Examining Partner Characteristics and ARV Adherence Among South African Women

Who Have Experienced Sexual Trauma

by

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Duke University

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Marta I. Mulawa

Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
in the Graduate School of Duke University

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ABSTRACT

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Abstract

Background: Prior studies have produced conflicting results regarding the associations between partner-level characteristics and antiretroviral treatment (ART) adherence, with some findings suggesting that romantic or sexual partners negatively impact ART adherence in women. This study aimed to examine ART adherence in association with individual- and partner-level factors among South African women with sexual trauma histories, a particularly vulnerable group with low levels of ART adherence. Methods: Data were collected as part of a larger trial of HIV-infected women with trauma histories in Cape Town. A structured survey assessed partner characteristics, including the frequency of partner drinking and serostatus-disclosure, as well as individual-level factors. The level of ART nonadherence was measured in the parent trial through medical record abstraction. Univariate and multivariate linear regression analyses were used to explore possible individual- and partner-level predictors of ART nonadherence. Log likelihood ratio tests were used to examine the possible moderation of disclosure on the association between hazardous drinking and ART nonadherence. Results: The combination of hazardous drinking and partner drinking accounted for a significant percentage of the variance in ART nonadherence ($F(2, 41) = 3.632, p < .05$). HIV-serostatus disclosure was found to significantly modify the relationship between hazardous drinking and nonadherence ($\text{LR chi}^2(1) = 5.67, p < .05$).
Conclusions: This study found that the frequency of partner drinking and hazardous drinking were significantly associated with ART nonadherence in HIV-seropositive South African women. These analyses additionally found that HIV-serostatus disclosure to a partner exacerbated the effects of hazardous drinking on nonadherence. These findings point to the importance of addressing problem drinking in women and men, and of considering the impact of partners on ART adherence.
Dedication

This thesis is dedicated to my parents: for giving me (and letting me continue to live in) a home full of warmth, books, and cats, and for always listening to me, even when you don’t know what I’m talking about.
Contents

Abstract .............................................................................................................................................. iv
List of Tables ........................................................................................................................................ ix
List of Figures ....................................................................................................................................... x
Acknowledgements ........................................................................................................................... xi
1. Introduction ...................................................................................................................................... 1
   1.1 HIV in South Africa ..................................................................................................................... 1
   1.2 Women and Sexual Trauma in South Africa .............................................................................. 2
   1.3 Adherence to Antiretroviral Therapy in South Africa ............................................................... 3
   1.4 Predictors of Adherence to Antiretroviral Therapy .................................................................. 4
   1.5 Partner Characteristics and Adherence to Antiretroviral Therapy ........................................... 6
   1.6 HIV Disclosure and Adherence to Antiretroviral Therapy ....................................................... 8
   1.7 Hypotheses and Aims ............................................................................................................... 9
2. Methods .......................................................................................................................................... 11
   2.1 Study Overview .......................................................................................................................... 11
   2.2 Study Setting ............................................................................................................................. 11
   2.3 Sample ....................................................................................................................................... 12
      2.3.1 Improving AIDS Care After Treatment ............................................................................ 12
   2.4 Measures .................................................................................................................................... 13
      2.4.1 Assessment Administration ............................................................................................... 13
      2.4.2 Primary Outcome ............................................................................................................... 13
List of Tables

Table 1: Sample study characteristics........................................................................................................23

Table 2: Pearson’s correlation coefficients and descriptive statistics for levels of ART nonadherence and possible predictors........................................................................................................25

Table 3: Univariate and multivariate analyses of predictor variables on level of ART nonadherence ..................................................................................................................................................27

Table 4: Multivariate analysis of hazardous drinking, partner drinking, and disclosure status on the level of ART nonadherence (n = 25)...................................................................................................................30

Table 5: Multivariate analysis testing for effect measure modification in the association of hazardous drinking, partner drinking, and disclosure status on mean number of missed pills (medical record) (n = 25) .............................................................................................................................................34
List of Figures

Figure 1: Frequency of Levels of ART Nonadherence (n = 44) ................................................................. 24

Figure 2: The interaction of AUDIT-C score and disclosure status on level of ART nonadherence, among participants with a main partner (n=25) ......................................................... 33
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1. Introduction

1.1 HIV in South Africa

South Africa currently reports one of the highest rates of HIV in the world with an approximate 7,000,000 people living with the virus (UNAIDS, 2015). Supporting the largest antiretroviral therapy (ART) program in the world, The Republic of South Africa currently invests $1.5 billion annually to increase access to treatment (Trust, 2015; UNAIDS, 2014b). Despite large domestic investment in ART programming, the Africa region reports a 36-month ART retention rate of 65% (Fox & Rosen, 2015), and suboptimal medication adherence rates with a pooled adherence estimate of 77% (Mills et al., 2006).

Current research reports that adherence rates between 70% to 90% are necessary in order to guard against virologic failure, to prevent the transmission of HIV, and to avoid the development of drug-resistant strains of HIV (Nachega, Mills, & Schechter, 2010; Simoni et al., 2006). However, with the 2014 UNAIDS Programme announcement of the 90-90-90 goal, a target of ensuring that globally 90% of all people living with HIV know their status, that 90% of those with an HIV diagnosis receive sustained antiretroviral therapy, and that 90% of the individuals receiving ART achieve viral suppression by the year 2020 (UNAIDS, 2014a), countries such as South Africa must continue striving to understand the multitude of individual- and societal-level factors that support and deter ART adherence.
1.2 Women and Sexual Trauma in South Africa

In South Africa, women are a particularly vulnerable group with a reported 4,000,000 women ages 15 and older currently living with HIV (UNAIDS, 2015). Across sub-Saharan Africa, women are disproportionately affected by the HIV epidemic due to increased biological susceptibility, as well as cultural, economic, and structural factors (Ramjee & Daniels, 2013). Specifically, research has found that poverty, gender status, and gender-based violence serve as key risk factors for women contracting HIV (Van Damme, Kober, & Kegels, 2008) with an estimated 20-25% of new HIV infections in young women resulting from gender-based violence (Feucht, Kinzer, & Kruger, 2007).

Despite research suggesting that national estimates of sexual violence in South Africa are severely underreported (Jewkes & Abrahams, 2002), studies have found that South African women still face disproportionately high rates of sexual violence compared to women in other parts of the world (Jewkes & Abrahams, 2002; Watt et al., 2016) with studies speculating that 29% of women in South Africa have been sexually assaulted (Gass, Stein, Williams, & Seedat, 2011) and more than one in five men have perpetrated sexual assault (Kalichman et al., 2005).

In addition to serving as a risk factor for the contraction of HIV, sexual violence also impacts women’s engagement and adherence to HIV care as well as their clinical health outcomes (Hatcher, Smout, Turan, Christofides, & Stockl, 2015; Schafer et al., 2012). The HIV treatment cascade, a framework used to conceptualize the benchmarks in
care for an individual with HIV, identifies distinct stages, including HIV testing and diagnosis, knowledge of HIV status, engagement with HIV care, ART initiation, retention in care, and eventually viral load suppression, that can be utilized to highlight areas of intervention and monitor progress towards programmatic goals (Haber et al., 2017). Data published in 2016 show that in South Africa, 86% of the total people living with HIV are believed to know their HIV status. Of those living with HIV, 56% are receiving antiretroviral treatment, and, of those with HIV, it is estimated that only 45% are virally suppressed (UNAIDS, 2017). With significant progress therefore still needed in order to achieve the UNAIDS 90-90-90 goals by 2020, understanding the barriers to care engagement and adherence for vulnerable populations, such as women with sexual trauma histories, is critical.

1.3 Adherence to Antiretroviral Therapy in South Africa

Data from South Africa suggest that the population-level antiretroviral adherence estimate for those receiving ART is similar to that reported across sub-Saharan Africa at approximately 77% (Eyassu, Mothiba, & Mbambo-Kekana, 2016; Mills et al., 2006). However, national South African data suggest that early patient retention and adherence to ART estimates care may be significantly lower than rates reported throughout the rest of the sub-Saharan Africa region. A study estimating ART retention over the first three years of care found that 65% of individuals in low- and middle-income Africa countries remained in care (Fox & Rosen, 2015; Rosen, Fox, & Gill, 2007).
In South Africa, however, adherence to HIV care is substantially lower with data from a large primary health care clinic in Johannesburg reporting that only 36.9% of patients who were diagnosed with HIV were retained in care 12-months post-ARV initiation (Clouse et al., 2013) These findings indicate that adherence during the first year of antiretroviral treatment is a critical point in the South African HIV-treatment cascade.

1.4 Predictors of Adherence to Antiretroviral Therapy

Research from the United States has found that predictors of adherence to combination antiretroviral medication include: sociodemographic factors, such as ethnicity, income status, educational level, age, and gender; behavioral factors, including alcohol and illicit drug use; medication-related factors (dose frequency, possession of adherence aids); and factors relating to psychological functioning (Golin et al., 2002; Mugavero et al., 2006). Research specific to Southern Africa has identified additional critical structural factors that deter adherence to antiretroviral treatment, including: (1) economic barriers, such as lack of transportation or the availability and coverage offered through disability grants, (2) institutional barriers, such as the capacity of health care facilities, including the availability of mental health services, and (3) political and cultural barriers, including migration patterns, traditional beliefs regarding HIV and AIDS, gender inequalities, and health literacy (Kagee et al., 2011).

