

**The Mental Wellbeing of Women living with HIV in South Africa: the Ndlovu
Cohort Study**

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Abstract

Background: Prior research has shown that women in South Africa are more vulnerable to HIV infection due to gender inequalities. Additionally, people living with HIV (PLHIV) are more likely to suffer from mental illnesses than people who do not live with HIV.

Furthermore, HIV-related stigma is considered to be a risk factor for mental illness among PLHIV. The socioeconomic position as well as relationship status also influence the mental health of PLHIV, and specifically women. This research will clarify the interplay between sex and mental health outcomes while analyzing whether sex causes differences in education, employment, and relationship status, which in turn may cause differences in HIV-related stigma which altogether may affect the mental health outcomes of PLHIV in South Africa.

Methods: Using data from the baseline questionnaire of the Ndlovu cohort study conducted in Moutse area, South Africa, this study performs a serial multiple mediation analysis on 855 PLHIV following the four-step model by Baron & Kenny (1986).

Results: No serial multiple mediation was observed. Relationship status is the only mediator between sex and mental health as the beta coefficient of sex decreased from $B = -.080$ ($p = .011$) to $B = -.149$ ($p < .001$).

Conclusion: The findings indicated that women living with HIV are more likely to be in an unstable relationship and that it may increase mental health issues. As in patriarchal systems an unstable relationship may come with other disadvantages caused by gender inequalities, there may be many more reasons for increased mental health issues among women living with HIV. Therefore, it is important to continue research on this topic and implement policies and interventions to alleviate the mental burden on women living with HIV in South Africa.

Introduction

Problem Statement

HIV is a worldwide public health issue to this day, having caused almost 33 million since its discovery in the 1980s (WHO, 2020). South Africa is particularly affected by HIV as it is the country with the largest HIV burden globally with 7.5 million people living with HIV (PLHIV) in 2019 (Sato & Boyer, 2019; UNAIDS, 2019). Furthermore, studies have shown that women in South Africa are generally more vulnerable to HIV infection not only in relation to biological reasons but also due to social and cultural reasons (Pengpid, 2013). This is because gender inequalities inhibit women's possibility to offer resistance against certain sexual practices and practice methods to reduce HIV risk (Pengpid, 2013). Furthermore, limited education and economic dependency are very common in relationships where men have significantly more power in decision-making (Pettifor et al., 2012). Ultimately, gender inequalities are perceived to be the main drivers of the HIV expansion among women globally (Krishnan et al., 2008).

HIV treatment and prevention have progressed considerably in South Africa (Chan et al., 2015). However, discrimination and stigma are still significant factors posing a barrier to successful HIV management (Chan et al., 2015). A common consequence is that PLHIV often hide their status from their family members, communities, workplaces, and sexual partners (Kalichman et al., 2018). Awareness of the discrimination and exclusion due to experienced stigma has negative effects on the mental health of PLHIV (Bos et al., 2013). Therefore, PLHIV are more likely to experience a mental health disorder than people without HIV (Remien et al., 2019). Social stigma can trigger mental ill-health and major depressive disorder in particular, which has shown to contribute to PLHIV not seeking health care and adhere to antiretroviral therapy (ART), hence increasing their mortality (Passchier et al., 2019).

This study aims to analyze to what extent there are sex differences in mental health outcomes of PLHIV and explores which factors may contribute to those sex differences. Ultimately it aims to clarify the factors influencing mental health outcomes in women living with HIV (WLHIV) in South Africa. More attention should be given to the reasons for the inequalities between men and women in society and the factors associated with WLHIV's mental wellbeing (UNAIDS, 2018). Research is the first step to change and will provide implications for change that will ultimately benefit WLHIV's wellbeing and health. Also, HIV is a virus that affects almost one-eighth of the South African population which means that any social problems caused by HIV can be seen as societal issues (UNAIDS, 2019). Therefore, this study proves useful for both South Africa's population and other countries with similar societal structures. Furthermore, this research contributes to existing scientific knowledge as there is not enough research on the relationship between education and employment and HIV-related stigma as explored in this study. This may help advance research and provide suggestions for interventions aiming at helping WLHIV in South Africa and improving their mental wellbeing.

Existing Research

HIV infection can negatively influence PLHIV's mental wellbeing and consequently lead to lower adherence to HIV medication (Remien et al., 2019). Living with HIV can cause a lot of stress for PLHIV and either intensify already existing mental health issues or cause them (CDC, 2020). The risk of getting diagnosed with a mental disorder is far higher when living with HIV (Rooks-Peck et al., 2019). This is evident by the fact that approximately half of all PLHIV receive a diagnosis for a psychiatric disorder at some point. Impaired mental wellbeing combined with an HIV infection may lead to lower adherence to ART or even refusal of HIV medications which may have the consequence that those PLHIV are not virally suppressed and are therefore able to transmit HIV to others and have increased mortality (Rooks-Peck et al., 2019). To prevent this, it is crucial to determine the factors influencing the mental wellbeing of PLHIV.

Many PLHIV in South Africa suffer from mental health disorders (Remien et al., 2019). In South Africa, 26-38% of PLHIV are estimated to have severe mental health issues compared to 13% in the general population. Especially elevated levels of depression and anxiety can be observed in PLHIV compared to people not living with HIV in South Africa (Thomas et al., 2017). Major depressive disorder is the most common mental illness affecting PLHIV in Sub-Saharan Africa with prevalence rates ranging from 11% to 38% (Passchier et al., 2019).

Stigma and Wellbeing of PLHIV

Stigma is one of the major risk factors for mental illness among PLHIV and can cause an internalization of those stigmatizing attitudes (Bos et al., 2013). PLHIV are often confronted with HIV-related stigma as its contraction is associated with sex work, drug use, homosexuality, and promiscuity which are highly stigmatized in South Africa (Bos et al., 2013). Stigma can lead to discriminatory behavior from individuals, groups of people, as well as designated service providers of health facilities tasked with helping the individual (Nyblade et al., 2019). Awareness of social stigma and discrimination may lead to internalized stigma which can be described as an internalization of stigmatizing attitudes and behavior by others. Internalized stigma is one factor that may influence PLHIV's mental wellbeing and self-worth and is quite common in Sub-Saharan Africa with the prevalence ranging from 14 to 26% across countries (Bos et al., 2013, Tsai, 2015). Internalized stigma inhibits PLHIV from coping with their HIV diagnosis healthily and contributes to lower ART adherence or even ART refusal (Earnshaw et al., 2018).

Fear of Transmission

Mental health issues combined with an HIV infection may create a fear of transmitting HIV to others (McHenry et al., 2016). However, if HIV medication is taken regularly, transmission is very unlikely (Peyre et al., 2019). The fear of transmission even when virally suppressed may be due to an internalization of stigmatizing attitudes by others

(McHenry et al., 2016). A common way of transmission is through sexual intercourse. Many PLHIV struggle with their sexual life due to the fear of transmission or fear of/ experienced rejection by partners with stigmatizing attitudes which means that many PLHIV abstain from sex completely (Peyre et al., 2019). Another study by Schuster et al. (2005) discovered that 36% of parents were afraid of transmitting HIV to their children through casual contact including sharing devices (15%) and kissing them on the lips (19%) – cases where transmission is biologically very unlikely (Schuster et al., 2005). These are examples that illustrate the way PLHIV internalize the social stigma they experience. Luckily, mother-to-child transmission through pregnancy has significantly decreased due to HIV treatment and is becoming less of an issue (Cowgill et al., 2008).

