0.003
Resilience score	Per one SD increase	0.97 (0.95;0.99)	0.001
Religious Involvement	Per one SD increase	0.96 (0.89;1.05)	0.409
Negative religious coping	Per one SD increase	1.12 (0.91;1.36)	0.282
Positive religious coping	Per one SD increase	1.01 (0.92;1.11)	0.784
Socioeconomic Index	Per one SD increase	0.82 (0.53;1.26)	0.358

Results from the logistic regression showed that none of religious involvement (P = 0.41), positive religious coping (P = 0.77) and negative religious coping (P = 0.28) were significantly associated with major depressive disorder. Individuals from Masaka were found to be significantly more depressed than individuals from Entebbe (aOR = 2.87, 95% CI: 1.52-5.39, P = 0.001). The odds of MDD varied with marital status, being highest for those who

were widowed, followed by those who were single and lowest for those who were currently married. However this association was not statistically significant (P=0.256).

Higher negative life events (aOR = 1.12, 95% CI 0.99-1.28, P = 0.083), higher childhood trauma scores (aOR = 1.03, 95% CI: 1.00-1.05, P = 0.017), higher felt stigma score (aOR = 1.08, 95% CI: 1.03-1.14, P = 0.002), higher coping scale score (aOR = 1.04, 95% CI: 1.01-1.08, P = 0.003), lower resilience scores (aOR = 0.97, 95% CI: 0.95-0.99, P = 0.001) were associated with MDD.

Figure 3: *A Theoretical Structural Model of Factors Affecting Major Depressive Disorder (MDD) (106, 107).*



○ = Unobserved (latent) factor;

□ = Observed variable;

→ = Direction of relationship between variables and/or factors;

X1 = Socioeconomic Status Index;

X2 = Stigma score;

X3 = Positive religious coping;

X4 = Negative religious coping;

X5 = CD4 count;

X6 = WHO stage;

X7 = Study site;

X8 = Employment;

X9 = Marital Status;

X10 = Negative life Events;

X11 = Social support score;

X12 = Childhood trauma score;

X13 = Sex;

X14 = Age;

Y1 = Poor Health;

Y2 = Depression;

Y3 = Vulnerability.

Table 5 below shows results from the GSEM model.

Table 5: *Results from estimating structural models of depression.*

Characteristic (Level)	**aOR (95% Confidence Interval)**	**Likelihood Ratio P-value**
Study site	2.72 (1.70;4.34)	<0.001
Marital status	Currently married (reference)	
Widowed	1.84 (1.04;3.24)	0.035
Divorced / separated	1.56 (0.98;2.48)	0.063
Single	1.16 (0.57;2.36)	0.685
Age (years)	0.99 (0.97;1.02)	0.576
Negative life Events		
Vulnerability	2.72 (constrained)	
Sex	1.24 (0.74;2.08)	0.406
Employment	1.04 (0.99;1.10)	0.125
Childhood trauma score		
Vulnerability	7.87 (3.88;15.95)	<0.001
Stigma score	1.15 (1.10;1.20)	<0.001
Negative religious coping	1.18 (0.99;1.40)	0.061
Positive religious coping	0.95 (0.89;1.02)	0.166
Socioeconomic Status Index	0.72 (0.50;1.04)	0.079
Social support score		
Vulnerability	0.32 (0.21;0.48)	<0.001
Poor health	2.72 (constrained)	

For GSEM, odds ratios and p-values were obtained for comparison purposes. Higher negative religious coping was found to be a predictor of MDD and this was marginally significant (aOR = 1.18, 95% CI: (0.99-1.40) 1.00-1.07, P = 0.061). For a change of 5 units in negative religious coping score, the aOR for depression increases by 18 %. There was no statistical significance in the association between positive religious coping and MDD (aOR = 0.95, 95% CI: 0.89-1.02, P = 0.166).Vulnerability was found to be an important predictor of major depressive disorder. Higher negative life events score (aOR = 2.72) and higher childhood trauma score (aOR = 7.87, 95% CI: 3.88-15.95, P < 0.001) were highly associated with MDD. On the other hand, lower social support score increased the odds of MDD (aOR = 0.32, 95% CI: 0.21-0.48, P < 0.001).

