Social and Behavioral Determinants of HIV Care and Outcomes among a Sample of African-American Women Living with HIV

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ABSTRACT

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African-American women are a vulnerable subpopulation of people living with HIV (PLWH) at risk for inadequate treatment and poor disease outcomes. The purpose of this dissertation as to investigate three aspects of social and behavioral determinants of HIV care and outcomes among African-American women living with HIV. Specifically, to: 1) evaluate the relationship between HIV-related stigma and viral suppression and explore the mediating roles of depression and nonadherence to ART 2) assess whether religiosity, social support, and ethnic identity modify the relationship between HIV-related stigma and depression, and 3) describe patterns of alcohol use and associated characteristics. We used baseline data from the Unity Study, a randomized controlled trial of an HIV-related stigma reduction intervention for African-American women living with HIV in Chicago, IL and Birmingham, AL. First, we estimated the total effect of stigma on viral suppression using logistic regression and estimated indirect and direct effects along hypothesized pathways using serial mediation analysis. Next, we used moderation analyses to estimate the modifying effects of religiosity, social support, and ethnic identity on the relationship between HIV-related stigma and depression. Finally, we compared participant characteristics across patterns of alcohol use and estimated adjusted associations using logistic regression. Among women in this sample, HIV-related stigma was common, and those who reported greater levels of HIV-related stigma were less likely to be virally suppressed; depression and ART nonadherence did not appear to account for this relationship. Still, women who reported higher levels of HIV-related stigma were more likely to report higher levels of depressive symptom severity. Religiosity buffered this relationship, but social support and ethnic identity did not. Among women in this study, half reported any alcohol use, and a quarter each screened positive for UAU and HED. Patterns of alcohol use and were associated with social characteristics (religiosity, social support, and HIV-related stigma), clinical characteristics (depression), and HIV-related clinical characteristics (ART adherence and viral suppression). African-American women living with HIV face substantial challenges but demonstrate great capacity for resilience. Effective interventions which integrate aspects of religiosity and social support are needed to reduce HIV-related stigma and any and unhealthy alcohol use. Future research should focus on better understanding the relevant mechanisms and developing and testing new interventions.

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CHAPTER 1

Introduction

BACKGROUND AND MOTIVATION

Despite significant innovations in prevention and treatment, the HIV epidemic is ongoing in the United States (US). Currently, there are an estimated 1.2 million people living with HIV (PLWH) in the US (CDC, 2014), and approximately 50,000 people are newly infected each year. Furthermore, receipt of HIV care is suboptimal (Kaiser Family Foundation, 2014). Specifically, among PLWH in the US, approximately only 86% have been diagnosed, 40% are engaged in medical care, 37% are prescribed antiretroviral therapy (ART), and 30% are virally suppressed (CDC, 2014). Moreover, the burden of HIV is not shared equally. While HIV is transmitted exclusively through biological mechanisms (namely, sex and injection drug use), trends in HIV acquisition, treatment and outcomes are largely socially-patterned. That is, race and ethnicity, gender, age, and socioeconomic status (SES) influence who gets infected, who gets treated, and who survives (Chu & Selwyn, 2008; Dean & Fenton, 2010; Pellowski, Kalichman, Matthews, & Adler, 2013; Zeglin & Stein, 2015).

African-American women are a particularly vulnerable sub-population who are susceptible to myriad social and behavioral determinants of health. Specifically, because of intersecting disadvantaged race and gender, many African-American women have increased risk for psychosocial stressors and structural barriers that increase vulnerability to inadequate care and poor health outcomes through various pathways (Thomas & Gonzalez-Prendes, 2009). Psychosocial stressors include poverty, racism, sexism, and other forms of discrimination and stigma (Krieger, Rowley, Herman, Avery, & Phillips, 1993; Mulia, Ye, Zemore, & Greenfield, 2008). Structural barriers include racial segregation and resource poor environments (D. R. Williams & Collins, 2001), mass incarceration of African-American men (Western & Wildeman, 2009), and systematic impediments to educational, occupational and financial advancement (Krieger et al., 1993; Schulz et al., 2000; D. R. Williams, 1999).

Heightened exposure to psychosocial stressors and structural barriers has specific implications for HIV acquisition and outcomes (Brawner, 2014; El-Bassel, Caldeira, Ruglass, & Gilbert, 2009; Newman, Williams, Massaquoi, Brown, & Logie, 2008; Wyatt et al., 2013). First, research shows that psychosocial stressors (e.g., poverty, racism and sexism) are associated with poor psychosocial outcomes (e.g., distress, anger, and depression) (Mulia et al., 2008; Thomas & Gonzalez-Prendes, 2009; D. R. Williams & Williams-Morris, 2000), as well as any and unhealthy alcohol use (Boyd, Berger, Baliko, & Tavakoli, 2009; Gilbert & Zemore, 2016; Martin, Tuch, & Roman, 2003; Mulia et al., 2008). Subsequently, poor psychosocial outcomes and alcohol use are associated with HIV risk behaviors (e.g., unprotected sex, multiple sex partners, injection drug use) which heighten risk of HIV acquisition (Brawner, Gomes, Jemmott, Deatrick, & Coleman, 2012; Perdue, Hagan, Thiede, & Valleroy, 2003; Sales, Brown, Vissman, & DiClemente, 2012; Seth, Raiji, DiClemente, Wingood, & Rose, 2009; Seth, Wingood, DiClemente, & Robinson, 2011). Furthermore, research suggests that regardless of individual behaviors, African-American women are at increased risk for HIV acquisition because of structural factors (Brawner, 2014). Specifically, there is evidence that racial segregation, high incarceration among males, and economic oppression contribute towards tight sexual networks and elevated community viral loads that are conducive to increased HIV transmission in African-American communities (Adimora & Schoenbach, 2005).

If an African-American woman acquires HIV, the stress and stigma of living with HIV can add to existing psychosocial stressors, contributing to increased risk of poor psychosocial outcomes (Earnshaw, Bogart, Dovidio, & Williams, 2013; C. Logie, James, Tharao, & Loutfy, 2013; Parker & Aggleton, 2003). Moreover, increased levels of psychosocial stressors and psychosocial outcomes associated with living with HIV can intensify alcohol use (Sullivan, Fiellin, & O'Connor, 2005) which may in turn, place additional strain on psychosocial outcomes (Sullivan, Goulet, Justice, & Fiellin, 2011). Among PLWH, both poor psychosocial outcomes (e.g., depression) and alcohol use are associated with diminished HIV health behaviors including adherence to ART (Gonzalez, Batchelder, Psaros, & Safren, 2011; Hendershot, Stoner, Pantalone, & Simoni, 2009; Kader, Govender, Seedat, Koch, & Parry, 2015; Katz et al., 2013; Lillie-Blanton et al., 2010; Sumari-de Boer, Sprangers, Prins, & Nieuwkerk, 2012; Tyer-Viola et al., 2014) and engagement in care (Cunningham et al., 2006; Messer et al., 2013; Monroe et al., 2016). Though some of the effects of alcohol use on HIV health behaviors likely operate through psychosocial outcomes, there is evidence of independent effects as well (Bilal et al., 2016; Kalichman et al., 2015). Finally, structural barriers (e.g., neighborhood segregation) can also negatively influence HIV treatment for African-American women by reducing access to care (D. R. Williams & Collins, 2001).

African-American women living with HIV who have stopped adhering to ART or otherwise disengaged from HIV treatment are at increased risk of poor viral control and HIV-related complications (Bangsberg et al., 2001; Berg et al., 2005; Crawford, Sanderson, & Thornton, 2014; Horberg et al., 2013). Furthermore, alcohol use may be independently associated with HIV disease progression and other comorbidities (Samet et al., 2007; E. C. Williams, Hahn, et al., 2016). Ultimately, likely because of these social and behavioral determinants, African-American women living with HIV are more likely to experience worse HIV-related outcomes (when compared to their White counterparts), contributing towards overall elevated morbidity and mortality (Chu & Selwyn, 2008; Lemly et al., 2009; Murphy, Xu, & Kochanek, 2013; Singh, Azuine, & Siahpush, 2013).

Despite these vulnerabilities, African-American women also have a rich history of perseverance and triumph; they have repeatedly demonstrated a remarkable ability to overcome adversity (Greene, 1994). As such, in the context of living with HIV, African-American women may capitalize on existing internal and external resources to promote resilience. These resilience resources, leveraged from the same intersecting identities that give rise to social and behavioral risk factors, may then be used to buffer the detrimental effects of psychosocial stressors, structural barriers and associated outcomes.

CONCEPTUAL MODEL

A conceptual model of the social and behavioral determinants of HIV acquisition, care and outcomes among African-American women described above is presented in **Figure 1.1**. To summarize, in this country, African-American women exist at the intersection of disadvantaged race and gender, and this combination puts African-American women at heightened risk for certain psychosocial stressors and structural barriers. Psychosocial stressors (e.g., racism, sexism) may lead to poor psychosocial outcomes (e.g., stress, anxiety and depression) and increased risk of any and unhealthy alcohol use, which may (along with structural behaviors) contribute to increased HIV risk behaviors, and subsequently, higher risk for HIV acquisition. If an African-American woman acquires HIV, it is often an additional source of psychosocial stress which will likely impact psychosocial outcomes and alcohol use patterns. For African-American

women living with HIV, these additional stressors can affect HIV health behaviors, and along with structural barriers, HIV outcomes. Ultimately, through these pathways, African-American women may be at increased risk of morbidity and mortality related to HIV. Simultaneously, the intersection of race and gender among African-American women living with HIV can also generate opportunities and tools for promoting resilience (e.g., spirituality, social support and attachment and belonging to one's ethnic identity), and these resilience resources may impact (e.g., buffer) different pathways. Finally, it is important to acknowledge that these phenomena are occurring within the context of other potential vulnerabilities (e.g. age, geography and SES) that must also be considered.

STUDY AIMS

The purpose of this dissertation is to investigate three aspects of social and behavioral determinants of HIV care and outcomes among African-American women living with HIV as conceptualized above.

First, as indicated in the conceptual model, African-American women living with HIV may be at increased risk for HIV-related stigma (a psychosocial stressor), and subsequently, depression (a psychosocial outcome). HIV-related stigma refers to prejudice, discrediting and discrimination directed at people living with HIV, and can be both perceived and internalized (Herek et al., 1998; Rao, Molina, Lambert, & Cohn, 2016). HIV-related stigma and depression are well-documented in studies of African-American women living with HIV (Buseh & Stevens, 2006; Clark, Lindner, Armistead, & Austin, 2003; Fletcher et al., 2016; Sanicki & Mannell, 2015; Wingood et al., 2007), and studies of other groups of PLWH have indicated that the two are highly correlated (Breet, Kagee, & Seedat, 2014; Charles et al., 2012; C. Logie et al., 2013). Furthermore, HIV-related stigma and depression are associated with ART nonadherence (an HIV health behavior), a critical barrier to achieving viral suppression (an HIV outcome) (Carr & Gramling, 2004; Mitzel et al., 2015; Rintamaki, Davis, Skripkauskas, Bennett, & Wolf, 2006; Turan et al., 2016). As such, we hypothesized that African-American women living with HIV who experience higher levels of HIV-related stigma would also be less likely to be virally suppressed. Furthermore, we hypothesized that the mechanism for this relationship would operate through depressive symptom severity and ART nonadherence. Therefore, the first study aim (Chapter 2) was to evaluate the relationship between HIV-related stigma and viral suppression and assess the role of depressive symptoms and nonadherence to ART as potential mediators of this association in a sample of African-American women living with HIV

Second, as previously discussed, African-American women living with HIV experience HIV-related stigma and depression within the context of intersectionality (Caiola, Docherty, Relf, & Barroso, 2014; Parker & Aggleton, 2003). That is, because of their race, gender and HIV status, African-American women living with HIV are vulnerable to magnified experiences of disadvantage (C. H. Logie, James, Tharao, & Loutfy, 2011; Rao, Andrasik, & Lipira, 2018). Research indicates that fostering resilience within these women may be an effective way of addressing HIV-related stigma in this context (Newman et al., 2008). This notion capitalizes on African-American women's longstanding ability to be resilient in the face of adversity (Greene, 1994), and provides motivation to identify sources of resilience that can be leveraged in programming for PLWH. Previous work suggests that religiosity, social support, and ethnic identity could function as resilience resources for African-American women living with HIV, and buffer the detrimental effects of HIV-related stigma (Himelhoch & Njie-Carr, 2016; Serovich, Kimberly, Mosack, & Lewis, 2001; M. T. Williams, Chapman, Wong, & Turkheimer, 2012).

Therefore, the second study aim (Chapter 3) was to estimate and test whether religiosity, social support and ethnic identity modify the relationship between HIV-related stigma and depression within a sample of African-American women living with HIV.

Third, as illustrated in the conceptual model, patterns of alcohol use are intimately intertwined with the other social and behavioral determinants of HIV discussed here and are a strong determinant of HIV and its sequelae. Specifically, alcohol use is likely influenced by psychosocial stressors (Boyd et al., 2009; Hutton et al., 2017; Wardell, Shuper, Rourke, & Hendershot, 2018), bidirectionally related to psychosocial outcomes (Sullivan et al., 2005; Sullivan et al., 2011), and has the potential to increase risk of morbidity and mortality through both independent effects and effects on HIV-related pathways (E. C. Williams, Hahn, et al., 2016). Any and unhealthy alcohol use may be common among African-American women living with HIV, especially among certain demographic and clinical subgroups, but this is understudied in this population (Matson et al., 2018; Mulia, Ye, Greenfield, & Zemore, 2009; Nolen-Hoeksema, 2004; Witbrodt, Mulia, Zemore, & Kerr, 2014). Therefore, the third study aim (Chapter 4) was to describe patterns of alcohol use and associated characteristics in a sample of African-American women living with HIV.

Collectively, the aims of this dissertation are intended to inform interventions for African-American women living with HIV. Specifically, better understanding the relationship and mechanism through which HIV-related stigma affects viral suppression (AIM 1) can help identify points of intervention. Similarly, if we can identify resilience resources that effectively buffer the effects of HIV-related stigma on depression (AIM 2), we can leverage those resources in the content of interventions. Finally, identifying patterns of alcohol use and associated characteristics (AIM 3) can provide critical information about the unique alcohol-related risks experienced by African-American women living with HIV (including particularly vulnerable subgroups) and the alcohol screening and treatment required to meet the needs of this population. Ultimately, the goal of this dissertation is to provide valuable information to help reduce the effects of social and behavioral determinants of HIV care and outcomes among African-American women living with HIV.

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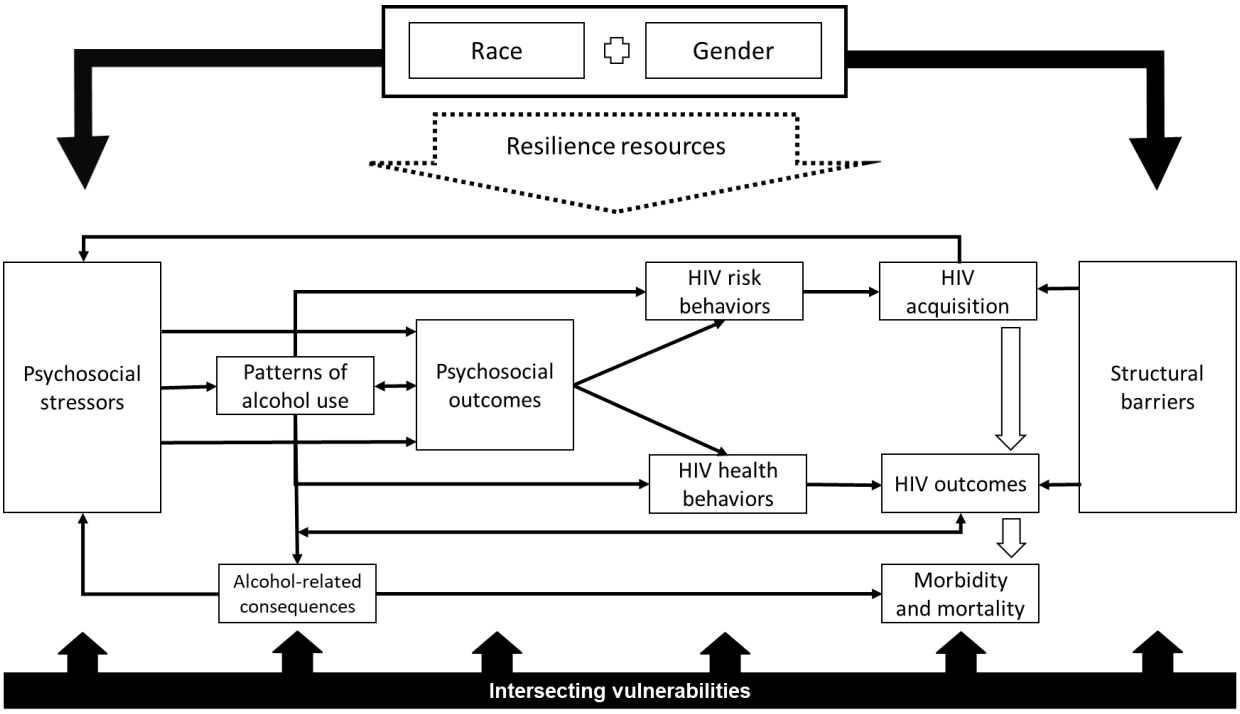
FIGURES

Figure 1.1 Conceptual model of social and behavioral determinants of HIV acquisition, care and outcomes among African-American women.