Socioeconomic Position and Wellbeing of PLHIV

The socioeconomic position has an effect on mental wellbeing. Studies have shown that employment may positively influence mental wellbeing, whereas unemployment may have the opposite effect (Rueda et al., 2012-a). The prevalence of unemployment in South Africa is higher in PLHIV than in the general population, ranging from 45% to 62%, which may be a factor increasing the risk of mental disorders among PLHIV (Rueda et al., 2012-b). Furthermore, precarious employment is associated with lowered mental wellbeing in men living with HIV which indicates that job security determines differences in mental health outcomes. In contrast, job security does not show a significant effect for WLHIV, implying that being employed is more important to WLHIV than its level of security. This might be the case because men are usually responsible for earning the money in the family which means that being in insecure employment may be more stressful for men than for women. At the same time, women are more vulnerable by being disadvantaged in education, income, and employment. This cumulative effect might lead WLHIV to focus more on other challenges that they perceive to be more stressful. Besides, women are generally more likely to work in precarious employment which means they might already have lower expectations of job security than men (Rueda et al., 2012-b).

The Reinforcement of Patriarchal Systems and its Effects on WLHIV

Employment is not the only factor where gender differences can be found among PLHIV. Gender issues can have an impact on all parts of society and are perpetuated by many institutions in South Africa. An example of that is the Christian church of which 79.8% of South African citizens are members (Eriksson et al., 2010). The Christian church has a large influence on society, formulating stigmatizing HIV prevention messages that influence the gendered difference in the perception and treatment of PLHIV. Whilst women are not allowed to engage in pre-marital sex, it is more accepted that men have an active sexual life regardless of their marital status. This already implies that women may be particularly stigmatized for their HIV status if unmarried (Hargreaves et al., 2018). Furthermore, a study by Eriksson et al. (2010) notes that Christian communities perpetuate patriarchy where women are undermined and have become invisible and passive in patriarchal institutions. At the same time, the Christian church in South Africa avoids open discussions about premarital sex as it is regarded as a sin and therefore fails to address young unmarried members, in turn further contributing to the aforementioned HIV-related stigma (Eriksson et al., 2010).

These patriarchal values can also be observed in married women in South Africa. Whilst they are expected to be faithful to their husbands, men are often even encouraged to have multiple sexual partners (Lekalakala-Modgele, 2016). Generally, men are less willing to get tested for HIV and are therefore often unaware of their status which makes women more vulnerable to HIV infection and transmission. Even though women in South Africa have limited authority over their sexual lives and bodies due to gender bias, they are blamed more often for spreading HIV than men (Lekalakala-Modgele, 2016).

Theoretical approach

The overall aim of this research project is to examine sex differences in the mental health outcomes among PLHIV in South Africa. Women in South Africa have shown to be

less educated and less likely to be employed compared to men (Klaas et al., 2018). Research has implied that the mental wellbeing of women in South Africa would significantly be improved if they had better access to education and had more job opportunities (Pettifor et al., 2012). Another study discovered that women who reported having relationship problems were most likely to seek mental health counseling (Pillay & Kriel, 2006). Furthermore, depending on their relationship status the likelihood of experiencing HIV- related stigma differs for women living with HIV (Hargreaves et al., 2018).

The theoretical framework for this research draws on the integrated model of the gendered stress process by Swendeman et al. (2018) whereby the authors combined the theory of gender and power by Connell (1987) with the stress process model by Pearlin et al. (1981). This integration allows for explanations for gender imbalances in power resulting from institutional and social structures, but also for explanations for mental health differences created by social stratification. According to the model, there are three main structures responsible for gender inequities. These include the difference in social norms between men and women and the division of power and labor. Together they can result in occupational segregation, lower expectations for women at work, schools, and institutions in general, and less control over resources. As women are in a disadvantaged position, they become more vulnerable to diseases, including HIV and mental illnesses. The model, therefore, explains how a PLHIV's status affects their access to resources and vulnerability to stressors which determines their mental health, and how this may be different across genders (Swendeman et al., 2018).

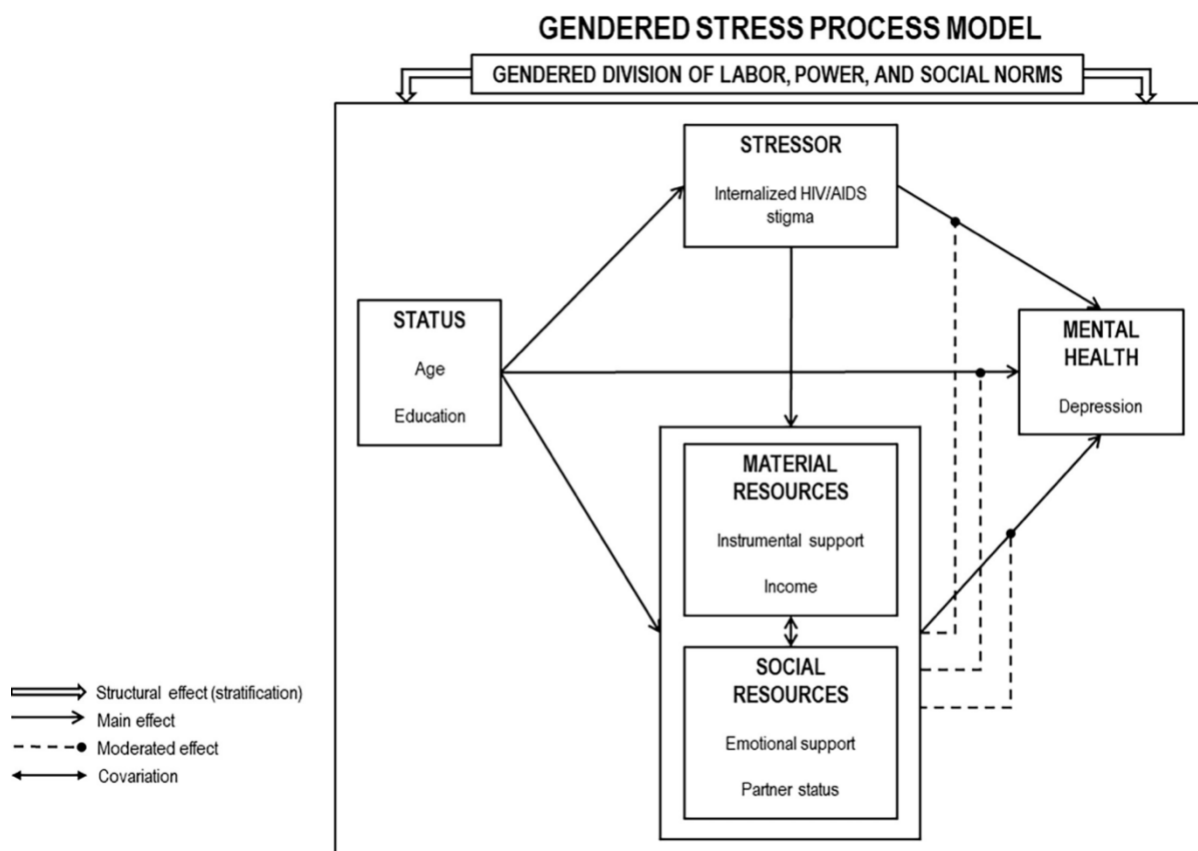
As seen in Figure 1, the gendered division of labor, power, and social norms has a structural effect on the whole model. While status (age and education) has a main effect on mental health (depression), it also affects the stressor (internalized HIV/AIDS related stigma) as well as material resources (instrumental support and income) and social resources (emotional support and partner status) which are covariates. In addition, the stressor has a main effect on material and social resources. Furthermore, the stressor and

the material and social resources have a main effect on mental health. Lastly, the material and social resources also have a moderated effect on mental health, the relationship between the stressor and mental health, and the association between status and mental health.

