

# Health Care-Specific Enacted HIV-Related Stigma's Association with Antiretroviral Therapy Adherence and Viral Suppression Among People Living with HIV in Florida

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## Abstract

Among people living with HIV (PLWH) in Florida, <2/3 are virally suppressed (viral load <200 copies/mL). Previous theoretical frameworks have pointed to HIV-related stigma as an important factor for viral suppression; an important outcome related to the HIV continuum of care. This study aims to analyze the association between enacted HIV-related stigma and antiretroviral therapy (ART) adherence and viral suppression among a sample of PLWH in Florida. The overall sample ( $n=932$ ) was male (66.0%), majority greater than 45 years of age (63.5%), black (58.1%), and non-Hispanic (79.7%). Adjusted odds ratios (AOR) and 95% confidence intervals (CI) were estimated using logistic regression models. The odds of nonadherence to ART was not significantly greater for those reporting low/moderate or high levels of general enacted HIV-related stigma (vs. no stigma) [AOR=1.30, CI: (0.87–1.95),  $p=0.198$ ; AOR=1.17, CI: (0.65–2.11),  $p=0.600$ , respectively]. Moreover, the odds of nonviral suppression were not significantly greater for those reporting low/moderate or high levels of general enacted HIV-related stigma (vs. no stigma) [AOR=0.92, CI: (0.60–1.42),  $p=0.702$ ; AOR=1.16, CI: (0.64–2.13),  $p=0.622$ , respectively]. However, ever experiencing health care-specific enacted HIV-related stigma was associated with both nonadherence [AOR=2.29, CI: (1.25–4.20),  $p=0.008$ ] and nonsuppression [AOR=2.16, CI: (1.19–3.92),  $p=0.011$ ]. Despite limitations, the results suggest that the perpetuation of stigma by health care workers may have a larger impact on 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 health care workers intended to reduce experienced stigma among PLWH and improve health outcomes.

**Keywords:** stigma, HIV/AIDS, Florida, continuum of care, antiretroviral therapy adherence, viral suppression

## Introduction

**I**N 2018, THERE WERE ~1 million (1,003,782) people living with HIV (PLWH) in the United States.<sup>1</sup> Of the total number of PLWH in the United States, an estimated 11.0% (110,034) live in Florida.<sup>1</sup> Among PLWH in Florida, only

64% have evidence of being virally suppressed (HIV viral load <200 copies/mL).<sup>2</sup> This is concerning as without viral suppression, HIV has more deleterious effects among PLWH, and also because the virus can be more easily transmitted to HIV negative sexual partners.<sup>3</sup> As the prevalence of HIV continues to grow in Florida and the United States as a

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whole, it is increasingly important to focus on factors that may affect antiretroviral therapy (ART) adherence and achievement of 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) HIV viral load suppression.<sup>4</sup> As described by Mugavero et al., multiple factors can hinder or facilitate success along the HIV continuum of care that follow the levels of the socioecological framework, including individual, relationship, community, system, and policy.<sup>5</sup> Under individual level factors, which are the focus of our reported research, there are three subfactors affecting continuum of care outcomes, including predisposing, enabling, and perceived need.<sup>5</sup> Predisposing factors are described as sociocultural factors that exist before illness (e.g., sex,<sup>6,7</sup> age,<sup>7–11</sup> race/ethnicity,<sup>6,7,10,11</sup> and so on), enabling factors are described as factors associated with care logistics (e.g., insurance status,<sup>12,13</sup> transportation,<sup>14,15</sup> income,<sup>9,13,16</sup> and so on), and perceived need factors are described as factors based on people's perception of health care need (e.g., comorbidities,<sup>11,17,18</sup> health beliefs,<sup>19–21</sup> and so on).<sup>5</sup>