There was overwhelming significant association between study site and major depressive disorder (MDD); participants from Masaka were at increased odds of MDD (aOR = 2.72, 95% CI: 1.70-4.34, P < 0.001) compared to Entebbe. The odds of MDD among PLWHA were higher among the widowed (aOR = 1.84), divorced / separated (aOR = 1.56) and those who were single (aOR = 1.16) relative to those who were married.

The odds of major depressive disorder among females was 1.24 times the odds of major depressive disorder among males (aOR = 1.24, 95% CI: 0.74-2.08, P = 0.406), but this was not statistically significant. Participants with poor health (low CD4 count and low WHO stage) had higher odds of MDD (aOR = 2.72). Moreover, GSEM results showed that socioeconomic index was marginally significant in predicting depressive symptoms. Socioeconomic status index was associated with major depressive disorder (P = 0.079). The odds of MDD decrease with increasing SES (aOR = 0.72, 95% CI: 0.50-1.04).

CHAPTER 4

DISCUSSION AND CONCLUSION

This chapter of the research report presents a brief summary of study findings, comparison of findings with previous studies, limitations experienced in the conduct of the present study, recommendations for further research and conclusion.

4.1 Summary of Study Findings

This study which investigated how religious coping mechanisms may reduce depressive symptoms among PLWHA yielded important findings. In summary, I estimated the prevalence of depression in relation to explanatory factors and the distribution of religious involvement, negative and positive religious coping by study site. I utilized logistic regression and generalized structural equation modelling (GSEM) methods to examine if religious coping mechanisms are associated with reduction in depression among PLWHA. The main explanatory variables were negative and positive religious coping mechanisms (as described in detail in the introduction and literature review sections of the research report). Additional explanatory variables included religious involvement, demographic variables, socio economic status, employment status, the study site or clinic where the participants were recruited as well as resilience score, child traumatic experience and coping score.

The results of the logistic regression procedures did not show a significant association between either negative religious coping or positive religious coping and depression. However, other explanatory variables namely stigma score, childhood traumatic experience, study site, negative life events, resilience score, coping score and education were all significantly associated with depression. On the other hand, results of the GSEM procedures

suggest that negative religious coping was marginally significant in reducing depression among PLWHA. In addition, stigma score, childhood trauma score, study site, marital status, negative life events, social support score and socio-economic status were significant in predicting depression. Thus, both modelling procedures suggest that stigma score, childhood trauma score, study site and negative life events were significantly associated with depression.

4.2 Comparison of Findings with Previous Studies

Although SEM methods have been employed in previous studies of mental health to investigate pathways between life stressors and depression (120-122), to my knowledge there are no studies that have compared the SEM and GSEM methods with logistic regression to investigate pathways between religious coping and depression in PLWHA. Thus this study makes an important contribution to the scientific literature. Below, I present comparative findings from both high and low to middle income countries:

When controlling for demographic and clinical variables, there was some evidence to suggest that negative religious coping was significantly associated with depression. The odds of depressive symptoms increase with increasing negative religious coping (aOR = 1.03). On the other hand, positive religious coping was not significantly associated with depressive symptoms. These findings are consistent with a range of previous studies. For example, Minsum and colleagues reported in 2014 in a study aimed examining the relationships of positive and negative religious coping with depression and quality of life among 198 PLWHA (52). Similarly, Pargament and colleagues suggest that negative religious coping may directly predict individuals' adjustment to stress thereby reducing the odds of depression (55).

Contrary to several studies, in my study, religious involvement was not predictive of depression in both approaches (123, 124). In a 10 year longitudinal study on 114 adult offspring of depressed and non-depressed parents, Miller and colleagues suggested that recognition of the importance of religious involvement might have a protective effect against recurrence of depression (125). Consistent with reported correlation between HIV related stigma and depressive symptoms, our results from both logistic regression and generalized structural equation modelling suggest that HIV related stigma was statistically significant in predicting depressive symptoms (44, 77). In this study, study site was a predictor of depression among PLWHA which was consistent with previous literature (77, 126). Participants from Masaka (rural) were found to be significantly more depressed than individuals from Entebbe (semi-urban). In a study on depression and its associated factors on 137 HIV-positive women in South India, Unnikrishnan and colleagues found that rural women were more depressed than urban women (127). The prevalence of MDD was higher in Masaka than in Entebbe. The baseline parent study also found the prevalence of MDD to be higher in Masaka than in Entebbe, but did not offer any possible reasons for this (128). Olley and colleagues suggested that in Nigeria, cultural attitudes and interpretation of life events in rural settings may predispose PLWHA more to depression compared to those living in the urban areas (77, 127).