This interdisciplinary model will help guide this research by illustrating the interrelationships between each of the determinants and yield results that demonstrate the effect of gender division on the mental wellbeing of WLHIV in South Africa.

Figure 1

Gendered Stress Process Model (Swendeman et al., 2018)



Research question

The current study focuses on sex differences in mental health outcomes for PLHIV in South Africa and the influence of socioeconomic indicators and HIV-related stigma on those

differences. Research has shown that women and especially WLHIV face many disadvantages in South African society compared to men (Pengpid, 2013). Those disadvantages include lower education, economic inferiority, and multifaceted difficulties depending on their relationship status. It is unclear how these disadvantages manifest in the mental health outcomes of WLHIV and how they relate to each other. Therefore, this study will investigate the differences in mental health outcomes between men and women and the influence of socioeconomic indicators and HIV-related stigma on those outcomes in South Africa.

Inspired by the Gendered Stress Process model by Swendeman et al. (2018), a serial multiple mediation model was created to illustrate some of those aforementioned relationships (Figure 2). The conceptual model displays the direct and indirect interplay between sex and mental health outcomes while modeling a process in which sex causes differences in education, employment, and relationship status, which in turn causes differences in HIV-related stigma which altogether affects the mental health outcomes of PLHIV in South Africa.

The following hypotheses will be tested:

H(1) Female PLHIV are expected to have lower mental health outcomes than male PLHIV.

H(2) Education, employment, and relationship status are expected to mediate the relationship between sex and mental health.

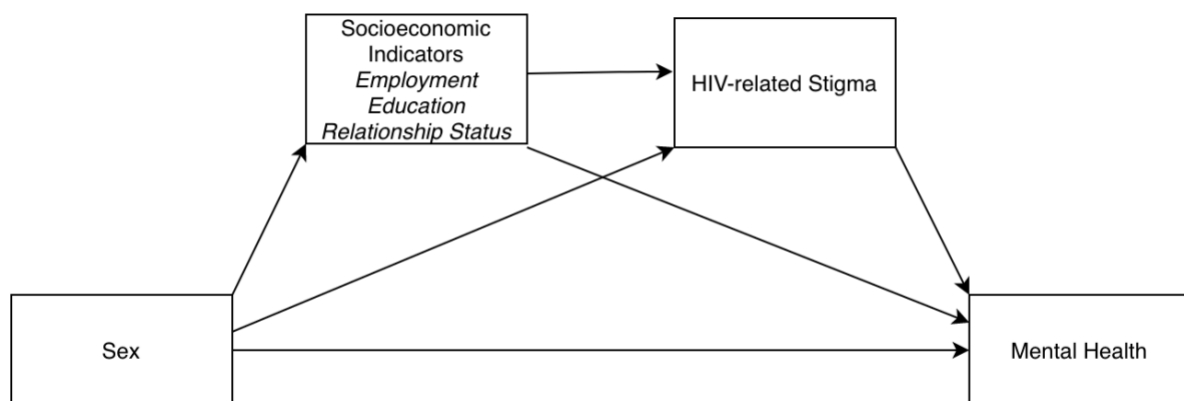
H(3) Education, employment, and relationship status are expected to be predictors for HIV-related stigma.

H(4) HIV-related stigma is expected to increase the risk of mental illness among PLHIV.

WLHIV are expected to have more mental health problems which is mediated by lower education, unemployment, and not having a stable relationship, which affects stigma and altogether more directly shapes mental health. Based on the hypotheses, the following research question will be examined: *Do mental health outcomes differ between men and women living with HIV and do education, employment, and relationship status each account for differences in HIV-related stigma which together influence the mental health outcomes of men and women living with HIV?*

Figure 2

Serial Multiple Mediation Model



Methods

Design and procedures

To investigate sex differences in mental health outcomes for PLHIV in South Africa, a quantitative research design will be used. Existing data from the baseline questionnaire of the Ndlovu cohort study conducted in Elandsdoorn, a rural township in the Moutse area, Limpopo Province, in South Africa will be analyzed to explore the research question. Whilst the Ndlovu study's primary aim is to estimate the risk of cardiovascular disease among PLHIV, the baseline questionnaire provides data that can also explore the beforementioned research focus. Quantitative data was collected dating from November 2014 to August 2017 (Vos et al., 2020).

Study population and sampling

The Ndlovu study is a prospective cohort study that recruited 1040 HIV-uninfected and 887 PLHIV of which 362 are WLHIV (Vos et al., 2017, Vos et al., 2020). In this research, all PLHIV of the cohort will be included. Eligible participants were people above the age of 18 living within a 30 km radius around the Ndlovu Medical Center, who provided written, informed consent and committed to a long-term follow-up. It is suggested that the study population represents a typical rural South African district, and the participants were recruited through community campaigns, in shopping areas, and local events by the community liaison officer and a team of counselors at the Ndlovu Medical Center HIV clinic (Vos et al., 2017).

Data collection

The data was collected through the study participants who filled out the baseline questionnaire. The data relevant for this research can be categorized into "General characteristics" and "Social and psychological aspects" (Vos et al., 2020). General characteristics include an assessment of the eligibility criteria and a signed informed consent

form. Furthermore, information on demographics, sex, age, general health, and HIV testing was collected. The data provides details on the participants' full medical history and current conditions and treatments, including HIV. Regarding the social and psychological aspects, information on employment, income position, and household support, the impact of stigma, sexual history in the past 12 months, quality of life, and social support was collected (Vos et al., 2020).

Measures

The data relevant for this research are the questions on demographics, the mental health questionnaire, and stigma.

Demographics. Sex was measured as a categorical variable with two answer options (female or male). Female was coded as the reference point (=0). Education was measured on an ordinal scale with six answer options (none, primary school completed, secondary school completed, matric, technicon/college, or university), and relationship status is categorical with eight answer options (married, life partner, living together >50% of the time, single, divorced, widowed, multiple partners or other). Data on the employment status was collected by asking whether the respondents were currently employed. The nine answer options are categorical (employed, self-employed, unemployed, student, retired, disabled, other, refused, don't know).