#### *HIV-related stigma*

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

HIV-related stigma can be separated into four subconstructs—enacted, community, internalized, and anticipated stigma.<sup>22</sup> Enacted stigmas are actual negative actions taken against someone due to their HIV status, while anticipated stigmas are hypothetical consequences of revealing one's HIV status.<sup>22</sup> Community stigma is the perceived negative public opinion of PLWH, while internalized stigmas are internal negative feelings about one's self due to one's HIV status.<sup>22</sup>

#### *Health care enacted HIV-related stigma*

Enacted stigma can be perpetuated by many types of people in the lives of PLWH (strangers, friends, family, health care workers, and so on). Health care settings are one of the main settings where PLWH experience HIV-related stigma,<sup>25–27</sup> manifested in the form of patient avoidance, differing precautionary measures for PLWH, refusal to touch PLWH, lack of confidentiality, and denial of services.<sup>28</sup> In a study among 651 health care workers in two Southeastern States, Stringer et al. found that 89% of clinical staff endorsed at least one stigmatizing attitude about PLWH.<sup>28</sup> Perceived

HIV-related stigma from health care workers has been associated with poorer care outcomes among PLWH.<sup>29,30</sup>

#### *Current literature review on enacted stigma, ART adherence, and viral suppression*

To date, the limited research shows mixed results of the effects of enacted stigma on ART adherence and viral suppression in the United States. As it relates to ART adherence, the study by Logie et al. 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.<sup>31</sup> In the United States, Turan and Rogers et al. surveyed 1356 women living with HIV and found that experiences of enacted HIV-related stigma in a health care setting was negatively associated with ART adherence.<sup>30</sup> As it relates to viral suppression, Kemp et al. analyzed longitudinal data from 234 black women living with HIV in the United States and found that enacted HIV-related stigma was negatively associated with viral suppression in adjusted models.<sup>32</sup> However, in a study by Vanable et al. among 221 PLWH in the United States, experiences of enacted stigma were not associated with viral suppression.<sup>33</sup>

To address current gaps in the literature and explore previous incongruous findings, we examined both general enacted HIV-related stigma and health care-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 health care-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 and 2018. As described previously,<sup>34</sup> 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 nine public health sites using venue-based convenience sampling throughout the state of Florida (Alachua County [two 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  $\geq 18$  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  $\sim 30$ –45 min 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 ART adherence and HIV viral suppression, the final two steps of the HIV care continuum.

**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  $\geq 95\%$  cut point.

**HIV viral suppression.** Defined as having  $< 200$  copies/mL in the most recent HIV viral load test as retrieved from the eHARS database.

**Predictors of interest.** Our primary predictors of interest were general enacted HIV-related stigma and health care-specific enacted HIV-related stigma. Our study utilized an abbreviated version of the Herek HIV-related Stigma measure ( $\alpha = 0.89$ ).<sup>35</sup> The scale included 10, 4-point Likert style questions that assessed experiences of enacted HIV-related stigma.

**General enacted HIV-related stigma.** Sample questions included: “Someone insulted or verbally abused me because I have HIV,” “A doctor, nurse, or healthcare worker avoided me or refused to take care of me because I have HIV,” etc. Total possible scores could range from 0 to 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.<sup>36</sup>

**Health care-specific enacted HIV-related stigma.** Focused on the specific item, “A doctor, nurse, or healthcare 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 to 3. Based on their scores, participants were stratified by never (0) versus ever ( $> 0$ ) experiencing health care-specific enacted HIV-related stigma.

**Demographics.** Demographic items included age group (18–34, 35–44, 45–54,  $\geq 55$  years), sex at birth (male or female), race (white, black, other), ethnicity (Hispanic or non-Hispanic), and self-reported sexual orientation (heterosexual or nonheterosexual). 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 to decrease collinearity.<sup>37,38</sup> We extracted 25 covariates from the survey guided by the framework developed by Mugavero et al. (variables listed in Appendix Table A1). 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 removed all indicators that were deleterious to the Cronbach’s alpha, leaving 16 remaining indicators.