It also emerged from our study in both approaches that women were more likely to be depressed than males but this finding was not found to be statistically significant. This result is not surprising. Several studies from Uganda and other low and middle income countries suggest that females may be at higher risk of depression compared to males (129-132). In a community-based survey conducted by Kinyanda and colleagues in 14 districts in Uganda, females were 1.7 times more likely to be at risk of experiencing depressive symptoms

compared to males (126). Similarly, Patel and colleagues who have worked in India suggest that women are disadvantaged socially and thus are at higher risk of depression compared to men (133). For instance, women are faced with primary social roles such as child bearing as well as reduced control over financial resources (133, 134). Moreover, some studies have suggested that females are more prone to become victims of sexual, physical and emotional abuse both in childhood and in adulthood and more predisposed to depression compared to their male counterparts (135, 136).

While overall marital status was not significantly associated with MDD, the results of both the multiple logistic regression model and the GSEM suggest that currently married people are at a lower risk of depression which is consistent other studies (20, 132, 137, 138). In a cross-national population based study aimed at estimating the rates and patterns of depression, Weissman and colleagues suggested that marriage provides a support system which is protective against depression (139).

The finding that childhood trauma and resilience score are predictive of depression is similar to several previous studies (140-142). From a convenience sample of 95 women infected with HIV in peri-urban communities in the Western Cape, South Africa, Spies and colleagues suggested that higher levels of resilience scores were associated with reduction of depression while childhood trauma placed individuals at higher risk of comorbid depression (140). Furthermore, from the GSEM results, the odds of depression were found to decrease with increasing socioeconomic status. In a National Population Health Survey in Canada, Wang and colleagues also suggest that financial burden in people of lower socioeconomic status placed people at risk of depression (143). In addition they found participants who had lower education status had a higher incidence of depression than those who had higher education

(OR=1.86, 95% CI: 1.28-2.69). From our findings, it emerged that higher education level was protective against depression. Participants who had no formal education had higher odds of depression compared to those who had at least primary education or secondary education and above. In our study, social support had protective influence on depression (OR = 0.32 95% CI: 0.21-0.48 P < 0.0001). This is consistent with several studies. For example, a report from India on anxiety and depression among HIV-infected heterosexual, poor social support from family was significantly associated with depression (144, 145). There were possible interactions between SES, study site and education level. However these were not explored as the models in GSEM diverged. For a similar reason the covariance between vulnerability and poor health that could influence MDD was not adjusted for.

In our study, GSEM seemed to give more insight in exploring the relationship between religious coping and depression. GSEM offered an advantage over logistic regression in the following way: Two latent constructs of interest (poor health and vulnerability) were associated with MDD. Despite being constrained in the model, the estimates (adjusted odds ratios) were considerably high. This could not be explored by logistic regression.

4.3 Limitations of the Study

Study design and conduct

The study design is cross-sectional and thus difficult to infer causality. In addition, the study excluded participants with defaulted appointments. This poses a likelihood of selection bias since depression is independently predictive of adherence to medical treatment (105, 146, 147). Furthermore, the assumption in the main study that episodes of depression would run within 6 months was not entirely met since 8.4 % of the participants only went into remission after the stipulated 6 months (105, 148).

Analysis

Analysis limitations of the study include the fact that there is no statistical test to objectively test goodness of fit for GSEM in Stata/IC. This makes it difficult to determine which of the approaches, GSEM or logistic regression, is superior over the other. Furthermore, GSEM requires a simple model in model specification to ensure model convergence. This is a draw back for analysis of complex models. Moreover, religious practices of participants might be time dependent rather than fixed. This creates need to treat religion variables as time varying covariates which is only possible in longitudinal data analysis rather than cross sectional data analysis. In our study, the number of outcome events (MDD) per independent variable (EPV) is less than 10. (59/15 = 3.9), and therefore the algebraic models in the logistic regression and GSEM may be unreliable (few events to estimate all the covariances) leading to imprecise or spurious results as stated by J Concato and Feinstein (149, 150).