The variable 'sex' remained unchanged for this research. The 'education' variable was recoded into two categories: low education (coded as 0) which includes 'none', 'primary', 'secondary' and high education (coded as 1) including 'matric', 'college' and 'university'. As this research is not interested in which kind of partnerships the respondents are in but rather if they are in a stable relationship, the variable 'partnership status' was changed to 'stable relationship'. For that, the answer options were recoded into 0= no (divorced, single, widowed, multiple partners) and 1= yes (married, cohabiting, life partner). Also, the variable 'employment' was adjusted for this research. First, the answer option 'employed' was

summarized with 'self-employed' and coded as 1. Respondents who answered with 'disabled', 'unemployed', 'volunteer', 'student' and 'retired' were summarized into the 'unemployed' category which was coded with 1.

Mental health questionnaire (PHQ9). The mental health questionnaire consists of nine statements that the participants can react to with five answer options (not at all, several days, more than half the days, nearly every day, or refuse) (American Psychological Association (APA), 2020). The questionnaire is derived from the popular Patient Health Questionnaire (PHQ-9) which is an instrument that screens for depressive symptoms over the last two weeks before the study participation. The scale has a high internal consistency with Cronbach alphas higher than 0.86 (APA, 2020). The variables were summarized into an overall PHQ9 score that averages the respondents' answers with scores from 0 to 3.

Stigma. The stigma questionnaire is taken from a study by Kalichman and Simbayi (2003) which consists of 12 items that could be answered to with four answer options (never, sometimes, often, and always) and two questions that could be answered with yes or no (Kalichman & Simbayi, 2003). The statements and questions generally aim to understand the participant's view on PLHIV and people living with AIDS. An overall stigma score was computed that calculates the average stigma scores from 1 to 4. The last two categorical questions asking for the participant's opinion on their view on HIV/AIDS positive family members and whether they would take care of them were excluded as the eligible participants for this research are PLHIV themselves and therefore their answers would most likely be biased.

Data analysis

This research will use the serial multiple mediation model (Figure 2) which will show which aspects may influence potential differences in mental health outcomes between men and women. The model may explain how the different socioeconomic indicators influence the participants' HIV-related stigma and the mental health outcomes resulting from that

depending on the respondents' sex. The statistical data was interpreted and analyzed using the IBM SPSS Statistics software Version 27.

Firstly, the data was screened for accuracy, missing data and outliers. The research includes all participants who are HIV-positive which are 887 PLHIV. There were 25 missing values found in the PHQ9 score. Additionally, by using the Mahalanobis distance criterion, seven outliers were found and excluded from the analysis. Finally, of these 887 PLHIV, 855 participants were eligible for this research.

A multiple linear regression analysis was performed to check for the assumptions for linear regression models. Firstly, linearity can be assumed when the association between the variables follows a pattern of a straight line. This assumption was confirmed after graphical inspection through Loess smoothing of the scatterplots. Secondly, an independence of error terms is another assumption which is defined as the impossibility of predicting the error of one measurement by knowing the error of another measurement. As every variable was only tested once on each participant, this assumption is held as well. Unfortunately, the assumption of a normal distribution of error terms cannot fully be confirmed as not all error terms fit closely to the line of the normal probability plot. The assumption of homoscedasticity can be tested with a residual plot. As the points in the plot are not scattered randomly with approximately the same distance to the line everywhere, the error variances are most likely rather heteroscedastic and therefore the assumption is not held either.

A serial multiple mediation analysis was performed following the four-step model by Baron & Kenny (1986). Firstly, the correlation between sex and mental health outcomes was examined. Then, the associations between sex and the mediators education, employment and relationship status as well as HIV-related stigma were tested. After that, the associations between the mediators and mental health outcomes were observed. Lastly, the effect of sex on mental health outcomes, controlling for the mediators, were tested to assess whether the

relationship is mediated by education, employment, relationship status and HIV-related stigma.

Ethical aspects

The study was approved by the Human Research Ethics Committee at the University of Pretoria in Pretoria, South Africa as well as from the Limpopo Department of Health Ethics Committee (Vos et al., 2017). Furthermore, written informed consent was required and collected from the participants before the study was started (Vos et al., 2017).

Results

In this study, 59.4% of PLHIV were female and 40.6% male. As for the socioeconomic indicators, 68.8% had a low education status and 31.3% achieved a higher education level. 73.1% of the respondents were unemployed and 26.9% were employed. Lastly, 45.5% indicated to not be in a stable relationship compared to 54.5% who were in a stable relationship. The average mean of HIV-related stigma was $M = 1.628$, $SD = 0.174$. Regarding the mental health outcomes, the respondents reported an average mean of $M = .458$, $SD = 0.453$.

To investigate whether mental health outcomes differ between men and women living with HIV and whether education, employment, and relationship status account for differences in HIV-related stigma and together influence the relationship between sex and mental health outcomes, a serial multiple mediation analysis was performed (Baron & Kenny, 1986).

Firstly, the independent variable should be correlated with the dependent variable. A significant association between sex and mental health outcomes was observed which indicates that women are more likely to have stronger mental health issues than men, $r_{pb} = -.087$, $p = .011$.

Next, the independent variable needs to be associated with each of the mediators. A significant association was found between sex and employment, $X^2(1) = 16.009$, $p < .001$, between sex and education, $X^2(1) = 16.666$, $p < .001$, and between sex and the relationship status, $X^2(1) = 13.122$, $p < .001$. The tables from these analyses showed that 78.01% of females were unemployed and 21.99% were employed. 65.83% of males were unemployed and 34.17% were employed. Regarding the education status, 63.48% of females had a low education status and 36.52% a high education level. Of the men, 76.47% had a low education level and 23.53% were higher educated. Referring to the relationship status, 50.48% of women were not in a stable relationship and 49.52% were in a stable one. 38.1% of men were not in a stable relationship and 61.91% were in a stable relationship. There was also a

significant association between sex and HIV-related stigma which indicates that men tend to have higher HIV-related stigma than women, $r_{pb} = .104$, $p = .002$.

To ensure that there could be a serial mediation, each of the socioeconomic indicators (education, relationship status and employment) should be correlated with HIV-related stigma. Education and HIV-related stigma are not significantly associated, $r_{pb} = .044$, $p = .191$. Also, relationship status and HIV-related stigma are not significantly correlated, $r_{pb} = -.037$, $p = .269$. However, employment and HIV-related stigma show a significant association which indicates that employed participants have higher HIV-related stigma, $r_{pb} = .107$, $p = .001$.

Furthermore, the mediators and the dependent variable need to be correlated. Education and mental health outcomes do not show a significant association, $r_{pb} = -.033$, $p = .336$. An association was observed between relationship status and mental health outcomes which shows that respondents who are in a stable relationship are less likely to suffer from mental health issues, $r_{pb} = -.172$, $p < .001$. Employment and mental health outcomes are not significantly correlated, $r_{pb} = -.066$, $p = .055$. An association between HIV-related stigma and mental health outcomes was found which indicates that the higher the HIV-related stigma is the more do mental health issues increase as well, $r_{pb} = .166$, $p < .001$.

The previous analysis shows that only the relationship status and HIV-related stigma were related to sex and mental health. Therefore, those two variables potentially qualify as mediators between the independent and dependent variable which is why the next step was to test for a simple mediation. The mediator for the first analysis was relationship status. When added, the beta coefficient of sex decreased and the test was found to be statistically significant, $B = -.061$, $p = .050$ (Table 1). The mediator for the second analysis was HIV-related stigma. When added, the beta coefficient of sex increased and the test was found to be statistically significant, $B = -.099$, $p = .002$. As a last step, the mediators should serially mediate the relationship between the dependent and independent variable. The mediators for this analysis were relationship status and HIV-related stigma. When added, the beta

coefficient of sex remained unchanged and the test was found to be statistically significant, $B = -.080$, $p = .010$ (Table 1).