Using the 16 remaining factors, we conducted a principal component analysis (PCA) with and without a varimax

rotation. PCA found six factors with an eigenvalue  $> 1$ , including mental health (four variables), socioeconomic status (three variables), social support (four variables), noninjection drug use (two variables), injection drug use (two variables), and usual place of HIV care (one variable). Finally, we categorized the standardized scores for the six factors into tertiles ( $\leq 25\%$  percentile, 25–50% percentile,  $> 50\%$  percentile) except for having a 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 examined sample frequencies and percentages to describe the characteristics of the sample by ART adherence and viral suppression. We used unadjusted logistic regression models to assess the association of each unique variable on nonadherence and nonsuppression. Then, we conducted two 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 two adjusted logistic regression models where the outcomes of interest remained the same but the predictor of interest was health care-specific enacted HIV-related stigma. Models were adjusted for demographics and factors using the indices described above. To be considered as statistically significant,  $\alpha$  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 nonconforming were removed from the final analysis due to small sample size, leaving a final sample of  $n = 773$  and  $n = 879$  for adherence and suppression outcomes, respectively. The majority of our overall sample ( $n = 932$ ) was male (66.0%), majority 45+ years of age (63.5%), black (58.1%), non-Hispanic (79.7%), and heterosexual (52.8%). Most of our sample reported low/moderate or high levels of general enacted HIV-related stigma (53.3%) and a minority reported ever experiencing health care-specific enacted HIV-related stigma (10.5%). The proportion of the sample meeting our definition of nonadherence was 30.8% and nonsuppression was 25.0%. The characteristics of our final sample stratified by adherence and suppression can be found in Table 1.

### 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) [odds ratio (OR) = 1.71, confidence intervals (CI): (1.08–2.70),  $p = 0.023$ ] had significantly increased odds of nonadherence. However, in the final adjusted model, neither low/moderate nor high levels of general enacted HIV-related stigma (vs. no stigma) [adjusted odds ratios (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.

TABLE 1. DESCRIPTIVE BASELINE SAMPLE STATISTICS OF THE FLORIDA COHORT STUDY STRATIFIED BY ANTIRETROVIRAL THERAPY ADHERENCE AND VIRAL SUPPRESSION

	<i>Adherent<sup>a</sup></i>	<i>Nonadherent<sup>a</sup></i>	<i>Suppressed<sup>b</sup></i>	<i>Nonsuppressed<sup>b</sup></i>
	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)
Nonheterosexual	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)
Health care 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)
Noninjection 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)

<sup>a</sup>Antiretroviral therapy adherence was dichotomized based on a ≥95% adherence cutpoint.

<sup>b</sup>Viral suppression was dichotomized based on a 200 viral copies/mL cutpoint.

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),  $p=0.004$ ], and 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], had high risk injection drug use (vs. low) [AOR=2.61, CI: (1.19–5.70),  $p=0.016$ ], and had significantly greater odds of nonadherence. Sex, sexual orientation, socioeconomic status, social support, and having a usual place for HIV care were not significantly associated with nonadherence (Table 2).

TABLE 2. UNADJUSTED AND ADJUSTED ODDS RATIOS AND 95% CONFIDENCE INTERVALS OF GENERAL ENACTED HIV-RELATED STIGMA AND OTHER SELECTED CHARACTERISTICS ON NONANTIRETROVIRAL THERAPY ADHERENCE AMONG A SAMPLE OF PEOPLE LIVING WITH HIV IN FLORIDA