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CHAPTER 2

HIV-related stigma and viral suppression among African-American women: Exploring the mediating roles of depression and ART nonadherence

BACKGROUND

African Americans are disproportionately burdened by HIV in the United States (U.S.) (Beer, Bradley, et al., 2016; Beer, Mattson, Bradley, & Skarbinski, 2016; CDC, 2014, 2017; Lemly et al., 2009; Lesko et al., 2015; Murphy et al., 2013; Novak, Hart, Chmiel, Brooks, & Buchacz, 2015; Ribaudo et al., 2013; Singh et al., 2013; Torian, Wiewel, Liu, Sackoff, & Frieden, 2008), and African-American women continue to be a particularly vulnerable subgroup. In 2015, African-American women who acquired HIV heterosexually accounted for 23% of new diagnoses among African Americans and 61% of new diagnoses among U.S. women – 5 times the rate of Hispanic women and 16 times the rate of White women (CDC, 2017). Studies also indicate that African-American women living with HIV are less likely to be on antiretroviral therapy (ART) (M. H. Cohen et al., 2004; Lillie-Blanton et al., 2010), experience more severe deterimental effects of late initiation and early discontinuation of ART (Losina et al., 2009), and have higher morbidity and mortality rates when compared to White women living with HIV (Lesko et al., 2015; Meditz et al., 2011).

African-American women living with HIV are also vulnerable to HIV-related stigma. HIV-related stigma refers to the prejudice, discounting, discrediting and discrimination that is directed at people perceived as having HIV (Herek et al., 1998). Qualitative studies have documented that African-American women living with HIV experience debilitating HIV-related stigma (Buseh & Stevens, 2006; Fletcher et al., 2016; McDoom, Bokhour, Sullivan, & Drainoni, 2015; Muturi & An, 2010; Sanicki & Mannell, 2015). Furthermore, among these women, HIV-related stigma is associated with isolation (Grodensky et al., 2015), decreased psychological functioning (Clark et al., 2003), and other symptoms of depression (Vyavaharkar et al., 2010; Wingood et al., 2007). In addition to poor psychosocial outcomes, HIV-related stigma has been consistently associated with diminished ART adherence (Carr & Gramling, 2004; Edwards, 2006; Rao, Kekwaletswe, Hosek, Martinez, & Rodriguez, 2007; Rintamaki et al., 2006). Research also suggests that associations between HIV-related stigma and ART nonadherence may be mediated through depressive symptoms (Mitzel et al., 2015; Rao, Feldman, et al., 2012; Turan et al., 2016).

It is likely, therefore, that HIV-related stigma contributes to poor HIV viral load control among African-American women living with HIV (Turan et al., 2017). Specifically, we hypothesize that HIV-related stigma affects viral suppression through psychosocial pathways (e.g., depressive symptoms) which influence HIV health behaviors (e.g., ART nonadherence, see **Figure 2.1**). However, to date, no study has established an association between HIV-related stigma and viral suppression among African-American women living with HIV. Furthermore, no study has assessed whether associations between HIV-related stigma and viral suppression are mediated by depressive symptoms, and subsequently, by ART nonadherence.

The purpose of this study was to 1) evaluate the relationship between HIV-related stigma and viral suppression in a sample of African-American women living with HIV, and 2) to assess the role of depressive symptoms and nonadherence to ART as potential mediators.

METHODS

Data source and study sample

This study is a secondary analysis of baseline data from the Unity Study, a multisite randomized controlled trial testing the effectiveness of a behavioral intervention to reduce HIV-related stigma among African-American women living with HIV (Rao, Kemp, et al., 2018). From May 2013 to October 2015, African-American women living with HIV were recruited from three clinical sites that provide HIV care in Chicago, Illinois and Birmingham, Alabama. Sites included the Northwestern University Infectious Diseases HIV clinic (NU) and the Ruth M. Rothstein CORE Center (CORE) in Chicago and the University of Alabama, Birmingham 1917 HIV Clinic (UAB) in Birmingham. To participate in the Unity Study, women needed to self-identify as African American, be at least 18 years old, and be currently receiving HIV services. Women were excluded from the Unity Study if they were foreign born and had lived in the US for less than 10 years.

Unity Study participants were included in the present secondary analysis if they reported being on ART during the baseline assessment, had HIV RNA viral load data collected within the relevant clinical window (defined below), and had complete data on covariates of interest.

Data collection

After being recruited into the study, Unity Study participants met with a research staff member for a baseline visit at which point they provided written consent to participate in the study, signed HIPAA authorizations to allow researchers to access their medical records for abstraction of clinical data, and completed baseline assessments. Baseline assessments were completed via tablet-based audio computer assisted self-interview (ACASI) and collected demographics and social-behavioral data. Relevant clinical data were abstracted from participant medical records.

Measures

Outcome. The outcome of interest was baseline viral suppression defined dichotomously as less than 200 vs. 200 or more copies/mL of plasma HIV RNA. Though a cutoff of 200 copies/mL reflects a threshold above undetectable, this cut point was chosen to accommodate potential differences in the sensitivity of viral load assays across study sites (Lalama et al., 2015). A 200 copies/mL cutoff is also consistent with viral suppression as defined by the US Department of Health and Human Services (HHS) HIV/AIDS Bureau's core performance indicators (U.S. Department of Health and Human Services, 2016). Based on ART guidelines, anticipated changes in plasma viral load will occur within 8 weeks of changing an ART regimen (Panel on Antiretroviral Guidelines for Adults and Adolescents, 2016). For this reason, we assessed baseline viral suppression using viral loads collected within 8-weeks of completing the baseline assessments (i.e., study entry).

*Predicto*r. The predictor of interest was HIV-related stigma as measured by the 14-item Stigma Scale for Chronic Illness (SSCI) score. The SSCI consists of two sub-scales that assess enacted and internalized stigma. In a sample of African Americans living with HIV, the SSCI demonstrated good internal reliability (Cronbach's alpha = 0.93) and excellent concurrent validity (Rao et al., 2009; Rao et al., 2016). The scale includes statements such as, "Because of my illness, people were unkind to me," and "Because of my illness, I felt left out of things." Participants respond on a 5-point Likert-type scale ranging from 1 = "Never" to 5 = "Always". For this study, participants were instructed to think of the past month and consider HIV as their "illness." The responses were summed to create an index ranging from 14 to 70, with 14 indicating no reported HIV-related stigma, and higher scores reflecting greater HIV-related stigma.

Mediators. The first mediator of interest was depressive symptom severity as measured by continuous score from the 8-item Patient Health Questionnaire (PHQ-8) (Kroenke et al., 2009). The PHQ-8 is an abridged version of the PHQ-9 (suicidality item omitted under recommendation of the Institutional Review Board) and is widely used for screening, diagnosing, and monitoring depression (Center for quality assessment and improvement in mental health, 1999). Regarding the preceding two weeks, participants respond to questions such as, "Have you been feeling down, depressed or hopeless?" and rank them on a 4-point Likert-type scale (from 0 = "Not at all" to 3 = "Nearly every day"). The responses were summed to create an index of depressive symptoms ranging from 0 to 24 with higher scores reflecting greater severity (0-4: minimal depression, 5-9: mild depression, 10-14: moderate depression, 15-19: moderately severe depression, 20-24: severe depression).

The second mediator of interest was nonadherence to ART, defined as the number of days in the past 30 in which the participant missed ART doses. Participants responded to the question, "In the last 30 days, on how many days did you miss at least one dose of any of your HIV medicines?" Self-reported adherence is less likely to be overreported and more likely to be associated with viral load when the recall period is longer (e.g., 30 days) (Lu et al., 2008; Simoni et al., 2006).

Covariates. Covariates were chosen *a priori* based on their potential for confounding. Primary covariates included Unity Study intervention arm (to account for early intervention effects among women who had their viral load collected after the intervention began), study site (NU, CORE, UAB), age in years (continuous), number of years living with HIV (continuous), and education (less than high school, high school degree or equivalent, some college, or college degree and beyond). Because alcohol use severity is strongly associated with both HIV-related stigma (Galvan, Davis, Banks, & Bing, 2008) and HIV viral suppression (Hahn & Samet, 2010), but also strongly correlated with depression (Sullivan et al., 2005) and nonadherence (Hendershot et al., 2009) (and thus a potential co-mediator), alcohol use severity was considered a secondary covariate. Alcohol use severity was measured by the Alcohol Use Disorders Identification Test (AUDIT) Consumption (AUDIT-C) questionnaire which assesses quantity and frequency of average drinking as well as heavy episodic drinking (4 or more alcoholic drinks on one occasion) (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). AUDIT-C scores range from 0 to 12, and increased scores are associated with increased alcohol use disorder symptoms and consequences (Bradley et al., 2007; Bradley et al., 2016; Bryson et al., 2008; Chavez, Williams, Lapham, & Bradley, 2012; Rubinsky, Dawson, Williams, Kivlahan, & Bradley, 2013). For the present study, alcohol use severity was defined categorically (AUDIT-C = 0, 1-2, 3-7, and 8-12).

Analyses

Descriptive analyses were conducted to summarize participant characteristics. Missing items on scales were mean imputed before calculating total scores. Individuals missing entire scale responses were dropped from analysis. To test for differences across sites, we used χ^2 test for independence for categorical variables and Kruskal-Wallis test (with ties) for continuous variables. A Kruskal-Wallis test is a non-parametric rank test that is appropriate when comparing medians (rather than means).

To evaluate the relationship between HIV-related stigma and viral suppression, we first estimated the total effect of HIV-related stigma on viral suppression using logistic regression. In these models, the viral suppression outcome was regressed on HIV-related stigma adjusted for primary covariates (intervention arm, study site, age, time living with HIV, and education). We calculated adjusted odds ratios (AOR) with 95% confidence intervals (95% CI). We also estimated and plotted predicted probabilties of viral suppression for all possible values of HIV-

related stigma. Predicted probabilities were obtained separately for each site with the intervention arm set at control, education set at less than high school (the modal category) and age and time living with HIV set at their respective medians.

Then, to explore the roles of depressive symptom severity and ART nonadherence as mediators, we estimated indirect and direct effects along possible pathways using serial mediation analysis with 95% CI generated from bias-corrected bootstrapped standard errors. For indirect pathways of interest, we also estimated individual unstandardized coefficients.

Two secondary analyses were undertaken. First, we extended the primary models with additional adjustment for alcohol use severity. This measure was not included in primary analyses because alcohol use may represent a parallel mediating pathway. However, due to its complex associations with HIV-related stigma (Galvan et al., 2008), depression (Sullivan et al., 2005), ART nonadherence (Hendershot et al., 2009), and viral suppression (Hahn & Samet, 2010), it was also considered a potential confounder and assessed as such in secondary models.

Second, because limiting the primary study sample to women with viral loads collected within 8-weeks of study entry considerably reduced the sample size, and potentially our ability to detect effects of interest, we conducted a sensitivity analysis with a sample of women who had viral loads collected within 24-weeks of study entry (the sensitivity sample). Specifically, after assessing differences between characteristics of the primary sample and the sensitivity sample, we then repeated the primary analyses in the sensitivity sample.

All non-mediation analyses were conducted using Stata Version 13 (StataCorp, 2013). Serial mediation analyses were conducted in SPSS Version 25 (Corp, 2017), using the PROCESS macro, a regression-based approach that can accomodate serial mediation models with dichotomous outcomes (Hayes, 2013). All Unity Study procedures were reviewed and approved by the Institutional Review Boards (IRB) at the University of Washington, NU, CORE, and UAB.

RESULTS

At baseline, 239 African-American women living with HIV were enrolled in the Unity Study. Among them, 218 women reported being on ART. Of those women on ART, 106 had viral loads collected within 8 weeks of study entry, and of those women, 100 had complete covariate data and were included in the primary sample. An additional 84 women on ART with complete covariate data had viral loads collected within 24 weeks of study entry, resulting in a sample of 184 women for sensitivity analyses (see **Figure 2.2** for participant flow chart).

Participant Characteristics

Table 2.1 summarizes participant characteristics for the primary sample (N = 100). Women in the sample were generally middle aged (median age = 45 years, interquartile range (*IQR)* = [38, 53]) and had been living with HIV for a median 14 years (*IQR* = [9, 20] years). In terms of education, most women (61%) had at least a high school education. Alcohol use was common (54%) and 24% of women reported unhealthy alcohol use (AUDIT-C ≥ 3) (Bradley et al., 2003).

The median HIV-related stigma (SSCI) score was 31 (IQR = [23, 41]), with 95% reporting at least some level of HIV-related stigma (i.e., SSCI > 14). The median PHQ-8 score was 7 (*IQR* = [3, 13]). Based on clinical cut points for depressive symptom severity, 64% reported minimal to mild symptoms, 29% reported moderate to moderately severe symptoms,

and 7% reported severe symptoms. In this sample, about half of participants (52%) had missed at least one ART dose in the previous 30 days, and the majority of women (79%) were virally suppressed.

Participant characteristics differed slightly across sites. Compared to Ruth M. Rothstein CORE Center (CORE, N = 31) and University of Alabama, Birmingham (UAB, *N* = 43), participants from Northwestern University (NU, *N* = 26) tended to be younger ($p = 0.03$). Alternatively, participants from CORE were more likely to have less than a high school education ($p < 0.01$) and less likely to consume alcohol ($p = 0.04$). Participants from CORE also had slightly higher stigma scores ($p = 0.07$) and were more likely to be virally suppressed ($p = 0.05$) when compared to the other study sites.

Total effect of HIV-related stigma on viral suppression

In the primary analysis, HIV-related stigma had a statistically significantly association with viral suppression, such that higher levels of HIV-related stigma were associated with lower odds of being virally suppressed ($p < .01$). Specifically, a 1-unit higher SSCI score was associated with 7% lower odds of being virally suppressed (*AOR* = 0.93, *95% CI* = [0.89, 0.98]). Results were similar with additional adjustment for alcohol use severity; a 1-unit higher SSCI score was associated with 9% lower odds of being virally suppressed (*AOR* = 0.91, *95% CI* = [0.85, 0.97]).

Using the primary analysis model, predicted probabilities of viral suppression at different levels of HIV-related stigma are presented for each site in **Figure 2.3**. Estimates reflect the predicted probability of viral suppression for a woman in the Unity Study control group, who is 45 years old, has lived with HIV for 14 years, and who has less than a high school education. For all sites, the predicted probability of viral suppression decreased with increased HIV-related stigma.

Direct and indirect effects of HIV-related stigma on viral suppression

Table 2.2 presents results of serial mediation analyses including total effects expressed as difference in log-odds for comparison. In the primary model, after accounting for potential mediators, HIV-related stigma had a statistically significant negative direct effect on viral suppression ($\beta = -0.085$, *95% CI* = [-0.145, -0.025]), and this direct effect was larger in magnitude than the estimated total effect of HIV-related stigma ($\beta = -0.069$, *95% CI* = [-0.117, -0.021]). None of the possible indirect effects were statistically significant.

Trends were similar in the secondary model; the direct effect of HIV-related stigma was larger than the total effect, and all indirect effects were statistically non-significant. Moreover, with the additional adjustment for alcohol use severity, the direct effect of HIV-related stigma was much larger in magnitude ($\beta = -0.238$, *95% CI* = [-0.385, -0.091]) than in the primary model. Post hoc analyses demonstrated that alcohol use severity was not associated with HIV-related stigma in this sample.

Figure 2.4 provides unstandardized path coefficients for the potential indirect pathways in the primary model. Looking first at the main indirect effect of interest (HIV-related stigma > depressive symptom severity > ART nonadherence > viral suppression), higher HIV-related stigma was significantly associated with higher depressive symptom severity ($\beta = 0.23$, $p < .001$) and ART nonadherence was significantly associated with lower likelihood of being virally suppressed ($\beta = -0.30$, $p < .01$). However, depressive symptom severity was not significantly

associated with ART nonadherence after accounting for HIV-related stigma (p = .35) or viral suppression after accounting for ART nonadherence (p = .50). Similarly, HIV-related stigma was not significantly associated with ART nonadherence after accounting for depressive symptom severity (p =.89).

Sensitivity Analysis

Comparing the 84 additional women in the sensitivity sample to the primary sample, women were similar in terms of age, years living with HIV, education, alcohol use severity, HIV-related stigma, depressive symptom severity, and ART nonadherence (data not shown, see **Appendix 2.A**). However, women who had viral loads collected within 24 weeks of study entry were slightly more likely to be virally suppressed than women who had viral loads collected within 8 weeks of study entry (χ^2 [df = 1] = 4.15, p = 0.04).

In the sensitivity sample (N = 184), analysis of the total effect of HIV-related stigma on viral suppression produced estimates from both the primary and secondary models that were consistent with the primary analysis (data not shown, see **Appendix 2.B**). However, trends from the serial mediation analysis in the sensitivity sample differed slightly from those in the primary sample. Namely, in the sensitivity analyses, the direct effect of HIV-related stigma was smaller than the total effect of HIV-related stigma in both the primary and secondary models (data not shown, see **Appendix 2.B**).

DISCUSSION

In this sample of African-American women living with HIV, HIV-related stigma was commonly reported, and those who experienced greater levels of HIV-related stigma were less likely to be virally suppressed. In cross-sectional mediation analysis, depressive symptoms and ART nonadherence did not appear to account for this relationship. Specifically, we did not identify support for indirect pathways through depressive symptoms and ART nonadherence, and the negative association between HIV-related stigma and viral suppression remained even after accounting for these hypothesized mediators.

Almost all of the women in this sample reported some level of HIV-related stigma. This is consistent with myriad quantitative and qualitative studies of African-American women living with HIV (Buseh & Stevens, 2006; Clark et al., 2003; Edwards, 2006; Fletcher et al., 2016; McDoom et al., 2015; Rao, Desmond, et al., 2012; Sanicki & Mannell, 2015; Vyavaharkar et al., 2010), and reiterates the importance of understanding and reducing HIV-related stigma in this population. Furthermore, in this study, we found a significant association between HIV-related stigma and lower likelihood of viral suppression, even when adjusting for potential confounders. This finding is in contrast with previous studies of people living with HIV (PLWH). For instance, in a sample of PLWH in the Netherlands, Sumari-Boer et al found no association between personalized HIV-related stigma and detectable viral load in univariate analysis (Sumari-de Boer et al., 2012). Similarly, in a nationally representative probability sample of PLWH in the U.S., Baugher et al found that stigma was no longer associated with viral suppression after adjusting for age (Baugher et al., 2017). Some of the discrepancy in results may be attributable to key differences in study design (e.g., different stigma measures); however, it is also possible that the association observed in the current study is indicative of a particularly vulnerable subpopulation of PLWH. Specifically, because African-American women exist at the intersection of disadvantaged race and gender, the effects of HIV-related stigma may be magnified (C. H. Logie et al., 2011; Parker & Aggleton, 2003; Rao, Andrasik, et al., 2018). Comparing the results

from this study to analyses among other subgroups of PLWH in the U.S. could provide further insight into potential differences in the effects of HIV-related stigma across populations.