Problem drinking, defined as alcohol consumption that results in reductions in health and social functioning, has also been found to be associated with decreases in
medication adherence among HIV-positive populations globally (Cook et al., 2001; Schensul et al., 2017). Studies have found that problem drinkers were more likely to miss medications and take medicines off-schedule as compared to patients who did not meet the criteria for problem drinking (Cook et al., 2001). Similarly, hazardous drinking, defined as more than seven drinks per week or more than three drinks per occasion in women, has been shown to be associated with decreased ART utilization as well as decreased viral suppression when compared to no alcohol use (Chander, Lau, & Moore, 2006).

Studies have suggested that psychosocial factors, specifically mental health status and perceived social support, are consistent predictors of ART adherence (Davies et al., 2006; Detsis et al., 2017; Heestermans, Browne, Aitken, Vervoort, & Klipstein-Grobusch, 2016; McDowell & Serovich, 2007; Mills et al., 2006; Nel & Kagee, 2011). Mental health conditions, including depression, have been found to be associated with adherence to antiretroviral treatment (Memiah et al., 2014). Additionally, individuals with exposure to lifetime traumatic events have been shown to report lower levels of antiretroviral adherence when compared to persons without trauma histories (Cohen et al., 2004; Mugavero et al., 2006). Social support has also been found to be related to ART adherence (Battaglioli-DeNero, 2007; Detsis et al., 2017), with participant mental health status potentially mediating the relationship between social support and ART adherence (Huynh, Kinsler, Cunningham, & Sayles, 2013). While research consistently identifies
mental health and perceived social support as key predictors of ART adherence, further work is needed to understand what sources of perceived social support and what categories of social support enable or deter ART adherence for women and men living with HIV.

1.5 Partner Characteristics and Adherence to Antiretroviral Therapy

In examining social and contextual-levels of influence, studies have produced conflicting results regarding the associations between main partner characteristics and ART adherence (Knowlton et al., 2011). While some studies suggest that main partners are a critical source of support for ART adherence (Conroy et al., 2017), others have found that the presence of a main partner was negatively associated with ART adherence (Knowlton et al., 2011).

Studies have suggested that the genders of those in the relationship may be critical in understanding the direction of the association between partner characteristics and adherence. When studying male same-sex couples in the United States, researchers have found that married, HIV-positive men had a greater likelihood of survival as compared to men who were unmarried and HIV-positive (Johnson et al., 2012). Other studies examining ART adherence rates among US couples have found that gay men reported significantly higher rates of adherence (99%) compared to heterosexual men (94%) and heterosexual women (87%) in relationships (Wagner, Remien, Carballo-Dieeguez, & Dolezal, 2002). Studies focusing on female HIV-seropositive participants,
however, have found that the presence of a romantic or sexual partner is negatively associated with ART adherence, and that women with main partners are significantly less likely to adhere to antiretroviral therapy when compared to women without partners (Knowlton et al., 2011).

Research has suggested that the type of support received by main partners as well as the HIV-status of reported partners might moderate the relationship between relationship status and adherence to antiretroviral treatment (Edwards, 2006). Specifically, patients with partners offering low levels of emotional and instrumental support may be less likely to adhere to treatment (Edwards, 2006), and women in seroconcordant partnerships, or partnerships in which the partner’s status is unknown, have been shown to report significantly lower levels of ART adherence than women in serodiscordant partnerships and women without a partner (Knowlton et al., 2011).

Research has indicated that relationship quality and levels of relationship conflict may influence ART adherence for HIV-positive women. In male same-sex couples in the United States, relationship quality, as defined by levels of relationship autonomy and intimacy, was associated with adherence such that individuals in more autonomous relationships were more likely to adhere to ART (Johnson et al., 2012). In South Africa, the only identified study which examined partners and ART adherence was a qualitative study of HIV-positive men and women. This study revealed that relationship conflict, including anticipated conflict, led to missed doses for female participants. However,
participants additionally discussed perceiving primary partners as positive supporters of ART adherence when conflict was not frequent in the relationship. Women reported viewing primary male partners as a key source of instrumental, informational, and emotional support (Conroy et al., 2017).

In conclusion, these findings suggest that the presence of a partner, partner demographic variables, relationship conflict, partner-delivered social support, and partner HIV-status are important in considering the adherence behaviors of HIV-positive women.

1.6 HIV Disclosure and Adherence to Antiretroviral Therapy

Finally, HIV-related stigma and disclosure of HIV-status have been shown to be associated with ART adherence in both HIV-infected adults and adolescents (Bikaako-Kajura et al., 2006; Cluver et al., 2015; Lyimo et al., 2014; Vanable, Carey, Blair, & Littlewood, 2006). Interventions focused on HIV disclosure and adherence have found that patients in serodiscordant relationships who disclosed their HIV-status to their partner then demonstrated higher rates of adherence when compared to patients who never disclosed to their main partner (Stirratt, Remien, Smith, Copeland, Dolezal, Krieger, et al., 2006). Research has also demonstrated associations between HIV-status disclosure and hazardous drinking with recent alcohol consumption having been found to be predictive of nondisclosure for HIV-positive women (Saggurti et al., 2013). Given the known associations between hazardous drinking and ART nonadherence (Cook et
al., 2001; Schensul et al., 2017), it is important to better understand the mechanisms by which HIV-serostatus disclosure may affect this relationship. For instance, for women with romantic or sexual partners, HIV-serostatus disclosure could theoretically moderate the association between hazardous drinking and ART nonadherence given that serostatus disclosure has the potential to alter relationship dynamics, including the types of support provided by partners and the patterns of communication within the relationship.

1.7 Hypotheses and Aims

With the majority of partner-related adherence research utilizing US-based populations, further research using diverse populations is needed to better understand the relationship between partners and ART adherence. While variables such as hazardous drinking and the perceived availability of social support have been investigated as predictors of ART adherence in the United States, this study will contribute to this field of inquiry by utilizing a South African population and considering novel predictors, such as partner drinking habits, which may prove to be critical in informing interventions and policies aimed at increasing ART adherence, specifically in the first months of treatment.

This research has two primary objectives: (1) to describe the typical partner relationships of HIV-positive women with sexual trauma histories in Cape Town, South
Africa; and (2) to examine ART adherence in association with partner characteristics, drinking behaviors, and disclosure patterns among women newly initiating ART.

We hypothesize that women who report having a main partner will report lower levels of adherence to ART than women without main partners, that women who engage in hazardous drinking will report lower ART adherence than women who do not meet the criteria for hazardous drinking, and that the frequency of partner drinking will be negatively associated with ART adherence. Alternatively, we expect that the perceived availability of social support will be positively associated with adherence to ART. Furthermore, we believe that disclosure will moderate the relationship between significant predictors, such as hazardous drinking, and ART adherence. We expect that nondisclosure will exacerbate the relationship between participant hazardous drinking and the number of missed pills.
2. Methods

2.1 Study Overview

Data for this study were collected as part of a randomized control intervention pilot trial seeking to assess the preliminary effectiveness of a coping intervention, ImpACT (Improving AIDS Care After Trauma), for HIV-infected women with sexual trauma histories living in Cape Town, South Africa (Sikkema et al., 2017). For this study, data were extracted from the ImpACT intervention’s 3-month assessment (assessments occurred at baseline, 3- and 6-months) as well as from medical records. All predictors of interest were measured at the 3-month assessment, and thus, our study sample consists of the 45 women who were retained for this assessment. Our outcome of interest, ART nonadherence, was abstracted from participants’ medical records and reflected adherence behaviors during the 6-month ImpACT study period.

2.2 Study Setting

The ImpACT pilot trial recruited participants receiving HIV-related care at a primary health care clinic located in a peri-urban township in Cape Town, South Africa. This primary care clinic was responsible for serving a large, low-resourced population and provided free HIV care and antiretroviral therapy. It was estimated that the clinic was providing HIV-related care to over 2500 adult patients during the ImpACT study period.
2.3 Sample

Participants were HIV-infected women who were newly initiating ART at a primary care clinic in Cape Town, South Africa. All women eligible for ART initiation were referred to the study staff and screened for eligibility for the ImpACT study between March 2016 and January 2017. Women were considered eligible if they met the following criteria: (1) HIV-infected and eligible for ART initiation; (2) history of sexual abuse as defined by the WHO CIDI and the Childhood Trauma Questionnaire; (3) 18 years or older; (4) Xhosa speaking; and (5) accessing HIV-related care at the study site (Sikkema et al., 2017). Women were excluded and referred for care if they presented with suicidal intent, as assessed throughout the study.