	<i>Unadjusted</i>			<i>Adjusted</i>		
	<i>OR</i>	<i>CI</i>	<i>p</i>	<i>AOR</i>	<i>CI</i>	<i>P</i>
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	<b>1.91</b>	<b>1.15–3.17</b>	<b>0.012</b>
45–54	—	—	—	—	—	—
≥55	0.89	0.60–1.32	0.564	1.04	0.61–1.79	0.880
Race						
White	—	—	—	—	—	—
Black	<b>1.80</b>	<b>1.27–2.55</b>	<b>0.001</b>	<b>2.07</b>	<b>1.26–3.41</b>	<b>0.004</b>
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	<b>1.86</b>	<b>1.03–3.36</b>	<b>0.039</b>
Sex						
Male	—	—	—	—	—	—
Female	1.11	0.80–1.52	0.542	0.95	0.59–1.52	0.814
Sexual orientation						
Heterosexual	—	—	—	—	—	—
Nonheterosexual	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	<b>1.71</b>	<b>1.08–2.70</b>	<b>0.023</b>	1.05	0.56–1.96	0.881
Mental health factor						
Low risk	—	—	—	—	—	—
Medium risk	<b>1.78</b>	<b>1.13–2.81</b>	<b>0.014</b>	<b>1.88</b>	<b>1.09–3.24</b>	<b>0.023</b>
High risk	<b>2.14</b>	<b>1.44–3.18</b>	<b>&lt;0.001</b>	<b>1.82</b>	<b>1.09–3.04</b>	<b>0.022</b>
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
Noninjection drug use factor						
Low risk	—	—	—	—	—	—
Medium risk	1.51	0.96–2.35	0.073	<b>1.94</b>	<b>1.17–3.23</b>	<b>0.010</b>
High risk	<b>1.69</b>	<b>1.17–2.43</b>	<b>0.005</b>	<b>1.81</b>	<b>1.15–2.85</b>	<b>0.011</b>
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	<b>2.60</b>	<b>1.42–4.76</b>	<b>0.002</b>	<b>2.61</b>	<b>1.19–5.70</b>	<b>0.016</b>
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  $p<0.05$ .

AOR, adjusted odds ratios; CI, confidence intervals; OR, odds ratios.

*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) [Crude Odds Ratio (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 associa-

tion remained nonsignificant 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,

TABLE 3. UNADJUSTED AND ADJUSTED ODDS RATIOS AND 95% CONFIDENCE INTERVALS OF GENERAL ENACTED HIV-RELATED STIGMA AND OTHER SELECTED CHARACTERISTICS ON NONVIRAL SUPPRESSION AMONG A SAMPLE OF PEOPLE LIVING WITH HIV IN FLORIDA

	<i>Unadjusted</i>			<i>Adjusted</i>		
	<i>OR</i>	<i>CI</i>	<i>p</i>	<i>AOR</i>	<i>CI</i>	<i>p</i>
Age group						
18–34	<b>2.12</b>	<b>1.41–3.20</b>	<b>&lt;0.001</b>	<b>2.49</b>	<b>1.48–4.21</b>	<b>&lt;0.001</b>
25–44	1.32	0.87–1.98	0.191	1.30	0.78–2.18	0.314
45–54	—	—	—	—	—	—
≥55	<b>0.44</b>	<b>0.27–0.71</b>	<b>&lt;0.001</b>	0.65	0.35–1.20	0.164
Race						
White	—	—	—	—	—	—
Black	<b>1.46</b>	<b>1.03–2.06</b>	<b>0.035</b>	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	<b>0.55</b>	<b>0.33–0.91</b>	<b>0.019</b>
Sexual orientation						
Heterosexual	—	—	—	—	—	—
Nonheterosexual	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	<b>1.64</b>	<b>1.03–2.62</b>	<b>0.038</b>	<b>2.08</b>	<b>1.16–3.73</b>	<b>0.014</b>
High risk	<b>2.02</b>	<b>1.35–3.00</b>	<b>&lt;0.001</b>	<b>2.03</b>	<b>1.19–3.45</b>	<b>0.009</b>
Socioeconomic factor						
Low risk	—	—	—	—	—	—
Medium risk	1.38	0.86–2.21	0.185	1.23	0.66–2.27	0.516
High risk	<b>1.48</b>	<b>1.00–2.19</b>	<b>0.049</b>	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
Noninjection 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	<b>1.64</b>	<b>1.15–2.33</b>	<b>0.007</b>	<b>1.63</b>	<b>1.03–2.58</b>	<b>0.036</b>
Injection drug use factor						
Low risk	—	—	—	—	—	—
Medium risk	<b>0.50</b>	<b>0.31–0.83</b>	<b>0.007</b>	<b>0.47</b>	<b>0.24–0.92</b>	<b>0.027</b>
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	<b>2.79</b>	<b>1.77–4.40</b>	<b>&lt;0.001</b>	<b>2.85</b>	<b>1.59–5.11</b>	<b>&lt;0.001</b>