4.4 Recommendations for Further Research

The causality of the differential effects of religious coping on depression can be studied by utilizing a longitudinal study design. Furthermore, investigating the change of religious coping strategies of participants across time as well as long-term consequences of each coping method will clarify the correlation implications of the coping strategies. Given that there was some evidence of a significant association between depression and negative religious coping, it may be of interest for future investigations to further explore the effect of religious coping and its interaction with other factors that are related to religious experiences. In addition, the development of context specific measures of religiosity might be appropriate.

Lastly there is a need for incorporating genetic and environmental factors that influence depression in any given country in sub-Saharan Africa (105, 151).

4.5 Conclusion

In conclusion, in comparing GSEM and logistic regression, the results obtained in this study suggest that the approaches differ only slightly. Of note was the additional statistical significance of negative religious coping and socioeconomic status in predicting depression from the GSEM approach. These findings, however, do not suggest superiority of either GSEM or logistic regression over the other, but guide researchers to consider utilizing GSEM in analyzing mental health data. The two approaches: GSEM and logistic regression yielded different risk factors for depression. However, both approaches suggest that in investigating factors that influence depression, stigma score, childhood trauma score, study site, marital status and negative life events should be considered.

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APPENDICES

Appendix 1: Plagiarism Declaration Form

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I **__ GLORY CHIDUMWA __** (Student number: _**1332997**_) am a student registered for the degree of **Master of Science in Epidemiology in the field of Biostatistics** in the academic year **2017**.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.

Signature:  Date: _____10/11/2017_____

Appendix 2: Ethics clearance certificate

R14/49 Mr Glory Chidumwa

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M170114

NAME: (Principal Investigator)	Mr Glory Chidumwa
DEPARTMENT:	School of Public Health Division of BioStatistics
PROJECT TITLE:	Religious Coping Mechanism in Reducing Depression among PLWHA: Comparison of Structural Equation Modelling and Logistic Regression
DATE CONSIDERED:	27/01/2017
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Jonathan Levin and Sumaya Mall
APPROVED BY:	Prof P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	10/02/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 301, Third floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in January and will therefore be due in the month of January each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

23/02/2017
Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix 3: Religious Coping Questionnaire

	QUESTION	**RESPONSE**	**DATA-ENTRY**
1a	Study I.D. Number *EKIKA KYOKUNOONYERERA KUNO*	……	PATID
1b	Study site where respondent is registered	1= TASO Entebbe 2= TASO Masaka 3= Others (specify) ……	STUDSITEC VX
1.2a	Do you regularly practice the Catholic religion? *Otera okusoma eddini eyabakatoliki ?*	1=Yes, *Yee* 2=No, *Nedda*	RELIGCAT
1.2b	Do you regularly practice the Protestant religion? *Otera okusoma eddini eyabakulisitaayo ?*	1=Yes, *Yee* 2=No, *Nedda*	RELIGPROT
1.2c	Do you regularly practice the Muslim religion? *Otera okusoma eddini eyabasiraamu?*	1=Yes, *Yee* 2=No, *Nedda*	RELIGMOSL
1.2d	Do you regularly practice the Seventh Day Adventist religion? *Otera okusoma eddini eyabadiventi?*	1=Yes, *Yee* 2=No, *Nedda*	RELIGMOSL
1.2d	Do you regularly practice the Seventh Day Adventist religion? *Otera okusoma eddini eyabadiventi?*	1=Yes, *Yee* 2=No, *Nedda*	RELIGSDA
1.2d	Do you regularly practice the 'Born Again' religion? *Otera okusoma eddini eyabalokole?*	1=Yes, *Yee* 2=No, *Nedda*	RELIGBORN
1.2d	Do you regularly practice Traditional religion? *Otera okwettanira eby'ekinansi?*	1=Yes, *Yee* 2=No, *Nedda*	RELIGTRAD

