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Examining Stigma and Its Effect on HIV Prevention & Care among People Living in Florida

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EXAMINING STIGMA AND ITS EFFECT ON HIV PREVENTION & CARE AMONG PEOPLE LIVING IN FLORIDA

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by

Angel Blake Algarin

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To: Dean Tomas R. Guilarte
Roberts Stempel College of Public Health & Social Work

This dissertation, written by Angel Blake Algarin, and entitled Examining Stigma and its effect on HIV Prevention & Care among People Living in Florida, having been approved in respect to style and intellectual content, is referred to you for judgement.

We have read this dissertation and recommend that it be approved.

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Florida International University, 2020

DEDICATION

I dedicate this thesis to my parents

Angel & Jodie Algarin,

to my grandmother

Lena Fronius,

and to my abuelo

Samuel Algarin.

Thank you for your love, guidance, and support.

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ABSTRACT OF THE DISSERTATION

EXAMINING STIGMA AND ITS EFFECT ON HIV PREVENTION & CARE AMONG PEOPLE LIVING IN FLORIDA

by

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Florida International University, 2020

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Professor Gladys E. Ibañez, Major Professor

Persistent increases of HIV incidence in Florida has made it essential to study ways to improve HIV prevention strategies. Treatment as Prevention (TasP) and Preexposure Prophylaxis (PrEP) are two recent methods in HIV prevention; however, their success may be limited due to barriers such as stigma. This dissertation explored the relationship between HIV-related stigma and 1) antiretroviral therapy adherence and viral suppression and 2) symptoms of anxiety and depression. Additionally, it sought to develop and validate a scale to measure community PrEP-related stigma.

We used data from the Florida Cohort Study which include 932 people living with HIV (PLWH). The odds of non-adherence to ART was not significantly greater for those reporting low/moderate or high levels of general enacted HIV-related stigma (vs no stigma) (p=0.198 and p=0.600, respectively). Moreover, the odds of non-viral suppression was not significantly greater for those reporting low/moderate or high levels of general enacted HIV-related stigma (vs no stigma) (p=0.702 and p=0.622,

respectively). However, ever experiencing healthcare specific enacted HIV-related stigma was associated with both non-adherence [p=0.008] and non-suppression [p=0.011]. Between HIV-related stigma and symptoms of anxiety and depression, we found that higher levels of enacted HIV-related stigma was significantly associated with higher levels of both anxiety (vs no stigma) ($p=0.006$ and $p<0.001$, respectively) and depression ($p=0.002$ and $p<0.001$, respectively).

To develop and validate the community PrEP-related stigma scale (community-PSS) we used data from an ongoing study among 108 sexual and gender minority men in Florida. The scale was found to have high internal consistency ($\alpha=0.86$) and had 4 factors (stigma of actions outside of sex, stigma of sexual actions, extreme stigma perceptions, and positive community perception). The community-PSS was valid; meeting 4/5 hypotheses and in the expected direction.

Research that focuses on specific constructs of HIV-related stigma can better inform future stigma reduction interventions. The community-PSS is a valid and reliable tool with potential of assessing stigma's impact on PrEP knowledge, uptake, and adherence. Future research should focus on the intersectionality of stigma on HIV risk outcomes.

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ABBREVIATIONS AND ACRONYMS

PLWH- people living with HIV

PrEP- Preexposure Prophylaxis

ART- antiretroviral therapy

AOR- adjusted odds ratio

COR- crude odds ratio

OR- odds ratio

CI- confidence interval

US- United States

SHARC-Southern HIV & Alcohol Research Consortium

HPSS- HIV PrEP Stigma Scale

Community-PSS- Community PrEP-related Stigma Scale

RedCAP- Research Electronic Data Capture

eHARS- Enhanced HIV/AIDS Reporting System

PCA-principal component analysis

FRESH- Finding Respect and Ending Stigma against HIV Workshop

MSM- men who have sex with men

Introduction

In 2018, Florida had the highest number of new HIV cases in the United States (4,698), comprising 12.6% of the total national cases (1). From 2013–2018, though the U.S. in general has seen a 5.2% decrease of HIV incidence (1), Florida has seen an increase of HIV incidence of 12.5% (2). Moreover, key groups of people with existing HIV burden continue to face increased HIV incidence in the 2012--2016 time period, including: Hispanics (29.5% increase), men (8.1% increase), aged 25-29 (24.6% increase), men who have sex with men (7.1% increase) (2). Geographically, South Florida ranked as number one metropolitan statistical area of residence in the nation for new HIV diagnoses with a rate of 33.7 per 100,000 persons in 2018 (1). Due to the persistence of, and in some cases, increases of HIV incidence in the U.S. it is essential to study ways to improve HIV prevention strategies.

The two most recent methods of HIV prevention include treatment as prevention (TasP) and preexposure prophylaxis (PrEP). TasP, shown to be effective in the landmark study HPTN 052 (3), is the maintenance of people living with HIV (PLWH) on antiretroviral therapy in order to diminish their viral load to undetectable(< 200 copies/ml) and consequently at levels untransmittable to HIV negative sexual partners (4, 5). PrEP, approved by the FDA in 2012 (6), is a pill taken every day by people living without HIV in order to cut their risk of HIV acquisition by more than 90% (7). Though these methods of prevention are effective when treatment maintenance is achieved, stigmatization has been found to be a barrier to effective treatment of PLWH (8-12) and prevention among people living without HIV on PrEP (13-16)

As first described by the sociologist Erving Goffman, the theory of social stigma describes stigma as an attribute or behavior that is socially undesirable or discrediting (17). Outside of constructs such as racism and sexism, stigma has been described as a fundamental cause of population health inequalities (18). Growing amounts of literature have shown that stigma associated with multiple attributes (e.g. sexual orientation, HIV status, obesity, drug use, mental illness, etc.) causes a major source of stress in people's lives and can be harmful to one's health (18). However, gaps in knowledge persist on how enacted stigma effects people living with HIV as it relates to the continuum of care and depression and anxiety. Additionally, gaps in knowledge on community PrEP-related stigma in people not living with HIV exist as there are currently no validated scales to measure this construct of stigma.

The overall objective of this dissertation was to examine the association of HIV-related stigma on 1) antiretroviral adherence & viral suppression and 2) symptoms of anxiety and depression among a sample of 932 PLWH in Florida. Lastly, we planned to develop and validated a community PrEP-related stigma scale among 108 men who are attracted to men in Florida.

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Enacted HIV-related stigma's association with antiretroviral therapy adherence & viral suppression among people living with HIV (PLWH) in Florida

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Abstract

Among people living with HIV (PLWH) in Florida, less than 2/3 are virally suppressed (viral load < 200 copies/mL). Previous theoretical frameworks have pointed to HIV-related stigma as an important factor in outcomes related to the HIV continuum of care. This study aims to analyze the association between enacted HIV-related stigma and antiretroviral therapy adherence (ART) and viral suppression among a statewide sample of PLWH in Florida. The sample (n=932) was male (65.6%), majority 45+ years of age (63.8%), Black (58.1%), and non-Hispanic (80.2%). Adjusted odds ratios (AOR) and 95% confidence intervals (CI) were estimated using logistic regression models. The odds of non-adherence to ART was not significantly greater for those reporting low/moderate or high levels of general enacted HIV-related stigma (vs no stigma) (AOR [CI] 1.30 [0.87, 1.95], p=0.198; AOR [CI] 1.17 [0.65, 2.11], p=0.600, respectively). Moreover, the odds of non-viral suppression was not significantly greater for those reporting low/moderate or high levels of general enacted HIV-related stigma (vs no stigma) (AOR [CI] 0.92 [0.60, 1.42], p=0.702; AOR [CI] 1.16 [0.64, 2.13], p=0.622, respectively). However, ever experiencing healthcare specific enacted HIV-related stigma was associated with both non-adherence [AOR (CI) 2.29 (1.25, 4.20), p=0.008] and non-suppression [AOR (CI) 2.16 (1.19, 3.92), p=0.011]. The results suggest that the perpetuation of stigma by healthcare workers may have a larger impact on the continuum of care outcomes of PLWH than other sources of enacted stigma. Based on the results, there is a need to develop and evaluate interventions for healthcare workers intended to reduce experience stigma among PLWH.

Introduction

In 2017, there were approximately 1 million (991,447) people living with HIV (PLWH) in the United States (US) (1). Of the total number of PLWH in the US, an estimated 10.9% (108,003) live in Florida (1). Among PLWH in Florida, only 62% have evidence of being virally suppressed (viral load < 200 copies/mL) (2). This is concerning as without viral suppression, HIV has more deleterious effects among PLWH, but also because the virus can be more easily transmitted to HIV negative sexual partners (3). As the prevalence of HIV continues to grow in Florida and the US as a whole, it is increasingly important to focus on factors that may affect the achievement of antiretroviral therapy (ART) adherence and HIV viral suppression.

The HIV continuum of care is used to monitor the progress of PLWH from diagnosis to viral suppression. The HIV continuum of care is most often displayed as a 5-step process, including: 1) HIV diagnosis, 2) linkage to HIV care, 3) retention in HIV care, 4) prescription of ART, and 5) viral load suppression (4). As described by Mugavero et al. (2013), multiple factors can hinder or facilitate success on the HIV continuum of care that follow the levels of the socioecologic framework, including: individual, relationship, community, system, and policy(5). Under individual level factors, there are three sub-groups affecting continuum of care outcomes including: predisposing, enabling, and perceived need (5). Predisposing factors are described as socio-cultural factors that exist prior to illness (e.g. sex(6, 7), age(7-11), race/ethnicity(6, 7, 10, 11), etc.), enabling factors are described as factors associated with care logistics (e.g. insurance status(12, 13), transportation(14, 15), income(9, 13, 16), etc.), and

perceived need factors are described as factors based on people's perception of healthcare need (e.g. comorbidities(11, 17, 18), health beliefs (19-21), etc.)(5).

HIV-related Stigma

Stigma has been identified as a predictor of poor engagement in the HIV continuum of care (5, 22). As first described by the sociologist Erving Goffman, the theory of social stigma describes it as an attribute or behavior that is socially undesirable or discrediting (23). Outside of constructs such as racism and sexism, stigma has been described as a fundamental cause of population health inequalities (24). Growing amounts of literature have shown that stigma associated with multiple attributes (e.g. sexual orientation, HIV status, obesity, drug use, mental illness, etc.) causes a major source of stress in people's lives and can be harmful to their health (24). The stigma faced by PLWH due to their HIV status is known as HIV-related stigma (22).