2.3.1 Improving AIDS Care after Trauma

ImpACT was designed to be a coping intervention for HIV-infected women with sexual abuse histories newly initiating ART (Sikkema et al., 2017). The intervention aimed to reduce traumatic stress and improve care engagement by promoting effective, trauma-based coping strategies (Sikkema et al., 2017). Data were collected at screening and baseline as well as 3- and 6-months post-baseline. All study procedures were approved by the Institutional Review Boards at Duke University and the University of Cape Town.
2.4 Measures

2.4.1 Assessment Administration

As part of the ImpACT pilot trial (Sikkema et al., 2017), participants were first screened for the eligibility and exclusion criteria by trained study staff in a private, secure room within the clinic. At the completion of the screening, women were informed of the aims of the study and its emphasis on sexual trauma. All screenings and assessments were administered by a local, Xhosa-speaking study staff member in a private room.

2.4.2 Primary Outcome

The outcome of interest in this study was level of ART nonadherence, as measured by the mean number of days not covered by antiretroviral treatment as assessed through medical record data. Study staff members extracted medical record data at two time intervals over the duration of the ImpACT trial. Participant medical records were retrospectively assessed approximately three months after baseline and then again six months after baseline. Pharmacy pill count data were recorded on participant medical charts as well as in pharmacy records by a medical care worker. Pill count data included the drug regimen as well as the number of pills the participant arrived with at each visit (‘in’ pills) and the number of pills they were prescribed (‘out’ pills).
Pill count data were used to create a measure of ART nonadherence that reflected pill coverage over the 6-month study interval period. The measure was calculated by determining the number of days without ART coverage during each pill count interval (determined through pill count dates and data on the number of pills distributed at each appointment), and then examining the mean number of days without medication coverage per interval. As patients newly initiating ART were typically prescribed 28 pills per visit, our measure therefore reflects the level of nonadherence to ART per month.

Data were then transformed into a categorical variable reflecting the range of average days without ART coverage during the study period. Participants who on average had not missed any medications each month, or who were reported to have a negative nonadherence value indicating that pills were regularly picked up early, were categorized as ‘0’ and were considered to be adherent. Participants who missed more than zero pills per month but less than two were recoded as ‘1’ and were noted to be minimally nonadherent. Participants who missed between two and seven pills per month were categorized as a ‘2’ and were considered suboptimally adherent. Finally, participants who on average missed more than a week’s worth of pills were determined to be in the third category classified as ‘3’ for nonadherent.

For the single participant who never initiated treatment, the primary outcome was coded as system missing and this case was dropped in subsequent analyses. Among
those participants who initiated treatment, the majority were prescribed the fixed dose combination of TDF (Tenofovir), FTC (Emtricitabine), and EFV (Efavirenz). Three participants were prescribed to alternate regimens. For those with unique pill count values, the level of nonadherence outcome measure was manually recoded to reflect the number of days covered by each specific regimen (for instance, a medication prescribed to be taken twice a day was divided in half to represent the number of days for which the medication was prescribed).

Finally, medical record data were consulted to corroborate the adherence data of participants known to have defaulted on antiretroviral treatment or who were known to have defaulted from the clinic without a request to transfer their care elsewhere. For participants documented to have defaulted clinical care, the level of ART nonadherence was assumed to be at the highest level of nonadherence (category ‘3’) if the participant defaulted within the first three months on ART. Participants known to have defaulted clinical care after at least three pill count visits were recategorized as the second highest level of nonadherence (category ‘2’). For participants with transfer of care requests in their clinical records, the level of ART nonadherence outcome was assumed to be missing if the participant had less than two pharmacy refill visits. For transfer patients with two or more pharmacy refill visits, the average level of ART nonadherence was calculated using the available data.
2.4.3 Individual-Level Variables

2.4.3.1 Hazardous Drinking

Participant drinking habits were assessed using The Alcohol Use Disorders Identification Test – C (AUDIT-C) (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). The three item AUDIT evaluated the frequency of alcohol consumption, the quantity of drinks consumed on a typical day, and the frequency of binge drinking (defined as 6 or more drinks in one occasion). Hazardous drinking on the AUDIT-C is categorized as a dichotomous variable in which hazardous drinking is defined as a sum score of 3 or more in women, unless all points derived from the first question (“How often did you have a drinking containing alcohol in the past three months?”) (Bush et al., 1998).

2.4.3.2 Social Support

Participants were asked to complete the Perceived Availability of Social Support subscale adapted from the Social Relationship Scale (O’Brien, Wortman, Kessler, & Joseph, 1993) consisting of eight items. The subscale was adapted, with the eighth item of this subscale (“Is there someone who could take care of your children if you got sick?”) having been added by South African collaborators. The results were summed to represent the amount of support a single participant perceived (possible range from 8 to 40). In this study, the scale’s Cronbach’s alpha was 0.83.
2.4.3.3 Medication-Specific Social Support

The Medication-Specific Social Support (MSS) scale (Lehavot et al., 2011) consisted of ten items assessing the levels of support given to the participant in the last three months (i.e., “How often has someone in the past three months done any of the following things? Helped you monitor your symptoms and medication side effects?”) (Lehavot et al., 2011). Medication-Specific Social Support was consolidated into a dichotomous variable reflecting whether the participant had received any support in the last three months.

2.4.4 Partner-Level Variables

2.4.4.1 Partner Characteristics

Partner status was defined by reporting at least one of the following: (1) at least one sex partner in the last three months; (2) a primary partner (such as a husband, lover, or someone else with whom they have had sex regularly); or (3) being married or in a relationship in the demographic section of the assessment. The partner characteristics items assessed whether the participant had a partner on whom to report, the level of exposure to the partner’s alcohol use (0 = Never, 1 = Monthly or less, 2 = 2-4 times a month, 3 = 2-3 times a week, 4 = 4 or more times a week), and the extent to which the participant relied on their partner for protection or safety (0 = None of the time, 1 = A little of the time, 2 = Some of the time, 3 = Most of the time, 4 = All of the time) (Sikkema et al., 2017).
As instructed during the original assessment, research staff only collected data on partner characteristics for participants who reported having a main partner (n=35). For this study, we chose to recode system missing participants, or participants without main partners (n=7), to ‘0’ (“Never”, or “None of the time”) for the items regarding partner drinking and relying on the partner for safety. These variables therefore reflect whether a participant was exposed to a partner drinking and the extent to which they relied on a partner for safety, such that women without partners are assumed to not be exposed to partner drinking and to not rely on a partner for safety. These steps ensured that all participants in our limited sample size were included in our analyses.

2.4.4.2 Abuse

Recent abuse by a partner was assessed using the IPV Physical Abuse: Revised Conflict Tactics Scale (CTS) and the Recent Sexual Abuse Scale (CTQ-SF) (Bernstein et al., 2003). The adapted CTS (Straus, 2006) consisted of three items regarding recent (last three months) physical abuse by a husband, boyfriend, or other sexual partner. The Recent Sexual Abuse Scale, first adapted by Bernstein and colleagues (2003) as a short form of the Childhood Trauma Questionnaire, was highly adapted for this study to be used in adults. This measure assessed any recent sexual abuse. Participants were asked to identify the perpetrator of the abuse as either a partner, a non-partner known, a non-partner acquaintance, or a non-partner stranger. The CTS and CTQ-SF measure were
combined to create a single dichotomous item reflecting whether the participant had experienced any physical or sexual abuse by a partner in the last three months.

### 2.4.5 Disclosure

Disclosure to a partner was assessed using a single item from an adapted sexual risk behavior measure (Sikkema et al., 2017). This item asked whether the partner knew the participant’s HIV-serostatus (“Does this partner know your HIV status?”) and participants were able to select either 0 ‘No’, 1 ‘Yes’, or 2 ‘I’m not sure’. This item was only asked for participants with a main partner, considered to be either a spouse, boyfriend, or regular sexual partner. Participants with more than one sexual partner who did not consider any of those sexual partners to be a main partner were coded as system missing on the remaining items. This disclosure item, therefore, reports a different sample size than the partner characteristics items.

### 2.5 Data Analysis

Pearson’s correlations were used to examine the unadjusted associations between the independent variables collected at the 3-month assessment and ART adherence over the 6-month study interval. Predictors were extracted from the 3-month assessment, as opposed to the baseline or 6-month assessment, in order to reflect the characteristics of the participants at the beginning of antiretroviral treatment. Data from the 3-month assessment were additionally preferred over those collected as part of the baseline assessment based on the presumption that women’s relationship statuses may be
affected by the initial HIV-diagnosis and that 3-month post-baseline measures would more accurately reflect the relationships occurring over the course of the antiretroviral treatment period.