Table 1

Path Coefficients for Mediation Models

Block		Coeff.	SE	p
1	Constant	.491	.020	<.001*
	Sex	-.080	.031	.011*
2	Constant	.713	.050	<.001*
	Sex	-.061	.031	.050*
	Relationship status	-.149	.31	<.001*
3	Constant	-.019	.152	.901
	Sex	-.080	.031	.010*
	Relationship status	-.142	.030	<.001*
	HIV-related stigma	.447	.088	<.001*

*Significance threshold $p < 0.05$

Discussion

The main findings

This research aimed to clarify whether mental health outcomes differ between men and women living with HIV and if education, employment, and relationship status each account for differences in HIV-related stigma which then together influence their mental health outcomes. The following paragraph will compare the findings to the hypotheses formulated in the 'research question' section of this paper.

The findings confirm hypothesis 1 (H(1)) as WLHIV report higher mental health issues than men living with HIV. Regarding the socioeconomic indicators, the findings show that less women than men in this sample are employed. Also, the results for the relationship status show that less women are in a stable relationship than men. Contrary to the expectations, women are more highly educated than men in this study. The results also demonstrate that men have higher HIV-related stigma than women which contradicts expectations. It was expected that lower education, employment and not being in a stable relationship would increase HIV-related stigma H(3). This cannot be confirmed as only employment was significantly correlated with HIV-related stigma and the findings also revealed that employed participants had higher HIV-related stigma than unemployed participants. The socioeconomic indicators education and employment status were not associated with mental health outcomes. Only relationship status showed a significant correlation with the dependent variable as PLHIV in a stable relationship are less likely to suffer from mental health issues than PLHIV without a stable relationship. The findings showed that higher HIV-related stigma also leads to more mental health issues which confirms H(4).

Resulting from these findings, only relationship status and HIV-related stigma qualified for a mediation analysis as they were the only two variables that were associated with both the independent and dependent variable. In a simple mediation analysis, relationship status partially mediated the association between sex and mental health as the beta coefficient of sex decreased when adjusted for relationship status which partially

confirms H(2). HIV-related stigma does not mediate the relationship between sex and mental health as the beta coefficient of sex increased when adjusted for HIV-related stigma. This is also confirmed in the final model where sex and mental health should be serially mediated by relationship status and HIV-related stigma. The findings showed that the beta coefficient of sex increased when HIV-related stigma was added to the model. All in all, multiple serial mediation was not discovered in this research.

Some of the findings of this analysis are in line with the existing literature discussed in earlier sections of this paper. Drawing back on the Gendered Stress Process model by Swendeman et al. (2018), one particular statement is in line with the current findings which is the fact that women tend to have lower mental health outcomes than men (Swendeman et al., 2018). Swendeman et al. (2018) argue that this is because they are more vulnerable to mental illness because of their disadvantaged position in society. This cannot be confirmed with these findings which might be due to the limited number of variables that were tested with mental health outcomes and the model includes more factors that might lead to different mental health outcomes (Swendeman et al., 2018). The findings confirm that HIV-related stigma can lead to mental health issues (Passchier et al., 2019). According to Bos et al. (2013), HIV-related stigma is even considered a major risk factor for mental ill-health among PLHIV (Bos et al., 2013). The findings of this research do not provide the evidence to tell whether this is the case but as both variables are associated with each other, it is not unlikely.

Interestingly, most of the findings deviate from previous literature. In contrast to many studies claiming that up to 38% of South African PLHIVs suffer from severe mental health issues, this analysis did not show a high degree of mental ill-health among the respondents (Remien et al., 2019). Even though the study sample supposedly represents a typical South African rural district, the results cannot be generalized for the whole South African population. Therefore, it is not unusual or worrisome that the findings do not accurately reflect the population.

In contrast to expectations, more women than men have a higher education status which contradicts the research by Klaas et al. (2018). As the sample does not reflect South Africa's population, the percentages calculated may not be very meaningful on a large scale. Alternatively, as more men are employed compared to women which is in line with the paper by Klaas et al. (2018), men might tend to start working earlier in life as they are most often financially responsible for their families and therefore leave school earlier than women.

The previous literature emphasizes the differences in HIV-related stigma for women depending on their relationship status (Hargreaves et al., 2018). This was not confirmed in this research as the two variables were not correlated. Again, the relationship variable only offered two answer options which may not provide for the needed amount of detail to lead to significant results. Relationship status, however, was correlated with mental health outcomes which is in line with the study by Pillay & Kriel (2006) who discovered that women without a stable relationship were more likely to reach out for professional help (Pillay & Kriel, 2006).

Pettifor et al. (2012) claimed in his research that women's mental health would be improved if they had better access to employment and education (Pettifor et al., 2012). As neither education nor employment were significantly associated with mental health outcomes in this study, this statement cannot be confirmed with these findings. As mentioned before, the mental health outcomes in this research were rather good, so therefore these results could have potentially skewed the relationship between those two variables.

Regarding the relationship between employment status and mental health, studies discovered that the mental state is affected by the employment status which was not confirmed in this analysis as those two variables were not associated with each other (Rueda et al., 2012-a). As there were only two answer options tested in this research, only asking whether someone was employed or not, the results may not be very meaningful. People who belonged into the 'unemployed' category could also be retired, students or volunteers. This

means that they might not be desperate for a job and therefore their unemployment does not necessarily burden their mental health.

Strengths and Limitations

The statistical model did not meet the assumptions for linear regression models. Both assumptions of homoscedasticity and normal distribution of error terms were not held which has the consequence that the regression coefficients produced in the analyses are not very reliable and therefore may be inaccurate. This means that the findings of this research might not be meaningful. However, the studied sample is rather large which improves the accuracy of the statistical tests. This research used self-reported data and additionally was collected verbally by a research officer which means that there could be bias involved. Nevertheless, a big strength of the study is the fact that it was conducted in Moutse area which is a typical South African rural area (Vos et al., 2017). As the environmental characteristics, gender distribution, economic status, and lifestyle of the respondents there are very representative of many rural areas in Sub-Saharan Africa, it increases the findings' generalizability to other Sub-Saharan rural areas (Vos et al., 2017).

Implications for change

As the statistical model is not very trustworthy, the findings cannot produce concrete implications for interventions and policies. Nevertheless, this paper makes clear that women in South Africa and especially WLHIV face many disadvantages in society which may or may not influence their mental health. This alone needs attention and should be dealt with in interventions and policies. According to this research, only a stable relationship may lead to better mental health outcomes. This however does not mean that employment or education will not lead to improved mental health. As many women in South Africa still live in very typical patriarchal family systems, they will most likely feel most secure in a stable relationship where they are financially taken care of rather than be employed and/or highly educated but by themselves. This may not be as acceptable as a woman in South African society and could therefore be a reason for the lack of associations between the variables. This means that as a starting point, women should be empowered through policies and

interventions to make their own decisions and become independent and more self-confident. At the same time, policies and interventions should tackle South African society by removing the patriarchal narrative from its systems and people. Research should focus more on different aspects leading to different mental health outcomes as there most likely will be many different factors with small effects rather than two or three main causes for differences in mental health among WLHIV. By identifying more reasons for mental ill-health among WLHIV, more coherent interventions and policies can be planned and undertaken.