HIV-related stigma can be separated into four sub-constructs: enacted, community, internalized, and anticipated stigma (22). Enacted stigma are actual negative actions taken against someone due to their HIV status, while anticipated stigma are hypothetical consequences of revealing one's HIV status(22). Community stigma is the perceived negative public opinion of PLWH, while internalized stigma are internal negative feelings about one's self due to their HIV status (22). Our study was interested in specifically the enacted sub-construct of stigma.

Healthcare enacted HIV-related stigma

Enacted stigma can be perpetuated by many types of people in the lives of PLWH (strangers, friends, family, healthcare workers etc.). Healthcare settings are one of the main settings that PLWH experience HIV-related stigma (25-27), manifested in the form of: patient avoidance, differing precautionary measures for PLWH, refusal to touch PLWH, lack of confidentiality, and denial of services (28). In a study among 651 healthcare workers in two Southeastern States, Stringer et al. (2016) found that 89% of clinical staff endorsed at least one stigmatizing attitude about PLWH(28). Perceived HIV-related stigma from healthcare workers has been associated with poorer care outcomes among PLWH (29, 30).

Current literature review

To date, the limited research shows mixed results of the effects of enacted stigma on ART adherence and viral suppression in the US. As it relates to ART adherence, the study by Logie et al. (2018) used baseline data from a national sample of 1425 Canadian women living with HIV and found that enacted HIV-related stigma did not have a significant association with ART adherence in adjusted models (31). In the US, Turan & Rogers et al. (2017) surveyed 1356 women living with HIV and found that experiences of enacted HIV-related stigma in a healthcare setting was negatively associated with ART adherence (30). As it relates to viral suppression, Kemp et al. (2019) analyzed longitudinal data from 234 Black women living with HIV in the US and found that enacted HIV-related stigma was negatively associated with viral suppression in adjusted

models (32). However, in a study by Vanable et al. (2006) among 221 PLWH in the US, experiences of enacted stigma were not associated with viral suppression (33).

To address current gaps in the literature and explore previous incongruous findings, we examined both general enacted HIV-related stigma and healthcare-specific enacted HIV-related stigma and analyzed their association with ART adherence and viral suppression. We hypothesized that those with higher levels of general enacted and healthcare specific HIV-related stigma would have poorer ART adherence and viral suppression after adjusting for potential factors associated with the continuum of care.

Methods

Study design and population

We used baseline data collected from the Florida Cohort study between 2014—2018. As described in previous studies (34), the Florida Cohort Study is overseen by the Southern HIV & Alcohol Research Consortium (SHARC) and has goals to assess factors that affect the health outcomes of PLWH. The Cohort recruited from 9 public health sites using venue-based convenience sampling throughout the state of Florida (Alachua County (2 sites), Broward County, Columbia County, Hillsborough County, Miami-Dade County, Orange County, Seminole County, and Sumter County). Participants were eligible for the study if they were living with HIV and ≥ 18 years of age. After obtaining consent, surveys were completed online using Research Electronic Data Capture (REDCap) or on paper. Participants had the option of completing the survey in English or Spanish and at the recruitment setting or at home. The survey consisted of items that assessed demographic, behavioral, mental, and social factors. Surveys took

approximately 30-45 minutes to complete, and after completion, participants received a $25 gift card. Additional data on HIV viral load were obtained through linkage to the Enhanced HIV/AIDS Reporting System (eHARS) database in collaboration with the Florida Department of Health. The Florida International University, University of Florida, and Florida Department of Health Institutional Review Boards have approved the protocol of this study.

Measures

HIV Continuum of Care Outcomes

The primary outcomes of interest were the final two steps of the HIV care continuum, ART adherence and HIV viral suppression.

ART Adherence- Defined as adhering to antiretroviral medication 95% of the time, was measured using the continuous item, "In the last 30 days, on how many days did you miss at least one dose of any of your HIV medicine?" Adherence was dichotomized as yes/no based on a 95% cutpoint.

HIV Viral Suppression- Defined as having less than 200 copies/mL of HIV in the most recent viral load test as retrieved from the eHARS database.

Predictors of Interest

Our primary predictors of interest were general enacted HIV-related stigma and healthcare specific enacted HIV-related stigma. Our study utilized an abbreviated version of the Herek HIV-related Stigma measure (35). The scale included 10, 4-point Likert style questions that assessed experiences of enacted HIV-related stigma. Sample

questions included: “Someone insulted or verbally abused me because I have HIV,” “A doctor, nurse, or health care worker avoided me or refused to take care of me because I have HIV,” etc.

General Enacted HIV-related Stigma- Total possible scores could range from 0-30. Based on their total score, participants were stratified into the following levels: never experienced HIV-related stigma (0), experienced low/moderate levels of HIV-related stigma (1-10), and experienced high levels of HIV-related stigma (11+). Similar stratification methods have been used in previous studies (36).

Healthcare specific enacted HIV-related stigma- Focused on the specific item, “A doctor, nurse, or health care worker avoided me or refused to take care of me because I have HIV,” from the general enacted HIV-related stigma measure. Total possible scores could range from 0-3. Based on their scores, participants were stratified by never (0) vs ever (>0) experiencing healthcare specific enacted HIV-related stigma.

Demographics

Demographic items included age group (18-34, 35-44, 45-54, ≥55 years), sex at birth (male or female), race (White, Black, Other), ethnicity (Hispanic or Non-Hispanic), and sexual orientation (heterosexual or non-heterosexual). All demographic items were self-reported by the participants.

Psychosocial and health need indices

Due to the large number of variables associated with the continuum of care, we created indices based on previous research (37, 38). Creating indices is advantageous in

models with many covariates to decrease collinearity. We extracted 25 covariates from the survey guided by the framework developed by Mugavero et al. (2013) (variables listed in appendix 1). All extracted variables were coded so that higher scores corresponded with higher risk of continuum of care failure. We then conducted a reliability analysis for all 25 indicators and deleted all indicators that were deleterious to the Cronbach's alpha, leaving 16 remaining indicators.

Using the 16 remaining factors, we then conducted a principal component analysis (PCA) with and without a varimax rotation. PCA found 6 factors with an eigenvalue greater than 1, including: mental health (4 variables), socioeconomic status (3 variables), social support (4 variables), non-injection drug use (2 variables), injection drug use (2 variables), and usual place of HIV care (1 variable). Finally, we categorized the standardized scores for the 6 factors into tertiles (≤25% percentile, 25-50% percentile, >50% percentile) except for usual place of HIV care which was made binary as only one item created the factor.

Analysis

All data were analyzed using SAS (v9.4; SAS Institute Inc., Cary, NC). We reported sample frequencies and percentages to describe the characteristics of the sample by ART adherence and viral suppression. We used unadjusted logistic regression models to show the association of each unique variable on non-adherence and non-suppression. Then, we conducted 2 adjusted logistic regression models where ART adherence and viral suppression were the outcomes and general enacted HIV-related stigma was the predictor of interest. Finally, we conducted an additional 2 adjusted logistic regression

models where the outcomes of interest remained the same but the predictor of interest was healthcare specific enacted HIV-related stigma. Models were adjusted for demographics and factors using the indices described above. To be considered as statistically significant, α was set to 0.05.

Results

Cohort characteristics

Our overall sample consisted of 932 PLWH across the state of Florida, of which 790 (84.8%) and 898 (96.4%) had complete adherence and suppression outcome measure data, respectively. Those who identified as transgender/ gender non-conforming were removed from the final analysis leaving a final sample of n=773 and n=879 for adherence and suppression outcomes, respectively. The majority of our overall sample was aged 45 years or older (63.8%), Black (58.1%), Non-Hispanic (80.2%), male (65.6%), and heterosexual (53.6%). The majority of our sample reported low/moderate or high levels of general enacted HIV-related stigma (53.3%) and a minority reported ever experiencing healthcare-specific enacted HIV-related stigma (10.5%). The proportion of the sample meeting our definition of non-adherence was 30.8% and non-suppression was 25.0%. The characteristics of our final sample stratified by adherence and suppression can be found in Table 1.

Table 1. Descriptive Baseline sample statistics of the Florida Cohort Study stratified by Antiretroviral Therapy(ART) Adherence & Viral Suppression				
	Adherent[a]	Non-Adherent[a]	Suppressed[b]	Non-Suppressed[b]
	n (%)	n (%)	n (%)	n (%)
	N=535	N=238	N=659	N=220
Age Group				
18-34	76 (14.2)	41 (17.2)	89 (13.5)	60 (27.3)
35-44	90 (16.8)	54 (22.7)	122 (18.5)	51 (23.2)
45-54	222 (41.5)	90 (37.8)	261 (39.6)	83 (37.7)
≥55	147 (27.5)	53 (22.3)	187 (28.4)	26 (11.8)
Race				
White	200 (37.5)	60 (25.2)	223 (33.9)	58 (26.5)
Black	282 (52.9)	152 (63.9)	370 (56.2)	140 (63.9)
Other	51 (9.6)	26 (10.9)	65 (9.9)	21 (9.6)
Ethnicity				
Non-Hispanic	426 (79.6)	191 (80.3)	518 (78.6)	184 (83.6)
Hispanic	109 (20.4)	47 (19.7)	141 (21.4)	36 (16.4)
Sex				
Male	356 (66.5)	153 (64.3)	420 (63.7)	154 (70.0)
Female	179 (33.5)	85 (35.7)	239 (36.3)	66 (30.0)
Sexual Orientation				
Heterosexual	258 (50.6)	132 (56.7)	347 (54.5)	109 (52.7)
Non-Heterosexual	252 (49.4)	101 (43.3)	290 (45.5)	98 (47.3)
General Enacted HIV-related Stigma				
None	249 (48.3)	98 (42.2)	299 (47.3)	100 (47.0)
Low/Moderate	206 (39.9)	93 (40.1)	250 (39.6)	80 (37.5)
High	61 (11.8)	41 (17.7)	83 (13.1)	33 (15.5)
Healthcare Specific Enacted Stigma				
Not Experienced	481 (91.3)	199 (85.0)	579 (90.2)	195 (89.5)
Experienced	46 (8.7)	35 (15.0)	63 (9.8)	23 (10.5)
Mental Health Factor				
Low Risk	170 (33.9)	45 (20.4)	197 (32.6)	42 (20.4)
Medium Risk	119 (23.8)	56 (25.3)	137 (22.7)	48 (23.3)
High Risk	212 (42.3)	120 (54.3)	270 (44.7)	116 (56.3)
Socioeconomic Factor				
Low Risk	146 (29.3)	55 (24.3)	179 (29.0)	45 (21.9)
Medium Risk	109 (21.9)	42 (18.6)	127 (20.5)	44 (21.5)
High Risk	243 (48.8)	129 (57.1)	312 (50.5)	116 (57.6)
Social Support Factor				
Low Risk	131 (26.4)	55 (24.2)	160 (26.3)	44 (22.0)
Medium Risk	132 (26.6)	47 (20.7)	155 (25.5)	47 (23.5)