Independent variables were chosen for univariate analyses and those significant at $p < 0.10$ were then selected for a multivariate linear regression. Potential interactive effects between participant hazardous drinking and disclosure status on ART adherence were explored using likelihood ratio tests for effect measure modification. Data were analyzed using IBM SPSS statistical software, version 24.
3. Results

3.1 Sample Characteristics

At the ImpACT intervention’s 3-month assessment, 45 women were retained. On average, these women were 30.3 years old (SD = 8.0), and 77.8% had only completed some high school education. Seventy-seven percent of participants experienced sexual abuse as an adult, and 42.2% of women experienced sexual abuse in the three months prior to the ImpACT study screening assessment. Almost half of the participants (46.7%) had been recently diagnosed with HIV, and nearly one-third of our sample met the criteria for hazardous drinking.

The majority of women (46.7%, n = 21) reported being in a romantic relationship but not living with their partner, however, 35 women (77.8%), in total, reported having a romantic or sexual partner We found that 44.4% of participants were not exposed to partner who consumed alcohol, however, 26.7% of women experienced a partner drinking two to three times a week. Over a third of participants (35.6%) reported relying on a partner for safety or security at all times.

In this population of HIV-positive women with sexual trauma histories, we found that the overwhelming majority of women with a main, or primary, partner had disclosed their HIV status to that partner (61.5%), and that approximately half of women knew their partner’s status in return (53.8%). The descriptive statistics for women included in these analyses did not differ significantly from those of the large ImpACT
sample (n = 64) (Sikkema et al., 2017). Further sample characteristics can be found in Table 1.

In examining the adherence data of our sample, we found that on average, participants had 4.38 pill count visits (SD = 2.34) and were enrolled on ART for an average of 4.80 months (SD = 0.10). Of the 45 women who completed the assessment, 44 had initiated antiretroviral treatment (ART), and the majority reported missing less than 2 pills per month, on average, and were therefore classified into one of the first two levels of ART nonadherence (levels ‘0’ and ‘1’) (Figure 1). Pearson’s correlation coefficients and descriptive statistics for predictors of interest and level of ART nonadherence can be found in Table 2.
**Table 1: Sample study characteristics**

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Level of ART Nonadherence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total sample (n = 45)</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>30.3 (8.0)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Some high school or less</td>
<td>35 (77.8)</td>
</tr>
<tr>
<td>Completed high school</td>
<td>4 (8.9)</td>
</tr>
<tr>
<td>Some university or more</td>
<td>6 (13.3)</td>
</tr>
<tr>
<td>Sexual abuse history</td>
<td></td>
</tr>
<tr>
<td>Sexual abuse in childhood</td>
<td>8 (17.8)</td>
</tr>
<tr>
<td>Sexual abuse in adolescence</td>
<td>24 (53.3)</td>
</tr>
<tr>
<td>Sexual abuse in adulthood</td>
<td>35 (77.8)</td>
</tr>
<tr>
<td>Recent sexual abuse</td>
<td>19 (42.2)</td>
</tr>
<tr>
<td>Recent HIV diagnosis</td>
<td>21 (46.7)</td>
</tr>
<tr>
<td>Individual-Level Variables</td>
<td></td>
</tr>
<tr>
<td>Hazardous drinking</td>
<td>12 (26.7)</td>
</tr>
<tr>
<td>Perceived availability of social support (mean, SD)</td>
<td>34.4 (6.7)</td>
</tr>
<tr>
<td>Medication-specific social support (n = 44)</td>
<td>38 (84.4)</td>
</tr>
<tr>
<td>Partner-Level Variables</td>
<td></td>
</tr>
<tr>
<td>Presence of a partner</td>
<td>35 (77.8)</td>
</tr>
<tr>
<td>Frequency of partner drinking</td>
<td></td>
</tr>
<tr>
<td>Never / No Partner</td>
<td>20 (44.4)</td>
</tr>
<tr>
<td>Monthly or less</td>
<td>3 (6.7)</td>
</tr>
<tr>
<td>2-4 times a month</td>
<td>6 (13.3)</td>
</tr>
<tr>
<td>2-3 times a week</td>
<td>12 (26.7)</td>
</tr>
<tr>
<td>4 or more times a week</td>
<td>4 (8.9)</td>
</tr>
<tr>
<td>Rely on partner for safety</td>
<td></td>
</tr>
<tr>
<td>None of the time</td>
<td>22 (48.9)</td>
</tr>
<tr>
<td>A little of the time</td>
<td>3 (6.7)</td>
</tr>
<tr>
<td>Some of the time</td>
<td>1 (2.2)</td>
</tr>
<tr>
<td>Most of the time</td>
<td>3 (6.7)</td>
</tr>
<tr>
<td>All of the time</td>
<td>16 (35.6)</td>
</tr>
<tr>
<td>Recent abuse by a partner</td>
<td>9 (20.0)</td>
</tr>
<tr>
<td>Partner knows HIV-status</td>
<td>16 (61.5)</td>
</tr>
</tbody>
</table>

1 No Missed Pills Per Month; 2 0 < x < 2 Missed Pills Per Month; 3 2 ≤ x ≤ 7 Missed Pills Per Month; 4 More than 7 Missed Pills Per Month; a Last 3 Months
Figure 1: Frequency of Levels of ART Nonadherence (n = 44)
Table 2: Pearson’s correlation coefficients and descriptive statistics for levels of ART nonadherence\(^a\) and possible predictors\(^c\)

<table>
<thead>
<tr>
<th>Variable (^b)</th>
<th>MSS (n=44)</th>
<th>ABUSE (n=45)</th>
<th>AUDIT (n=45)</th>
<th>PAS (n=26)</th>
<th>DISC (n=45)</th>
<th>RELY (n=45)</th>
<th>DRINK (n=45)</th>
<th>PAR (n=45)</th>
<th>MISS PILLS (n=56)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.164</td>
</tr>
<tr>
<td>DRINK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.536**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.356*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RELY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.378*</td>
<td>.500**</td>
<td>.048</td>
<td></td>
</tr>
<tr>
<td>DISC</td>
<td></td>
<td></td>
<td></td>
<td>.280</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.178</td>
</tr>
<tr>
<td>PAS</td>
<td></td>
<td>.188</td>
<td>.174</td>
<td>.067</td>
<td>.333*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUDIT</td>
<td>.073</td>
<td>-.220</td>
<td>.005</td>
<td>.444**</td>
<td>.322*</td>
<td>.291</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABUSE</td>
<td>.075</td>
<td>.183</td>
<td>-.055</td>
<td>-.078</td>
<td>.135</td>
<td>.000</td>
<td>.000</td>
<td>-.003</td>
<td></td>
</tr>
<tr>
<td>MSS</td>
<td>.037</td>
<td>-.076</td>
<td>.605*</td>
<td>.452*</td>
<td>.094</td>
<td>-.012</td>
<td>.101</td>
<td>.003</td>
<td></td>
</tr>
</tbody>
</table>

Mean          | .86         | .20          | .27          | 34.44      | .62        | 1.73        | 1.49        | .78        | 1.46            |

SE            | .05         | .06          | .07          | 1.00       | .10        | .28         | .22         | .06        | .15             |

Notes. \(^a\) Levels of ART Nonadherence: 0 (0 missed days), 1 (0 – 2 missed days), 2 (2 – 7 missed days), 3 (7 or more missed days); \(^b\) Abbreviations: PAR (Partner to Report); DRINK (Partner Drinking); RELY (Rely on Partner for Safety); DISC (Partner Knows Status); PAS (Sum Perceived Availability of Social Support); AUDIT (Hazardous Drinking – Dichotomous); ABUSE (Any Recent Abuse by Partner); MSS (Any Medication-Specific Social Support); MISS PILLS (Level of ART Nonadherence); \(^c\) 3 participants referred to the study were reinitiating ART after previously defaulting treatment

\(*p < .05\)
3.2 Unadjusted and Adjusted Analyses

Unadjusted analysis indicated that the level of ART nonadherence over the 6-month study period was significantly higher for women who reported hazardous drinking compared to those who did not. Similarly, increasing levels of nonadherence were associated with increasing frequency of partner drinking (Table 3). Univariate regression analyses were then conducted. Hazardous drinking and partner drinking frequency were both significant predictors of ART nonadherence and were selected for entry into a multiple regression analysis. The linear model including hazardous drinking and partner drinking habits was significantly related to the level of ART nonadherence over the first months of ART use, $F(2, 41) = 3.632, p < .05$. This model accounted for 15% of the variance in ART nonadherence over the 6-month study period. While the combination of 3-month predictors did significantly predict the outcome, hazardous drinking did not make a statistically significant contribution individually to the model, although the frequency of partner drinking reached marginal statistical significance given our small sample size (hazardous drinking: $t(41) = 1.08, p = .29$; partner drinking: $t(41) = 1.78, p = .08$) (Table 3). After adjustment, approximately 11% (adjusted $R^2$) of the variance in ART nonadherence was accounted for by the combination of drinking measures.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariate Analysis</th>
<th>Multivariate Analysis – Model 1 (n = 44)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
<td>95% CI</td>
</tr>
<tr>
<td>PAR: Partner to Report&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.164</td>
<td>-0.385, 1.267</td>
</tr>
<tr>
<td>DRINK: Partner Drinking</td>
<td>0.356</td>
<td>0.049, 0.491</td>
</tr>
<tr>
<td>RELY: Partner for Safety&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.048</td>
<td>-0.160, 0.218</td>
</tr>
<tr>
<td>DISC: Partner Knows Status&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.178</td>
<td>-0.603, 1.470</td>
</tr>
<tr>
<td>PAS: Perceived Availability of Social Support (Sum)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-0.097</td>
<td>-0.069, 0.036</td>
</tr>
<tr>
<td>AUDIT: Hazardous Drinking</td>
<td>0.291</td>
<td>-0.018, 1.533</td>
</tr>
<tr>
<td>ABUSE: Any Recent Partner Abuse&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-0.003</td>
<td>-0.880, 0.861</td>
</tr>
<tr>
<td>MSS: Any Medication Specific Social Support&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.003</td>
<td>-1.014, 1.031</td>
</tr>
</tbody>
</table>

**Notes:**

<sup>a</sup> Variable included if \( p < .10 \)

<sup>b</sup> Variable was removed because of no significance for analysis.
As these data were embedded in a randomized control intervention trial, intervention condition was added to the model to control for any differential effects. Intervention condition was found to not be associated with the level of ART nonadherence over the study period ($r(56) = .124, p = .36$), and we found that controlling for intervention condition did not change our model. Intervention condition was therefore not included in subsequent analyses.