Interestingly, the results from this study did not support the hypothesis that depressive symptoms and ART nonadherence are the mechanisms through which HIV-related stigma is associated with viral suppression. As seen in Figure 3, two of the tested pathways (HIV-related stigma > depressive symptoms > ART nonadherence > viral suppression; HIV-related stigma > ART nonadherence > viral suppression) appear to break down at ART nonadherence. Although ART nonadherence was negatively associated with viral suppression as expected (Gross, Bilker, Friedman, & Strom, 2001), neither HIV-related stigma nor depressive symptoms were associated with ART nonadherence in this sample; a finding inconsistent with the extant literature on ART adherence (Gonzalez et al., 2011; Katz et al., 2013). Possibly, we did not see these associations with ART nonadherence because women in the Unity Study were similarly adherent to their ART; almost 90% reported 4 or fewer missed doses in the past 30 days. In other words, there was minimal variability in ART nonadherence. Restricted ranges in variable values reduce statistical power and attenuate bivariate associations (Shadish, Cook, & Campbell, 2002). As such, even if there were associations between ART nonadherence and other variables in the study, it would be difficult to detect in this sample. Repeating the analysis with a more sensitive measure of ART nonadherence or using a sample with greater variance in nonadherence may better elucidate the role of ART nonadherence in mediating the effects of HIV-related stigma on viral suppression among African-American women living with HIV.

Alternatively, the third pathway (HIV-related stigma > depressive symptoms > viral suppression) appears to break down between depressive symptoms and viral suppression; greater depressive symptom severity was not directly associated with likelihood of viral suppression after accounting for ART nonadherence. This finding is consistent with Leserman's 2003 argument that direct biological effects of depression on HIV disease-related outcomes are slow and difficult to observe in the short-term (Leserman, 2003). A longitudinal study of HIV-related stigma, depressive symptoms and viral suppression may be more appropriate for understanding this particular mechanism.

Finally, in this study, the association between HIV-related stigma and viral suppression remained after accounting for the two hypothesized mediators. Although HIV-related stigma may directly influence viral suppression, it is possible that other mediating variables, not examined in the present study, account for the observed association. For example, Turan et al found that social support was a mediating factor on the pathway between HIV-related stigma and ART adherence among a national sample of U.S. women living with HIV (Turan et al., 2016). Similarly, Helms et al found that attachment-related anxiety and concerns about inadvertent disclosure mediated an association between HIV-related stigma and ART adherence (Helms et al., 2016). Engagement in care (i.e. attended clinical visits) is another key component of effective HIV treatment that may be impacted by HIV-related stigma among African-American women living with HIV (McDoom et al., 2015; Walcott, Kempf, Merlin, & Turan, 2015). Finally, alcohol and other substance use may also play an important role.

Of these additional factors that may play a role in the association between HIV-related stigma and viral suppression, we assessed only alcohol use. Specifically, we fit secondary models controlling for alcohol use severity and found that alcohol use severity had a nuanced effect on the direct effect between HIV-related stigma and viral suppression. Exploration of other factors was limited by availability of relevant measures in the Unity Study and the scope of the primary hypothesis of the current study. Further research is needed to understand the many and

complex roles of the myriad factors which may mediate the effect of HIV-related stigma on viral suppression in this population.

Limitations

This study had several important limitations. First, the data are cross-sectional. Though we limited our primary sample to women with viral loads collected within a clinically relevant window, we must be cautious in making causal interpretation of any observed associations. Second, there may have been limitations to our measures. Self-reported measures are subject to recall and social desirability bias. Additionally, the absence of certain measures (e.g., income, sexual orientation, binge drinking and prescribed ART dosage) may have left our analyses susceptible to residual confounding. Third, there were limitations to the sample in terms of generalizability. Namely, because the women in the Unity Study were all currently seeking HIV care and agreed to participate in a study that would require talking about living with HIV with researchers and other participants, findings may not be generalizable to the larger population of African-American women living with HIV, many of whom are not in care and are especially vulnerable to poor outcomes (M. H. Cohen et al., 2004; Kaiser Family Foundation, 2017). Finally, this study may have had inadequate statistical power. In serial mediation, the relationship between mediators can increase sampling variance and reduce power, especially when the sample size is small (Hayes, 2013). Using a dichotomous outcome also reduces statistical power (Bhandari, Lochner, & Tornetta, 2002). While viral suppression has high clinical significance (and is recognized as the final stage of the HIV care continuum and considered the ultimate goal of HIV treatment) (Panel on Antiretroviral Guidelines for Adults and Adolescents, 2016), using this particular measure may have contributed to insufficient power to detect the indirect effects of interest. Increasing the sample size from 100 to 184 in sensitivity analyses did not result in the detection of any additional effects; however, it is possible that an even larger sample may have been necessary.

Conclusions

In summary, the current study indicates that HIV-related stigma is common among African-American women living with HIV, and those who experience higher levels of HIV-related stigma are less likely to be virally suppressed. Though the mechanisms remain unclear, these findings suggest potential health-related consequences associated with HIV-related stigma and underscore the need for incorporating stigma-reduction programming into regular HIV clinical care, social services for PLWH, and HIV prevention efforts. Future research with African-American women living with HIV is needed to 1) better understand the roles of depressive symptoms and ART nonadherence and 2) clarify the roles of additional mediating factors such as social support, engagement in care and alcohol and other substance use. Longitudinal studies of large samples of African-American women living with HIV, including women outside of care, would be particularly valuable.

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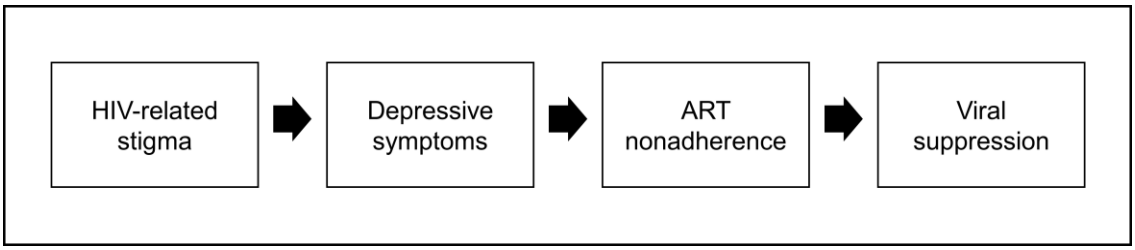
FIGURES

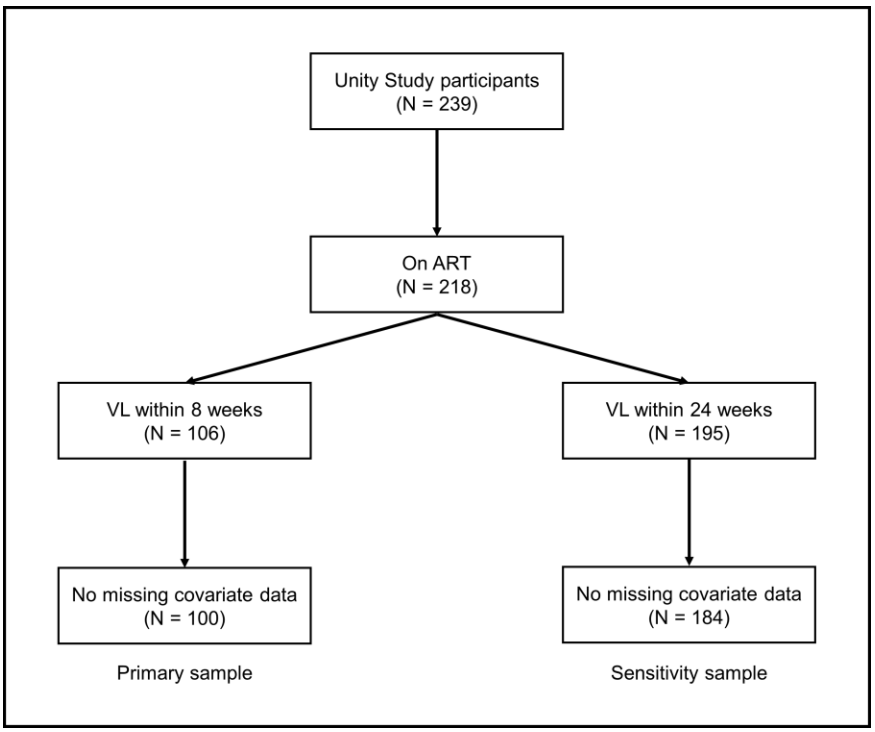
Figure 2.1. Hypothesized pathway from HIV-related stigma to viral suppression



ART – antiretroviral therapy

RETURN TO TEXT

Figure 2.2. Primary and sensitivity study samples: flow of participant study inclusion among African-American women living with HIV enrolled in an HIV-related stigma-reduction intervention (Unity Study)



ART – antiretroviral therapy, VL – viral load
Covariates of interest include age, number of years living with HIV, and education

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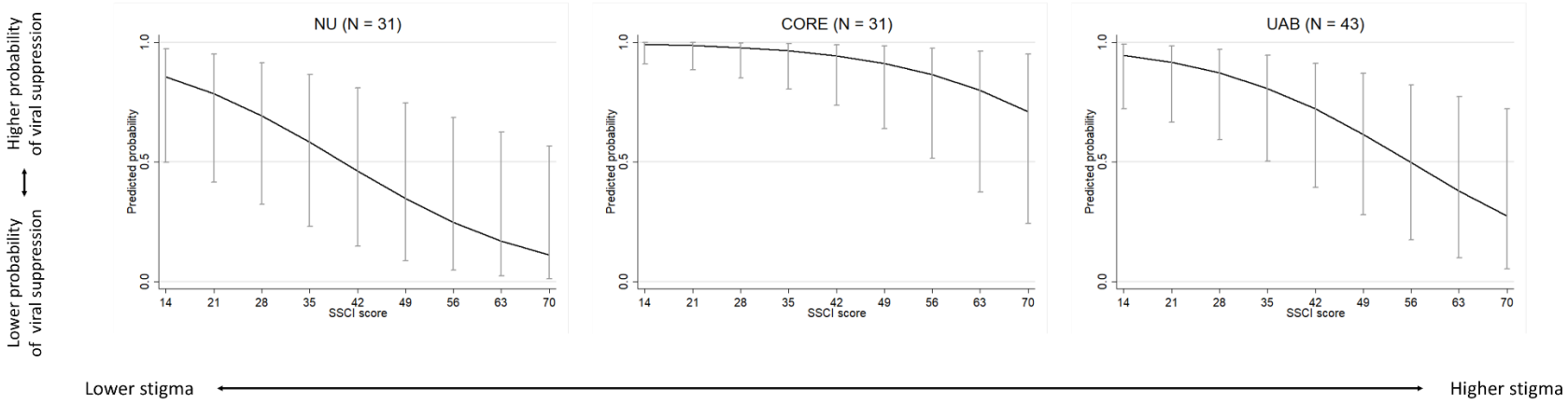
Figure 2.3. Predicted probability of viral suppression and 95% confidence intervals for different levels of HIV-related stigma (SSCI), by study site, among a sample of African-American women living with HIV enrolled in the Unity Study (N = 100)



SSCI – 14-item Stigma Scale for Chronic Illness
NU – Northwestern University, CORE – Ruth M. Rothstein CORE Center, UAB – University of Alabama, Birmingham

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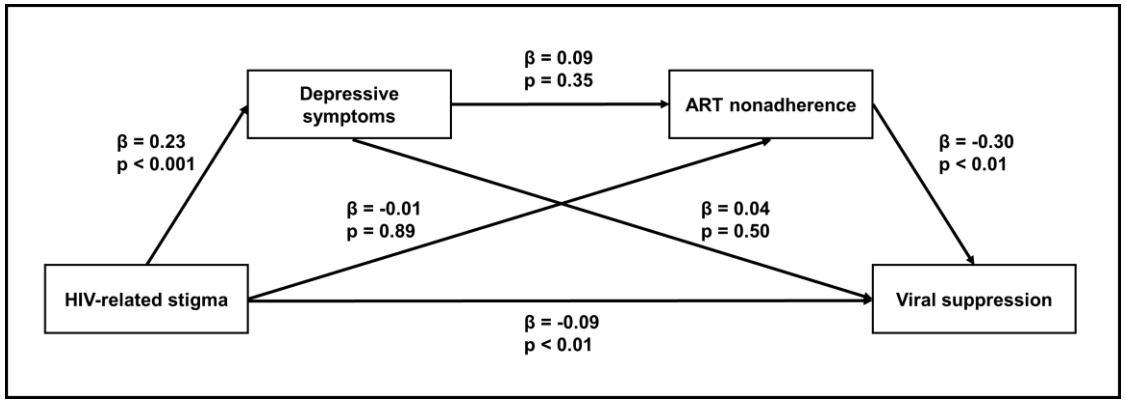
Figure 2.4. Primary serial mediation model with unstandardized path coefficients estimating associations between HIV-related stigma, depressive symptoms, ART nonadherence and viral suppression among a sample of African-American women living with HIV enrolled in the Unity Study (N = 100)



ART – antiretroviral therapy

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TABLES

Table 2.1 Baseline characteristics of African-American women living with HIV who participated in an HIV-related stigma-reduction intervention (Unity Study) and had viral loads collected within 8-weeks of study entry (N = 100)

	NU (N = 26)		CORE (N = 31)		UAB (N = 43)		Total (N = 100)		
	Median/N	(IQR/%)	Median/N	(IQR/%)	Median/N	(IQR/%)	Median/N	(IQR/%)	**p-value***
Age (years)	36 years	(30-49)	47 years	(41-54)	45 years	(42-53)	45 years	(38-53)	0.03
Time living with HIV (years)	15 years	(13-20)	12 years	(7-18)	13 years	(7-20)	14 years	(9-20)	0.24
Education									<0.01
Less than high school	5	(19%)	19	(61%)	15	(35%)	39	(39%)	
High school or equivalent	5	(19%)	4	(13%)	9	(21%)	18	(18%)	
College	9	(35%)	7	(23%)	16	(37%)	32	(32%)	
More than college	7	(27%)	1	(3%)	3	(7%)	11	(11%)	
Alcohol use severity (AUDIT-C score)									0.04
0	11	(42%)	21	(68%)	14	(33%)	46	(46%)	
1-2	8	(31%)	5	(16%)	17	(40%)	30	(30%)	
3-7	7	(27%)	3	(10%)	11	(26%)	21	(21%)	
8-12	0	(0%)	2	(6%)	1	(2%)	3	(3%)	
HIV-related stigma (SSCI)	29	(22-35)	35	(30-45)	29	(20-37)	31	(23-41)	0.07
Depressive symptom severity (PHQ-8)	5	(2-13)	7	(3-15)	8	(4-12)	7	(3-13)	0.53
ART nonadherence (out of 30 days)	2	(0-4)	0	(0-2)	1	(0-2)	1	(0-2)	0.19
Viral suppression									0.05
Yes	18	(69%)	29	(94%)	32	(74%)	79	(79%)	
No	8	(31%)	2	(6%)	11	(26%)	21	(21%)	

NU – Northwestern University, CORE – Ruth M. Rothstein CORE Center, UAB – University of Alabama, Birmingham
IQR – Interquartile range
*p-values refer to χ^2 test for independence for categorical variables and Kruskal-Wallis test (with ties) for continuous variables
AUDIT-C – Alcohol Use Disorders Identification Test - Consumption
SSCI – 14-item Stigma Scale for Chronic Illness
PHQ-8 – 8-item Patient Health Questionnaire
ART – antiretroviral therapy

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Table 2.2. Direct and indirect effects of HIV-related stigma on viral suppression among a sample of African-American women living with HIV enrolled in the Unity Study (N = 100)

	β	(95% CI)
Primary model*		
Total effect (difference in log-odds)	-0.069	(-0.117, -0.021)
Direct effect	-0.085	(-0.145, -0.025)
Indirect effects		
Stigma > depression > nonadherence > viral suppression	-0.006	(-0.045, 0.029)
Stigma > depression > viral suppression	0.010	(-0.046, 0.054)
Stigma > nonadherence > viral suppression	0.002	(-0.087, 0.051)
Secondary model**		
Total effect (difference in log-odds)	-0.096	(-0.016, -0.032)
Direct effect	-0.238	(-0.385, -0.091)
Indirect effects		
Stigma > depression > nonadherence > viral suppression	-0.010	(-0.072, 0.054)
Stigma > depression > viral suppression	0.064	(-0.140, 0.206)
Stigma > nonadherence > viral suppression	0.009	(-0.105, 0.107)

*Adjusted for treatment, site, age, education, time living with HIV
**Adjusted for treatment, site, age, education, time living with HIV, alcohol use severity

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APPENDICES

Appendix 2.A. Baseline characteristics of African-American women living with HIV who participated in a trial of an HIV-related stigma-reduction intervention, comparing those who had viral loads collected within 8-weeks of study entry (primary sample) to those who had viral loads collected within 24-weeks of study entry (sensitivity sample)

	Primary sample (8-week viral load) N = 100		**Sensitivity sample (24-week viral load) N =184**	
	Median/N	(IQR/%)	Median/N	(IQR/%)
Site				
NU	26	(26%)	374	(19%)
CORE	31	(31%)	65	(35%)
UAB	43	(43%)	85	(46%)
Age (years)	45 years	(38-53)	46 years	(39-54)
Time living with HIV (years)	14 years	(9-20)	14 years	(8-20)
Education				
Less than HS	39	(39%)	68	(37%)
HS or equivalent	18	(18%)	41	(22%)
College	32	(32%)	59	(32%)
More than college	11	(11%)	16	(9%)
Alcohol use severity (AUDIT-C score)				
0	46	(46%)	81	(44%)
1-2	30	(30%)	63	(34%)
3-7	21	(21%)	36	(20%)
8-12	3	(3%)	4	(2%)
HIV-related stigma (SSCI)	31	(23-41)	30	(22-41)
Depressive symptom severity (PHQ-8)	7	(3-13)	6	(2-12)
ART nonadherence (out of 30 days)	1	(0-2)	1	(0-2)
Viral suppression				
Yes	79	(79%)	156	(78%)
No	21	(21%)	44	(22%)