High Risk	233 (47.0)	125 (55.1)	293 (48.2)	109 (54.5)
Non-Injection Drug Use Factor				
Low Risk	247 (51.5)	83 (39.5)	296 (50.4)	84 (42.4)
Medium Risk	83 (17.3)	42 (20.0)	110 (18.7)	32 (15.2)
High Risk	150 (31.2)	85 (40.5)	181 (30.8)	84 (42.4)
Injection Drug Use Factor				
Low Risk	388 (78.1)	163 (72.4)	459 (75.1)	167 (80.3)
Medium Risk	87 (17.5)	38 (16.9)	115 (18.8)	21 (10.1)
High Risk	22 (4.4)	24 (10.7)	37 (6.1)	20 (9.6)
Usual Place of Care Factor				
Low Risk	490 (92.8)	225 (94.9)	601(92.8)	179 (82.1)
High Risk	38 (7.2)	12 (5.1)	47 (7.2)	39 (17.9)

a. ART adherence was dichotomized based on a ≥95% adherence cutpoint.
b. Viral suppression was dichotomized based on a 200 viral copies/mL cutpoint.

Logistic regression analyses of general enacted stigma on ART adherence

The unadjusted logistic models found that those reporting high levels of general enacted HIV-related stigma (vs no stigma) (OR=1.71, CI: [1.08, 2.70], p=0.023) had significantly increased odds of non-adherence. However, in the final adjusted model, low/moderate nor high levels of general enacted HIV-related stigma (vs no stigma)(AOR=1.35, CI:[0.88, 2.07], p=0.165; AOR=1.05, CI:[0.56, 1.96], p=0.881, respectively) remained significantly associated with ART adherence.

Those who identified as 35-44 years of age (vs 45-54)(AOR=1.91, CI:[1.15, 3.17], p=0.012), Black (vs White)(AOR=2.07, CI:[1.26, 3.41], p=0.004), Hispanic (vs Non-Hispanic) (AOR=1.86, CI:[1.03, 3.36], p=0.039), had moderate or high mental health risk (vs low)(AOR=1.88, CI:[1.09, 3.24], p=0.023; AOR=1.82, CI:[1.09, 3.04], p=0.022, respectively), had moderate or high risk non-injection drug use (vs low)(AOR=1.94,

CI:[1.17, 3.23], p=0.010; AOR=1.81, CI:[1.15, 2.85], p=0.011, respectively), and had high risk injection drug use (vs low)(AOR=2.61, CI:[1.19, 5.70], p=0.016) had significantly greater odds of non-adherence. Sex, sexual orientation, socioeconomic status, social support, and having a usual place for HIV care were not significantly associated with non-adherence (Table 2).

Table 2. Unadjusted & adjusted odds ratios and 95% confidence intervals of general enacted HIV-related stigma and other selected characteristics on non-antiretroviral therapy adherence among a sample of PLWH in Florida						
	Unadjusted			Adjusted		
	OR	CI	p	AOR	CI	p
Age Group						
18-34	1.33	0.85, 2.09	0.215	1.56	0.89, 2.72	0.118
35-44	1.48	0.98, 2.25	0.065	1.91	1.15, 3.17	0.012
45-54	--	--	--	--	--	--
≥55	0.89	0.60, 1.32	0.564	1.04	0.61, 1.79	0.880
Race						
White	--	--	--	--	--	--
Black	1.80	1.27, 2.55	0.001	2.07	1.26, 3.41	0.004
Other	1.70	0.98, 2.96	0.061	1.17	0.57, 2.38	0.673
Ethnicity						
Non-Hispanic	--	--	--	--	--	--
Hispanic	0.96	0.66, 1.41	0.842	1.86	1.03, 3.36	0.039
Sex						
Male	--	--	--	--	--	--
Female	1.11	0.80, 1.52	0.542	0.95	0.59, 1.52	0.814
Sexual Orientation						
Heterosexual	--	--	--	--	--	--
Non-Heterosexual	0.78	0.57, 1.07	0.125	0.65	0.40, 1.06	0.085
General Enacted Stigma						
None	--	--	--	--	--	--
Low/Moderate	1.15	0.82, 1.61	0.427	1.35	0.88, 2.07	0.165
High	1.71	1.08, 2.70	0.023	1.05	0.56, 1.96	0.881
Mental Health Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	1.78	1.13, 2.81	0.014	1.88	1.09, 3.24	0.023
High Risk	2.14	1.44, 3.18	<0.001	1.82	1.09, 3.04	0.022
Socioeconomic Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	1.02	0.64, 1.64	0.925	0.76	0.42, 1.39	0.377
High Risk	1.41	0.97, 2.05	0.074	0.89	0.53, 1.51	0.675
Social Support Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	0.85	0.54, 1.34	0.481	0.80	0.46, 1.38	0.416
High Risk	1.28	0.87, 1.87	0.209	0.98	0.60, 1.59	0.927
Non-Injection Drug Use Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	1.51	0.96, 2.35	0.073	1.94	1.17, 3.23	0.010
High Risk	1.69	1.17, 2.43	0.005	1.81	1.15, 2.85	0.011

Injection Drug Use Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	1.04	0.68, 1.59	0.857	0.84	0.48, 1.48	0.552
High Risk	2.60	1.42, 4.76	0.002	2.61	1.19, 5.70	0.016
Usual Place of Care Factor						
Low Risk	--	--	--	--	--	--
High Risk	0.69	0.35, 1.34	0.272	0.65	0.29, 1.48	0.308
Bold values indicate p<0.05						

Logistic regression analyses of general enacted stigma on viral suppression

In the unadjusted model, neither low/moderate nor high levels of general enacted HIV-related stigma (vs no stigma) (COR=0.96, CI:[0.68, 1.34], p=0.798; COR=1.19, CI:[0.75, 1.89], p=0.464, respectively) were significantly associated with viral suppression. The association remained non-significant in adjusted models as well (AOR=0.92, CI:[0.60, 1.43], p=0.718; AOR=1.18, CI:[0.65, 2.17], p=0.584, respectively).

The final adjusted logistic regression analysis found that those who identified as 18-34, (vs 45-54 years) (AOR=2.49, CI:[1.48, 4.21], p<0.001) moderate or high mental health risk (vs low)(AOR=2.08, CI:[1.16, 3.73], p=0.014; AOR=2.03,CI:[1.19, 3.45], p=0.009, respectively), high risk non-injection drug use (vs low) (AOR=1.63, CI:[1.03, 2.58], p=0.036), and with no usual place for HIV care risk (vs low)(AOR=2.85, CI:[1.59, 5.11], p<0.001) had significantly greater odds of non-suppression. Additionally, female sex (vs male)(AOR=0.57, CI:[0.34, 0.93], p=0.025), and medium risk injection drug use (vs low)(AOR=0.47, CI:[0.24, 0.92], p=0.027) had significantly lower odds of non-suppression. Race, ethnicity, sexual orientation, socioeconomic status, and social support were not significantly associated with viral suppression (Table 3).

Table 3. Unadjusted & adjusted odds ratios and 95% confidence intervals of general enacted HIV-related stigma and other selected characteristics on non-viral suppression among a sample of PLWH in Florida						
	Unadjusted			Adjusted		
	OR	CI	p	AOR	CI	p
Age Group						
18-34	2.12	1.41, 3.20	<0.001	2.49	1.48, 4.21	<0.001
25-44	1.32	0.87, 1.98	0.191	1.30	0.78, 2.18	0.314
45-54	--	--	--	--	--	--
≥55	0.44	0.27, 0.71	<0.001	0.65	0.35, 1.20	0.164
Race						
White	--	--	--	--	--	--
Black	1.46	1.03, 2.06	0.035	1.17	0.72, 1.89	0.521
Other	1.24	0.70, 2.20	0.456	0.94	0.45, 1.98	0.877
Ethnicity						
Non-Hispanic	--	--	--	--	--	--
Hispanic	0.72	0.48, 1.08	0.108	0.89	0.49, 1.63	0.704
Sex						
Male	--	--	--	--	--	--
Female	0.75	0.54, 1.05	0.091	0.55	0.33, 0.91	0.019
Sexual Orientation						
Heterosexual	--	--	--	--	--	--
Non-Heterosexual	1.08	0.79, 1.47	0.649	0.74	0.45, 1.21	0.225
General Enacted Stigma						
None	--	--	--	--	--	--
Low/Moderate	0.96	0.68, 1.34	0.798	0.92	0.60, 1.43	0.718
High	1.19	0.75, 1.89	0.464	1.18	0.65, 2.17	0.584
Mental Health Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	1.64	1.03, 2.62	0.038	2.08	1.16, 3.73	0.014
High Risk	2.02	1.35, 3.00	<0.001	2.03	1.19, 3.45	0.009
Socioeconomic Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	1.38	0.86, 2.21	0.185	1.23	0.66, 2.27	0.516
High Risk	1.48	1.00, 2.19	0.049	1.60	0.93, 2.74	0.090
Social Support Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	1.10	0.69, 1.76	0.682	1.16	0.67, 2.01	0.596
High Risk	1.35	0.91, 2.02	0.138	0.98	0.59, 1.62	0.929

Non-Injection Drug Use Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	0.96	0.60, 1.54	0.869	0.87	0.50, 1.51	0.618
High Risk	1.64	1.15, 2.33	0.007	1.63	1.03, 2.58	0.036
Injection Drug Use Factor						
Low Risk	--	--	--	--	--	--
Medium Risk	0.50	0.31, 0.83	0.007	0.47	0.24, 0.92	0.027
High Risk	1.49	0.84, 2.63	0.175	0.91	0.43, 1.92	0.808
Usual Place of Care Factor						
Low Risk	--	--	--	--	--	--
High Risk	2.79	1.77, 4.40	<0.001	2.85	1.59, 5.11	<0.001
Bold values indicate p<0.05						

Adjusted logistic regression analyses of healthcare-specific HIV-related stigma on adherence and suppression

In the unadjusted models, healthcare-specific HIV-related stigma was significantly associated with non-adherence (COR=1.84, CI:[1.15, 2.94], p=0.011), but not non-suppression (COR=1.08, CI:[0.66, 1.80], p=0.754). After adjusting for all the same factors from our previous analyses on general enacted HIV-related stigma, those who ever faced healthcare-specific enacted HIV-related stigma had significantly greater odds of both non-adherence and non-suppression (vs no stigma) (AOR=2.27, CI:[1.24, 4.17], p=0.008; AOR=2.06, CI:[1.12, 3.76], p=0.020, respectively) (Table 4).