### 3.3 Examining Potential Effect Measure Modification

Given the known importance of disclosure, it was hypothesized that disclosure status might modify the association between hazardous drinking and adherence. Disclosure status was therefore examined as a potential modifier on the relationship between hazardous drinking and ART nonadherence. Disclosure status was selected for entry into a second multiple regression analysis despite not being a significant predictor of the ART nonadherence in a univariate analysis. With disclosure status data being only relevant for participants with a primary sexual partner, these analyses therefore considered a sub-group of our total sample and examined the variance of the mean number of missed pills over the first months of ART usage for women with a main partner (n=26).

This second model predicting adherence using the linear model consisting of participant hazardous drinking, partner drinking, and disclosure status was able to significantly predict the level of ART nonadherence, $F(3, 21) = 4.09, p < .05$ (Table 4). This
model also accounted for a greater percentage of variation in the level of ART nonadherence as compared to first model which excluded disclosure status, $R^2 = .37$, adjusted $R^2 = .28$ (Table 4). In this revised model, hazardous drinking was the only significant contributor to the prediction equation ($t(21) = 2.23, p < .05$).
Table 4: Multivariate analysis of hazardous drinking, partner drinking, and disclosure status on the level of ART nonadherence (n = 25)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>F</th>
<th>Sig.</th>
<th>95% CI</th>
<th>R-Squared</th>
<th>Adjusted R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 2:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Missed Pills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.167</td>
<td>--</td>
<td>0.745</td>
<td>-1.220, 0.887</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>DRINK:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partner Drinking</td>
<td>0.306</td>
<td>--</td>
<td>0.062</td>
<td>-0.017, 0.629</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>AUDIT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous Drinking (last 3 months)</td>
<td>0.989</td>
<td>--</td>
<td>0.037</td>
<td>0.068, 1.911</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>DISC:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partner Knows Status</td>
<td>0.677</td>
<td>--</td>
<td>0.139</td>
<td>-0.238, 1.592</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
After examining sample means stratified by disclosure status and hazardous drinking (Figure 2), an interaction term was fitted between disclosure status and hazardous drinking and subsequently added to the model. The linear model including hazardous drinking, partner drinking frequency, disclosure status, and the interaction term was able to predict the level of ART nonadherence for women with a main partner, $F(4, 20) = 4.94, p < .01$, and the percentage variance accounted for increased from the model without the fitted interaction term, $R^2 = .50$, adjusted $R^2 = .40$ (Table 5). The interaction predictor itself was also significant, $t(20) = 2.26, p < .05$. A likelihood-ratio test was conducted to confirm the modification of disclosure status on the relationship between hazardous drinking and ART nonadherence. The test verified that an interaction was present (LR $\chi^2(1) = 5.67, p < .05$) (Figure 2).

In examining the stratified mean levels of ART nonadherence, women who reported engaging in hazardous drinking and who had disclosed their HIV-serostatus to a partner reported the highest average level of ART nonadherence with a mean nonadherence level of 2.80 (SE = 0.20, N = 5). Alternatively, women who were not hazardous drinkers and had disclosed their serostatus to a partner reported the lowest average level of ART nonadherence with an average mean of 0.90 (SE = 0.28, N = 10). For women who had not disclosed their HIV-serostatus to a main partner, we found that the level of ART nonadherence was only slightly higher for hazardous drinkers ($M = 1.17$,
SE = 0.54, N = 6) compared to non-hazardous drinkers (M = 1.00, SE = 0.71, N = 4), indicating the presence of a qualitative interaction effect.
Figure 2: The interaction of AUDIT-C score and disclosure status on level of ART nonadherence, among participants with a main partner (n=25)
Table 5: Multivariate analysis testing for effect measure modification in the association of hazardous drinking, partner drinking, and disclosure status on mean number of missed pills (medical record) (n = 25)

<table>
<thead>
<tr>
<th>Model 3: Predictors on Mean Number of Missed Pills</th>
<th>B</th>
<th>F</th>
<th>Sig.</th>
<th>95% CI</th>
<th>R-Squared</th>
<th>Adjusted R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.440</td>
<td>4.941</td>
<td>0.006</td>
<td>-0.678, 1.557</td>
<td>0.497</td>
<td>0.396</td>
</tr>
<tr>
<td>DRINK: Partner Drinking</td>
<td>0.320</td>
<td>0.036</td>
<td>0.907</td>
<td>-1.370, 1.223</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>AUDIT: Hazardous Drinking (last 3 months)</td>
<td>-0.073</td>
<td>--</td>
<td>0.907</td>
<td>-1.387, 0.963</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>DISC: Partner Knows Status</td>
<td>-0.212</td>
<td>--</td>
<td>0.711</td>
<td>-1.387, 0.963</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Interaction Term (DISC * AUDIT)</td>
<td>1.813</td>
<td>--</td>
<td>0.035</td>
<td>0.137, 3.490</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
4. Discussion

This study sought to examine individual- and partner-level characteristics and their associations with ART nonadherence with the goal of better understanding the factors which deter ART adherence for women who have experienced sexual trauma. This study found that individual-level factors as well as partner-level characteristics, specifically hazardous drinking and the frequency of exposure to partner drinking, are significantly associated with antiretroviral treatment nonadherence in HIV-seropositive South African women with sexual trauma histories. This work underscores the importance of accounting for relationship-level characteristics when examining the adherence behaviors of HIV-positive women.

In our sample of a particularly vulnerable group, women with sexual trauma histories newly initiating ART, we found that the majority of women reported having a romantic or sexual partner. These findings are supported by previous studies based in South Africa which have found similar frequencies of partners amongst HIV-positive women, with one study stating that 81% of women reported having a sexual partner (Simbayi et al., 2007b). While nearly half of our sample was not exposed to partner drinking, nearly a third were in a relationship in which the partner consumed alcohol two to three times per week. Although our measure did not assess the quantity of alcohol consumed by partners, in South Africa, demographic surveillance data have found risky drinking to be highly prevalent in men with approximately 28% of males
reportedly consuming five or more standard measures of alcohol per drinking occasion (National Department of Health (NDoH), 2017). Together, these statistics suggest that a sizable proportion of HIV-seropositive women newly initiating ART in South Africa may be in partnerships with men who frequently consume alcohol and who may engage in risky drinking.

While there is consensus that individual drinking behaviors are significantly associated with adherence to antiretroviral medication (Chander et al., 2006; Cook et al., 2001), the finding that the frequency of partner drinking affects medication adherence is useful in better understanding the relationship between partner characteristics and ART nonadherence. In one of the few studies that exclusively considered the impact of partners on HIV-infected women, Knowlton and colleagues found that the presence of a partner was negatively associated with adherence to highly-active antiretroviral treatment (HAART) (Knowlton et al., 2011). One hypothesis suggested by the researchers to explain this association posed that, due to typical gender roles and constructs, women are more attentive to their partners’ needs than their partners may be to their own. They suggested that women facing a chronic illness such as HIV may be exerting much of their energy and attention on the needs of their partner, and that, consequently, their own needs go unattended (Knowlton et al., 2011).

Contrary to our hypotheses, we did not find that being in a partnered relationship was associated with nonadherence to ART. Nonetheless, Knowlton’s
hypothesis (Knowlton et al., 2011) regarding the role of gender norms in relationships could suggest a mechanism by which partner drinking and nonadherence to ART may be associated. For women with partners who drink frequently, it is possible that this drinking is seen as a concerning behavior that either diverts the attention, time, or energy of the female partner such that their own needs are overlooked. This theory is supported by anthropological reports of gender norms in South Africa which state that while evolving, women are still seen as having distinct roles and responsibilities within relationships and are often expected to value the needs of their male partners above their own (Mantell et al., 2009).