NU – Northwestern University, CORE – Ruth M. Rothstein CORE Center, UAB – University of Alabama, Birmingham
IQR – Interquartile range
*p-values refer to χ^2 test for independence for categorical variables and Kruskal-Wallis test (with ties) for continuous variables
AUDIT-C – Alcohol Use Disorders Identification Test - Consumption
SSCI – 14-item Stigma Scale for Chronic Illness
PHQ-8 – 8-item Patient Health Questionnaire
ART – antiretroviral therapy

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Appendix 2.B. Sensitivity analysis comparing direct and indirect effects of HIV-related stigma on viral suppression among two samples of African-American women living with HIV enrolled in the Unity Study, differing by viral load collection period

	Primary sample (8-week viral load) N = 100		Sensitivity sample (24-week viral load) N = 184	
	β	**(95% CI)**	**β**	**(95% CI)**
Primary model*				
Total effect (difference in log-odds)	-0.069	(-0.117, -0.021)	-0.052	(-0.084, -0.020)
Direct effect	-0.085	(-0.145, -0.025)	-0.043	(-0.082, -0.004)
Indirect effects				
Stigma > depression > nonadherence > viral suppression	-0.006	(-0.045, 0.029)	-0.003	(-0.010, 0.002)
Stigma > depression > viral suppression	0.010	(-0.046, 0.054)	0.010	(-0.037, 0.014)
Stigma > nonadherence > viral suppression	0.002	(-0.087, 0.051)	0.001	(-0.012, 0.010)
Secondary model**				
Total effect (difference in log-odds)	-0.096	(-0.016, -0.032)	-0.056	(-0.089, -0.022)
Direct effect	-0.238	(-0.385, -0.091)	-0.052	(-0.092, -0.011)
Indirect effects				
Stigma > depression > nonadherence > viral suppression	-0.010	(-0.072, 0.054)	-0.002	(-0.011, 0.003)
Stigma > depression > viral suppression	0.064	(-0.140, 0.206)	0.006	(-0.034, 0.021)
Stigma > nonadherence > viral suppression	0.009	(-0.105, 0.107)	0.001	(-0.012, 0.011)

*Adjusted for treatment, site, age, education, time living with HIV
**Adjusted for treatment, site, age, education, time living with HIV, alcohol use severity

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CHAPTER 3

Religiosity, social support and ethnic identity: Exploring "resilience resources" for African-American women experiencing HIV-related stigma

BACKGROUND

In the United States (U.S.), African-American women exist at the intersection of disadvantaged race and gender; a position which makes them uniquely vulnerable to HIV (Brawner, 2014; El-Bassel et al., 2009; Newman et al., 2008; Wyatt et al., 2013). In 2015, African-American women accounted for 12% of all U.S. women, but 61% of new HIV infections among U.S. women (CDC, 2017). African-American women living with HIV are also particularly vulnerable to underreceipt of antiretroviral therapy (ART), adverse effects associated with poor treatment (M. H. Cohen et al., 2004; Lillie-Blanton et al., 2010; Losina et al., 2009), and high rates of morbidity and mortality (Lesko et al., 2015; Meditz et al., 2011).

African-American women living with HIV also report substantial HIV-related stigma and depression. HIV-related stigma refers to the, "prejudice, discounting, discrediting and discrimination that are directed at people perceived as having HIV" (Herek et al., 1998). Negative experiences with HIV-related stigma are well-documented among African-American women living with HIV (Buseh & Stevens, 2006; Fletcher et al., 2016; McDoom et al., 2015; Sanicki & Mannell, 2015), and these experiences have been associated with isolation (Grodensky et al., 2015), decreased psychological functioning (Clark et al., 2003), and other symptoms of depression (Travaglini, Himelhoch, & Fang, 2018; Vyavaharkar et al., 2010; Wingood et al., 2007). Moreover, because stigma can intensify existing inequalities (Parker & Aggleton, 2003), HIV-related stigma among African-American women living with HIV must be considered within the context of stigmatized race, gender, and socioeconomic status (Caiola et al., 2014; Lanier & DeMarco, 2015; Rao, Andrasik, et al., 2018). Simultaneous sources of stigma are a manifestation of intersectionality, the convergence of social identities and structural inequalities that produce magnified experiences of disadvantage (C. H. Logie et al., 2011).

Strategies to address HIV-related stigma in the context of intersectionality emphasize promoting resilience (Earnshaw et al., 2013; Earnshaw, Lang, Lippitt, Jin, & Chaudoir, 2015; Newman et al., 2008), or the ability to identify and employ resources and protective factors to assist with coping in adversity (Subramaniam, Camacho, Carolan, & Lopez-Zeron, 2017). Earnshaw et al. (2013) defined resilience resources as "modifiable strength-based moderators that may be appropriate targets for intervention" (Earnshaw et al., 2013). For African-American women living with HIV who experience HIV-related stigma, there is evidence that religiosity, social support, and ethnic identity may be resilience resources; that is, these resources may buffer the negative effects of HIV-related stigma on poor psychosocial outcomes such as depression (Himelhoch & Njie-Carr, 2016; Serovich et al., 2001; M. T. Williams et al., 2012).

Religiosity is a multidimensional construct with varying defintions (Hackney & Sanders, 2003; Medved Kendrick, 2017). Here, we use religiosity to refer to formal and informal participation in religious activities. This includes manifestations of personal spirituality, as these two concepts are not always distinguishable (Szaflarski, 2013). Historically, religiosity is a recognized source of support for African-American women that fosters positive action and outcomes (Dessio et al., 2004; Mattis, 2002; Musgrave, Allen, & Allen, 2002; Olphen et al., 2003). Though the role of religion and religious groups in the HIV epidemic has not always been

supportive (and even damaging) (Idler, 2014), research indicates that religiosity is associated with general psychological well-being among African-American women living with HIV (Coleman & Holzemer, 1999), and provides motivation to maintain healthy behaviors (Grodensky et al., 2015). Additionally, African-American women living with HIV have indicated that spiritual practice enhances their clinical care (Woodard & Richard, 2001), and supporting a spiritual practice may be important when addressing depression in this population (Himelhoch & Njie-Carr, 2016).

Social support is another potential resilience resource for African-American women living with HIV. Throughout the HIV epidemic, greater social support has been consistently associated with lower HIV-related stigma among people living with HIV (PLWH) (C. Logie & Gadalla, 2009; Rueda et al., 2016). Furthermore, among women living with HIV, social support has been associated with reduced loneliness, stress, and depressive symptoms (Serovich et al., 2001). African-American women living with HIV have explicitly voiced desire for emotional and instrumental support (Edwards, 2006), and highlighted support as a mechanism for resisting the negative impact of HIV-related stigma (Buseh & Stevens, 2006). In one study of African-American women living with HIV, disclosure, an act largely associated with increased social support (Smith, Rossetto, & Peterson, 2008), moderated the relationship between HIV-related stigma and distress (Clark et al., 2003).

Finally, while African Americans are frequently considered a racial group, Cornell and Hartman (2006) argue that they are also a distinct ethnic group (Cornell & Hartmann, 2006). Furthermore, because African Americans are an ethnic minority group with a long history of discrimination in the United States, ethnic identity has particular salience (Brown et al., 2014; Phinney, 1992; Phinney & Ong, 2007). This strong sense of ethnic identity may serve to promote resilience in situations of stigma and discrimination (Belgrave, Chase-Vaughn, Gray, Addison, & Cherry, 2000; Roberts et al., 1999; Townsend, Kaltman, Saleem, Coker-Appiah, & Green, 2017; M. T. Williams et al., 2012). Among African-American women, stronger ethnic identity has been associated with less HIV-related risk-taking (Beadnell et al., 2003), and in a sample of African-American women living with HIV, greater ethnic identity was associated with less perceived stress (Lopez, Antoni, Fekete, & Penedo, 2012).

The purpose of this study is to formally evaluate whether these three resilience resources buffer the negative effects of HIV-related stigma among African-American women with HIV. Specifically, we aim to estimate and test the moderating effects of 1) religiosity, 2) social support, and 3) ethnic identity on the association between HIV-related stigma and depression within a sample of African-American women living with HIV.

METHODS

Data source

This study is a secondary analysis of baseline data from the Unity Study, a multisite randomized controlled trial evaluating the longterm effectiveness of an HIV-related stigma-reduction intervention for African-American women living with HIV.(Rao, Kemp, et al., 2018) From 2013 to 2015, African-American women living with HIV were recruited from three clinical sites that provide HIV care: Northwestern University Infectious Diseases HIV clinic (NU) and the Ruth M. Rothstein CORE Center (CORE) in Chicago, Ilinois and the University of Alabama, Birmingham 1917 HIV Clinic (UAB) in Birmingham, Alabama.

Study sample

To participate in the Unity Study, individuals needed to self-identify as African-American women, be ≥18 years old, and be currently receiving HIV services. Women were excluded if they were foreign-born and had lived in the US for less than 10 years. Baseline data from Unity Study participants were included in the current study if they had complete data for all measures of interest.

Data collection

After providing consent, participants met with a research staff member to complete baseline assessments (demographics and psychosocial measures) via tablet-based audio computer assisted self-interview (ACASI). All Unity Study procedures were reviewed and approved by the Institutional Review Boards (IRB) at the University of Washington, NU, CORE, and UAB.

Measures

Outcome. Depressive symptom severity was measured continuously using the 8-item Patient Health Questionnaire (PHQ-8) (Kroenke et al., 2009). The PHQ-8 is a validated, abridged version of the PHQ-9 (suicidality item omitted) and is commonly used for screening, diagnosing, and monitoring depression (Center for quality assessment and improvement in mental health, 1999). Regarding the preceding two weeks, participants respond to questions such as, “Have you been feeling down, depressed or hopeless?” and rank them on a 4-point Likert-type scale from 0 (*Not at all*) to 3 (*Nearly every day*). Responses are summed to create a total score ranging from 0 to 24. Higher scores reflect greater severity, with clinical cut-points as follows: (0-4: minimal depression, 5-9: mild depression, 10-14: moderate depression, 15-19: moderately severe depression, 20-24: severe depression (Kroenke et al., 2009).

Predictor. HIV-related stigma was measured continuously using the 14-item Stigma Scale for Chronic Illness (SSCI). The SSCI is a scaled measure of perceived and internalized stigma that has been validated for use with African Americans living with HIV (Rao et al., 2009; Rao et al., 2016). Participants are offered statements such as, “Because of my illness, people were unkind to me” and asked to respond on a 5-point Likert-type scale ranging from 1 (*Never*) to 5 (*Always*). Responses are summed to create a total score ranging from 14 to 70, with 14 indicating no reported HIV-related stigma and higher scores reflecting greater HIV-related stigma. For the Unity Study, participants were instructed to think of the past month and consider HIV as their “illness.”

Moderators. Moderators included religiosity, social support, and ethnic identity. Religiosity was measured continuously using the 7-item version of the Religious Beliefs and Behaviors survey (RBB). The RBB assesses God conciousness (i.e. thinking about God) and formal religious practices over the past year, and demonstrated good internal consistency in a African-American church-based sample (Connors, Tonigan, & Miller, 1996; Hawes & Berkley-Patton, 2014). Participants are first asked to select the term that best describes their level of God consciousness from 0 (*Athiest) to 4 (Religious)*. Then, participants are asked how often they engaged in religious activities (e.g., prayer). Participants respond using an 8-point Likert scale from 0 (*Never)* to 7 (*More than once a day*). Factor subscale scores are summed for an overall religiosity score ranging from 0 to 46, with higher scores reflecting greater religiosity.

Social support was measured continuously using select subscales (Emotional/Informational Support and Positive Social Interaction) of the Medical Outcomes Study Social Support Survey (MOS-SSS) (Sherbourne & Stewart, 1991). The MOS-SSS is widely used and all subscales have demonstrated good internal consistency (Sherbourne & Stewart, 1991). Participants answer questions regarding how often certain types of social support (e.g. someone to give you good advice about a crisis) are available by responding on a 5-point Likert scale from 1 (*None of the time)* to 5 (*All of the time)*. For this study, an overall support score (range 1-5) was calculated by averaging all items from the two select subscales.

Ethnic identity was measured continuously using the Commitment subscale of the revised Multigroup Ethnic Identity Measure (MEIM-R) (Phinney, 1992; Phinney & Ong, 2007). The Commitment subscale assesses attachment and belonging to an individual's ethnic or racial group, demonstrates good internal consistency, and can be used independently of the full instrument (Phinney & Ong, 2007). Participants respond to statements such as, "I have a strong sense of belonging to my own ethnic group" on a a Likert-type scale from 1 (*Strongly disagree*) to 5 (*Strongly agree*). A subscale score is generated by taking an average of the individual items resuting in scores between 1 and 5.

Covariates. Covariates were chosen *a priori* based on their potential to confound the association between HIV-related stigma and depression, and included study site (NU, CORE, UAB); age in years (continuous) (Faravelli, Alessandra Scarpato, Castellini, & Lo Sauro, 2013; C. Logie & Gadalla, 2009); time since diagnosis in years (continuous) (Galvan et al., 2008; Mello, Segurado, & Malbergier, 2010; Vanable, Carey, Blair, & Littlewood, 2006); and education (less than high school, high school degree or equivalent, some college, or college degree and beyond) (C. Logie & Gadalla, 2009; Lorant et al., 2003). Alcohol and other substance use were also considered as potential covariates (Galvan et al., 2008; Sullivan et al., 2005). However, we chose not to include them in models because substance use may be on the causal pathway between HIV-related stigma and depression (Sullivan et al., 2011), and thus, adjusting for these factors could reduce our ability to detect associations of interest..

Analysis

Participant characteristics were described for the entire sample and compared across study sites using χ^2 test for independence for categorical variables and Kruskal-Wallis test (with ties) for continuous variables. Missing items on scales were mean imputed before calculating total scores.

To assess whether religiosity, social support, and ethnic identity modifed the relationship between HIV-related stigma and depression, we conducted three separate moderation analyses using linear regression models with interactions between HIV-related stigma and each moderator of interest. Models were adjusted for study site, age, time since diagnosis, and education. Estimates of main effects and interaction terms were reported with 95% confidence intervals (CI). For statistically significant moderators, we also predicted and plotted estimates of the association between HIV-related stigma and depression for the 25^{th}, 50^{th}, and 75^{th} percentile values of the moderator for each site. When obtaining predicted values, education was set at the modal category, and age and time since diagnosis were set at their medians. For all regression analyses, Wald tests were used to test for statistical significance ($\alpha = 0.05$). All analyses were conducted using Stata statistical software, v.13 (StataCorp, 2013).

RESULTS

Among the 239 women consented into the Unity Study, 95% (n = 226) had complete baseline data for the measures of interest (including mean imputed scores) and were included in the current analysis. No significant differences were identified between women who were and were not included in this analysis (p >0.05). **Table 3.1** describes characteristics of women included in the present study, overall and by site. The median age was 46 years (interquartile range (IQR) = [40-54]), and the majority (63%) had at least a high school education.

The median HIV-related stigma (SSCI) score was 30.15 (IQR = [22,41]); all but 9 participants reported experiencing at least some level of HIV-related stigma (SSCI>14). Median PHQ-8 score was 6 (IQR = [2-12]), with 67% of women reporting minimal to mild depression, 15% reporting moderate depression, and 18% reporting moderately severe to severe depression.(Kroenke et al., 2009) The median religiosity (RBB) score was 30 (IQR = [22,41]), with 3% of women identifying as atheist, agnostic or unsure, 28% of women identifying as spiritual, and 69% of women identifying as religious. The median social support (MOS-SSS subscales) score was 3 (IQR = [2-4]), and the median ethnic identity (MEIM-R commitment subscale) score was 4 (IQR = [3-5]).

Women were similar across study sites in terms of years living with HIV, depressive symptom severity, social support, and attachment and belonging to one's ethnic identity ($p < 0.05$). Compared to the Ruth M. Rothstein CORE Center (CORE, N = 82) and University of Alabama, Birmingham, (UAB, N = 102), participants from Northwestern University (NU, N = 42) tended to be younger ($p < 0.001$). Conversely, participants from CORE had less education ($p < 0.001$) and higher HIV-related stigma scores ($p = 0.04$) when compared to participants from other two sites. Religiosity scores were generally higher among participants from UAB ($p = 0.04$).

Table 3.2 provides estimates from the three moderation analyses. While greater levels of HIV-related stigma were associated with greater depression in all three models ($p < 0.05$), only religiosity significantly modified the association between HIV-related stigma and depression ($p = 0.04$). Higher religiosity was associated with a weaker association between HIV-related stigma and depression. Specifically, for each 1-unit higher religiosity score, the association between HIV-related stigma and severity of depressive symptoms was 0.01 units smaller ($\beta = -0.01$, 95% CI: -0.01, -0.0004). Predicted estimates of the association between HIV-related stigma and depression at different levels of religiosity are presented by site in **Figure 3.1**. For all sites, the magnitude of the association between HIV-related stigma and depression decreased with increased religiosity.

To better understand aspects of religiosity that may influence the association between HIV-related stigma and depression, we conducted post-hoc analyses investigating specific religious behaviors as measured by individual items of the RBB. In regression analyses, the relationship between HIV-related stigma and depression was moderated by frequency of prayer ($p = 0.03$) and attending worship services ($p = 0.04$, **Table 3.3**). Specifically, for women who more frequently prayed or attended worship services, the association between HIV-related stigma and depression was weaker than for those who prayed ($\beta = -0.04$, 95% CI: -0.08, -0.01) or attended worship services ($\beta = -0.03$, 95% CI: -0.05, -0.001) less frequently. In this sample, 96% of women reported praying at least once a day and 53% reported attending worship service at least weekly. **Figure 3.2** compares the predicted association between HIV-related stigma and depression for rare (item = 1) versus almost daily (item = 6) prayer and worship attendance.