Table 4. Unadjusted & Adjusted odds ratios and 95% confidence intervals of healthcare specific enacted HIV-related stigma and other selected characteristics on non-antiretroviral therapy & non-viral suppression among a sample of PLWH in Florida

	Non-Adherence						Non-Suppression					
	OR	CI	p	AOR	CI	p	OR	CI	p	AOR	CI	p
Healthcare specific enacted HIV-related stigma												
Not experienced	--	--	--	--	--	--	--	--	--	--	--	--
Experienced	1.84	1.15, 2.94	0.011	2.27	1.24, 4.17	0.008	1.08	0.66, 1.80	0.754	2.06	1.12, 3.76	0.020

Bold values indicate $p<0.05$
*models adjusted for age group, race, ethnicity, sex, sexual orientation, mental health, socioeconomic status, social support, non-injection drug use, injection drug use, usual place of care

Discussion

This study is the first quantitative study to examine the association of both general & healthcare specific enacted HIV-related stigma on ART adherence and viral suppression among a diverse statewide sample of PLWH. The primary finding of this study is that general enacted HIV-related stigma was not significantly associated with non-adherence or non-suppression after adjusting for important confounders. However, healthcare specific enacted HIV-related stigma yielded significantly greater odds of non-adherence and non-suppression. This could mean that differences in health outcomes could depend on who specifically is perpetuating stigma in the lives of PLWH. The research presented by Turan & Rogers et al. (2017) among women living with HIV, found that HIV-related stigma in a healthcare setting was negatively associated with medication adherence (30). Our finding highlights the long lasting impact of stigma

perpetuated by healthcare workers, and adds to the necessity of the implementation of HIV-related stigma reduction interventions focused on healthcare workers. One evidence-based intervention to reduce HIV-related stigma among healthcare workers is the Finding Respect and Ending Stigma against HIV Workshop (FRESH) (40). The FRESH Workshop brings together PLWH and healthcare workers to develop stigma-reduction strategies/tools together and has been seen as feasible and highly acceptable by both PLWH and healthcare workers (40). The workshop dedicates 2-days (12hrs total) to address: 1) an overview of HIV-related stigma, 2) intersecting stigmas (i.e. racism, sexism, etc.), 3) HIV knowledge, 4) coping with stigma, 5) addressing stigma, 6) stigma reduction tool development, presentation, and feedback, 7) reflection. Interventions like the FRESH workshop should be evaluated to see if they could be implemented in a statewide Florida context.

Another explanation of the non-significant association between general enacted HIV-related stigma and non-adherence & non-suppression, could be that other factors of HIV-related stigma (ie internal, community, and anticipated) may have a larger effect on these outcomes than general enacted HIV-related stigma. Previous work by Logie et al. (2018) stratified stigma by specific factors and found in addition to enacted stigma, internalized stigma was also a significant factor in ever initiating ART (31). Though general enacted HIV-related stigma was non-significant in our study, research should continue to report results on specific factors of stigma versus the use of an overall score that measures all 4 factors of HIV-related stigma in one score. Moreover, person-specific items (e.g. A doctor, nurse, or health care worker avoided me or refused to take care of me because I have HIV, A family member stopped speaking to me when they found out I

have HIV, etc.) with previous scientific precedent should be tested to ensure that the total score of the factor is not masking the specific item's association with the outcome. Reporting factor (and in some cases, item) stratified HIV-related stigma provides researchers and community organizations specific constructs of stigma that should be addressed most immediately. This is important as an intervention that seeks to address enacted stigma may have a completely different target than one that seeks to address internalized HIV-related stigma.

Finally, our study highlighted the similarities and differences in significant factors that are associated with ART adherence and viral suppression among PLWH in Florida. Our findings imply that interventions with aims to improve both ART adherence and viral suppression should focus on populations with mental health risk and non-injection drug use risk. Our findings could also indicate that interventions that aim to improve viral suppression specifically may have a larger community impact if they are focused among young men, but future interventions that want to improve ART adherence specifically with a larger community impact should focus on Black and Hispanic communities.

Limitations

First, our study only included enacted HIV-related stigma questions because other HIV-related stigma factors were not included in the Florida Cohort questionnaire. Additionally, the stigma measure did not clarify the time when enacted stigma occurred (recent or past), or by specific types of healthcare worker (e.g. provider, nurse, clinical staff). Second, our study may have limited generalizability as recruitment was carried out via venue-based convenience sampling and it is not a fully-representative sample of

PLWH in Florida. Third, we were unable to adjust for gender identity due to the low number of transgender/gender non-conforming persons in our sample. Fourth, the outcome of ART adherence was self-reported and could be subject to reporting bias. Fifth, many of our participants completed the questionnaires within in a HIV clinic. In light of our findings on healthcare specific enacted stigma, this may have introduced bias. Lastly, some variables in the model created by Mugavero et al. (2013) were not collected in the study (spirituality, coping, resiliency, etc.) and may be important to models predicting HIV continuum outcomes (5). Future studies should continue to study and report on these factors.

Conclusion

Among our sample of PLWH, 69.2% achieved ART adherence and 75.0% achieved viral suppression. Although general enacted HIV-related stigma was not significantly associated with ART adherence and viral suppression, that healthcare-specific HIV-related stigma was significantly associated with both ART non-adherence and non-suppression. There is a need to develop and evaluate interventions for healthcare workers intended to reduce experience stigma among PLWH.

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Enacted HIV-related Stigma's association with Anxiety & Depression among people living with HIV (PLWH) in Florida

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Abstract

Previous research has shown that HIV-related stigma contributes to people living with HIV having a higher risk of mental health disorders. Enacted stigma is one construct of HIV-related stigma that describes a negative interpersonal outcome due to one's HIV status. Our study examines the association between levels of enacted HIV-related stigma and symptoms of anxiety and depression among PLWH in Florida. We used baseline data from 932 PLWH collected from the Florida Cohort study between 2014-2018. The sample was majority 45+ years of age (63.5%), male (66.0%), Black (58.1%), non-Hispanic (79.7%), and U.S. born (84.0%). We conducted ordinal logistic regression models where the outcomes, anxiety and depression, were categorized in three levels (low, moderate, high). Most of the sample reported experiencing some level of enacted HIV-related stigma (53.1%). Additionally, 56.6% and 65.2% showed moderate to high levels of anxiety and depression, respectively. Those who experienced any levels of enacted HIV-related stigma (vs none) had significantly greater odds of higher levels of anxiety (AOR[CI]= 1.54[1.13, 2.10], p=0.006; AOR[CI]= 3.36[2.14, 5.26], p<0.001, respectively) and depression (AOR[CI]= 1.61[1.19, 2.18], p=0.002; AOR[CI]= 3.66[2.32, 5.77], p<0.001, respectively). These findings suggest a need to develop and evaluate interventions for PLWH and their social support networks intended to reduce the deleterious effects of enacted HIV-related stigma on the mental health of PLWH.

Introduction

Mental health disorders are one of the most common forms of disability in the United States (U.S.) where 1 in 6 adults will experience depression and a little less than 1 in 3 adults will experience an anxiety disorder during their lifetime (1). In 2018, 12.8% of Florida adults reported poor mental health on 14 or more days during the past month (2). In addition to mental health burden, Florida also accounts for a disproportionate amount of HIV infections, ranking 2nd in both prevalence and incidence in 2018 in the U.S. (3). Among a sample of 2,864 people living with HIV (PLWH) in the U.S., 36% had major depression and 15.8% had generalized anxiety disorder, in comparison to 7.6% and 2.1% in the general population, respectively (4). These data underscore the pressing need for continued research aimed at understanding the factors contributing to increased rates of mental health disorders faced by PLWH in disproportionately affected states.

One challenge encountered among PLWH is HIV-related stigma. Previous studies among PLWH in the U.S. have found that HIV-related stigma is an important factor in mental health outcomes such as anxiety and depression (5-18). HIV-related stigma can be broken down into 4 main factors: enacted, community, internalized, and anticipated (19). Enacted HIV-related stigma are actions taken against PLWH due to their HIV status, while internalized HIV-related stigma are negative feelings that PLWH harbor about themselves due to their HIV status (19). Community HIV-related stigma are the perceived negative feelings of PLWH by their communities, while anticipated HIV-related stigma are feared consequences of divulging one's HIV status (19). Our study

focused on enacted stigma as we were interested in how experiences of discrimination are associated with mental health outcomes.

In 2010, the World Health Organization published a framework of understanding factors that contribute to mental health conditions (20). The 3 main contributing factors were reduced development (i.e. poverty, population inequity, social capital), increased vulnerability (i.e. stigma, violence, reduced access to health and social services), and worsened mental health (i.e. sleep and eating problems, interpersonal problems, sadness) (20). However, previous literature on correlates of mental health disorders have also found correlates unique to PLWH such as viral load count (11, 12) and years since diagnosis (7, 9, 11, 12).

Enacted HIV-related Stigma and Depression

Three recent studies examined the correlation between depression and enacted HIV-related stigma (7, 9, 18). The study by Crockett et al. (2019) found, that among 199 PLWH recruited from a Ryan White clinic in Central Georgia, enacted HIV-related stigma was significantly associated with depression (7). Additionally, the study by Lipira et al. (2019) found that among 226 Black women recruited from 3 clinical sites in Chicago, Illinois and Birmingham, Alabama, enacted HIV-related stigma was significantly associated with depression (9). However, the study by Felker-Kantor et al. (2019) among 380 PLWH recruited from local HIV-clinics in New Orleans, found that enacted HIV-related stigma was strongly associated with depression but not at the significance level of $\alpha=0.05$ (18). Though these studies found strong association between HIV-related stigma and depression, two had relatively small sample sizes (7, 9), and one

was not statistically significant at $\alpha=0.05$. Additionally, their findings may not be generalizable due to single site/city recruitment in one study (7, 18), and the inclusion of only Black women and not the general population of PLWH in the other (9).