Section 3A: DUKE Religious Index

	QUESTION ***EKIBUUZO***	**RESPONSE** ***EKIDDIBWAMU***	**DATA-ENTRY**
2a.1	How often do you attend church or other religious meetings? *Emirundi emeeka gyogenda mu kannisa/ekeleziya oba enkungaana endala ez'eddini?*	1= Never 2 = Once a year or less 3 = A few times a year 4 = A few times a month 5 = Once a week 6 =More than once/week 1 = *Sigendangayokko* *2 =Omulundi gumu omwaka oba noobutatuukayo* *3 = Emirundi mitono nnyo mumwaka* *4= Emirundi mitono nnyo mumwezi* *5 = Omulundu gumu mu wiiki* *6 = Okussuka omulundi gumu mu wiiki*	DUKEONE
2a.2	How often do you spend time in private religious activities, such as prayer, meditation or Bible study? *Emirundi emeeka gyomaala nga oli mubikolwa ebyekuusa ku by'eddiini nga oli wekka, gamba nga okusaaba, okufumiitiriza ku by'eddini oba okusoma ekigambo kya katonda?*	1 = Rarely or never 2 =A few times a month 3 =Once a week 4 =Two or more times/week 5 =Daily 6 =More than once a day *1= Siteera oba sikyikolangako* *2 = Emirundi mitono nnyo mumwezi* *3 = Omulundu gumu mu wiiki* *4 = Emirundi ebiri oba okusuukamu mu wiiki* *5 = Buli lunaku* *6 = Okussuka mu mulundi gumu olunaku*	DUKETWO

The following section contains 3 statements about religious belief or experience. Please mark the extent to which each statement is true or not true for you.

Ekitundu ekiddakko wansi kirino ebintu bisatu ebyekuusa ku nzikiriza oba byewali oyiseemu olwe'nzikiriza

	QUESTION ***EKIBUUZO***	**RESPONSE** ***EKIDDIBWAMU***	**DATA-ENTRY**
2a.3	In my life, I experience the presence of the Divine (i.e., God) *Mubulamu bwange mpuliira okubeerawo kwa oyo ali wagulu (Katonda)*	1 = Definitely not true 2 = Tends not to be true 3 = Unsure 4 = Tends to be true 5 = Definitely true of me *1 = Ddala sikituufu* *2 = Ndowooza kituufu* *3 = Ssikikakaasa* *4= Ndowooza kituufu* *5= Ddala kituufu kunze*	DUKETHREE
2a.4	My religious beliefs are what really lie behind my whole approach to life *Enzikiriza yange mu ddini yeli emabeega wa buli kyenkola mu bulamu*	1 = Definitely not true 2 = Tends not to be true 3 = Unsure 4 = Tends to be true 5 = Definitely true of me *1 = Ddala sikituufu* *2 = Ndowooza kituufu* *3 = Ssikikakaasa* *4= Ndowooza kituufu* *5= Ddala kituufu kunze*	DUKEFOUR
2a.5	I try hard to carry my religion over into all other dealings in life *Nfuba nnyo okulaba nti eddini yange ngiyingiza mu bintu ebirala byonna byenkola mu bulamu*	1 = Definitely not true 2 = Tends not to be true 3 = Unsure 4 = Tends to be true 5 = Definitely true of me *1 = Ddala sikituufu* *2 = Ndowooza kituufu* *3 = Ssikikakaasa* *4= Ndowooza kituufu* *5= Ddala kituufu kunze*	DUKEFIVE

Section 3B: Brief RCOPE

The following items deal with ways you coped with a HIV and its associated problems in your life. There are many ways to try to deal with problems. These items ask what part religion played in what you did to cope with this illness. Obviously different people deal with things in different ways, but we are interested in how you tried to deal with it. Each item says something about a particular way of coping. We want to know to what extent you did what the item says. How much or how frequently. Don't answer on the basis of what worked or not – just whether or not you did it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