All in all, this research shows that there might be many reasons for differences in mental health outcomes among WLHIV and that it is important to continue research on this topic as well as implementing policies and interventions to combat the burden of those factors and to improve WLHIV's mental health and overall quality of life.

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Appendices

Appendix A: Ndlovu Cohort study baseline questionnaire

BASELINE QUESTIONNAIRE

Demographics	
Q1	Gender <div style="margin-left: 20px;"> <input type="radio"/> Female <input type="radio"/> Male </div>
Q2	Date of Birth DD/MM/YYYY: _____
Q3	Education <div style="margin-left: 20px;"> <input type="radio"/> None <input type="radio"/> Primary school completed <input type="radio"/> Secondary school completed <input type="radio"/> Matric <input type="radio"/> Technicon/ College <input type="radio"/> University </div>
Q4	Partnership status (Current situation; Please only select one) <div style="margin-left: 20px;"> <input type="radio"/> Married (since: _____ year) <input type="radio"/> Life partner (since: _____ year) <input type="radio"/> Living together >50% of the time (since: _____ year) <input type="radio"/> Single (since: _____ year) <input type="radio"/> Divorced (since: _____ year) <input type="radio"/> Widowed (since: _____ year) <input type="radio"/> Multiple partners (since: _____ year) <input type="radio"/> Other (specify: _____) </div>

Employment

- | | |
|-----------|--|
| Q5 | Are you currently employed? <div style="margin-left: 20px;"> <input type="radio"/> Yes, employed
 <input type="radio"/> Yes, self employed
 <input type="radio"/> No, unemployed → Go to Q9
 <input type="radio"/> No, student → Go to Q9 </div> |
|-----------|--|

- No, retired → **Go to Q9**
- No, disabled → **Go to Q9**
- No, other → **Go to Q9**
 - Specify: _____
- Refused → **Go to Q9**
- Don't know → **Go to Q9**

Q6 In which economic sector do you work?

- Agriculture, fishing, forestry
- Mining and quarrying
- Manufacturing (e.g. clothing, food)
- Electricity, gas, water
- Construction
- Wholesale/ retail
- Catering and accommodation
- Transport, storage and communication
- Finance, real estate and business services
- Public administration (local, provincial) government
- Community, social and personal services
- Security, police
- Education
- Private household
- Other - Specify : _____
- Don't know
- Refused

Q7 How many hours do you work at this job in a typical week?

_____ Hours

- Refused
- Don't know

Q8 Would you say last month's take home pay was:

- Less than or equal to R600
- R600- R1300
- R1300 – R3100
- R3100 – R5900
- R5900 – R11 000
- R11 000 – R18 000
- More than R18 000

- Refused
- Don't know

Income composition

- Q9** What are the sources of income for this household? (select all applicable)
- Salaries/wages/commission
 - Income from a business
 - Remittance (money received from people living elsewhere)
 - Pensions
(Amount received per month: _____)
 - Grants (include old age grant here)
(Amount received per month: _____)
 - Other income sources e.g. rental income, interest
 - No income → **Go to Q12**

- Q10** What is the main source of income? (select only one)
- Salaries/wages/commission
 - Income from a business
 - Remittance (money received from people living elsewhere)
 - Pensions
 - Grants (include old age grant here)
 - Other income sources e.g. rental income, interest

- Q11** Do you receive any of the listed financial support? (select all that apply)
- No
 - Old-age grant (60-74, R1200; 75+, R1220)
 - Disability grant (<60, R1200)
 - Permanent disability
 - Temporary disability
 - Don't know
 - Child support grant (0-16, R280)
 - Care dependency grant (0-17, R1200)
 - Foster child grant (<22, R770)
 - War veterans grant (60+, R1220)
-

- Grant-in-aid (R250 and should have another grant)
- Social relief of distress
- Refused
- Don't know

Household support

- Q12** Who is the head of the household?
- Self
 - Spouse/partner
 - Parent
 - Other, specify _____

- Q13** Do other members of your household earn an income? (select those that are applicable)
- Partner (amount: _____ Don't know)
 - Brother (amount _____ Don't know)
 - Sister (amount _____ Don't know)
 - Parent(s) (amount _____ Don't know)
 - Non relatives (amount _____ Don't know)
 - No
 - Refuse
 - Don't know

Household composition

- Q14** How many persons live under your roof? (excluding yourself) _____ Number

- Q15** How do these people relate to you?
- Partner
 - Biological children (number _____)
 - Non biological children (number _____)
 - Parent(s) (number _____)
 - Parent(s) in law (number _____)
 - Brothers/sisters (number _____)
 - Non-relatives (not non-biological children), (number _____)
 - I live alone
 - Refused
 - Don't know

- Q16** Have you ever had biological children? (please include those that have passed away)
- Yes, living with me (number _____)
- Yes, not living with me (number _____)
- Yes, but the child died (number _____)
- No
- Refused
- Don't know

- Q17** Are you currently expecting a biological child (yourself or your partner)? *
- Yes (number _____)
- No
- Refused
- Don't know

Mental Health Questionnaire (PHQ9)

Over the last 2 weeks, how often have you been bothered by any of the following problems?

		Not at all	Several days	More than half the days	Nearly every day	Refuse
Q18	Little interest or pleasure in doing things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q19	Feeling down, depressed, or hopeless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q20	Trouble falling or staying asleep, or sleeping too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q21	Feeling tired or having little energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q22	Poor appetite or overeating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q23	Feeling bad about yourself — or that you are a failure or have let yourself or your family down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q24	Trouble concentrating on things, such as reading the newspaper or watching television	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q25	Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

or restless that you have been moving around a lot more than usual

- Q26** Thoughts that you would be better off dead or of hurting yourself in some way

HIV Testing

(Based on: Factors related to HIV-testing behaviour and interest in testing in Namibia by Alisha H. Creela* and Rajiv N. Rimalb)

- Q27** What is your opinion of HIV testing:
- Getting tested for HIV helps people feel better
 - Getting tested for HIV helps people from getting HIV
 - People in my life would leave me if I had HIV
 - People who tested positive should hide it from others
 - I would rather not know if I have HIV

- Q28** Have you ever had an HIV test?
- Yes, within the past 6 months
 - Yes, more than 6 months ago
 - No
 - Refuse

- Q29** Did you tell anyone that you went to the clinic for HIV testing? (mark all applicable)
- Yes, I told it to my partner
 - Yes, I told it to my parent(s)
 - Yes, I told it to my friend(s)
 - Yes, I told it to my child
 - Yes, I told it to another person
 - No
 - Not applicable

- Q30** Did you tell anyone about the test result? (mark all applicable)
- Yes, I told it to my partner
 - Yes, I told it to my parent(s)
 - Yes, I told it to my friend(s)
 - Yes, I told it to my child
 - Yes, I told it to another person
 - No
 - Not applicable