Enacted HIV-related Stigma and Anxiety

Two recent studies examined the correlation between general anxiety and enacted HIV-related stigma. The study by Beer et al. (2019) found that enacted HIV-related stigma was significantly associated with the prevalence of general anxiety disorder symptoms using the 2015 Medical Monitoring Project data collected by the Centers for Disease Control and Prevention (14). Additionally, the study by Felker-Kantor et al. (2019) found, among 380 PLWH recruited from local HIV-clinics in New Orleans, enacted HIV-related stigma was significantly associated with anxiety (18).

Though many studies continue to demonstrate the burden of HIV-related stigma on mental health (12), the majority lack specificity of what type of stigma is most detrimental to mental health (i.e. enacted, community, etc.). Studies that examine specific constructs of HIV-related stigma will better inform both state and national strategies to produce more tailored interventions to combat HIV-related stigma. Additionally, the most current research on HIV-related stigma and depression has included small sample sizes with narrow inclusion criteria, which may limit the generalizability of the findings (7, 9). The primary objective of this study is to address these gaps by examining the association of enacted HIV-related stigma with symptoms of anxiety and depression among PLWH in the state of Florida.

Methods

Participants & Setting

We used baseline data collected from the Florida Cohort study between 2014–2018. As described previously (21), the Florida Cohort Study is overseen by the Southern HIV & Alcohol Research Consortium (SHARC) and has goals to assess factors that affect the health outcomes of PLWH (https://sharc-research.org/). The Cohort recruited from 9 public health sites using venue-based convenience sampling throughout the state of Florida (Alachua County (2 sites), Broward County, Columbia County, Hillsborough County, Miami-Dade County, Orange County, Seminole County, and Sumter County). Participants were eligible for the study if they were living with HIV and ≥ 18 years of age. After obtaining written consent, participants had the option of completing the survey in English or Spanish and at the recruitment site or at home. Surveys were completed online using Research Electronic Data Capture (REDCap) or on paper. Surveys collected data on demographic, behavioral, mental, and social factors. Surveys took approximately 30-45 minutes to complete, and participants received a $25 gift card after completion. The Florida International University, University of Florida, and Florida Department of Health Institutional Review Boards have approved the protocol of this study.

Outcomes of Interest

Anxiety

General anxiety symptoms were measured using the General Anxiety Disorder Screener (GAD-7). Previous studies have found the GAD-7 to have high internal

reliability (α=0.93) (22). Participant's answered each statement of this 7 question tool using a 4-point Likert scale with options from "Not at all" (0) to "Nearly everyday" (3). Total possible scores could range from 0-21. Anxiety symptom scores were then categorized into levels as low (0-4), moderate (5-9), and high (10+).

Depression

Depression symptoms were measured using the Patient Health Questionnaire (PHQ-8). Previous studies, have found the PHQ-8 to have high internal reliability (α=0.89) (23). Participant's answered each statement of this 8 question tool using a 4-point Likert scale with options from "Not at all" (0) to "Nearly everyday" (3). Total possible scores could range from 0-24. Depression symptom scores were then categorized into levels as low (0-4), moderate (5-9), and high (10+).

Predictors of Interest

Enacted HIV-related Stigma

Enacted HIV-related stigma was measured using an abbreviated version of the Herek HIV-related stigma measure (α=0.89). The scale included 10, 4-point Likert style questions that assessed experiences of enacted HIV-related stigma, ranging from "never"(0) to "3+ times"(3). Sample items included, "Someone didn't want to touch me because I have HIV", "Someone insulted or verbally abused me because I have HIV," etc. Possible scores could range from 0-30. Based on the total score, participants were stratified into the following levels: never experienced HIV-related stigma (0), experienced low/moderate levels of HIV-related stigma (1-10), and experienced high

levels of HIV-related stigma (11+). Similar stratification methods have been used in previous studies (24, 25).

Demographics

Demographic items were self-reported and included age group (18-34, 35-44, 45-54, ≥55), biological sex (male or female), race (White, Black, Other), ethnicity (Hispanic or Non-Hispanic), sexual orientation (heterosexual or non-heterosexual), and nationality (US born or foreign born).

Mental Health Risk Indices

We controlled for potential confounders by creating indices based on previous research in order to decrease collinearity (24, 26, 27). We extracted 11 variables from the survey guided by the model presented by the World Health Organization (2012) (variables listed in appendix 2). All extracted variables were coded so that higher scores corresponded with higher risk of poor mental health outcomes. We then conducted a reliability analysis for all 11 variables and removed all variables that were deleterious to the Cronbach's alpha, leaving 8 remaining variables.

Using the 8 remaining variables, we conducted principal component analysis (PCA) with and without a varimax rotation. PCA found 3 factors with an eigenvalue greater than 1, including: socioeconomic risk (3 variables), social support risk (2 variables), and substance use risk (3 variables). Factors were added and the standardized scores were categorized into risk tertiles: low, moderate, and high risk (≤25% percentile, 25-50% percentile, >50% percentile, respectively).

HIV-Specific Predictors

Based on previous literature (7, 9, 11, 12), time since HIV diagnosis and viral suppression were included in our analyses as covariates. These data on HIV viral load and time since diagnosis were obtained through linkage to the Enhanced HIV/AIDS Reporting System (eHARS) database in collaboration with the Florida Department of Health. Viral suppression was classified as ≤200 copies/mL.

Analysis

All data were analyzed using SAS (v9.4; SAS Institute Inc., Cary, NC). We examined sample frequencies and percentages to describe the characteristics of the sample by anxiety and depression symptom levels. Chi-Square tests were used to compare proportions. The test for the proportional odds assumption was conducted to determine if ordinal logistic regression was appropriate for the analyses. Then, we conducted two adjusted ordinal logistic regression models where anxiety and depression symptom levels were the outcomes and enacted HIV-related stigma was the predictor of interest. Models were adjusted for demographics and risk factors using the indices described above. To be considered as statistically significant, α was set to 0.05.

Results

Our overall sample consisted of 932 PLWH across the state of Florida, of which the majority were 45+ years of age (63.5%), male (66.0%), Black (58.1%), non-Hispanic (79.7%), and U.S. born (84.0%). From the overall sample, 884 (94.8%) and 877 (94.1%) had complete anxiety and depression symptom outcome measure data, respectively.

Those who identified as transgender/ gender non-conforming were removed from the final analysis due to small sample size, leaving a final sample of n=858 and n=855 for anxiety and depression symptom outcomes, respectively. Most of our sample reported low/moderate or high levels of enacted HIV-related stigma (53.1%); moreover, 56.6% and 65.2% showed moderate to high levels of anxiety and depression symptoms, respectively. The characteristics of our final sample stratified by anxiety and depression symptoms can be found in Table 5.

Table 5. Descriptive baseline sample statistics of the Florida Cohort Study stratified by level of depression & anxiety								
	Anxiety				Depression			
	Low	Moderate	High		Low	Moderate	High	
	n (%)	n (%)	n (%)	p	n (%)	n (%)	n (%)	p
Age group				**0.040**				**0.003**
18-34	61 (16.2)	31 (14.1)	55 (20.4)		46 (15.3)	48 (17.8)	55 (18.8)	
35-44	75 (19.9)	42 (19.2)	58 (21.5)		51 (16.9)	67 (24.8)	55 (18.8)	
45-54	137 (36.3)	93 (42.5)	112 (41.5)		110 (36.5)	102 (37.8)	127 (43.5)	
≥55	104 (27.6)	53 (24.2)	45 (16.6)		94 (31.2)	53 (19.6)	55 (18.8)	
Race				0.481				0.560
White	120 (32.0)	74 (33.8)	84 (31.1)		103 (34.4)	84 (31.1)	91 (31.2)	
Black	225 (60.0)	120 (54.8)	155 (57.4)		173 (57.9)	155 (57.4)	170 (58.2)	
Other	30 (8.0)	25 (11.4)	31 (11.5)		23 (7.7)	31 (11.5)	33 (10.6)	
Ethnicity				0.487				0.857
Non-Hispanic	300 (79.6)	183 (83.6)	218 (80.7)		241 (80.1)	218 (80.7)	239 (81.8)	
Hispanic	77 (20.4)	36 (16.4)	52 (19.3)		60 (19.9)	52 (19.3)	53 (18.2)	
Sex				0.797				0.079
Male	252 (66.8)	146 (66.7)	174 (64.4)		216 (71.8)	175 (64.8)	186 (63.7)	
Female	125 (33.2)	73 (33.3)	96 (35.6)		85 (28.2)	95 (35.2)	106 (36.3)	
Sexuality				0.842				0.472
Heterosexual	195 (54.2)	110 (51.6)	137 (53.1)		148 (51.0)	136 (52.5)	158 (56.0)	
Non-heterosexual	165 (45.8)	103 (48.4)	121 (46.9)		142 (49.0)	123 (47.5)	124 (44.0)	
Nationality				0.645				0.594
US Born	311 (83.4)	188 (85.8)	231 (85.6)		252 (84.6)	223 (83.2)	252 (86.3)	
Foreign Born	62 (16.6)	31 (14.2)	39 (14.4)		46 (15.4)	45 (16.8)	40 (13.7)	
Enacted HIV-related Stigma				**<0.001**				**<0.001**
None	207 (56.9)	91 (43.7)	97 (36.6)		174 (60.2)	114 (43.8)	106 (37.3)	
Low/Moderate	134 (36.8)	90 (43.3)	105 (39.6)		102 (35.3)	111 (42.7)	113 (39.8)	
High	23 (6.3)	27 (13.0)	63 (23.8)		13 (11.5)	35 (13.5)	65 (22.9)	