1 = Not at all
2 = Somewhat
3 = Quite a bit
4 = A great deal

Ebintu wano wammanga byogera kungeri gye wezzamu amaanyi okuva lwe wakimanya nti olina obulwadde bwa mukkenenya. Waliiwo engeri nnyingi ezo kugumiramu ebizibu. Bino wammanga bibuuza engeri gye wakozesamu eddini okwezzamu amanyi bwe wakizuula nti olina obulwadde bwamukenenya. Kirabika bulabisi nti abantu ab'enjawula bakozesa engeri zanjawulo naye kye twagala okumanya yengeri gwe gyewezzamu amaanyi. Twagala okumanya bwenkaanyi kki bwe wakozesa engeri zino wamanga. Bungi kki era emirundi emeeka. Toddamu kusinzira kuba oba kyakola oba nedda- naye sinzira nti oba wakikozesa oba nedda. Damu nga okozesa ebiri wano wammanga. Gezaakko okuteeka buli kimu mumitendera mu mwoyo gwo kyokka nakyokka. Ebyokuddamu byo bibeere nga gyoli bituufu nga bwe kisoobaoka
1= Nedda
2 = Akatono
3 = Emirundi egimu
4 = Nnyo nyo ddala

	QUESTION ***EKIBUUZO***	**RESPONSE** ***EKIDDIBWAMU***	**DATA-ENTRY**
2b.1	Looked for a stronger connection with God. *Nanoonya enkolagana essingawo ne katonda*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPEONE
2b.2	Sought God's love and care. *Nanoonya obwagazi bwa katonda no kufaayo kwe*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal	RCOPETWO

	QUESTION ***EKIBUUZO***	**RESPONSE** ***EKIDDIBWAMU***	**DATA-ENTRY**
		1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	
2b.3	Sought help from God in letting go of my anger. *Nanoonya obuyambi bwa katonda okwewonya obusungu/ ekiruuyi*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPETHREE
2b.4	Tried to put my plans into action together with God. *Nageezako okuteeka enteegeka zange wamu ne katonda*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPEFOUR
2b.5	Tried to see how God might be trying to strengthen me in this situation. *Nageezako okulaba engeri Katonda gyayinza okubeera nga angumyamu mumbeera eno*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPEFIVE
2b.6	Asked forgiveness for my sins. *Nasaba okusonyiyibwa ebibi byange*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono*	RCOPESIX

	QUESTION ***EKIBUUZO***	**RESPONSE** ***EKIDDIBWAMU***	**DATA-ENTRY**
		3 = Emirundi egimu *4 = Nnyo nyo ddala*	
2b.7	Focused on religion to stop worrying about my problems. *Nakozesa eddini okulekeraawo okwelarikirira ebizibu byange*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPESEVEN
2b.8	Wondered whether God had abandoned me. *Nalowooza nti oba Katonda andekulidde*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPEEIGHT
2b.9	Felt punished by God for my lack of devotion. *Nalowooza nti Katonda ambonereza olwobuteewayo bwange yye*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPENINE
2b.10	Wondered what I did for God to punish me. *Nebuuza kki kyenakola okubonerezebwa Katonda*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu*	RCOPETEN

	QUESTION ***EKIBUUZO***	**RESPONSE** ***EKIDDIBWAMU***	**DATA-ENTRY**
		4 = Nnyo nyo ddala	
2b.11	Questioned God's love for me. *Nabuusabuusa okwagala kwa Katonda gyendi*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPEELEVEN
2b.12	Wondered whether my church had abandoned me. *Nalowooza nti oba ekannisa yange endekulidde*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPETWELVE
2b.13	Decided the devil made this happen. *Nasalawo nti setaani ye yakireeta okubaawo*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPETHIRTEEN
2b.14	Questioned the power of God. *Nabusabusa amaanyi ga katonda*	1 = Not at all 2 = Somewhat 3 = Quite a bit 4 = A great deal 1= *Nedda* *2 = Akatono* *3 = Emirundi egimu* *4 = Nnyo nyo ddala*	RCOPEFORTEEN

Note: For each assessment, there is a scoring algorithm leading to one of three acuity ranges: Low, Moderate, or High.
Each of the 7 items of Negative Coping is scored 1-4, as indicated below.
Negative coping score is calculated as follows:

Low Spiritual Struggle: (All items = 1) or (6 items=1 and 1 item=2).
Moderate Spiritual Struggle: (Two items = 2 and remaining items = 1).
High Spiritual Struggle: (Two or more items = 3 or 4) OR (Three or more items are > or = 2) OR (one item = 2 and one or more
items = 3 or 4).