- Q31** Did you go for HIV testing at your own initiative? (mark all applicable)
- Yes

Q32

Was it likely that any of your family members was HIV infected at the time that you went for testing?*

- No, I was stimulated/ enforced to go for testing by my partner
- No, I was stimulated/ enforced to go for testing by my parent(s)
- No, I was stimulated/ enforced to go for testing by my friend(s)
- No, I was stimulated/ enforced to go for testing by my child
- No, I was stimulated/ enforced to go for testing by another person
- No, I did the test to be eligible to join the study
- Definitely not
- Probably not
- Not sure
- Probably yes
- Definitely yes

Q33

I got HIV tested because:

- If I am infected, I want to know so that I will not infect others
 - I was concerned that I might have been sexually exposed
 - If I am infected I want to know so that I can get treatment
 - I believe there is more hope with treatment these days
 - I was concerned that I might have been exposed through blood or needles
 - My sex partner wanted me to
 - My friends wanted me to
 - My family wanted me to
 - I was in a research study
 - I was in a drug treatment program
-

STIGMA

(taken from: HIV testing attitudes, AIDS stigma, and voluntary HIV counselling and testing in a black township in Cape Town, South Africa by S C Kalichman, L C Simbayi)

What is your opinion on the following statements?		Never	Sometimes	Often	Always
Q34	People who have AIDS are dirty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q35	People who have AIDS are cursed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q36	People who have AIDS cannot be trusted	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q37	People who have AIDS are like everybody else	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q38	People who have AIDS should be ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q39	People who have AIDS have nothing to feel guilty about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q40	Most people become HIV positive by being weak or foolish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q41	It is safe for people who have AIDS to work with children	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q42	People who have AIDS must expect restrictions on their freedom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q43	A person with AIDS must have done something wrong and deserves to be punished	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q44	People who have HIV should be isolated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q45	People who have AIDS should not be allowed to work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q46	Would you care for a family member with HIV/AIDS?	<input type="radio"/> Yes <input type="radio"/> No			
Q47	Would you mind if people knew if your family member had HIV/AIDS	<input type="radio"/> Yes <input type="radio"/> No			

Sexual Partners in the last 12 months

- Q48** How many sexual partners have you had in the last 12 months? _____ Number
- Q49** What is your sexual partner's age compared to you?
- ≥ 5 years older
- ≥ 5 years younger

		<input type="checkbox"/> About the same age
		<input type="checkbox"/> Not applicable
Q50	How many sexual partners do you have at the same time?	_____ Number
		<input type="checkbox"/> Never
Q51	Do you ever have sex in exchange for money or goods?	<input type="checkbox"/> Sometimes
		<input type="checkbox"/> Often
		<input type="checkbox"/> Always

Diet

- Q52** Did your household run out of money to buy food during the past 12 months?
- Yes
 No → **Go to Q59**
 Don't know
- Q53** Has it happened in the past 30 days?
- Yes
 No → **Go to Q59**
 Don't know
- Q54** Has it happened 5 or more days in the past 30 days?
- Yes
 No
 Don't know
- Q55** In the past 12 months, were there times when members of your household went hungry because there was not enough food in the house to eat?
- Yes
 No
 Don't know
- Q56** Which were the months (in the last 12 months) in which you experienced a lack of food or money such that one or more members of your household had to go hungry?
- January
 February
 March
 April
 March
 April

- May
- June
- July
- August
- September
- October
- November
- December
- Not applicable
- Don't know

Q57 Did you cut the size of meals during the past 12 months because there was not enough food in the house?

- Yes
- No → **Go to Q60**
- Don't know

Q58 Has it happened 5 or more days in the past 30 days?

- Yes
- No
- Don't know

Q59 Did you skip any meals during the past 12 months because there was not enough food in the house?

- Yes
- No → **Go to Q62**
- Don't know

Q60 Has it happened 5 or more days in the past 30 days?

- Yes
- No
- Don't know

Q61 Did you eat smaller variety of foods during the past 12 months than you would have liked to, because there was not enough food in the house?

- Yes
- No → **Go to Q64**
- Don't know

Q62 Has it happened 5 or more days in the past 30 days?

- Yes
- No
- Don't know

Q63 In a typical week, on how many days do you eat fruit? _____ Days Don't know

Q64 How many servings of fruit do you eat on one of those days? _____ Servings Don't know

Q65 In a typical week, on how many days do you eat vegetables? _____ Days Don't know

Q66 How many servings of vegetables do you eat on one of those days? _____ Servings Don't know

Physical activity

If you work, please answer all questions, if you are unemployed, please start from Q73

Q67	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like carrying or lifting heavy loads, digging or construction work for at least 10 minutes continuously?	<input type="radio"/> yes <input type="radio"/> no
Q68	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	_____ Days
Q69	How much time do you spend doing vigorous-intensity activities at work on a typical day?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Hours: Minutes
Q70	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate like brisk walking, carrying light loads, cleaning, cooking, washing clothes for at least 10 minutes continuously?	<input type="radio"/> yes <input type="radio"/> no
Q71	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	_____ Days
Q72	How much time do you spend doing moderate-intensity activities at work on a typical day?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Hours: Minutes
Q73	Do you walk or use a bicycle for at least 10 minutes continuously to get to and from places?	<input type="radio"/> yes <input type="radio"/> no → Go to Q77
Q74	In a typical week, how many times do you walk or cycle for at least 10 minutes continuously to get to and from places?	_____ Days
Q75	How much time do you spend walking or cycling for travel on typical days?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Hours: Minutes
Q76	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like running or football for at least 10 minutes continuously?	<input type="radio"/> yes <input type="radio"/> no → Go to Q80
Q77	In a typical week, how many times do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	_____ Days
Q78	How much time do you spend doing vigorous-intensity sports, fitness or recreational (leisure) activities on typical days?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Hours: Minutes
Q79	How much time do you spend sitting or reclining on typical days?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Hours: Minutes

Smoking habits

Q80	Have you ever smoked any tobacco product such as cigarettes, cigars or pipes?	<input type="radio"/> yes <input type="radio"/> no → Go to Q86
Q81	How old were you when you first started smoking?	<input type="radio"/> _____ years old <input type="radio"/> unknown
Q82	Do you currently smoke any tobacco products such as cigarettes, cigars, or pipes?	<input type="radio"/> yes → Go to Q84 <input type="radio"/> no
Q83	How long ago did you stop smoking? (Choose either years, months or weeks)	<input type="radio"/> Years ago → Go to Q85 <input type="radio"/> Months ago → Go to Q85 <input type="radio"/> Weeks ago
Q84	During the last 30 days, how frequently have you smoked your tobacco products	<input type="radio"/> Daily <input type="radio"/> 5-6 days per week <input type="radio"/> 1-4 days per week <input type="radio"/> 1-3 per month
Q85	On average how many of the following do you smoke each day?	<input type="checkbox"/> Manufactured cigarettes (amount _____) <input type="checkbox"/> Hand rolled cigarettes (amount _____) <input type="checkbox"/> Pipes full of tobacco (amount _____) <input type="checkbox"/> Cigars (amount _____) <input type="checkbox"/> Dagga/ marijuana (amount _____) <input type="checkbox"/> Other, please specify _____ (amount _____)