Research has also found partner drinking to be a key risk factor for intimate partner violence (Jewkes, 2002; Kalichman, Simbayi, Jooste, & Cain, 2007; Morojele et al., 2006), which could also impact a woman’s adherence to antiretroviral therapy. In our analyses, we did not find intimate partner violence by a current partner to be significantly associated with ART nonadherence, however, with our limited sample size, violence perpetrated by a current partner was only reported by 9 participants at the 3-month assessment point. It is therefore important that larger studies continue to examine the possible association between partner drinking, intimate partner violence, and ART nonadherence.

Despite evidence finding HIV-serostatus disclosure to be positively associated with ART adherence (Stirratt, Remien, Smith, Copeland, Dolezal, & Krieger, 2006), we
found that disclosure was not associated with adherence at the univariate level of analysis. In our final model, however, we tested the hypothesis that disclosure status moderated the relationship between participant hazardous drinking and the level of ART nonadherence and found that HIV serostatus-disclosure exacerbated the association between drinking and ART adherence. For women who had not disclosed their serostatus to a main partner, we found that there was no association between hazardous drinking and the level of nonadherence to ART. However, we found that for women who had disclosed their HIV-status to a main partner, the level of nonadherence to ART was significantly higher for women who reported hazardous drinking. While these findings fit with our original hypotheses, the effect of disclosure on the association was not as predicted. Disclosure therefore only significantly strengthened the association between hazardous drinking and ART nonadherence for women who had disclosed their serostatus to a main partner, while nondisclosure of one’s serostatus to a main partner appeared to have buffered the negative effects of hazardous drinking on adherence to ART.

In considering these findings, one possible hypothesis warranting further investigation is that disclosure serves as a proxy variable for an unmeasured construct in this study, such as relationship closeness. In her work with the partners of HIV-seropositive women, Knowlton and colleagues proposed several theories to explain the observed association between partners and HAART nonadherence in women (Knowlton
et al., 2011). The previously discussed theory, which suggested that traditional gender constructs result in women caring for their partners at the expense of their own health, could also be applicable in understanding the moderation effects of serostatus disclosure. If disclosure of one’s HIV-status to a main partner is a marker for the strength and intimacy of a relationship, it may follow that, for women who already meet the criteria for hazardous drinking, having a main partner with whom they feel comfortable disclosing this HIV-status indicates additional caregiving responsibilities. For women who meet the criteria for hazardous drinking, it is therefore reasonable to hypothesize that being in a committed partnership with increased social obligations and concerns may exacerbate the effects of drinking on ART adherence.

It is alternatively possible that the decision to disclose one’s serostatus fundamentally changed the relationship between the woman and her partner. Research from South Africa investigating the impacts of HIV-stigma and discrimination has demonstrated that serostatus disclosure frequently results in negative outcomes (Simbayi et al., 2007a). In examining the discrimination experiences of men and women living with HIV and AIDS in Cape Town, one study found that one in three individuals had been treated differently by a friend or family member following their status disclosure (Simbayi et al., 2007a). In our sample, women who had disclosed their serostatus to their partners and were reported to be hazardous drinkers reported the most nonadherence of all groups. It is plausible that disclosure resulted in an
unmeasured change in the relationship, such as an increase in hostility or behavior that is seen as controlling or harmful and which then strengthens the existing association between participant drinking and nonadherence to ART. Research has also found that there is a significant association between perceived HIV stigma and the self-report of missed medications (Dlamini et al., 2009). We suggest that serostatus disclosure may similarly represent an increase in the stigma women perceive from their partners which may then intensify the effects of hazardous drinking on ART adherence.

While it is conceptually feasible that serostatus disclosure might predict hazardous drinking, which would then influence ART adherence, we found no evidence of an association between disclosure status and hazardous drinking. In this sample, there was additionally no significant variation in the AUDIT-C scores of those who had disclosed compared to those who had not. There was additionally no support for disclosure serving as a mediator of the relationship between hazardous drinking and ART adherence.

### 4.1 Study limitations

A critical limitation of this study involves the use of a novel method of categorizing pharmacy refill records as an indirect method of assessing adherence to antiretroviral treatment. In ideal circumstances, instruments for assessing ART adherence would be valid and reliable while also reducing the burden on participants and clinic staff (Simoni et al., 2006). For instance, ‘direct’ methods of assessing
medication adherence, which typically involve collecting biological markers of active drug ingestion, are often considered to be the ‘gold standard’ for assessing ART adherence (Simoni et al., 2006). In resource-limited settings with high burdens of HIV, such as South Africa, indirect methods of assessing ART adherence are commonly utilized in order to minimize financial and logistic challenges (Henegar et al., 2015; Simoni et al., 2006). While these measures are believed to compromise psychometric and epidemiologic accuracy when compared with direct measures of ART adherence, research from South Africa has reported that indirect measures of ART adherence derived from pharmacy medical record data, specifically, can report high rates of sensitivity (Simoni et al., 2006).

In South Africa, several studies have examined the psychometric properties and reliabilities of pharmacy record data (Gachara, Mavhandu, Rogawski, Manhaeve, & Bessong, 2017; Henegar et al., 2015) and self-reported measures of adherence (Simoni et al., 2006). Using data from nearly 30,000 pharmacy visits in Johannesburg, one study found that adherence measures based on pharmacy refill data demonstrated acceptably high specificity with a range of 83%-98% but were limited in their sensitivity (range of 5%-19%) when compared to viral load test results (Henegar et al., 2015). Another study utilizing data from South Africa found that their pharmacy record measure of ART adherence was highly correlated with virological outcomes with 91% of those categorized as optimally adherent having achieved virologic suppression (Gachara et al.,
Together these findings suggest that in the South African health care system, pharmacy refill measures tend to be accurate in classifying nonadherence, although they typically do not capture the entire population of patients failing to achieve virologic suppression and are dependent upon the quality of health record systems.

An advantage of our analyses was that it corroborated pharmacy refill records with clinic and study documentation so as to more accurately classify participants who had collected a sufficient number of prescriptions but who were known to be nonadherent. In our sample, we identified three participants who had sufficiently refilled their ARV prescriptions during the first three months of care but who were known to have defaulted ART care based on clinical records abstracted by study staff. These participants were subsequently recoded to reflect their nonadherence to ART, thereby potentially increasing the sensitivity of our adherence measure. Additionally, in comparing the validity of pharmacy refill records and self-reported adherence data in South Africa, prior studies have found that the association between self-reported data and virological failure was weaker than that between refill data and viral load, indicating that pharmacy-based measures of adherence are more accurate than self-report data in South Africa (Henegar et al., 2015).

Additionally, while our measure was calculated uniquely to account for the average number of missed pills per participant per visit interval, other studies based in South Africa have similarly collected and categorized pharmacy refill data. For instance,
one study explicitly examined pill coverage based on refill data to determine whether or not participants had collected enough pills per refill period (Henegar et al., 2015), while another study constructed a categorical indicator of adherence based the percentage of time without medication during the study period which mirrors our own adherence categorizations (Gachara et al., 2017).

Other limitations of this study include our limited sample size, which potentially limited our ability to detect meaningful associations within our target population, and which considerably reduced the statistical power needed to examine sub-samples of our participants such as women with main partners compared to women with multiple partners. As data were analyzed secondarily, we were additionally limited in the measures we could examine in our regression analyses. For instance, while we were able to examine the association between the perceived availability of social support and ART adherence, we were not able to specifically consider perceived social support provided by a partner.

4.2 Implications for Policy and Practice

The findings of this study point to the importance of addressing problem drinking in men and women in South Africa. For HIV-seropositive women, our analyses concluded that hazardous drinking, defined as more than seven drinks per week or more than three drinks per occasion in women (Chander et al., 2006), was consistently predictive of the mean number of missed pills over the study period. For men, alcohol
consumption was assessed as a categorical rather than dichotomous variable with the conclusion that the frequency of partner drinking was negatively associated with the ART adherence of their female partners. It is therefore critical to address substance use issues in men, regardless of HIV-status, as well as in populations of HIV-seropositive women.

According to South Africa’s 2016 Demographic and Health Survey Data, the prevalence of alcohol use is high among South African men with 28% reporting having engaged in risky drinking, defined as drinking five or more standard measures of alcohol in a single occasion, over the past 30 days (National Department of Health (NDoH), 2017). For women, risky drinking is less prevalent with only 5% of South African women meeting the criteria (National Department of Health (NDoH), 2017). With a significant proportion of the male population engaging in frequent alcohol consumption, it is reasonable to conclude that a substantial proportion of South African women are currently engaged in sexual or romantic partnerships with men frequently consuming alcohol. Additionally, while we did not find a correlation between recent partner-perpetuated physical or sexual abuse and ART nonadherence, intimate partner violence (IPV) is a known predictor of ART nonadherence in women, globally, (Hatcher, Smout, Turan, Christofides, & Stöckl, 2015), and heavy alcohol consumption in men has been shown to increase the risk of violence against women (Jewkes, 2002).
For the South African Ministry of Health and the National Government of South Africa, which currently invests $1.5 billion annually into antiretroviral therapy treatment programs (Trust, 2015; UNAIDS, 2014b), developing screening and scalable intervention programs for men who engage in problem drinking may therefore be an effective strategy for increasing population-level ART adherence as both HIV-seropositive men and women with male partners would be expected to benefit. Prior work in South Africa has demonstrated that hazardous drinking can be effectively screened for using the Alcohol Use Disorder Identification Test (AUDIT) in outpatient hospital care settings, and that the combination of alcohol screening and simple educational methods, such as pamphlets, may reduce alcohol use in men and women (Pengpid, Peltzer, Skaal, & Van der Heever, 2013). Translating these findings into policy may therefore have significant impacts on population-level ART adherence rates and HIV-related health outcomes.