DISCUSSION

In this cross-sectional analysis of a recruited sample of African-American women living with HIV, higher levels of HIV-related stigma were consistently associated with greater depression, providing further evidence that HIV-related stigma is a risk factor for poor psychosocial outcomes among this population. Of the three potential resilience resources assessed, religiosity appeared to buffer this association. Higher levels of religiosity were associated with a weaker association between HIV-related stigma and depressive symptoms. Post hoc analyses indicated that frequency of prayer and attending worship services may be particularly influential. Conversely, neither social support nor ethnic identity influenced the association between HIV-related stigma and depression.

Our finding that religiosity buffered the association between HIV-related stigma and depression is consistent with myriad qualitative studies of African-American women living with HIV. Specifically, aspects of religion and spirituality are frequently cited as both sources of support and mechanisms for coping (Grodensky et al., 2015; Himelhoch & Njie-Carr, 2016; Peltzer, Ogawa, Tusher, Farnan, & Gerkovich, 2017; Polzer Casarez & Miles, 2008). Findings are also consistent with Chaudoir et al's (2012) study of racially diverse men and women living with HIV in Alabama, in which spiritual peace buffered the effects of HIV-related stigma on depression (Chaudoir et al., 2012). Though spiritual peace may be considered distinct from religiosity as measured in the current study, the similar trends highlight the therapeutic potential for religion and spirituality-related resilience resources in the context of HIV-related stigma.

Looking at the individual items of the religiosity measure, our results suggest that attending worship services may be key in buffering the effects of HIV-related stigma in this population. Worship services often provide opportunities for social interaction and community engagement in addition to spiritual guidance (Taylor, Chatters, Lincoln, & Woodward, 2017), and the power of religious attendance has been established (Koenig, 2009). In a longitudinal study in Northern California, Strawbridge et al. found that weekly religious attendance was associated with positive physical, mental and social outcomes (Strawbridge, Shema, Cohen, & Kaplan, 2001). As the Black Church has traditionally played a predominate role in promoting African-American community health (Giger, Appel, Davidhizar, & Davis, 2008), and our study indicates that worship attendance occurs frequently, there is clear opportunity for faith-based organizations to leverage the benefits of religious attendance by integrating interventions for African-American women living with HIV into programming.

Indeed, the health promoting effects of religion and spirituality among African-Americans have encouraged many faith-based organizations to engage in HIV prevention activities (Francis & Liverpool, 2009). Similarly, multiple interventions have attempted to decrease HIV-related stigma among African-American church congregants (Berkley-Patton et al., 2013; Griffith, Pichon, Campbell, & Allen, 2010; Lindley, Coleman, Gaddist, & White, 2010). However, faith-based programming developed specifically for PLWH (not just those at risk) is far less common, and no interventions have been tested among African-American women with HIV to our knowledge.

One potential explanation for the dearth of faith-based programs for PLWH is, in fact, HIV-related stigma. Historically, the Black church and other faith-based organizations have struggled to address aspects of the HIV epidemic that seemed contrary to their religious teachings (e.g., same sex relationships, sex work and drug use), making them vulnerable to

stigmatizing the disease itself (Idler, 2014). A study of religiosity and HIV-related stigma in African-American women revealed complex relationships between religiosity, knowledge of HIV, and different types of stigma, with respondents reiterating that faith-based organizations can play positive and negative roles (Muturi & An, 2010). Moreover, in a study of African-American church congregants in South Carolina, higher HIV-related stigma was associated with less enthusiasm for the involvement of Black churches in HIV-related activities (Pryor, Gaddist, & Johnson-Arnold, 2015). Thus, faith-based organizations have the potential to both mitigate and propagate HIV-related stigma (Medved Kendrick, 2017). Any efforts to implement HIV-related stigma programming for PLWH within faith-based organizations will likely require stigma reduction at the organizational and/or community level.

Alternatively, some African-American women living with HIV may benefit more from interventions that support their personal spiritual practices (Himelhoch & Njie-Carr, 2016). Results from our study support this option – prayer buffered the association between HIV-related stigma and depression. This finding is in line with a recent review of observational studies, not HIV-specific, which reported consistent associations between prayer and better mental health outcomes (Anderson & Nunnelley, 2016). This finding is also consistent with a study that showed African-American women endorse prayer as a coping strategy for mental illness (Ward, Clark le, & Heidrich, 2009). Moreover, our study indicates that prayer is extremely common among African-American women living with HIV; the vast majority of women in our sample prayed more than once a day. This high frequency of prayer underscores the potential for this specific religious behavior to be leveraged in interventions among this population.

Regarding other possible resilience resources, social support and ethnic identity did not buffer the association between HIV-related stigma and depression in this sample. Similarly, social support did not moderate associations between HIV-related stigma and psychosocial outcomes in studies conducted among persons with HIV in South Africa and Canada (Breet et al., 2014; C. Logie et al., 2013). Breet et al. (2014) hypothesized that their null findings were a result of other factors countering the protective effects of social support (Breet et al., 2014). Given the many forms of disadvantage facing African-American women living with HIV, this explanation may be applicable to the present study. Competing and negating factors may also explain the fact that ethnic identity did not have a moderating effect. Alternatively, it is possible that the hypothesized pathways tested here are inaccurate. In a study of rural African-American women with HIV, HIV-related stigma mediated the effects of social support on depression, suggesting that social support precedes HIV-related stigma (Vyavaharkar et al., 2010). And in a study of minority women living with HIV in U.S., ethnic identity was associated with lower stress and this was mediated by social support (Lopez et al., 2012). Further work is needed to elucidate the complex relationships between these different phenomena.

Limitations

There are several limitations to this study. First, the analysis was cross-sectional; therefore, we cannot make causal interpretation of any observed associations. Second, self-reported measures may be subject to recall and social desirability bias. Third, we only assessed an overall measure of HIV-related stigma; exploring different dimensions of HIV-related stigma (e.g. anticipated, perceived, internalized) may provide a more nuanced understanding of the associations of interest. Similarly, we evaluated three constructs hypothesized to promote resilience. Future research should consider other constructs related to resilience (e.g. critical consciousness) (Kelso et al., 2014) as well as specific measures of resilience among African-

American women with HIV. Fourth, we chose not to include substance use in our analysis. Given the substantial impact substance use has on HIV (E. C. Williams, Hahn, et al., 2016), and its complex relationships with depression (Sullivan et al., 2005), social support (Illangasekare, Burke, Chander, & Gielen, 2014; Peirce, Frone, Russell, Cooper, & Mudar, 2000), and potentially, other resilience resources, additional studies are needed to understand the role of substance use. Fifth, because all women in this sample were currently receiving HIV care and willing to participate in a randomized controlled trial of a stigma-reduction intervention, the experiences of stigma and depression among these women may not be generalizable to the larger population of African-American women living with HIV. Lastly, while the sample was appropriately powered for Unity Study primary outcomes, we may have had insufficient power to detect moderating effects of interest in the current study.

Conclusions

Despite these limitations, this is the first study to our knowledge to investigate these three resilience resources as potential buffers of the association between HIV-related stigma and depression among African-American women living with HIV. We found that higher HIV-related stigma was associated with higher depression severity, and that this relationship was buffered by religiosity. The protective effects of religiosity, especially worship attendance and prayer, may be leveraged in interventions for African-American women living with HIV who are struggling with HIV-related stigma. HIV-related stigma should be acknowledged and addressed at the community level and among faith-based organizations. Future research is needed to better understand the roles of social support, ethnic identity, other resilience resources, and substance use in the lives of African-American women living with HIV.

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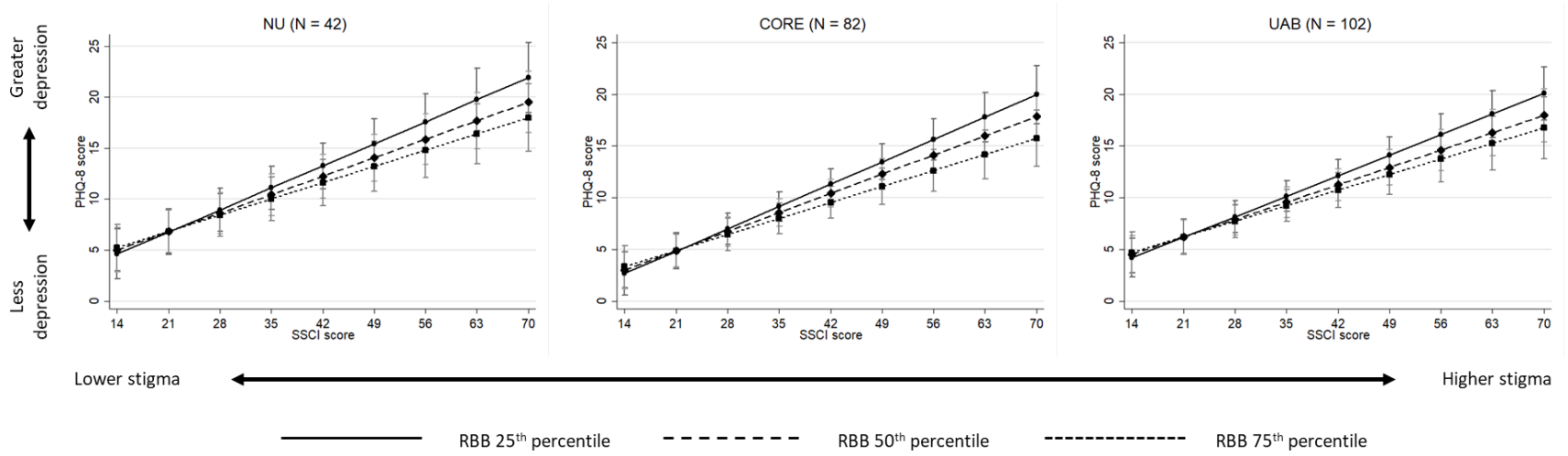
FIGURES

Figure 3.1. Predicted mean depressive symptom scores (PHQ-8) and 95% confidence intervals across values of HIV-related stigma (SSCI) at different levels of religiosity (RBB) calculated for each study site among a sample of African-American women living with HIV*



*Estimates reflect predictions for a woman in the Unity Study who is 46 years old, has lived with HIV for 14 years, and who has less than a high school education. Religiosity scores are based on individual site percentiles.
SSCI – 14-item Stigma Scale for Chronic Illness
PHQ-8 – 8-item Patient Health Questionnaire
RBB – 7-item Religious Beliefs and Behaviors survey
NU – Northwestern University, CORE – Ruth M. Rothstein CORE Center, UAB – University of Alabama, Birmingham

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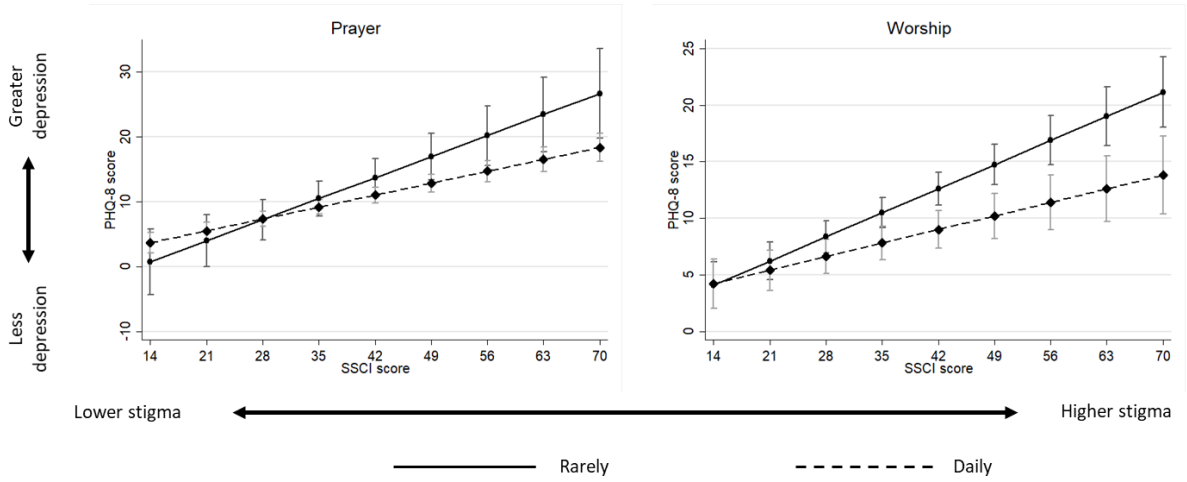
Figure 3.2. Predicted mean depressive symptom scores (PHQ-8) and 95% confidence intervals across values of HIV-related stigma (SSCI), comparing rare and daily prayer and worship attendance among a sample of African-American women living with HIV*



*Estimates reflect predictions for a woman in the Unity Study who is 46 years old, has lived with HIV for 14 years, and who has less than a high school education.
SSCI – 14-item Stigma Scale for Chronic Illness
PHQ-8 – 8-item Patient Health Questionnaire

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TABLES

Table 3.1. Baseline characteristics of African-American women living with HIV who participated in an HIV-related stigma-reduction intervention (N = 226)

	NU (N = 42)		CORE (N = 82)		UAB (N = 102)		Total (N = 226)		p-value*
	Median/N	(IQR/%)	Median/N	(IQR/%)	Median/N	(IQR/%)	Median/N	(IQR/%)	
Age (years)	41 years	(31-49)	46 years	(41-54)	50 years	(43-55)	46 years	(40-54)	<0.001
Time since HIV diagnosis (years)	15 years	(11-20)	13 years	(8-18)	15 years	(7-20)	14 years	(9-20)	0.29
Education									<0.001
Less than high school	10	(24%)	44	(54%)	30	(29%)	84	(37%)	
High school or equivalent	10	(24%)	16	(20%)	27	(26%)	53	(23%)	
College	13	(31%)	21	(26%)	36	(35%)	70	(31%)	
More than college	9	(21%)	1	(1%)	9	(9%)	19	(8%)	
HIV-related stigma (SSCI)	29	(22-37)	35	(24-45)	30	(22-37)	30	(22-41)	0.04
Depressive symptom severity (PHQ-8)	5	(2-13)	6	(2-14)	6	(3-11)	6	(2-12)	0.78
Religiosity score (RBB)	33	(25-38)	32	(25-39)	36	(29-40)	34	(27-39)	0.04
Social Support score (MOS-SSS subscales)	3	(2-4)	3	(2-4)	3	(2-4)	3	(2-4)	0.96
Ethnic Identity score (MEIM-R subscale)	4	(3-5)	4	(3-5)	4	(3-5)	4	(3-5)	0.95

NU – Northwestern University, CORE – Ruth M. Rothstein CORE Center, UAB – University of Alabama, Birmingham
IQR – Interquartile range
*p-values refer to χ^2 test for independence for categorical variables and Kruskal-Wallis test (with ties) for continuous variables
SSCI – 14-item Stigma Scale for Chronic Illness
PHQ-8 – 8-item Patient Health Questionnaire
RBB – 7-item Religious Beliefs and Behaviors survey
MOS-SSS subscales – Medical Outcomes Study Social Support Survey Emotional/Informational Support and Positive Social Interaction subscales
MEIM-R subscale – Multigroup Ethnic Identity Measure Commitment subscale

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Table 3.2. Estimated associations between HIV-related stigma (SSCI) and depression (PHQ-8) and main and moderating effects of religiosity (RBB), social support (MOS-SSS subscales) and ethnic identity (MEIM-R subscale) among a sample of African-American women living with HIV

Predictors/moderators of interest	β*	(95% CI)	p-value
RELIGIOSITY (RBB)			
HIV-related stigma (main effect)	0.46	(0.27, 0.66)	<0.001
Religiosity (main effect)	0.14	(-0.07, 0.34)	0.20
HIV-related stigma x religiosity	-0.01	(-0.01, -0.0004)	0.04
SOCIAL SUPPORT (MOS-SSS subscales)			
HIV-related stigma (main effect)	0.33	(0.19, 0.46)	<0.001
Social support (main effect)	0.47	(-1.18, 2.12)	0.58
HIV-related stigma x social support	-0.03	(-0.08, 0.02)	0.20
ETHNIC IDENTITY (MEIM-R subscale)			
HIV-related stigma (main effect)	0.22	(0.02, 0.42)	0.03
Ethnic identity (main effect)	-0.56	(-2.42, 1.30)	0.56
HIV-related stigma x ethnic identity	0.01	(-0.04, 0.06)	0.70

*Adjusted for study site, age, time since HIV diagnosis and education
SSCI – 14-item Stigma Scale for Chronic Illness
PHQ-8 – 8-item Patient Health Questionnaire
RBB – 7-item Religious Beliefs and Behaviors survey
MOS-SSS subscales – Medical Outcomes Study Social Support Survey Emotional/Informational Support and Positive Social Interaction subscales
MEIM-R subscale – Multigroup Ethnic Identity Measure Commitment subscale

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Table 3.3. Estimated main and moderating effects of individual RBB scale items on the association between HIV-related stigma (SSCI) and depression (PHQ-8) among a sample of African-American women living with HIV

Individual items of RBB Scale*	**β****	**(95% CI)**	**p-value**
How often have you thought about God?			
Main effect	0.27	(-1.45, 2.00)	0.76
Interaction with HIV-related stigma	0.01	(-0.05, 0.06)	0.84
How often have you prayed?			
Main effect	1.13	(-0.23, 2.49)	0.10
Interaction with HIV-related stigma	-0.04	(-0.08, -0.01)	0.03
How often have you meditated?			
Main effect	0.28	(-0.47, 0.01)	0.17
Interaction with HIV-related stigma	-0.01	(-0.03, 0.01)	0.17
How often have you attended a worship service?			
Main effect	0.35	(-0.51, 1.21)	0.42
Interaction with HIV-related stigma	-0.03	(-0.05, -0.001)	0.04
How often have you read scriptures or holy writings?			
Main effect	0.21	(-0.58, 1.01)	0.60
Interaction with HIV-related stigma	-0.01	(-0.03, 0.01)	0.31
How often have you had direct experiences with God?			
Main effect	0.36	(-0.19, 1.43)	0.13
Interaction with HIV-related stigma	-0.02	(-0.04, 0.002)	0.08

*Questions regarding frequency of religious behavior refer to the past 6 months
**Adjusted for study site, age, time since HIV diagnosis and education
SSCI – 14-item Stigma Scale for Chronic Illness
PHQ-8 – 8-item Patient Health Questionnaire
RBB – 7-item Religious Beliefs and Behaviors survey

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CHAPTER 4

Patterns of alcohol use and associated characteristics among a sample of African-American women living with HIV

BACKGROUND

Alcohol use is highly prevalent among people living with HIV (PLWH) (Galvan et al., 2002; Saitz, 2005). Moreover, among PLWH, research demonstrates that alcohol use is associated with a wide range of adverse outcomes (E. C. Williams, Hahn, et al., 2016) including delayed engagement in HIV medical care (Samet et al., 1998), decreased utilization of HIV care (Cunningham et al., 2006), poor retention in care (Monroe et al., 2016), nonadherence to antiretroviral therapy (ART) (Hendershot et al., 2009; Kader et al., 2015; Lillie-Blanton et al., 2010), lack of viral suppression (Barai et al., 2017; Cook et al., 2017), comorbidities common among PLWH (e.g. complications associated with Hepatitis C (Tsui et al., 2013), certain cancers (McGinnis et al., 2006), and neurological disorders (Persidsky et al., 2011; Rothlind et al., 2005)), and increased risk of mortality (Justice et al., 2016; Neblett et al., 2011).