Socioeconomic Risk				**0.003**				**<0.001**
Low Risk	141 (37.4)	59 (26.9)	75 (27.8)		112 (37.2)	89 (33.0)	71 (24.3)	
Moderate Risk	82 (21.7)	57 (26.0)	49 (18.1)		74 (24.6)	55 (20.4)	59 (20.2)	
High Risk	154 (40.9)	103 (47.0)	146 (54.1)		115 (38.2)	126 (46.6)	162 (55.5)	
Social Support Risk				**<0.001**				**<0.001**
Low Risk	169 (44.8)	50 (22.8)	43 (15.9)		137 (45.5)	67 (24.8)	52 (17.8)	
Moderate Risk	93 (24.7)	57 (26.0)	54 (20.0)		72 (23.9)	74 (27.4)	62 (21.2)	
High Risk	115 (30.5)	112 (51.1)	173 (64.1)		92 (30.6)	129 (47.8)	178 (61.0)	
Substance Use Risk				**<0.001**				**0.003**
Low Risk	234 (62.1)	106 (48.4)	121 (44.8)		187 (62.1)	137 (50.8)	135 (46.2)	
Moderate Risk	56 (14.8)	30 (13.7)	43 (15.9)		39 (13.0)	43 (15.9)	48 (16.4)	
High Risk	87 (23.1)	83 (37.9)	106 (39.3)		75 (24.9)	90 (33.3)	109 (37.4)	
Time Since Diagnosis				**<0.001**				**<0.001**
<= 1 year	39 (10.4)	28 (13.0)	42 (15.6)		32 (10.7)	35 (13.2)	43 (14.9)	
2-5 years	44 (11.7)	21 (9.8)	62 (23.1)		31 (10.4)	33 (12.4)	62 (21.4)	
5+ years	292 (77.9)	166 (77.2)	165 (61.3)		236 (78.9)	198 (74.4)	184 (63.7)	
Virally Suppressed				0.174				0.083
Yes	283 (77.5)	151 (72.6)	187 (71.4)		229 (79.0)	185 (71.1)	204 (72.9)	
No	82 (22.5)	57 (27.4)	75 (28.6)		61 (21.0)	75 (28.9)	76 (27.1)	
Bolded values indicate p<0.05								

Ordinal logistic regression analyses of enacted stigma on level of anxiety

Enacted HIV-related stigma was significantly associated with anxiety symptom levels ($p<0.001$). The test for the proportional odds assumption for the adjusted ordinal logistic regression was non-significant meaning that the model was appropriate to use ($p=0.314$), meaning that the change in odds was proportional to each level change in

enacted HIV-related stigma. Those who have experienced low/moderate or high levels of enacted HIV-related stigma (vs none) had significantly greater odds of higher levels of anxiety symptoms (AOR[CI]= 1.54[1.13, 2.10], p=0.006; AOR[CI]= 3.36[2.14, 5.26], p<0.001, respectively).

Those who had moderate or high social support risk (vs low) (AOR[CI]= 1.99[1.34, 2.96], p<0.001; AOR[CI]= 3.60[2.52, 5.13], p<0.001, respectively), high substance use risk (vs low) (AOR[CI]= 1.43[1.04, 1.97], p=0.029), less than one year or 2-5 years since HIV diagnosis (vs 5+years) (AOR[CI]= 2.00[1.27, 3.15], p=0.003; AOR[CI]= 2.42[1.61, 3.63], p<0.001, respectively) had significantly greater odds of higher levels of anxiety symptoms. Age, race, ethnicity, sex, sexuality, nationality, socioeconomic risk, and viral suppression were not significantly associated with level of anxiety symptoms (Table 6).

Ordinal logistic regression analyses of enacted stigma on level of depression

The inferential statistics found that enacted HIV-related stigma was significantly associated with depression symptom levels (p<0.001). The test for the proportional odds assumption for the adjusted ordinal logistic regression was non-significant meaning that the model was appropriate to use (p=0.571), meaning that the change in odds was proportional to each level change in enacted HIV-related stigma. Those who have experienced low/moderate or high levels of enacted HIV-related stigma (vs none) had significantly greater odds of higher levels of depression symptoms (AOR[CI]= 1.61[1.19, 2.18], p=0.002; AOR[CI]= 3.66[2.32, 5.77], p<0.001, respectively).

Those who identified as female (vs male) (AOR[CI]= 1.57[1.11, 2.21], p=0.011), high socioeconomic status risk (vs low) (AOR[CI]= 1.66[1.16, 2.36], p=0.005), moderate or high social support risk (vs low) (AOR[CI]= 2.02[1.38, 2.97], p<0.001; AOR[CI]= 3.17[2.24, 4.48], p<0.001, respectively), less than one year or 2-5 years since HIV diagnosis (vs 5+ years) (AOR[CI]= 1.97[1.26, 3.09], p=0.003; AOR[CI]= 2.50[1.66, 3.77], p<0.001, respectively) had significantly greater odds of higher levels of depression symptoms. Age, race, ethnicity, sexuality, nationality, substance use risk, and viral suppression were not significantly associated with level of depression symptoms (Table 6).

Table 6. Adjusted odds ratios and 95% confidence intervals of enacted HIV-related stigma and other selected characteristics on anxiety & depression among a sample of PLWH in Florida

	Anxiety			Depression		
	AOR	CI	p	AOR	CI	p
Age group						
18-34	--	--	--	--	--	--
35-44	1.15	0.72, 1.83	0.565	1.09	0.69, 1.72	0.720
45-54	1.38	0.89, 2.14	0.152	1.25	0.81, 1.93	0.312
≥55	1.00	0.61, 1.64	0.999	0.91	0.56, 1.47	0.689
Race						
White	--	--	--	--	--	--
Black	0.90	0.63, 1.27	0.531	1.02	0.73, 1.43	0.902
Other	1.28	0.76, 2.15	0.360	1.21	0.72, 2.04	0.472
Ethnicity						
Non-Hispanic	--	-	--	--	--	--
Hispanic	0.81	0.50, 1.30	0.381	0.99	0.62, 1.59	0.967
Sex						
Male	--	--	--	--	--	--
Female	1.34	0.95, 1.90	0.097	**1.57**	**1.11, 2.21**	**0.011**
Sexuality						
Heterosexual	--	--	--	--	--	--
Non-heterosexual	1.02	0.72, 1.44	0.919	0.90	0.64, 1.26	0.535
Nationality						
US Born	--	--	--	--	--	--
Foreign Born	1.19	0.73, 1.95	0.485	1.24	0.77, 2.02	0.378
Enacted HIV-related Stigma						
None	--	--	--	--	--	--
Low/Moderate	**1.54**	**1.13, 2.10**	**0.006**	**1.61**	**1.19, 2.18**	**0.002**
High	**3.36**	**2.14, 5.26**	**<0.001**	**3.66**	**2.32, 5.77**	**<0.001**
Socioeconomic Status Risk						
Low Risk	--	--	--	--	--	--
Moderate Risk	1.18	0.79, 1.77	0.422	1.16	0.78, 1.73	0.458
High Risk	1.41	0.99, 2.01	0.058	**1.66**	**1.16, 2.36**	**0.005**
Social Support Risk						
Low Risk	--	--	--	--	--	--
Moderate Risk	**1.99**	**1.34, 2.96**	**<0.001**	**2.02**	**1.38, 2.97**	**<0.001**
High Risk	**3.60**	**2.52, 5.13**	**<0.001**	**3.17**	**2.24, 4.48**	**<0.001**
Substance Use Risk						
Low Risk	--	--	--	--	--	--
Moderate Risk	1.26	0.85, 1.87	0.257	1.48	1.00, 2.18	0.051
High Risk	**1.43**	**1.04, 1.97**	**0.029**	1.28	0.93, 1.77	0.129
Time Since Dx						
<= 1 year	**2.00**	**1.27, 3.15**	**0.003**	**1.97**	**1.26, 3.09**	**0.003**
2-5 years	**2.42**	**1.61, 3.63**	**<0.001**	**2.50**	**1.66, 3.77**	**<0.001**
5+ years	--	--	--	--	--	--

Virally Suppressed						
Yes	--	--	--	--	--	--
No	1.19	0.85, 1.65	0.318	1.15	0.83, 1.60	0.402
Bold values indicate p<0.05						

Discussion

This study continues to bolster association of enacted HIV-related stigma on both levels of anxiety and depression symptoms among a diverse statewide sample of PLWH. The sample had a high prevalence of any symptoms for anxiety and depression (56.6% and 65.2%, respectively), consistent with findings from previous studies (4). The primary finding of this study is that enacted HIV-related stigma was significantly associated with higher levels of both anxiety and depression symptoms after adjusting for important confounders, consistent with the majority of current literature (7, 9, 14). However, the study by Felker-Kantor et al. (2019) found a strong association between enacted HIV-related stigma and depression but the association was non-significant in their adjusted model (18). This non-significant finding could be due to high levels of environmental stressors (residential racial segregation, violent crime rates, etc.) among their sample confounding the relationship between HIV-related stigma and depression (18). Our finding bolsters the generalizability of the association between enacted HIV-related stigma and levels of anxiety and depression, however factors such as environmental stressors should continue to be examined for significance in other populations.

Our study also found that higher social support risk was significantly associated with higher levels of both anxiety and depression symptoms. Previous research among 335 PLWH initially entering outpatient HIV care found that those with higher levels of

affectionate social support had significantly lower odds of depression (28). Our findings of social support and enacted HIV-related stigma may support the necessity of a mental health intervention that addresses both factors simultaneously. Additional research should be conducted to identify which specific constructs of social support are most important in protecting against anxiety and to bolster support for the association between social support and depression for future intervention development.

Additionally, our study also found that shorter time since HIV diagnosis was significantly associated with higher levels of both anxiety and depression symptoms after adjusting for important confounders. Previous qualitative research in the U.S. has highlighted the experiences of PLWH when first testing positive, including feelings of shock, denial, numbness, anger, and sadness (29, 30). Accepting and beginning the process of coping with a positive diagnosis for HIV has been described as the first step of recently diagnosed PLWH in moving on with their lives (31). However, in the provider testing manual developed by the World Health Organization (2011), though attention is given to current emotions and follow-up referrals for confirmatory HIV testing and linkage to care, little emphasis is placed on referrals to community based support groups for PLWH (32). A referral to a community workgroup could help those recently diagnosed learn about functional coping strategies and living with HIV in the community in which they live. Increasing levels of functional coping may prevent the potential manifestation of anxiety and depression derived from the denial and numbness induced by a recent HIV diagnosis, as suggested by previous research (33, 34).

Limitations

First, our study may have limited generalizability as we recruited using venue-based convenience sampling and it is not a fully-representative sample of PLWH in Florida. Additionally, it is hypothesized that those who agreed to participate in the study may have lower levels of HIV-related stigma as they were willing to participate in a study associated with HIV. Second, our study only included enacted HIV-related stigma questions because other HIV-related stigma factors were not collected. Moreover, the stigma measure did not include a timeline of when enacted stigma occurred (recent or past). Third, we were unable to include transgender/gender non-conforming persons in our analyses due to the low number of transgender/gender non-conforming persons in our sample. Fourthly, our measures of anxiety and depression measured symptoms, but not clinical diagnoses. Lastly, some variables in the model presented by the World Health Organization (2012) were not collected in the study (interpersonal violence, social/gender inequality, nutrition, etc.) and may be important to models predicting mental health outcomes. Future studies should continue to study and report on these factors.