### 4.3 Implications for Further Research

Future research should continue to examine the influence romantic and sexual partners may have on the adherence behaviors of HIV-positive women in endemic regions such as South Africa. With preexisting research indicating that the effects of partners differ for men and women (Puskas & Hogg), it is critical to further consider relationship-level factors that may shape and deter ART adherence. These analyses provide several tangible avenues warranting further inquiry, including the drinking behaviors of HIV-seropositive women and their partners as well as serostatus disclosure.
within relationships. While we found that disclosure status moderated the relationship between participant hazardous drinking and ART adherence, we unfortunately can only speculate as to why this association may occur. More robust studies are therefore needed in order to evaluate a wider range of partner-level variables, such as partner-perpetuated stigma, the perceived availability of social support provided by a partner, the perceived support given to a partner by the HIV-seropositive female participant, and more, with the aim of clarifying these pathways. Additionally, longitudinal research is needed in order to examine the causal associations between hazardous drinking, partner drinking, and HIV-serostatus disclosure on ART nonadherence.

Further research will additionally be needed to assess the external validity of these results and, specifically, their applicability to populations of HIV-infected women without sexual trauma histories. Given the known associations between sexual trauma histories and hazardous drinking (Watt et al., 2012), it will be critical to understand the relevance of these models for populations with lower prevalence rates of hazardous drinking.
5. Conclusion

This study of partner-characteristics and participant ART adherence contributes to a growing field of study by suggesting that the drinking behaviors of women and their partners significantly predict ART nonadherence. This research emphasizes the importance of considering partner-level characteristics in contexts with a high burden of HIV.

These analyses additionally investigated the role of HIV-serostatus disclosure on the association between participant and partner drinking habits and found that disclosure moderates the relationship between hazardous drinking and ART nonadherence. For HIV-seropositive women, the strength of the relationship between hazardous drinking and ART nonadherence varies by disclosure status, such that for women who had disclosed their HIV-status to their main partners, the effects of drinking on adherence were exacerbated. Further research is needed to understand the unexpected effects of disclosure and to clarify the relevance of this conceptual model for broader populations.

With prior research indicating that the presence of partner is predictive of nonadherence (Knowlton et al., 2011), this research suggests specific mechanisms that might account for this relationship. While previous research has concluded that the presence of a partner might hinder ART adherence, this study contributes to this field of inquiry by suggesting that it may be the specific attributes of partners that impact ART
adherence. In doing so, these findings highlight potential pathways for intervention that may aid countries such as South Africa in achieving 90% virologic suppression by 2020 (UNAIDS, 2017). With the knowledge that an individual’s drinking behaviors may affect the ART adherence behaviors of another, addressing problem drinking in men and women in South Africa may increase population-level adherence rates by targeting the barriers to ART adherence for vulnerable populations, such as women with sexual trauma histories. To attain these goals, however, it is imperative that cost-effective and efficacious treatments for problem drinking are first made accessible to men and women across South Africa.
Appendix A

Medication Adherence (PILLCOUNT)

Write down all visit dates on patient’s file and corresponding pill counts for each visit, from date of ART enrollment or re-enrollment to 6 months after enrollment. “In” = number of pills patient brought back for the visit date. “Out” = number of pills patient took home from clinic visit.

<table>
<thead>
<tr>
<th>Visit Date</th>
<th>Pill Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>dd / mm / YYYY</td>
<td>Medication name: _____</td>
</tr>
</tbody>
</table>

| PILLCOUNT1 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT2 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT3 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT4 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT5 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT6 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT7 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT8 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT9 | ___/___/___ | In = ___ | Out = ___ |
| PILLCOUNT10 | ___/___/___ | In = ___ | Out = ___ |
**Partner Characteristics (PCS)**

**NOTE TO ASSESSOR:** Ask the following questions if *any* of the following are true:
- The woman reports *one* sex partner above (SRB2)
- The woman reports more than one sex partner, but can identify one as a *primary* partner (SRB3)
- The woman did not report any sex, but says that she is married or in a relationship (DEM8)

| PCS1 | Does this woman have a partner to report on (1 of 3 above)? | 0. No [SKIP PCS2-PCS10]  
1. Yes |
|------|-------------------------------------------------------------|--------------------------|

**NOTE TO ASSESSOR:** First, tell her which relationship you would like to ask her about.

**Description:** I’m going to ask you some questions about this partner.

| PCS2 | Is your partner working now? | 0. No  
1. Yes  
2. Casual/sometimes |
|------|-------------------------------|----------|
| PCS3 | To your knowledge, how often does your partner have a drink containing alcohol? | 0. Never  
1. Monthly or less  
2. 2-4 times a month  
3. 2-3 times a week  
4. 4 or more times a week |
| PCS4 | To your knowledge, how often does your partner use tik or other illegal drugs? | 0. Never  
1. Monthly or less  
2. 2-4 times a month  
3. 2-3 times a week  
4. 4 or more times a week |
| PCS5 | [SKIP if no substance use (PCS3 and PCS4 are both 0)] How often does your partner become more aggressive towards you (verbally, sexually, or physically) after he drinks alcohol or uses drugs? | 0. None of the time  
1. A little of the time  
2. Some of the time  
3. Most of the time  
4. All of the time |
| PCS6 | How often do you rely on your partner for food? | 0. None of the time  
1. A little of the time  
2. Some of the time  
3. Most of the time  
4. All of the time |
|------|-----------------------------------------------|-------------------------------------------------|
| PCS7 | How often do you rely on your partner for a place to stay/housing? | 0. None of the time  
1. A little of the time  
2. Some of the time  
3. Most of the time  
4. All of the time |
| PCS8 | How often do you rely on your partner for money to pay bills or buy necessities or to “make ends meet”? | 0. None of the time  
1. A little of the time  
2. Some of the time  
3. Most of the time  
4. All of the time |
| PCS9 | How often do you rely on your partner for protection or safety? | 0. None of the time  
1. A little of the time  
2. Some of the time  
3. Most of the time  
4. All of the time |
| PCS10 | How often do you rely on your partner for emotional support? | 0. None of the time  
1. A little of the time  
2. Some of the time  
3. Most of the time  
4. All of the time |
### Sexual Risk Behavior (SRB)

**Description:** Next I am going to ask you some questions about your sexual activity / sex life. We know these are personal questions and it may be hard to remember everything that has happened over the past three months. I will keep your answers private, and you can take as much time as you need to think carefully and choose your answer. If you don’t understand a question, please tell me. It is very important for you to answer all questions truthfully. **NOTE TO ASSESSOR: USE A CALENDAR / ANCHOR POINT FOR THREE MONTHS. FOR QUESTIONS NOT ASKED, MARK VARIABLE NAME WITH AN “X.”**

| SRB1 | In the past 3 months, did you have sex of any kind (vaginal/anal)? | 0. No [skip to SRB10]  
1. Yes |
|------|-------------------------------------------------|------------------------|
| SRB2 | How many men have you had sex with in the past 3 months? [IF 0 SKIP TO SRB10.] | 0. No  
1. Yes |
| SRB3 | IF SRB2 IS ONE: Would you consider that partner a main partner, like a husband, lover, or someone else that you had sex with regularly?  
IF SRB2 IS TWO OR MORE: Of the men you have had sex with in the past 3 months, did you have a main partner – like a husband, a lover, or someone else that you had sex with regularly? | 0. No  
1. Yes |

If the participant had ONE PARTNER or A MAIN PARTNER, ask the following section (Srb4-srb7).

| SRB4 | Does this partner know your HIV status? | 0. No  
1. Yes  
2. I’m not sure |
|------|----------------------------------------|------------------------|
| SRB5 | What is this partner’s HIV status? | 1. Negative  
2. Positive  
3. I don’t know |
| SRB6 | In the past 3 months (90 days) how many times did you have (vaginal/anal) sex with this partner? | 0. No  
1. Yes  
2. I’m not sure |
In the past 3 months, of these times that you had (vaginal/anal) sex with this partner, how many times did you use condoms?

If the participant had MORE THAN 1 PARTNER (SRB2 is 2 or more), ask the following section (srb8-srb9).