No level of alcohol use is considered safe (Burton & Sheron, 2018; Wood et al., 2018), and this may be especially true for PLWH (Justice et al., 2016). Furthermore, unhealthy alcohol use (UAU) and heavy episodic drinking (HED) may be particularly dangerous (E. C. Williams, Hahn, et al., 2016). Unhealthy alcohol use is a broad term referring to the spectrum of alcohol use from drinking above nationally recommended limits to meeting diagnostic criteria for alcohol use disorder (AUD) (Saitz, 2005). Heavy episodic drinking, or binge drinking, is a type of UAU associated with both short-term (e.g., trauma) and long-term (e.g., AUD) alcohol-related consequences (Kuntsche, Kuntsche, Thrul, & Gmel, 2017). For PLWH, all levels of UAU are associated with elevated risks of morbidity and mortality (Okosun, Seale, Daniel, & Eriksen, 2005; E. C. Williams, Bradley, Gupta, & Harris, 2012; E. C. Williams et al., 2010), and alcohol-related consequences generally increase with increasing levels of alcohol use (Bradley et al., 2016; Chavez et al., 2012; Harris, Bradley, Bowe, Henderson, & Moos, 2010; National Institute on Alcohol Abuse and Alcoholism; E. C. Williams et al., 2010).

African-American women living with HIV are subject to multiple forms of stigma, stress, and vulnerability – all of which may be associated with increased risk of any and unhealthy alcohol use (Hutton et al., 2017; E. C. Williams, Joo, Lipira, & Glass, 2016). Specifically, African-American women are disproportionately exposed to high levels of psychosocial stressors and structural barriers such as sexism, racism and segregation, poverty and resource-poor environments, mass incarceration of African-American men, and systematic impediments to educational, occupational and financial advancement(Gilbert & Zemore, 2016; Martin et al., 2003; Mulia et al., 2008). Boyd et al. hypothesized that African-American women may drink alcohol (and use other substances) as a method of coping with these stressors (Boyd et al., 2009). For African-American women living with HIV, the added stress and stigma associated with living with HIV may contribute to unhealthy patterns of alcohol use (Cook et al., 2016; Elliott, Aharonovich, O'Leary, Wainberg, & Hasin, 2014; Wardell et al., 2018). In a sample of African Americans living with HIV, individuals with current alcohol use disorders (AUD) reported higher levels of HIV-related stigma than those without AUD (Galvan et al., 2008). Finally, research has shown that females, racial/ethnic minorities, and PLWH are at increased risk of alcohol-related consequences (Matson et al., 2018; McGinnis et al., 2016; Mulia et al., 2009; Nolen-Hoeksema, 2004; Sanchez-Craig, Wilkinson, & Davila, 1995). As such, African-American women living with HIV may be especially susceptible to poor outcomes associated with alcohol use.

Though alcohol use has the potential to increase morbidity and mortality among African-American women living with HIV (Vagenas et al., 2015; E. C. Williams, Hahn, et al., 2016), prevalence and correlates of any and unhealthy alcohol use are not well understood in this population. Therefore, the purpose of the present study was to describe patterns of alcohol use, along with associated characteristics, in a sample of African-American women living with HIV who enrolled in a randomized controlled trial of an HIV-related stigma-reducing intervention.

METHODS

Data source

This study is a secondary analysis of baseline data from a cohort of African-American women living with HIV who enrolled in the Unity Study, a randomized controlled trial evaluating the long-term (12 month) effectiveness of an HIV-related stigma-reduction intervention (Rao, Kemp, et al., 2018). From 2013 to 2015, African-American women living with HIV were recruited from three clinical sites that provide HIV care: Northwestern University Infectious Diseases HIV clinic (NU) and the Ruth M. Rothstein CORE Center (CORE) in Chicago, Ilinois and the University of Alabama at Birmingham 1917 HIV Clinic (UAB) in Birmingham, Alabama.

Study sample

To participate in the Unity Study, individuals needed to self-identify as African-American women, be at least 18 years old, and be currently receiving HIV services from a participating study clinic (NU, CORE, or UAB). Women were excluded if they were foreign born and had lived in the US for less than 10 years. Baseline data from Unity Study participants with complete alcohol-related data were included in the current analyses. As ART adherence was a critical correlate of interest, women were excluded if they were not currently prescribed ART or did not provide adherence data.

Data collection

After providing consent to participate in the Unity Study, participants met with a research staff member to complete baseline assessments via tablet-based audio computer assisted self-interview (ACASI). These included questions about patterns of alcohol use as well as demographic, and psychosocial measures. Relevant clinical data were abstracted from participant medical records.

Measures

Patterns of alcohol use. We used the Alcohol Use Disorders Identification Test (AUDIT) Consumption (AUDIT-C), alcohol screening questionnaire to characterize three patterns of alcohol use: 1) any alcohol use, 2) any UAU, and 3) any HED. The AUDIT-C is a brief screening tool for UAU (Jonas, Garbutt, Brown, et al., 2012), consisting of three items that assess frequency of drinking (How often do you have a drink containing alcohol?), quantity of drinking (How many standard drinks containing alcohol do you have on a typical day?), and frequency of HED (How often do you have 4 or more drinks on one occasion?). Each item is scored 0-4, resulting in a total score ranging from 0 to 12 (Bush et al., 1998), with higher scores indicating higher levels of alcohol-related risk (e.g., consumption, UAU severity, and probability of AUD) (Rubinsky et al., 2013; Rubinsky, Kivlahan, Volk, Maynard, & Bradley, 2010; E. C. Williams, Rubinsky, et al., 2014) and alcohol-related consequences (e.g. health status, trauma and mortality) (Bradley et al., 2016; Chavez et al., 2012; Harris et al., 2010; E. C. Williams et al.,

2010). Any alcohol use was defined dichotomously (AUDIT-C > 0), UAU was defined dichotomously using a female-specific threshold for UAU (AUDIT-C ≥ 3) (Bradley et al., 2003) and HED was defined dichotomously using the female-specific threshold (4 drinks) for the third item of the AUDIT-C (item score >0) (Substance Abuse and Mental Health Services Administration (SAMHSA), 2016).

Associated characteristics. Four sets of characteristics (demographic, social, clinical, and HIV-related clinical) were chosen based on a review of the alcohol and HIV literature and measures available in the Unity Study (E. C. Williams, Hahn, et al., 2016).

Demographic characteristics hypothesized to be associated with patterns of alcohol use in this sample included participant age (continuous), educational level (less than high school, high school or equivalent, or greater than high school), Latina/Hispanic identity (Latina/Hispanic or other), and marital status (married/partnered or other) (Chavez, Ornelas, Lyles, & Williams, 2015; Curran, Muthen, & Harford, 1998; Darrow, Russell, Cooper, Mudar, & Frone, 1992; Epstein, Fischer-Elber, & Al-Otaiba, 2007; Klein, Sterk, & Elifson, 2016; Okosun et al., 2005; Volk, Steinbauer, & Cantor, 1996; E. C. Williams, Bradley, et al., 2014).

Social characteristics included characteristics hypothesized to be negatively or positively associated with patterns of alcohol use: HIV-related stigma, religiosity, social support, and attachment and belonging to one's ethnic identity (Brome, Owens, Allen, & Vevaina, 2000; Cotton et al., 2006; Lehavot et al., 2011; Liao et al., 2014; Mannes et al., 2016; Martin et al., 2003; Mulia et al., 2008; Peirce et al., 2000; Serovich et al., 2001; Vyavaharkar et al., 2010). *HIV-related stigma* was measured continuously using the 14-item Stigma Scale for Chronic Illness (SSCI), a measure validated for use with African Americans living with HIV (Rao et al., 2009; Rao et al., 2016). Referring to the past month, participants respond to statements such as, "Because of my illness, people were unkind to me," on a 5-point Likert-type scale ranging from 1 (*never*) to 5 (*always*) resulting in scores from 14 to 70, with higher scores reflecting greater HIV-related stigma. *Religiosity* was measured continuously using the 7-item version of the Religious Beliefs and Behaviors survey (RBB) (Connors et al., 1996; Hawes & Berkley-Patton, 2014). The RBB has demonstrated good internal consistency in an African-American church-based sample (Hawes & Berkley-Patton, 2014). Participants are first asked to select the term that best describes their level of God consciousness from 0 (*atheist*) to 4 (*religious*) and then asked how often they engaged in formal religious activities (e.g., prayer) in the last year. Participants respond using an 8-point Likert-type scale from 0 (*never*) to 7 (*more than once a day*). Factor subscale scores are summed for an overall religiosity score ranging from 0 to 46, with higher scores reflecting greater religiosity. *Social support* was measured continuously using two subscales (Emotional/Informational Support and Positive Social Interaction) from the Medical Outcomes Study Social Support Survey (MOS-SSS) (Sherbourne & Stewart, 1991). Participants answer questions regarding how often certain types of social support are available by responding on a 5-point Likert-type scale from 1 (*none of the time*) to 5 (*all of the time*). For this study, an overall support score was calculated by averaging all items from the two subscales. *Attachment and belonging to one's ethnic identity* was measured continuously using the Commitment subscale of the revised Multigroup Ethnic Identity Measure (MEIM-R) (Phinney, 1992; Phinney & Ong, 2007). Participants respond to statements such as, "I have a strong sense of belonging to my own ethnic group" on a a Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). A subscale score is generated by taking an average of the individual items.

Clinical characteristics included depressive symptom severity, post-traumatic stress disorder (PTSD), and other substance use, all of which are known to be associated with any and unhealthy alcohol use (Braithwaite et al., 2016; Crane et al., 2017; Hasin, Stinson, Ogburn, & Grant, 2007; Hoggatt, Williams, Der-Martirosian, Yano, & Washington, 2015; Jasinski, Williams, & Siegel, 2000; Korthuis et al., 2012; Sullivan et al., 2005; Sullivan et al., 2011). *Depressive symptom severity* was measured using the 8-item Patient Health Questionnaire (PHQ-8) (Center for quality assessment and improvement in mental health, 1999; Kroenke et al., 2009). Participants answer questions about depressive symptoms in the past two weeks using a 4-point Likert-type scale from 0 (*not at all*) to 3 (*nearly every day*) resulting in scores from 0 to 24 with higher scores reflecting greater severity. *Symptomatic PTSD* was defined dichotomously as a score >30 on the 17-item PTSD Checklist – Civilian version (PCL-C) (Ruggiero, Del Ben, Scotti, & Rabalais, 2003) Participants answer questions about PTSD symptoms in the past month, using a 5-point Likert scale from 1 (*not at all*) to 5 (*extremely*) resulting in scores from 17 to 85 (U.S. Department of Veterans Affairs National Center for Posstraumatic Stress Disorder, 2012). A cut off of >30 is considered appropriate for women (U.S. Department of Veterans Affairs National Center for Posstraumatic Stress Disorder, 2012; Walker, Newman, Dobie, Ciechanowski, & Katon, 2002; Yeager, Magruder, Knapp, Nicholas, & Frueh, 2007). *Other substance use* was included in two measures: any drug use vs no drug use and opioid use vs. no opioid use. Participants were asked to respond to the question, "Do you use other drugs?" Participants who responded affirmatively then responded to the question, "What is your drug of choice?" Responses were categorized as either opioids or other.

HIV-related clinical characteristics included two outcomes that may be influenced by patterns of alcohol use: adherence to ART (100% adherent, < 100% adherent) and viral supression (Azar, Springer, Meyer, & Altice, 2010; Bryson et al., 2008; Hendershot et al., 2009; Kader et al., 2015; Kalichman et al., 2014). We evaluated viral suppression using participants' mean viral load during the 6 months pre- and post-entry into the Unity Study. Viral suppression was defined dichotomously as less than 200 vs. 200 or more copies/mL of plasma HIV RNA.

Analysis

Descriptive analyses evaluated participant characteristics overall and across the three patterns of alcohol use (any use, UAU, and HED). To test for differences across groups, we used χ^2 tests of independence and Kruskal-Wallis tests (with ties) for categorical and continuous variables, respectively. We then estimated the adjusted relative risks (aRR) of each pattern of alcohol use associated with each characteristic. We estimated aRR using generalized linear models with a log link, a Poisson distribution, and robust standard errors (Cummings, 2009). Though we anticipated patterns of alcohol use to be common, as a sensitivity analysis, we also estimated adjusted odds ratios (AOR) using logistic regression to facilitate comparisons with existing studies. In each model, the alcohol pattern outcome was regressed on all hypothesized social, clinical, and HIV-related clinical characteristics, with study site and study arm as additional covariates. We included study arm because a small number of participants had viral loads collected after the intervention started, and we hypothesized that participation in a HIV-related stigma reduction intervention could influence alcohol use and severity and viral suppression, thus confounding the observed association.

With N = 220 participants, we estimated sufficient power (80%) to detect a difference of 20% in patterns of alcohol use between similarly sized groups based on a 2-arm binomial design with two-sided alpha=.05 tests. The use of covariate modeling to explain additional

components of variation increased power for each comparison. We set alpha=.05 with no adjustments for multiple comparisons. Thus, the examination was considered hypothesis-generating, requiring confirmation in independent studies.

RESULTS

Participant Characteristics

Of the 239 African-American women living with HIV enrolled in the Unity Study, 220 met inclusion criteria for this analysis; 15 women did not report being prescribed ART and 5 women did not provide adherence data and were excluded. Characteristics of the sample are described in **Table 4.1.** The median age was 47 years (interquartile range [IQR] = [40, 54]), a minority (2%) identified as Hispanic/Latina, three-quarters (76%) were unmarried (single/separated/divorced/widowed), more than half (60%) had at least a high school education.

The median HIV-related stigma (SSCI) score was 30 (IQR = [22,41]), and all but 9 participants reported experiencing at least some level of HIV-related stigma (SSCI > 14). Median PHQ-8 score was 6 (IQR = [2-12]). The median religiosity (RBB) score was 34 (IQR = [27,39]), the median social support (MOS-SSS subscales) score was 4 (IQR = [3-5]), and the median ethnic identity (MEIM-R Commitment subscale) score was 4 (IQR = [3-5]). Based on clinical cut points,(Kroenke et al., 2009) 67% of women experienced minimal to mild depressive symptoms, 15% experienced moderate depressive symptoms, and 18% experienced moderately severe to severe depressive symptoms. Symptomatic PTSD was common in this sample (78% met diagnostic criteria), but other substance use was not (22% of women reported using other substances, and 3% reported opioid use). Almost 90% of the women in this sample were currently taking ART, about half of whom reported to be 100% adherent in the past month. Nearly three-quarters of participants (73%) were virally suppressed.

Patterns of Alcohol Use and Associated Characteristics

A little more than half of participants (54%) reported any alcohol use; 24% screened positive for UAU, and 27% screened positive for HED.

In bivariate analyses, (**Table 4.2**) women reporting any alcohol use were more likely to report lower religiosity (p = .04), higher depressive symptom severity (p = .03), other substance use (p = .01), and sub-optimal adherence to ART (p < .001). Similarly, women who met criteria for UAU were more likely than those that did not to report lower religiosity (p = .01), higher depressive symptom severity (p <.01), other substance use (p = .03), and sub-optimal adherence to ART (p = .03). These women were also less likely to be virally suppressed (p = .05). Finally, women who met criteria for HED were more likely than those that did not to have higher depressive symptom severity (p = .03), to use other substances (p < .01) and to be nonadherent to ART (p < .01).

In adjusted regression analyses, **(Table 4.3)** other substance use and sub-optimal adherence were associated with higher odds of any alcohol use and any HED. Specifically, other substance use was associated with 1.5 times higher risk of reporting any alcohol use (adjusted relative risk [ARR] = 1.45, 95% confidence interval [CI] = 1.12, 1.90) and almost 2 times higher risk of reporting any HED (ARR = 1.93, 95% CI: 1.17, 3.20). Similarly, sub-optimal adherence was associated with approximately 1.5 times the risk of reporting any alcohol use

(ARR = 1.44, 95% CI: 1.07, 1.95) and almost 2 times the risk of reporting HED (ARR = 1.86, 95% CI: 1.06, 3.26). Other substance use was also associated with higher risk of UAU (ARR = 2.20, 95% CI: 1.31, 3.69). Conversely, higher HIV-related stigma (AAR = 0.97, 95% CI: 0.94, 1.00) and viral suppression (ARR = 0.42, 95% CI: 0.24, 0.74) were associated with lower risk of UAU. Results from the logistic regression were consistent with the primary analysis and are not shown here (see **Appendix 4.A**).