Conclusion

Among our sample of PLWH, the majority of participants showed moderate to high levels of anxiety and depression symptoms. Increased enacted HIV-related stigma, social support risk, and more recent time since HIV diagnosis were significantly associated with greater odds of higher levels of both anxiety and depression symptoms. There is a need to develop and evaluate interventions for PLWH and their social support networks intended to reduce the deleterious effects of enacted HIV-related stigma on

PLWH. Additionally, a larger emphasis should be placed on organizations that test for HIV to also refer those recently diagnosed with HIV to community workgroups to increase functional coping with the final goal of decreasing levels anxiety and depression.

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Development and Validation of the Community PrEP-related Stigma Scale (Community-PSS)

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Abstract

Men who have sex with men (MSM) in the United States continue to face the largest burden of HIV. Due to this disparity, it is important to study potential barriers to HIV prevention methods, like pre-exposure prophylaxis stigma (PrEP). Considering limitations of previously developed scales, our study plans to develop and validate the community PrEP-related stigma scale (community-PSS) among 108 sexual and gender minority men. We assessed reliability using Cronbach's alpha analysis, determined scale factors using principal component analysis, and assessed construct validity based on 5 a priori hypotheses. The scale was found to have high internal consistency (α=0.86) and had 4 factors (Stigma of actions outside of sex, Stigma of sexual actions, Extreme stigma perceptions, and positive community perception). The community-PSS was valid; meeting 4/5 hypotheses and in the expected direction. The community-PSS is a valid and reliable tool and was correlated with a previously validated PrEP stigma scale, HIV knowledge, PrEP knowledge, and likelihood of condom use with a partner on PrEP.

Introduction

In 2018, men who have sex with men (MSM) made up more than 2/3 of all new HIV cases in the United State, where Black and Latino MSM bore the largest burden (1). While White, Non-Hispanic MSM continue to experience declines in HIV incidence, ethnic and racial minority MSM are experiencing no changes or even increases in HIV rates (1). Pre-exposure prophylaxis was approved in 2012 by the Food & Drug Administration to prevent the acquisition of HIV for use among those at substantial risk (i.e. MSM, people who inject drugs, serodifferent partners, etc.)(2). In response to rising rates of HIV cases and increased accessibility to PrEP, it is important to understand potential barriers in HIV prevention such as PrEP-related stigma.

Past research implies that depressed rates of PrEP uptake could be due to the concept of PrEP-related stigma (3-8). PrEP-related stigma, born out of HIV-related stigma, is the discriminative thoughts and actions used against people who use PrEP. Applying past research in HIV-related stigma (9) and if applied to PrEP-related stigma, there are four potential sub-dimensions of stigma: enacted (e.g. someone stopped speaking to me because I am on PrEP), community (e.g. people think that people who use PrEP are more promiscuous), anticipated (e.g. I am afraid of my family finding out about my PrEP use), and internalized (e.g. I am less of a person because I use PrEP). Most research on PrEP-related stigma has focused primarily on qualitative methods, and some studies that have attempted to measure PrEP-related stigma quantitatively have used unvalidated tools for measurement (10) or tools validated by non-diverse samples (11). No current studies directly measure the community construct of PrEP-related stigma.

This study's objective was to develop and validate the community PrEP-related stigma scale (Community-PSS).

Methods

Scale development

To develop the community-PSS, we reviewed qualitative literature on PrEP stigma and identified key sources for items (12). The first iteration of the scale included 11 questions and was implemented among 200 participants of Miami Gay Pride parade (13). The initial iteration was found to have high internal reliability (alpha=0.870). After initial implementation, we checked face validity (i.e. subjective assessment of whether the items measure the intended concepts) by conducting cognitive interviews among participants of the target population until we reached theme saturation (n=7). Following cognitive interviews, an expert panel (n=3) was convened including experts in PrEP, MSM research, and stigma for further face validity testing. Results from the initial scale implementation and the cognitive interviews were provided to the experts to assist in their suggestions on the scale. Based on the initial scale implementation, cognitive interviews, and expert panel results, the community-PSS was clarified and left with 16 items.

Current Study

Data using the 16-item revised Community-PSS was collected in a cross-sectional online survey using Qualtrics. To be eligible for the survey, participants had to be male, 18 years or older, residents of Florida, and must have been aware of PrEP prior to

recruitment. Participants were recruited through flyers at various venues (e.g. gay bars, coffee shops, sex stores, etc.), posts on gay-related community groups in Florida, and through tasks on *mTurk*. Participants recruited through *mTurk* were compensated $1.50 for survey completion, while participants recruited via our other forms of recruitment were compensated $10. The study was approved by the Florida International University Institutional Review Board.

Variables to establish Construct Validity

To assess construct validity, we tested the following a priori hypotheses.

Community-PSS is positively associated with the HIV PrEP Stigma Scale (HPSS).

The HPSS is a validated 12-item scale with good internal reliability (alpha=0.837) (11) using 5-point Likert style responses. The HPSS measures multiple constructs (internal, anticipated, enacted) and sources (shame, character judgement, social support) of PrEP-stigma. Scores could range from 12-60 where higher scores are indicative of greater stigma.

Community-PSS is negatively associated with HIV knowledge.

HIV knowledge was measured using the transmission myths and facts factors of the International AIDS Questionnaire (14). The abbreviated scale included 10, 5-point Likert scale items with possible cumulative scores ranging from 10-50, where lower scores were indicative of lower HIV-related knowledge.

Community-PSS is negatively associated with PrEP-related knowledge.

PrEP-related knowledge was assessed by asking 10 true or false questions with information supported by the Centers for Disease Control and Prevention(15). Scores ranged from 0-10.

Community-PSS is negatively associated with the perceived percent of friends/sex partners who are on PrEP.

Perceived proportion of friends/sex partners on PrEP was measured using a sliding scale with responses ranging from 0-100% as described in a previous study (11).

Community-PSS is positively associated with likelihood of using a condom with someone who is on PrEP

Likelihood of using a condom with someone who is on PrEP was measured using the 5-point Likert question "How likely would you be to use condoms during sex with someone who tells you they are HIV-negative and on PrEP?" Responses ranged from "A lot less likely to use condoms" (Score=1) to "A lot more likely to use condoms" (Score=5).

Statistical Analyses

Data were analyzed using SAS (v9.4; SAS Institute Inc., Cary, NC). Descriptive data were used to report the sample characteristics and the statistics of each item of the Community-PSS. Cronbach's alpha was used to assess the internal reliability of the scale. All items that were found to be deleterious to the internal reliability (based on an increase in the Chronbach's alpha if the item was deleted) were removed. We then conducted an exploratory factor analysis on the remaining variables with a *Varimax* rotation to

determine the presence of latent constructs. Items with a factor loading of <0.40 were removed from the scale. Both Scree plots and Eigenvalues were used to determine the number of factors within the scale. Pearson's correlation coefficients (r) were used to assess construct validity of the Community-PSS. To be considered significant alpha was set to 0.05.

Results

Sample Demographics

The study successfully recruited 108 participants. Demographic and hypothesized PrEP-related stigma correlate characteristics of the sample are displayed in Table 7. The average age of our sample was 30.4±9.4 years of age. The majority of our sample identified as cis-gender male (96.3%), racial/ethnic minority (59.4%), gay (55.1%), >High School Education (95.4%), and single (55.1%). The sample had high HIV-related knowledge (43.9±6.0) and PrEP-related knowledge (8.2±1.9), while also reporting low percentage of friends/sexual partners on PrEP (31.2±27.0) and low PrEP-related stigma (28.5±7.3).

Table 7. Demographic and Hypothesized Community PrEP-related stigma correlates of 108 survey participants		
	n (%)	Mean±std
Age		30.4±9.4
Gender		
Male	104 (97.2)	
Transgender	3 (2.8)	
Race/Ethnicity		
White, Non-Hispanic	43 (40.6)	
Black, Non-Hispanic	7 (6.6)	
Hispanic	37 (34.9)	
Other, Non-Hispanic	19 (17.9)	
Sexuality		
Heterosexual	6 (5.6)	
Gay	59 (55.1)	
Bisexual	39 (36.5)	
Other	3 (2.8)	
Education		
≤High school Degree	5 (4.6)	
Some College/2-year Degree	40 (37.0)	
4-year Degree	44 (40.7)	
Graduate Degree	19 (17.6)	
Relationship Status		
Single, Never Married	59 (55.1)	
Single, Divorced	6 (5.6)	
Married/Committed Partnership (Exclusive)	25 (23.4)	
Married/Committed Partnership (Open Relationship)	16 (15.0)	
Other	1 (0.9)	
HIV-related knowledge		43.9±6.0
PrEP-related knowledge		8.2±1.9
HIV PrEP-related Stigma Scale		28.5±7.3
Percent Friends/Sexual Partners on PrEP		31.2±27.0
Likelihood of condom use with a partner on PrEP		2.9±1.4

Factor Analysis

The final Chronbach's alpha after dropping the items deleterious to the internal reliability was α=0.86. Two items were dropped from the scale as they were deleterious to the internal reliability. Factor analysis of the Community-PSS found 4 unique factors based on the Eigenvalues and the scree plot including: Stigma of actions outside of sex (6-items), Stigma of sexual actions (3-items), Extreme stigma perceptions (3-items), and positive community perception (2-items). All items had a factor loading of ≥ 0.40. (Table 8)

Table 8. Factor Analysis Results of the Community PrEP-related Stigma Scale						
People think that people who are on PrEP are…	Mean±std[c]	Item-Total Correlation	Factor 1: Stigma of actions outside of sex	Factor 2: Extreme stigma perceptions	Factor 3: Stigma of sexual actions	Factor 4: Positive Community Perception
1. Taking responsibility for their health[a]	2.0±1.0	0.33	0.13	0.10	0.04	**0.84**
2. Having sex with a lot of people	3.7±0.9	0.44	0.08	0.16	**0.84**	0.10
3. More likely to have sex with strangers	4.0±0.9	0.35	0.18	-0.12	**0.82**	0.04
4. Less likely to use condoms[b]						
5. Protecting themselves and others[a]	2.1±1.0	0.31	0.09	0.05	0.10	**0.89**
6. Having riskier sex	3.7±0.9	0.49	0.17	0.28	**0.71**	0.05
7. Possibly living with HIV	2.9±1.3	0.43	0.15	**0.79**	0.13	-0.11
8. More likely to engage in sex under the influence of drugs	3.1±1.1	0.64	**0.64**	0.32	0.23	0.06
9. More likely to have a sexually transmitted infection	3.3±1.2	0.61	**0.58**	0.33	0.28	0.00
10. People who do not want to get HIV[a,b]						