Appendix 4: Data Collection Tools for this Study

	Instrument used	Description	Questions or categories (examples)	Cronbach's Alpha	Remarks
Group 1 factors (socio-demographic factors)					
	study site, sex, age, marital status, highest educational attainment, religion, employment status, Socio-economic index (SEI)	SEI was constructed from commonly available household items in a typical Ugandan household, has previously been used by this group	Examples of questions in the SEI: does your household have electricity? Response: Yes/no Index created by totaling up all positive items		Has previously been used by this study group.
Group 2 A factors					
Cd4 counts	CD4 count taken in the last 6 months				
Who clinical stage for HIV/AIDS	WHO Clinical Staging criteria		Respondents classified as Stage I to IV based on the presence/absence a combination of 17 HIV associated clinical symptoms		
HIV associated neurocognitive impairment **Body weight (kg)**	International HIV Dementia scale	3-item question assesses motor, psychomotor and memory impairment	Memory -Ask the patient to recall the four words. Maximum total score is 16		
Degree of disability	Sheehan Disability Scale (SDS)	Assesses degree of impairment in 3 domains work/school, social life and home life or family responsibilities.	Use a 10-point visual analog scale to assess each of the 3 domains		

	Instrument used	Description	Questions or categories (examples)	Cronbach's Alpha	Remarks
		are impaired by his or her symptoms on a 10 point visual analog scale.			
Childhood trauma	Childhood Trauma Questionnaire Short Form CTQ-SF	28-item questionnaire on traumatic events in childhood	Selected examples: Did your mother die? Response: 1= Yes 2= No	0.88	Employed for the first time. Reverse scored items: 2, 5, 7, 10, 13, 16, 19, 22, 28.
Social support	Multidimensional Scale of Perceived Social Support MSPSS	12-item question perceptions of support received	Does your family support you? 7-point Likert scale: very strongly disagree / strongly disagree / etc.	0.85	Employed for first time.
HIV felt stigma	Brief HIV Stigma Scale	10-item question experiences, feelings, and opinions as to how PLWHA are treated	I have been hurt by how people reacted to learning I have HIV. 4-point Likert scale: strongly disagree /disagree/ agree/etc.	0.77	Employed for first time.
Negative coping style	Carver Brief COPE	28-item question style of coping with stress	I've been turning to work or other activities to take my mind off things.	0.69	Employed for first time. Reverse scored items: 1, 2, 5,
			4-point Likert scale: I haven't been doing this at all/ I've been doing this a little bit / I've been doing this a medium amount/ etc.		7, 10, 12, 14, 15, 17, 18, 19, 20, 22, 23, 24, 25, 27, 28.
Resilience	Connor–Davidson Resilience Scale CDRISC	25-item question stress coping ability	I am able to adapt when changes occur. 5-Likert scale not true at all/ rarely true/ sometimes	0.93	Employed for first time.

	Instrument used	Description	Questions or categories (examples)	Cronbach's Alpha	Remarks
			true/ etc.		
Family history of mental disorder		1-item	Have any members of your family ever been diagnosed with a psychiatric disorder? Responses: yes/no		Has previously been used by this study group.
When did you know your HIV status?	One item question	Closed question	When did you know your HIV status? Responses: 1=less the 3 months ago; 2= between 3 and 6 months ago; 3= between 6 and 12 months ago; 4=more than 12 months ago		Previously used in the HIV situation of Uganda by authors.
Group 2 B factors					
Negative life events	Modified Adverse life events module of the European Parasuicide Interview schedule EPSIS	27-item questi. on adverse life events experienced in the last 6months with related to parents, sibling, children and self.	Did your father die in the last 6 months? Response: yes/no Index created by totalling up positive items		Previously adapted to the Ugandan sociocultural context and used in HIV research [6–8].
Stress	Derived from items of the Modified adverse life events module of the EPSIS	27-items based on an objective measure of stress	Different life events were weighted on an objective assessment of stress e.g. death of spouse or child in the last 6 months was given a stress score of 5; sickness of important others a stress score of 2, etc. Stress Index was created by totaling		A previous version of this scale has been used in the HIV situation of Uganda by authors.

	Instrument used	Description	Questions or categories (examples)	Cronbach's Alpha	Remarks
			up all the scores.		
Food insecurity	One item question	Closed question	In the last month, did you or your family have enough food? Response yes/no		Previously used in the HIV situation of Uganda by authors.