DISCUSSION

In this cross-sectional analysis of a sample of African-American women living with HIV, slightly more than half reported any alcohol use, a quarter screened positive for UAU, and another quarter reported HED. In bivariate comparisons, patterns of alcohol use were associated with predominately social and clinical characteristics including religiosity, social support, depression, other substance use, ART adherence and viral suppression. Specifically, social factors hypothesized to be protective appeared to be so: women who did not report any or unhealthy alcohol use (including HED) were more likely to report higher levels of religiosity and social support. Alternatively, women who reported any or unhealthy alcohol use (including HED) were more likely to report greater depressive symptoms, other substance use, sub-optimal ART adherence and lack of viral suppression. After accounting for other factors, other substance use and HIV-related clinical characteristics remained significantly associated with patterns of alcohol use in this sample. Finally, in adjusted analysis, we observed a significant association between higher levels of HIV-related stigma and lower odds of UAU.

Estimates of any and unhealthy alcohol use (including HED) in this sample of African-American women living with HIV were similar to national estimates among Black females (Substance Abuse and Mental Health Services Administration (SAMHSA), 2015), women living with HIV (Crane et al., 2017), and older adults living with HIV (E. C. Williams, Bradley, et al., 2014). That is, despite the intersecting vulnerabilities associated with being an African-American women living with HIV, any and unhealthy alcohol use was not occurring at elevated levels as hypothesized. This finding suggests that African-American women living with HIV may not be using alcohol as a negative coping mechanism (Boyd et al., 2009), but instead, may be practicing resilience through other means, such as religiosity and social support (Earnshaw et al., 2013). Though patterns of alcohol use were not significantly associated with religiosity and social support in adjusted analysis, bivariate associations are consistent with previous studies demonstrating the protective effects of religiosity and social support among African-American women living with HIV (Buseh & Stevens, 2006; Grodensky et al., 2015; Himelhoch & Njie-Carr, 2016; Serovich et al., 2001).

Still, our study does indicate that a substantial number of African-American women living with HIV are indeed engaging in any and unhealthy alcohol use (including HED). Moreover, our results provide further evidence that African-American women living with HIV may be at increased risk of adverse alcohol-related clinical outcomes (Witbrodt et al., 2014). For example, the women in this study who reported any alcohol use had an over two times higher odds of being sub-optimally adherent to ART compared to women who did not report alcohol use – an AOR higher than that reported in a recent meta-analysis of alcohol use and ART adherence (AOR = 2.39 vs AOR = 1.82) (Hendershot et al., 2009). Similarly, women in this study who met criteria for UAU were less likely than those who did not to be virally suppressed, even after adjusting for ART adherence (Azar et al., 2010). This finding is consistent with other recent studies demonstrating the harmful effects of alcohol use on HIV disease progression

independent of ART adherence (Cook et al., 2017; Deiss et al., 2016; E. C. Williams et al., 2018). However, the magnitude of the association observed in the current study was almost twice that observed in a study of PLWH in Florida (Cook et al., 2017). While some of the discrepancy may be attributable to differences in comparison groups (no UAU vs no drinking), it is also possible that African-American women living with HIV who engage in UAU are at higher risk of poor HIV-related disease outcomes associated with unhealthy drinking.

High risk of adverse clinical outcomes associated with alcohol use reiterates the need for regular alcohol screening and appropriate interventions for this population (Edelman, Williams, & Marshall, 2018). Among the general population, brief alcohol-related interventions have reduced alcohol use (Jonas, Garbutt, Amick, et al., 2012). However, previous research indicates that PLWH who screen positive for UAU may be less likely to receive brief alcohol interventions than people not living with HIV (E. C. Williams, Lapham, Shortreed, et al., 2017). Furthermore, in settings where routinely offered, brief interventions may not be having their intended benefits among PLWH (E. C. Williams, Lapham, Bobb, et al., 2017). Still, a recent review of the literature highlights the potential for adapting existing interventions and integrating alcohol treatment into HIV care (Edelman et al., 2018). Indeed, among a sample of women living with HIV recruited from an urban HIV clinic in Baltimore, a brief intervention adapted for women living with HIV was effective in reducing drinking frequency (but not frequency of heavy drinking days or drinks per drinking day) (Chander, Hutton, Lau, Xu, & McCaul, 2015). Furthermore, a meta-analysis of behavioral interventions, the majority of which addressed alcohol use as a part of comprehensive HIV-related behavior change, found that interventions were associated with reduced alcohol consumption, improved medication adherence, and decreased viral load (Scott-Sheldon, Carey, Johnson, & Carey, 2017). In combination, these studies suggest that African-American women living with HIV may benefit from targeted brief alcohol interventions that are integrated into broader HIV-related care initiatives. Future research is needed to develop and test these interventions in this population.

In this sample, patterns of alcohol use were associated with a variety of social and clinical characteristics, many of which should be considered in the development of interventions. Most notably, after accounting for other participant characteristics, other substance use was associated with any alcohol use, UAU and HED. The observed association between substance use and all patterns of alcohol use is consistent with studies of both PLWH and the general population (Crane et al., 2017; Galvan et al., 2002; Hasin et al., 2007), and has important implications for African-American women living with HIV. Specifically, PLWH who have comorbid alcohol and substance use may be less adherent to HIV care and at greater risk for poor outcomes, including reduced neurologic function, Hepatitis C co-infection, and drug overdose (E. C. Williams, Hahn, et al., 2016). PLWH with co-occurring alcohol and substance use disorders may also be less likely to seek alcohol and substance use treatment (Stinson et al., 2005). Because Black women are already at risk for low utilization of alcohol treatment (Zemore et al., 2014), this additional risk factor has particular relevance.

Depression was also common in this sample and associated with increased risk of any and unhealthy alcohol use (including HED) in bivariate analyses. Though directionality remains unclear, alcohol use has been consistently associated with poor psychosocial outcomes such as depression among PLWH (Braithwaite et al., 2016; Sullivan et al., 2011). Given that adjustment for other factors attenuated the association between depression and patterns of alcohol use, it could be that other factors (e.g., religiosity or social support) may account for the observed

bivariate associations (Bowie, Ensminger, & Robertson, 2006). Nonetheless, over a third of the sample reported moderate to severe depressive symptoms, and depression is dependably associated with poor ART adherence and engagement in care (Gonzalez et al., 2011). Thus, we believe comorbid depression should be considered in alcohol-related intervention development and clinical care for African-American women living with HIV.

Finally, in adjusted analysis, higher levels of HIV-related stigma were associated with lower odds of UAU. This finding is notably inconsistent with previous research which demonstrates increased risk of any and unhealthy alcohol use associated with HIV-related stigma (Galvan et al., 2008; Liao et al., 2014; Wright, Naar-King, Lam, Templin, & Frey, 2007). Potentially, African-American women living with HIV are uniquely responding to greater HIV-related stigma by drinking less. Alternatively, African-American women living with HIV who engage in any and unhealthy alcohol use may subsequently belong to social networks wherein HIV has been normalized and HIV-related stigma is low. Further investigation is needed to better understand the directionality and context of the observed association between HIV-related stigma and unhealthy alcohol use in this study.

Limitations

There are several important limitations to this study. First, the analysis was cross-sectional, and therefore, we cannot make causal interpretation of any observed associations. Relatedly, patterns of alcohol use were assessed at a single time point. Any and unhealthy alcohol use can change over time (Dawson, Stinson, Chou, & Grant, 2008; Karlamangla, Zhou, Reuben, Greendale, & Moore, 2006; Lapham et al., 2014; Moore et al., 2005). For example, in a study of women living with HIV, about 20% of women had substantial changes in drinking behavior over time (Cook et al., 2013). For this reason, regular and repeated screening over an extended period of time may provide a more accurate and comprehensive assessment of patterns of alcohol use. Second, self-reported measures may be subject to recall and social desirability bias. Third, women in the present study were currently seeking medical care and willing to participate in a study. Thus, the experiences of these women may not be generalizable to the larger population of African-American women living with HIV, many of whom are not in care.

Conclusions

In summary, despite intersecting vulnerabilities, African-American women living with HIV who participated in this study did not appear to have substantially higher prevalence of any or unhealthy alcohol use (including HED) when compared to similar populations. These women may be taking advantage of resilience resources such as religiosity and social support. However, over half of the women in this sample reported any alcohol use, and a quarter each screened positive for UAU and HED. These women were at increased risk of poor HIV clinical behaviors and outcomes and were more likely to report certain social and clinical characteristics when compared to women who did not engage in any and unhealthy alcohol use. Our findings suggest that African-American women living with HIV should be offered regular alcohol screening and intervention. Special attention may be indicated for women who present with, or are at risk for, other substance use and depression. Future research is needed to investigate longitudinal trends of alcohol use patterns in larger samples of African-American women living with HIV; clarify the size and directionality of relationships between religiosity, social support, HIV-related stigma, and alcohol use patterns in this population; and develop and test brief

interventions that are targeted for African-American women living with HIV and integrated into HIV care.

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TABLES

Table 4.1. Baseline characteristics of African-American women living with HIV who participated in an HIV-related stigma-reduction intervention (Unity Study, N = 220)

	N/Median	(%/IQR)
Study characteristics		
Study arm		
Control	107	(49%)
Treatment	113	(51%)
Study site		
NU	44	(20%)
CORE	77	(35%)
UAB	99	(45%)
Demographic characteristics		
Age (years)	46 years	(40-54 years)
Ethnicity		
Hispanic/Latina	4	(2%)
Not Hispanic/Latina	212	(96%)
Missing	4	(2%)
Marital status		
Single/Separated/Divorced/Widowed	169	(77%)
Married/Partner	50	(23%)
Missing	1	(<1%)
Education		
Less than high school	79	(36%)
High school or equivalent	49	(23%)
More than high school	86	(39%)
Missing	6	(3%)
Social characteristics		
HIV-related stigma (SSCI)*	30	(22-41)
Religiosity (RBB)*	34	(27-39)
Social support (MOS-SSS subscales)*	4.0	(3.1-4.8)
Ethnic identity (MEIM-R)*	4.0	(3.3-5.0)
Clinical characteristics		
Depressive symptom severity (PHQ-8)*	6.0	(2.0-12.0)
Symptomatic PTSD		
Yes	148	(67%)
No	72	(33%)
Other substance use		
Yes	44	(20%)
No	175	(80%)
Missing	1	(<1%)
Opioid use		
Yes	5	(2%)
No	215	(98%)
HIV-related clinical characteristics		
ART adherence		
100% adherent	108	(49%)
<100% adherent	112	(51%)
Viral suppression (<200 copies/mL)		
Yes	170	(77%)
No	50	(23%)

*Missing values for participants, NU – Northwestern University, CORE – Ruth M. Rothstein CORE Center, UAB – University of Alabama, Birmingham, IQR – Interquartile range, AUDIT-C – Alcohol Use Disorders Identification Test – Consumption
SSCI – 14-item Stigma Scale for Chronic Illness, RBB – 7-item Religious Beliefs and Behaviors survey, MOS-SSS – Medical Outcomes Study Social Support Survey Emotional/Information Support and Positive Social Interaction subscales, MEIM-R – Multigroup Ethnic Identity Measure Commitment subscale, PHQ-8 – 8-item Patient Health Questionnaire
PTSD – post-traumatic stress disorder, ART – antiretroviral therapy

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Table 4.2. Bivariate comparisons of participant characteristics across patterns of alcohol use among a sample of African-American women living with HIV recruited to the Unity Study (N = 220)

	No Alcohol Use (N = 102)		**Any Alcohol Use (N = 118)**		**No Unhealthy Alcohol Use (N = 172)**		**Any Unhealthy Alcohol Use (N = 48)**		**No Heavy Episodic Drinking (N = 164)**		**Any Heavy Episodic Drinking (N = 56)**	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Demographic characteristics												
Age (mean years, IQR)	46	(40-55)	47	(40-54)	46	(40-55)	46	(37-54)	48	(41-55)	45	(36-54)
Education												
Less than high school	44	(45%)	35	(30%)	61	(36%)	18	(38%)	58	(36%)	21	(38%)
High school or equivalent	20	(20%)	29	(25%)	40	(24%)	9	(19%)	35	(22%)	14	(25%)
More than high school	33	(33%)	53	(45%)	66	(40%)	20	(43%)	66	(42%)	20	(36%)
Hispanic/Latina ethnicity	1	(1%)	3	(3%)	3	(2%)	1	(2%)	2	(1%)	2	(4%)
Marital status												
Single/Separated/Divorced/Widowed	78	(77%)	91	(77%)	132	(77%)	37	(77%)	126	(77%)	43	(77%)
Married/Partner	23	(23%)	27	(23%)	39	(23%)	11	(23%)	37	(23%)	13	(23%)
Social characteristics												
HIV-related stigma (median SSCI, IQR)	30	(20-43)	32	(24-41)	30	(22-40)	34	(21-43)	30	(22-43)	32	(22-41)
Religiosity (median RBB, IQR)	**35**	**(28-41)**	**33**	**(25-39)**	**34**	**(28-40)**	**29**	**(24-38)**	34	(28-40)	32	(24-39)
Social support (median MOS-SSS, IQR)	4.3	(2.8-5.0)	3.9	(3.1-4.5)	4.1	(3.2-4.9)	3.6	(2.9-4.5)	**4.2**	**(3.3-4.9)**	**3.6**	**(2.8-4.4)**
Ethnic identity (median MEIM-R, IQR)	4.0	(3.3-5.0)	4.0	(3.0-4.7)	4.0	(3.3-5.0)	4.0	(3.3-4.7)	4.0	(3.3-5.0)	4.0	(3.3-4.7)
Clinical characteristics												
Depression (median PHQ-8, IQR)	**5.0**	**(1.0-12.0)**	**6.0**	**(4.0-12.0)**	**6.0**	**(2.0-12.0)**	**7.5**	**(5.5-15.0)**	**6.0**	**(2.2-12.0)**	**6.5**	**(5.0-11.0)**
Symptomatic PTSD	67	(66%)	81	(69%)	111	(65%)	37	(77%)	108	(66%)	40	(71%)
Other substance use	**13**	**(13%)**	**31**	**(27%)**	**29**	**(17%)**	**15**	**(35%)**	**27**	**(17%)**	**17**	**(30%)**
Opioid use	3	(3%)	2	(2%)	5	(3%)	0	(0%)	4	(2%)	1	(2%)
HIV-Related clinical characteristics												
ART adherence												
100% adherent	**63**	**(62%)**	**45**	**(38%)**	91	(53%)	17	(35%)	**91**	**(55%)**	**17**	**(30%)**
<100% adherent	**39**	**(38%)**	**73**	**(62%)**	**81**	**(47%)**	**31**	**(65%)**	**73**	**(45%)**	**39**	**(70%)**
Viral suppression (<200 copies/mL)	82	(80%)	88	(75%)	**138**	**(80%)**	**32**	**(67%)**	131	(80%)	39	(70%)

Bold used to indicate p-value <0.05 based on χ^2 test for independence for categorical variables and Kruskal-Wallis test (with ties) for continuous variables, IQR – Interquartile range, SSCI – 14-item Stigma Scale for Chronic Illness, RBB – 7-item Religious Beliefs and Behaviors survey, MOS-SSS – Medical Outcomes Study Social Support Survey, Emotional/Information Support and Positive Social Interaction subscales, MEIM-R – Multigroup Ethnic Identity Measure Commitment subscale, PHQ-8 – 8-item Patient Health Questionnaire, PTSD – post-traumatic stress disorder, ART – antiretroviral therapy

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Table 4.3. Estimated independent associations between demographic, clinical, social, and HIV-related clinical characteristics and patterns of alcohol use among African-American women living with HIV recruited to the Unity Study (N = 197)*

	Any Alcohol Use		Unhealthy Alcohol Use		Any Heavy Episodic Drinking	
	ARR	(95% CI)	ARR	(95% CI)	ARR	(95% CI)
Demographic characteristics						
Age (mean years, IQR)	1.01	(0.99, 1.02)	1.02	(0.99, 1.04)	1.00	(0.98, 1.02)
Education						
Less than high school	REF	-	REF	-	REF	-
High school or equivalent	1.07	(0.75, 1.51)	0.64	(0.31, 1.32)	0.66	(0.34, 1.29)
More than high school	1.24	(0.90, 1.69)	0.97	(0.56, 1.69)	0.75	(0.43, 1.32)
Hispanic/Latina ethnicity	1.26	(0.65, 2.41)	0.98	(0.14, 7.11)	1.26	(0.30, 5.38)
Marital status						
Single/Separated/Divorced/Widowed	REF	-	REF	-	REF	-
Married/Partner	1.08	(0.77, 1.50)	1.40	(0.80, 2.44)	1.30	(0.73, 2.34)
Social characteristics						
HIV-related stigma (SSCI)	1.00	(0.98, 1.01)	**0.97**	**(0.94, 1.00)**	0.98	(0.95, 1.01)
Religiosity (RBB)	0.99	(0.98, 1.01)	0.98	(0.95, 1.00)	0.99	(0.96, 1.02)
Social support (MOS-SSS)	1.03	(0.90, 1.18)	0.94	(0.74, 1.19)	0.83	(0.67, 1.03)
Ethnic identity (MEIM-R)	1.07	(0.93, 1.24)	1.05	(0.80, 1.39)	1.05	(0.81, 1.36)
Clinical characteristics						
Depression (PHQ-8)	1.02	(1.00, 1.05)	1.04	(0.98, 1.10)	1.03	(0.98, 1.09)
Symptomatic PTSD	0.86	(0.61, 1.22)	1.61	(0.83, 3.12)	1.03	(0.54, 1.98)
Other substance use	**1.45**	**(1.12, 1.90)**	**2.20**	**(1.31, 3.69)**	**1.93**	**(1.17, 3.20)**
Opioid use	0.70	(0.16, 2.98)	**	**	0.76	(0.16, 3.58)
HIV-Related clinical characteristics						
ART adherence						
100% adherent	REF	-	REF	-	REF	-
<100% adherent	**1.44**	**(1.07, 1.95)**	1.36	(0.78, 2.38)	**1.86**	**(1.06, 3.26)**
Viral suppression (<200 copies/mL)	0.87	(0.65, 1.18)	**0.42**	**(0.24, 0.74)**	0.62	(0.35, 1.08)