11. Less picky about their sex partners	3.4±1.1	0.45	**0.63**	-0.10	0.36	-0.03
12. More likely to use drugs	2.8±1.2	0.69	**0.72**	0.39	0.05	0.15
13. More likely to abuse alcohol	2.9±1.2	0.63	**0.85**	0.21	-0.06	0.16
14. More likely to cheat on their partner	3.1±1.2	0.66	**0.76**	0.21	0.15	0.13
15. Usually bad people	2.0±1.1	0.58	0.28	**0.77**	0.08	0.19
16. Hiding something	2.2±1.2	0.66	0.41	**0.71**	0.04	0.27

a. Item reverse coded
b. Item deleted due to deleterious effect to internal reliability
c. Higher means are indicative of greater stigma

Validity Assessment

In general, our sample perceived relatively low levels of community PrEP-related stigma and moderately high levels of community PrEP-related support. The Community-PSS was correlated with 4 of the 5 hypothesized variables and in the expected direction; where more stigma was associated with decreased PrEP knowledge (p=0.005) and HIV knowledge (p=0.012), and increased HPSS scores (p<0.001) and likelihood of condom usage with a partner on PrEP (p=0.032) (Table 9).

Table 9. Community PrEP-related stigma Scale correlation with external constructs

	HIV PrEP-related Stigma Scale	PrEP-related Knowledge	HIV-related knowledge	% partners/ friends on PrEP	Condom use with Partner on PrEP
Pearson's Correlation Coefficient	0.44	-0.27	-0.24	-0.03	0.21
p-value	<0.001	0.005	0.012	0.796	0.032

Discussion

We developed and validated the community-PSS, the first scale to look at community PrEP-related stigma specifically. The community-PSS demonstrated face validity as it covered key aspects of PrEP-related stigma and was found as acceptable by both participants through cognitive interviews and by experts in the fields of stigma, PrEP, and MSM research. Moreover, the scale had high internal reliability and showed acceptable construct validity, with significant correlations found with 4 of the 5 hypothesized associations. The scale meets the previous calls for development of a PrEP-

related stigma scale, however more research is necessary to create scales that assess other constructs of PrEP-related stigma such as anticipated, internalized, and/or enacted stigma.

In comparison, to the recently published HPSS assessment among MSM (11), our study has demonstrated key strengths. Firstly, the participants of our study had greater racial diversity (Racial/Ethnic Minority %: 15.4 vs 59.6). Having a scale that is reliable and valid among a diverse population in HIV research is important as racial/ethnic minorities are at the highest risk for HIV acquisition (1). Secondly, though similar, our scale showed higher internal reliability (Chronbach's alpha: 0.81 vs 0.86). Finally, the HPSS only included items to address internalized, anticipated and experienced stigma domain. Our study fills the gap by assessing community PrEP-related stigma.

Despite the study's strengths, there are several limitations. Firstly, the study utilized convenience sampling potentially introducing sampling error. Secondly, due to the small sample size, we were unable to run multivariate models or conduct a confirmatory factor analysis. Future studies with larger sample sizes should be conducted to confirm factors associated with the community-PSS through a confirmatory factor analysis. Finally, the study only included MSM and therefore the scale may not be generalizable to other at risk populations. Future research should test the external validity of the community-PSS among other at risk populations.

Conclusion

We developed and validated the first community PrEP-related stigma assessment. Having a validated measurement of community PrEP-related stigma can provide a tool for researchers to use when assessing the impact of stigma on outcomes such as PrEP

knowledge, uptake, and adherence. Future opportunities of research remain in validating the scale among other at risk populations and in various geographical locations.

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Conclusion

The high burden of HIV faced by the state of Florida reinforces the importance of research focused on factors that may be inhibiting successful HIV prevention efforts. To our knowledge, this is the first study that encompassed a statewide sample of PLWH to examine HIV-related stigma's association with continuum of care and mental health outcomes.

Our findings indicate that general enacted HIV-related stigma was not significantly associated with ART adherence nor viral suppression; however, healthcare-specific enacted HIV-related stigma was positively associated with non-ART adherence and non-viral suppression. This could mean that differences in health outcomes could depend on who specifically is perpetuating stigma in the lives of PLWH. Our finding highlights the long lasting impact of stigma perpetuated by healthcare workers, and adds to the necessity of the implementation of HIV-related stigma reduction interventions focused on healthcare workers.

Additionally, we found that enacted HIV-related stigma was significantly associated with increased symptoms of both depression and anxiety. Our finding bolsters the generalizability of the association between enacted HIV-related stigma and symptom levels of anxiety and depression, however factors such as environmental stressors should continue to be examined for significance in other populations. Future mental health interventions that address social support and enacted HIV-related stigma simultaneously may be of benefit to our population.

Finally, we found that the developed community PrEP-related stigma scale was reliable and valid. The scale meets the previous calls for development of a PrEP-related stigma scale, however more research is necessary to create scales that assess other constructs of PrEP-related stigma such as anticipated, internalized, and/or enacted stigma.

Our findings collectively highlight the significance of stigma on HIV maintenance and prevention and may have the potential to inform evidence-based prevention interventions with aims to decrease the drivers and manifestations of stigma.

Appendices.

Appendix 1. Variable list of survey covariates used to create HIV continuum of care indices				
Socioecological Level[a]	**Variables**	**Assessment Tool**	**Categorization**	**Factor Loading**
Individual				
Predisposing	Mental Health			
	Anxiety	GAD-7 (1)	0. No (Score < 10) 1. Yes (Score ≥ 10)	Mental Health
	Depression	PHQ-8 (2)	0. No (Score < 10) 1. Yes (Score ≥ 10)	Mental Health
	PTSD	PC-PTSD (3)	0. No (Score ≤ 1) 1. Yes (Scores >1)	Mental Health
	Substance use			
	Injection drug use past 12 months	Self-Report	0. No 1. Yes	Injection Drug use
	Non-injection drug use past 12 months	Self-Report	0. No 1. Yes	Non-injection drug use
	Marijuana use past 3 months	Self-Report	0. No 1. Yes	[b]
	Hazardous drinking past 12 months	Self-Report	0. No 1. Yes	Non-injection drug use
Enabling	Insurance Status	Self-Report	0. No 1. Yes	[b]
	Transportation	Self-report type of transportation used to get to HIV care appointments	0. Walk/Bike/Public Transportation 1. Drive	Social support
	Housing	Self-Report	0. Stable Housing 1. Unstable housing 2. Homeless	Social Support
	Household Income	Based off of the US Department of Health & Human Services 2014 poverty line (4)	0. Below poverty level 1. above poverty level	[b]
	Education	Self-Report	0.<High School 1. High school 2. > High school	Socioeconomic status
	Social Support	MOS-SSS (5)	Inverse of total score	Social Support
Perceived Need	Health beliefs			

	Overall Health	Self-Report	0. Excellent, very good 1. Good/Fair 2. Very poor/poor	Mental Health
	Comorbidities			
	Tuberculosis diagnosis (ever)	Self-Report	0. No 1. Yes	[b]
	Hepatitis C diagnosis (ever)	Self-Report	0. No 1. Yes	Injection drug use
	Sexually transmitted infection diagnosis past 12 months	Self-Report	0. No 1. Yes	[b]
Relationships	HIV-disclosure	Self-Report	0. Multiple groups 1. Disclose to only 1 of the following: friend/family/partner 2. No one	[b]
	Current HIV case manger	Self-Report	0. Yes 1. No/not sure	[b]
	Usual place for HIV care	Self-Report	0. Yes 1. No	Usual place of HIV care
Community	Employment	Self-Report	0. Employed 1. Unemployed/unable to work/disabled	Socioeconomic status
	Neighborhood	Based on US Census classification of recruitment site County (6)	0. Urban 1. Rural	[b]
	Corrections experience (ever)	Self-Report	0. Never 1. 1 time 2. 2-5 times 3. 6+ times	Socioeconomic status
System	Primary care provider	Self-Report	0. Receive primary care from HIV provider/ someone outside of HIV provider 1. No primary care provider	[b]
	HIV clinic distance	Self-Report	0. <30 minutes 1. 30-60 minutes 2. 1-2 hours 3. 2+ hours	Social support

a. Based off of the model by Mugavero et al. (2013) (7)
b. Removed as deleterious to Cronbach's alpha

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Appendix 2. Variable list of survey covariates used to create HIV continuum of care indices				
Framework constructs[a]	**Variables**	**Assessment Tool**	**Categorization**	**Factor Loading**
Individual attributes and behaviors[b]				
	Substance use			
	Injection drug use past 12 months	Self-Report	2. No 3. Yes	Substance use
	Non-injection drug use past 12 months	Self-Report	2. No 3. Yes	Substance use
	Hazardous drinking past 12 months	Self-Report	2. No 3. Yes	Substance use
Social and economic circumstance				
	Insurance Status	Self-Report	2. Yes 3. No	[c]
	Housing	Self-Report	3. Stable Housing 4. Unstable housing 5. Homeless	Social Support
	Education	Self-Report	0.> High School 1. High school 2.< High school	Socioeconomic status
	Social Support	MOS-SSS (1)	Inverse of total score	Social Support
	HIV-disclosure	Self-Report	3. Multiple groups 4. Disclose to only 1 of the following: friend/family/partner 5. No one	[c]
	Employment	Self-Report	2. Employed 3. Unemployed/unable to work/disabled	Socioeconomic status
	Corrections experience (ever)	Self-Report	4. Never 5. 1 time 6. 2-5 times 7. 6+ times	Socioeconomic status

Environmental Factors	Neighborhood	Based on US Census classification of recruitment site County (2)	2. Urban 3. Rural	c

a. Based off of the model reported by the World Health Organization (2012) (3)
b. Demographic variables were not included in indicator creation, and were modeled as separate predictor variables.
c. Removed as deleterious to Cronbach's alpha

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