Alcohol consumption

Q86	Have you ever consumed an alcoholic drink such as beer, wine, spirits, fermented cider, <i>thothotho</i> or traditional beer?	<input type="radio"/> yes <input type="radio"/> no → Go to Q92
Q87	Have you consumed an alcoholic drink within the past 12 months	<input type="radio"/> yes <input type="radio"/> no
Q88	Have you consumed an alcoholic drink within the past 30 days?	<input type="radio"/> yes <input type="radio"/> no → Go to Q92
Q89	During the past 30 days, how frequently have you had at least one alcoholic drink?	<input type="radio"/> Daily <input type="radio"/> 5-6 days per week <input type="radio"/> 1-4 days per week <input type="radio"/> 1-3 days per month <input type="radio"/> Don't know

Q90 During the past 7 days, how many drinks of any alcoholic beverage did you have each day?

on Monday (amount _____)

on Tuesday (amount _____)

on Wednesday (amount _____)

on Thursday (amount _____)

on Friday (amount _____)

on Saturday (amount _____)

on Sunday (amount _____)

Don't know

Q91 During the past 30 days, when you consumed an alcoholic drink, how often was it with meals? Do not count snacks

Usually with meals

Sometimes with meals

Rarely with meals

Never with meals

HIV Status

Q92 What is your HIV Status?

Positive, on treatment

Positive, not on treatment

Negative → **END QUESTIONAIRE**

I don't know → **END QUESTIONAIRE**

Q93 If you are HIV positive, do you often talk about being HIV positive?*

Never

Sometimes

Regularly

Often

All the time

Not applicable

HIV Positive, on-treatment cohort ONLY - Adherence

How sure are you that:	Not at All	Somewhat	Very	Extremely
Q94 You will be able to take all or most of the medication as directed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q95 The medication will have a positive effect on your health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q96 If you do not take this medication exactly as instructed, the HIV in your body will become resistant to HIV medication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The following questions asks about your social support

- Q97** In general, how satisfied are you with the overall support you get from your friends and family members?
- Very Dissatisfied
 - Somewhat Dissatisfied
 - Somewhat Satisfied
 - Very Satisfied

- Q98** To what extent do your friends or family members help you remember to take your medication?
- Not At All
 - A Little
 - Somewhat
 - A Lot
 - Not Applicable

People may miss their medication for various reasons. Here is a list of possible reasons why you may have missed taking any medications within the **past month**.

In the past month, how often have you missed taking your medication because you:		Never	Rarely	Sometimes	Often
Q99	Were away from home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q100	Were busy with other things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q101	Simply forgot?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q102	Had too many pills to take?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q103	Wanted to avoid side effects?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q104	Did not want other notice you taking medication?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q105	Had a change in daily routine?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q106	Felt like drug was toxic/harmful?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q107	Fell asleep/slept through dose time?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q108	Felt sick or ill?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q109	Felt depressed/overwhelmed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q110	Had problem taking pills at a specified times (with meals, on empty stomach etc)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q111	Ran out of pills?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q112	Felt good?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

- Q113** When was the last time you missed taking any of your medications? Check one box.
- 5: within the past **week**
 - 4: 1-2 **weeks** ago
 - 3: 2-4 **weeks** ago
 - 2: 1-3 **months** ago
 - 1: More than 3 **months** ago
 - 0: **Never** skip medication or **not applicable**

****END QUESTIONNAIRE ****

Appendix B: SPSS Syntax

* Encoding: UTF-8.

CORRELATIONS

/VARIABLES=EducaFin PHQ_Fin

/PRINT=TWOTAIL NOSIG FULL

/MISSING=PAIRWISE.

CORRELATIONS

/VARIABLES=PHQ_Fin RelaFin

/PRINT=TWOTAIL NOSIG FULL

/MISSING=PAIRWISE.

CORRELATIONS

/VARIABLES=PHQ_Fin EmplFin

/PRINT=TWOTAIL NOSIG FULL

/MISSING=PAIRWISE.

CORRELATIONS

/VARIABLES=PHQ_Fin StigFin

/PRINT=TWOTAIL NOSIG FULL

/MISSING=PAIRWISE.

CROSSTABS

/TABLES=SEX BY EducaFin

/FORMAT=AVALUE TABLES

```
/STATISTICS=CHISQ  
/CELLS=COUNT EXPECTED RESID  
/COUNT ROUND CELL.
```

CROSSTABS

```
/TABLES=SEX BY RelaFin  
/FORMAT=AVALUE TABLES  
/STATISTICS=CHISQ  
/CELLS=COUNT EXPECTED RESID  
/COUNT ROUND CELL.
```

CROSSTABS

```
/TABLES=SEX BY EmplFin  
/FORMAT=AVALUE TABLES  
/STATISTICS=CHISQ  
/CELLS=COUNT EXPECTED RESID  
/COUNT ROUND CELL.
```

CORRELATIONS

```
/VARIABLES=StigFin SEX  
/PRINT=TWOTAIL NOSIG FULL  
/MISSING=PAIRWISE.
```

REGRESSION

```
/MISSING LISTWISE  
/STATISTICS COEFF OUTS R ANOVA
```

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT PHQ_Fin

/METHOD=ENTER SEX

/METHOD=ENTER EducaFin.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT PHQ_Fin

/METHOD=ENTER SEX

/METHOD=ENTER RelaFin.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT PHQ_Fin

/METHOD=ENTER SEX

/METHOD=ENTER EmplFin.

REGRESSION

/MISSING LISTWISE

```
/STATISTICS COEFF OUTS R ANOVA  
/CRITERIA=PIN(.05) POUT(.10)  
/NOORIGIN  
/DEPENDENT PHQ_Fin  
/METHOD=ENTER SEX  
/METHOD=ENTER StigFin.
```

REGRESSION

```
/MISSING LISTWISE  
/STATISTICS COEFF OUTS R ANOVA  
/CRITERIA=PIN(.05) POUT(.10)  
/NOORIGIN  
/DEPENDENT PHQ_Fin  
/METHOD=ENTER SEX  
/METHOD=ENTER EducaFin  
/METHOD=ENTER StigFin.
```

REGRESSION

```
/MISSING LISTWISE  
/STATISTICS COEFF OUTS R ANOVA  
/CRITERIA=PIN(.05) POUT(.10)  
/NOORIGIN  
/DEPENDENT PHQ_Fin  
/METHOD=ENTER SEX  
/METHOD=ENTER RelaFin  
/METHOD=ENTER StigFin.
```


REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT PHQ_Fin

/METHOD=ENTER SEX

/METHOD=ENTER EmplFin

/METHOD=ENTER StigFin.

DESCRIPTIVES VARIABLES=EmplFin StigFin RelaFin EducaFin PHQ_Fin SEX

/STATISTICS=MEAN STDDEV MIN MAX.

FREQUENCIES VARIABLES=EmplFin StigFin RelaFin PHQ_Fin EducaFin

/ORDER=ANALYSIS.

FREQUENCIES VARIABLES=SEX

/ORDER=ANALYSIS.

CORRELATIONS

/VARIABLES=EmplFin StigFin RelaFin EducaFin

/PRINT=TWOTAIL NOSIG FULL

/MISSING=PAIRWISE.