Bold used to indicate p<0.05, ARR – adjusted relative risk, models adjusted for study site and intervention arm
*Individuals without complete covariate data were dropped from the multivariable analysis, **Opioid use perfectly predicted no unhealthy alcohol use and was dropped from the model
SSCI – 14-item Stigma Scale for Chronic Illness, RBB – 7-item Religious Beliefs and Behaviors survey, MOS-SSS – Medical Outcomes Study Social Support Survey Emotional/Information Support and Positive Social Interaction subscales, MEIM-R – Multigroup Ethnic Identity Measure Commitment subscale, PHQ-8 – 8-item Patient Health Questionnaire, PTSD – post-traumatic stress disorder, ART – antiretroviral therapy

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APPENDICES

Appendix A. Estimated independent associations between demographic, clinical, social, and HIV-related clinical characteristics and patterns of alcohol use among African-American women living with HIV recruited to the Unity Study (N = 197)*

	Any Alcohol Use		**Unhealthy Alcohol Use**		**Any Heavy Episodic Drinking**	
	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)
Demographic characteristics						
Age (mean years, IQR)	1.02	(0.98, 1.05)	1.02	(0.98, 1.06)	1.00	(0.96, 1.04)
Education						
Less than high school	REF	-	REF	-	REF	-
High school or equivalent	1.27	(0.53, 3.04)	0.56	(0.19, 1.68)	0.55	(0.20, 1.53)
More than high school	1.77	(0.81, 3.85)	0.96	(0.40, 2.29)	0.66	(0.28, 1.56)
Hispanic/Latina ethnicity	2.48	(0.17, 36.93)	0.89	(0.06, 12.48)	1.83	(0.15, 21.81)
Marital status						
Single/Separated/Divorced/Widowed	REF	-	REF	-	REF	-
Married/Partner	1.15	(0.54, 2.45)	1.62	(0.64, 4.07)	1.43	(0.60, 3.45)
Social characteristics						
HIV-related stigma (mean SSCI, IQR)	1.00	(0.97, 1.03)	**0.96**	**(0.92, 1.00)**	0.97	(0.93, 1.01)
Religiosity (mean RBB, IQR)	0.97	(0.93, 1.01)	0.96	(0.92, 1.01)	0.99	(0.95, 1.04)
Social support (mean MOS-SSS, IQR)	1.08	(0.78, 1.50)	0.93	(0.63, 1.37)	0.77	(0.53, 1.10)
Ethnic identity (mean MEIM-R, IQR)	1.18	(0.81, 1.74)	1.08	(0.69, 1.69)	1.06	(0.69, 1.64)
Clinical characteristics						
Depression (mean PHQ-8, IQR)	1.06	(0.99, 1.14)	1.06	(0.99, 1.15)	1.05	(0.97, 1.14)
Symptomatic PTSD	0.73	(0.30, 1.77)	2.01	(0.70, 5.81)	1.02	(0.37, 2.80)
Other substance use	**3.45**	**(1.31, 9.09)**	**3.50**	**(1.41, 8.69)**	**2.72**	**(1.13, 6.53)**
Opioid use	0.38	(0.02, 6.03)	**	**	0.62	(0.04, 9.84)
HIV-Related clinical characteristics						
ART adherence						
100% adherent	REF	-	REF	-	REF	-
<100% adherent	**2.39**	**(1.20, 4.81)**	1.58	(0.68, 3.65)	**2.37**	**(1.06, 5.33)**
Viral suppression (<200 copies/mL)	0.72	(0.31, 1.64)	**0.27**	**(0.15, 0.67)**	0.49	(0.20, 1.17)

Bold used to indicate p<0.05, AOR – adjusted odds ratios, models adjusted for study site and intervention arm

*Individuals without complete covariate data were dropped from the multivariable analysis

**Opioid use perfectly predicted no unhealthy alcohol use and was dropped from the model

SSCI – 14-item Stigma Scale for Chronic Illness, RBB – 7-item Religious Beliefs and Behaviors survey, MOS-SSS – Medical Outcomes Study Social Support Survey Emotional/Information Support and Positive Social Interaction subscales, MEIM-R – Multigroup Ethnic Identity Measure Commitment subscale, PHQ-8 – 8-item Patient Health Questionnaire, PTSD – post-traumatic stress disorder, ART – antiretroviral therapy

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CHAPTER 5

Conclusions

SUMMARY OF FINDINGS

This dissertation examined social and behavioral determinants of HIV care and outcomes among a sample of African-American women living with HIV who were recruited from clinical settings in Chicago, IL and Birmingham, AL to participate in a randomized controlled trial of an HIV-related stigma reduction intervention. In the first study, we first established that HIV-related stigma was common, and those who reported greater levels of HIV-related stigma were less likely to be virally suppressed. We hypothesized that this relationship operated through depression, and subsequently, nonadherence to ART. However, our mediation analysis did not provide support for this hypothesis. Still, in the second study, we demonstrated that women who reported higher levels of HIV-related stigma were, in fact, more likely to report higher levels of depressive symptom severity. Moreover, using moderation analysis, we determined that this relationship was buffered by religiosity, so that the effect of HIV-related stigma on depression was less severe among women who reported higher levels of religiosity. Specifically, greater frequency of prayer and attending worship services appeared to be especially influential. The relationship between HIV-related stigma and depression was not buffered by social support or attachment to one's ethnic identity as expected. Finally, in the third study, we estimated patterns of alcohol use and their correlates in this sample. Despite our hypothesis that African-American women living with HIV may be at increased risk of any and unhealthy alcohol use, the women in this study reported patterns of alcohol use comparable to other populations (e.g., African-American women and other groups of PLWH). Nonetheless, any and unhealthy alcohol use were relatively common (half reported any alcohol use, a quarter screened positive for UAU, and another quarter reported HED) and were generally associated with poor ART adherence and lack of viral suppression. In bivariate comparisons, certain social factors appeared to be protective: women who did not report any or unhealthy alcohol use were more likely to report higher levels of religiosity and social support. Alternatively, women who reported any or unhealthy alcohol use were more likely to report greater depressive symptoms and other substance use. Interestingly, in adjusted analysis, higher levels of HIV-related stigma were associated with lower likelihood of UAU.

IMPLICATIONS

Collectively, these studies have important implications. First, these studies provide further evidence that HIV-related stigma is an ongoing challenge for African-American women living with HIV that may have profound consequences. In the total sample (N = 239), 96% of women reported at least some level of HIV-related stigma (SSCI >14) and 20% of women reported experiencing some level of *every* form of HIV-related stigma included in the SSCI measure (item >1 for all 14 items). The ubiquity of HIV-related stigma in our sample is consistent with previous (largely, qualitative) studies which have documented the pervasive nature of HIV-related stigma among the lives of African-American living with HIV (Buseh & Stevens, 2006; Clark et al., 2003; Edwards, 2006; Fletcher et al., 2016; McDoom et al., 2015; Rao, Desmond, et al., 2012; Sanicki & Mannell, 2015; Vyavaharkar et al., 2010).

Moreover, we found that higher levels of HIV-related stigma were associated with poor psychosocial and disease-related outcomes. Specifically, in the second study, women who reported higher levels of HIV-related stigma were more likely to report greater depressive symptom severity. Historically, African-American women with depression are underdiagnosed,

undertreated, and more likely to suffer from long-term symptoms and greater disability when compared to their White counterparts (Bailey, Patel, Barker, Ali, & Jabeen, 2011; Carrington, 2006). In the third study, we also showed that depression was associated with patterns of alcohol use. Furthermore, although we were unable to detect an association between depressive symptoms and ART nonadherence among our sample in the first study (N = 100), depression has been consistently associated with poor ART adherence among PLWH (Gonzalez et al., 2011). Moreover, in a study of low-income PLWH, African-American PLWH with depression were significantly less likely to be adherent to ART when compared to White PLWH with depression (Kong, Nahata, Lacombe, Seiber, & Balkrishnan, 2012). It is reasonable to assume, therefore, that in the larger population of African-American women living with HIV who experience depression associated with HIV-related stigma, ART adherence is also a challenge (Lambert, Mugavero, Najjar, Enah, & Guthrie, 2018).

Relatedly, in the first study, we found a significant association between HIV-related stigma and lower likelihood of viral suppression, even when adjusting for potential confounders. This finding is in contrast with two previous studies of PLWH (one in a nationally-representative sample of PWLH from the US and another in a convenience sample of PLWH from the Netherlands) in which HIV-related stigma was not significantly associated with viral suppression (Baugher et al., 2017; Sumari-de Boer et al., 2012). On the other hand, this finding is consistent with a recent cross-sectional study of PLWH recruited from an urban HIV clinic in a Southeastern US city which found a relationship between experienced HIV-related stigma in the healthcare setting (but not the community setting) and lower odds of being virally suppressed (Kay et al., 2018). Together, these studies indicate that the relationship between HIV-related stigma and HIV-related disease outcomes may be population and context specific, and because of their unique identities and environments, African-American women may be particularly vulnerable to this social determinant of health.

In the third study, we also found evidence that any and unhealthy alcohol use (including HED) was relatively common among African-American women living with HIV. Furthermore, our study indicated that African-American women living with HIV are at heightened risk of other substance use and adverse alcohol-related HIV clinical outcomes including sub-optimal ART adherence and lack of viral suppression. Compared to studies of other groups of PLWH (Hendershot et al., 2009), the risk of poor ART adherence associated with any alcohol use was higher among the women in this study. These findings suggest that African-American women living with HIV may experience particularly severe HIV-related outcomes associated with alcohol use when compared to other groups of PLWH.

Notably, because studies one and three demonstrated that HIV-related stigma and UAU are associated with lack of viral suppression among African-American women living with HIV, there are additional implications in terms of HIV prevention. Specifically, one of the most effective HIV strategies for preventing the transmission of HIV is to ensure that PLWH are virally suppressed i.e., “treatment as prevention” (M. S. Cohen et al., 2016). Therefore, any factors that prevent an individual from achieving viral suppression are effectively increasing the risk of further transmission of HIV. In other words, HIV-related stigma and patterns of alcohol use among African-American women living with HIV are not just personal issues, they are public health issues, and effective screening and interventions are essential.

A recent systematic review of HIV-related stigma reducing interventions for African/Black diasporic women, found just two interventions that were targeted explicitly for this population

(Loutfy et al., 2015). Of these, one was an HIV self-care symptom management intervention for African-American mothers that consisted of in home visits by registered nurses (Miles et al., 2003). The other was the Unity Workshop (the intervention evaluated by the Unity Study), a peer-led two-day workshop with emphasis on skill-building and social support (Rao, Desmond, et al., 2012). Results from a randomized controlled trial (RCT) of the self-care intervention indicated that the intervention was effective in reducing HIV-related stigma (Miles et al., 2003). Conversely, the Unity Workshop, while showing promise in a pilot study (Rao, Desmond, et al., 2012), was not effective in reducing long-term HIV-related stigma or HIV viral load in an RCT setting (Rao, Kemp, et al., 2018).

In terms of alcohol-related interventions, in general populations, brief alcohol-related interventions have proven to be effective (Jonas, Garbutt, Amick, et al., 2012). However, PLWH may require more tailored, clinically-integrated programming (Edelman et al., 2018; Scott-Sheldon et al., 2017; E. C. Williams, Lapham, Bobb, et al., 2017; E. C. Williams, Lapham, Shortreed, et al., 2017). To the authors' knowledge, only one alcohol-related intervention has shown promise for African-American women living with HIV; in an urban HIV clinic in Baltimore, a brief intervention adapted for women living with HIV was effective in reducing drinking frequency among a sample of (predominately African-American) women living with HIV (Chander et al., 2015). However, this intervention was not effective in reducing frequency of heavy drinking days, drinks per drinking day, or HIV viral load, suggesting further refinement is needed.

Fortunately, results from studies two and three of this dissertation suggest strategies for enhancing programming for African-American women living with HIV. Specifically, in the second study, religiosity buffered the relationship between HIV-related stigma and depression. Similarly, in the third study, women who did not report any or unhealthy alcohol use were more likely to report higher levels of religiosity and social support. In combination, these findings suggest that integrating religiosity and social support into programming for African-American women living with HIV could promote resilience and improve outcomes associated with HIV-related stigma and patterns of alcohol use. This notion is consistent with numerous studies demonstrating the protective effects of religion, spirituality and social support for African-American women, including those living with HIV (Buseh & Stevens, 2006; Grodensky et al., 2015; Himelhoch & Njie-Carr, 2016; Serovich et al., 2001).

Arguably, the most straightforward way to integrate these resilience resources into programming for African-American women living with HIV is through church-based interventions (Campbell et al., 2007). Church attendance implicitly combines religiosity and social support so that any program overlaid will naturally include those elements (Taylor et al., 2017). Furthermore, the Black Church has a long history of health promotion in the African-American community (Giger et al., 2008), including HIV prevention (Francis & Liverpool, 2009), Perhaps, the biggest barrier for both HIV and alcohol-related church-based programming, however, is stigma (Idler, 2014; Wong, Derose, Litt, & Miles, 2018). In order for church-based programming to be effective for African-American women living with HIV, there will need to be efforts to reduce both HIV-related and alcohol-related stigma among church congregants and the surrounding community.

Interestingly, in our third study, there appeared to be a protective effect of HIV-related stigma on UAU. That is, higher levels of HIV-related stigma were associated with a lower likelihood of screening positive for UAU. This unexpected finding in the third study may be due

to multiple comparisons. However, this finding may, in part, explain the similarly counterintuitive finding in the first study wherein adjusting for alcohol use severity seemed to magnify the association between HIV-related stigma and viral suppression (although the sample used in the first study was a subset of the sample used in the third study, and HIV-related stigma was not statistically significantly associated with alcohol use severity in the first study). A negative association between HIV-related stigma and UAU is inconsistent with numerous studies of PLWH (Galvan et al., 2008; Liao et al., 2014; Wright et al., 2007), and requires further investigation. Potentially, African-American women living with HIV are responding to greater HIV-related stigma by drinking less e.g., HIV-related stigma is causing women to avoid social situations where alcohol may be present. Alternatively, African-American women living with HIV who engage in unhealthy alcohol use may subsequently belong to certain social networks (e.g., people who use illicit substances) wherein HIV has been normalized and HIV-related stigma is low. Ultimately, until conclusive studies have been established, it would be spurious to define HIV-related stigma as a "protective factor."

LIMITATIONS

As described in Chapters 2-4, these studies had several important limitations. First, because we examined only baseline data from the Unity Study, all the analyses were cross-sectional. As such, we could not make causal interpretation of any observed associations. Second, there were several limitations in terms of measures. Self-reported measures are subject to recall and social desirability bias. Additionally, the absence of certain measures (e.g., income, sexual orientation, prescribed ART dosage) may have left our analyses susceptible to residual confounding. Relatedly, utilizing different measures (e.g., a specific measure of resilience or a more sensitive measure for ART adherence) may have yielded more nuanced results. Lastly, there were limitations in the interpretability of certain measures (e.g., HIV-related stigma, social support, religiosity). Because these scales do not have established clinical cut points and/or functional thresholds, practical interpretation of numeric values can be challenging. Third, there were limitations to the sample in terms of generalizability. Namely, because the women in the Unity Study were all currently seeking HIV care and agreed to participate in a study that would require talking about living with HIV with researchers and other participants, findings may not be generalizable to the larger population of African-American women living with HIV, many of whom are not in care and are especially vulnerable to poor outcomes (M. H. Cohen et al., 2004; Kaiser Family Foundation, 2017). Fourth, while the sample was appropriately powered for Unity Study primary outcomes, we may have had insufficient power to detect effects of interest for the dissertation aims.

OPPORTUNITIES FOR FUTURE RESEARCH

The implications and limitations of these studies lay the foundation for future research opportunities. First, to better understand the mechanism through which HIV-related stigma may influence viral suppression, the mediation analysis conducted in the first study needs to be replicated in a large representative sample including women outside of care. These analyses should also consider other possible mediating factors such as social support, engagement in care and alcohol and other substance use. Longitudinal studies would be particularly valuable. Furthermore, comparing the results from this study to similar analyses among other subgroups of PLWH in the U.S. could provide insight into potential differential effects of HIV-related stigma. Next, to identify additional resilience resources for African-American women living with HIV, future research could focus on exploring the moderating roles of other constructs related to resilience among this population (e.g., critical consciousness). These studies could also include

an explicit measure of resilience to more precisely describe and evaluate the mechanisms at hand. Additionally, further research is needed to investigate longitudinal trends of alcohol use patterns in larger samples of African-American women living with HIV. Longitudinal studies could help clarify the size and directionality of relationships between religiosity, social support, HIV-related stigma, and alcohol use patterns in this population. Finally, research is needed to develop and test screening and interventions that are targeted for African-American women living with HIV and focus on preventing further transmission. Interventions should focus on alleviating HIV-related stigma and any and unhealthy alcohol use and should incorporate aspects of religiosity and social support (potentially through church-based programming). Special attention should be given to African-American women living with HIV who present with symptoms of, or risk factors for, depression and alcohol and other substance use.

CONCLUSIONS

In summary, these three studies indicate that African-American women living with HIV face substantial challenges and demonstrate great resilience. HIV-related stigma is common among this population and represents a significant strain on women's psychosocial and physical well-being. Similarly, many women engage in any and unhealthy alcohol use, behaviors associated with poor HIV-related behaviors and outcomes. Additionally, because of their relationships with viral suppression, both HIV-related stigma and patterns of alcohol use are threats to HIV prevention. The results from these studies also indicate that African-American women living with HIV practice resilience via religiosity and social support. Collectively, these findings emphasize a need for effective interventions for African-American women living with HIV and highlight the opportunity to integrate religiosity and social support in efforts to reduce HIV-related stigma and any and unhealthy alcohol use. Future research should focus on better understanding the relevant mechanisms and developing and testing new interventions.

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