SRB8 You told me that in the past 3 months you have had ______ partners who are not a main partner. In the past 3 months (90 days) how many times did you have (vaginal/anal) sex with these partners?

Note: Interviewer should figure out number of partners based on participant’s answers to SRB2 and SRB 3.

SRB9 In the past 3 months, of these times you had (vaginal/anal) sex with these partners, how many times did you use condoms?

Ask everyone the following section (srb10-srb11).

SRB10 In the past 3 months, how many times have you talked with a sex partner, or a potential sex partner, about using condoms?

SRB11 In the past 3 months, how many times have you refused sex because there was not a condom?
**Recent IPV Physical Abuse: Revised Conflict Tactics Scale (R_CTS)**

**Description:** I am now going to ask you about experiences you may have had with your husband, boyfriend, or other sexual partner in the past 3 months. In the past 3 months, has a husband, boyfriend, or other sexual partner done any of the following things?

<table>
<thead>
<tr>
<th>R_CTS1</th>
<th>Threatened to hit or throw something at you?</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R_CTS2</th>
<th>Beat, kicked, or hit you?</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R_CTS3</th>
<th>Used a knife, gun, or bottle on you?</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Recent Sexual Abuse (R_ABUSE)

**Description:** I am going to ask you several questions about sexual experiences that may have been forced or unwanted in the past 3 months. In the past three months, have any of the following things happened to you?

| R_ABUSE1 | Did anyone touch you in a sexual way or make you touch them in a sexual way against your will, when you made it clear through words or actions that you did not want to? | 0. No [Skip to R_ABUSE3]  
1. Yes |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| R_ABUSE2 | If R_ABUSE1 is YES: What was the identity of the person (or people) who did this? (circle all that apply)  
Was the person (or persons) a partner, someone who was NOT a partner but who you knew, an acquaintance, or a stranger? | 1. Partner  
2. Non-partner: known  
3. Non-partner: acquaintance  
4. Non-partner: stranger |
| R_ABUSE3 | Has anyone threatened to hurt you unless you did something sexual with them? | 0. No [Skip to R_ABUSE5]  
1. Yes |
| R_ABUSE4 | If R_ABUSE3 is YES: What was the identity of the person (or people) who did this? (circle all that apply)  
Was the person (or persons) a partner, someone who was NOT a partner but who you knew, an acquaintance, or a stranger? | 1. Partner  
2. Non-partner: known  
3. Non-partner: acquaintance  
4. Non-partner: stranger |
| R_ABUSE5 | Has anyone forced you (physically, emotionally, or with a weapon) to have sexual intercourse or other sexual activities against your will? | 0. No [Skip to R_DISC1]  
1. Yes |
| R_ABUSE6 | If R_ABUSE5 is YES: What was the identity of the person (or people) who did this? (circle all that apply) | 1. Partner  
2. Non-partner: known  
3. Non-partner: acquaintance  
4. Non-partner: stranger |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Was the person (or persons) a partner, someone who was NOT a partner but who you knew, an acquaintance, or a stranger?</td>
<td></td>
</tr>
</tbody>
</table>

**Perceived Availability of Social Support (PAS)**

**Description:** The following questions have to do with the support you get from people in your life. I’m going to read you a series of questions about the different types of help people might give you. Please tell me whether someone would be available to provide that kind of help or support if you needed it. Remember that I’m not asking whether or not you need this kind of help at this time, but whether someone could help you if you needed it.

<table>
<thead>
<tr>
<th></th>
<th>Definitely not</th>
<th>Probably not</th>
<th>Possibly</th>
<th>Probably yes</th>
<th>Definitely yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAS1</td>
<td>Would someone be available to talk to you if you were upset, nervous, or depressed?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PAS2</td>
<td>Is there someone you could contact if you wanted to talk about an important personal problem you were having?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PAS3</td>
<td>Is there someone who would help take care of you if you had to stay in</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PAS4</td>
<td>Is there someone you could turn to if you needed to borrow R10, needed to get a ride to the doctor, or needed some other small immediate help?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PAS5</td>
<td>Is there someone you could turn to if you needed to borrow some money to help pay your rent for one month?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PAS6</td>
<td>Would the people in your personal life give you information, suggestions, or guidance if you needed it?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PAS7</td>
<td>Is there someone you could turn to if you needed advice to help make a decision?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>PAS8</td>
<td>Is there someone who could take care of your children if you got sick?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Medication-Specific Social Support (MSS)

Description: Here is a list of some things that people in your life (other than clinic staff) may do to help you manage your HIV treatment. Please listen to each statement carefully and tell me how often you have gotten this type of support in the past 3 MONTHS [or since you started taking medication, if less than 3 months ago]. How often has someone in the past three months done any of the following things?

<table>
<thead>
<tr>
<th>MSS</th>
<th>Description</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very often</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSS1</td>
<td>Helped you monitor your symptoms and medication side effects?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MSS2</td>
<td>Reminded you to take your medications?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MSS3</td>
<td>Helped you pick up your HIV medication prescriptions?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MSS4</td>
<td>Helped you understand information about your medications?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MSS5</td>
<td>Checked in with you about your medications?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MSS6</td>
<td>Encouraged you to talk to your doctor about your medications when you have questions or problems?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MSS7</td>
<td>Helped you to believe you can take your medications as prescribed?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>MSS8</td>
<td>Called you specifically to ask how you were doing with your HIV medications?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
The Alcohol Use Disorders Identification Test – C (AUDIT)

**Description:** Now I am going to ask you some questions about your use of alcoholic beverages during the past 3 MONTHS.

| AUDIT1     | How often did you have a drink containing alcohol? | 0. Never [STOP]  
|            |                                               | 1. Monthly or less  
|            |                                               | 2. 2-4 times a month  
|            |                                               | 3. 2-3 times a week  
|            |                                               | 4. 4 or more times a week  
| AUDIT2     | How many standard drinks containing alcohol did you have on a typical day? 1 drink is equal to 1 can or small bottle of beer, 1 glass of wine, or 1 shot of spirits or liquor. | 0. 1 or 2  
|            |                                               | 1. 3 or 4  
|            |                                               | 2. 5 or 6  
|            |                                               | 3. 7, 8, or 9  
|            |                                               | 4. 10 or more  
| AUDIT3     | How often did you have 6 or more drinks on one occasion? | 0. Never  
|            |                                               | 1. Less than monthly  
|            |                                               | 2. Monthly  
|            |                                               | 3. Weekly  
|            |                                               | 4. Daily or almost daily  

## Appendix B

Appendix Table 1: Pearson’s correlation coefficients for mean number of missed pills (categorical) and additional predictors of interest

<table>
<thead>
<tr>
<th>Variable</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.232</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.166</td>
<td>0.095</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.390</td>
<td>-0.048</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.617**</td>
<td>0.318</td>
<td>0.144</td>
<td>0.068</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.500**</td>
<td>0.823**</td>
<td>0.363</td>
<td>-0.040</td>
<td></td>
<td>0.056</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.315</td>
<td>0.070</td>
<td>0.245</td>
<td>-0.087</td>
<td>0.120</td>
<td>0.009</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.240</td>
<td>0.302</td>
<td>0.293</td>
<td>0.302</td>
<td>0.141</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.144</td>
<td>-0.034</td>
<td>0.032</td>
<td>0.180</td>
<td>-0.006</td>
<td>0.465*</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>0.227</td>
<td>0.071</td>
<td></td>
<td>0.182</td>
<td>0.137</td>
<td>0.104</td>
<td>0.294</td>
<td>0.243</td>
<td>0.066</td>
</tr>
</tbody>
</table>

### Notes
1. Mean Number of Missed Pills – Categorical
2. Partner Drug Use
3. Partner Aggressive
4. Partner for Food
5. Partner for Housing
6. Partner for Money
7. Partner for Emotional Support
8. Partner’s HIV-Status Known (Y/N)
9. PTSD Checklist (PCL) – Civilian (Dichotomous at Diagnostic cutoff of 33)
10. Center for Epidemiologic Studies Depression Scale

*p < .05  
**p < .01
Appendix Table 2: Pearson’s correlation coefficients exploring possible adherence outcome measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Any Recent Nonadherence (Last 30 Days) – Self Report</th>
<th>Number of Days Missed (Last 90 Days) – Self Report</th>
<th>Number of Days Missed (Last 30 Days) – Self Report</th>
<th>Mean Number of Missed Pills (Categorical) – Medical Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Days Missed (Last 30 Days) – Self Report</td>
<td>--</td>
<td></td>
<td></td>
<td>0.374</td>
</tr>
<tr>
<td>Number of Days Missed (Last 90 Days) – Self Report</td>
<td></td>
<td>--</td>
<td>0.878**</td>
<td>0.425*</td>
</tr>
<tr>
<td>Any Recent Nonadherence (Last 30 Days) – Self Report</td>
<td></td>
<td>0.192</td>
<td>0.272</td>
<td>0.242</td>
</tr>
</tbody>
</table>

**Notes.** *p < .05, **p < .01*
References


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