Bold values indicate *p*<0.05.

respectively], high-risk noninjection 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. In addition, female sex at birth (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 nonsuppression. Race, ethnicity, sexual orientation, socioeconomic status, and social support were not significantly associated with viral suppression (Table 3).

#### Adjusted logistic regression analyses of health care-specific HIV-related stigma on adherence and suppression

In the unadjusted models, health care-specific HIV-related stigma was significantly associated with nonadherence [COR=1.84, CI: (1.15–2.94),  $p=0.011$ ], but not significantly associated with nonsuppression [COR=1.08, CI: (0.66–1.80),  $p=0.754$ ]. After adjusting for the same factors from previous analyses on general enacted HIV-related stigma, those who ever faced health care-specific enacted HIV-related stigma had significantly greater odds of both nonadherence and nonsuppression (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).

#### Discussion

This study is the first quantitative study to examine the association of both general and health care-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 nonadherence or nonsuppression after adjusting for important confounders. However, health care-specific enacted HIV-related stigma yielded significantly greater odds of nonadherence and nonsuppression, indicating that differences in health outcomes may depend on who specifically is perpetuating stigma in the lives of PLWH. Our findings are consistent with previous research, which found that HIV-related stigma in health care settings is negatively associated with HIV care outcomes.<sup>30,39,40</sup> Our finding highlights the impact of stigma perpetuated by health care workers and supports the necessity of the implementation of HIV-related stigma reduction and

cultural competency interventions focused on health care workers. Previous research has identified factors related to HIV-related stigma among health care providers in the United States,<sup>41</sup> although the majority of HIV-related stigma reduction interventions among health care workers have taken place in international samples.<sup>42</sup> Previous research has identified factors related to HIV-related stigma among health care providers. One evidence-based intervention to reduce HIV-related stigma among health care workers in the United States is the Finding Respect and Ending Stigma against HIV Workshop (FRESH).<sup>43</sup> The FRESH workshop brings together PLWH and health care workers to develop stigma-reduction strategies/tools together and has been seen as a feasible and highly acceptable intervention by both PLWH and health care workers.<sup>43</sup> Interventions like the FRESH workshop should be evaluated to see if they could be implemented in a statewide context such as Florida.

Another explanation of the nonsignificant association between general enacted HIV-related stigma and nonadherence and nonsuppression could be the other factors of HIV-related stigma (i.e., internal, community, and anticipated) that may have a larger effect on these outcomes than general enacted HIV-related stigma. Previous work by Logie et al. stratified stigma by specific factors and found in addition to enacted stigma, internalized stigma was also a significant factor in ever initiating ART.<sup>31</sup> Although general enacted HIV-related stigma was nonsignificant in our study, research should continue to report results on specific factors of stigma versus the use of an overall score that measures all four 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, and so on) 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 that 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 that 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.

TABLE 4. UNADJUSTED AND ADJUSTED ODDS RATIOS AND 95% CONFIDENCE INTERVALS OF HEALTH CARE SPECIFIC ENACTED HIV-RELATED STIGMA AND OTHER SELECTED CHARACTERISTICS ON NONANTIRETROVIRAL THERAPY AND NONVIRAL SUPPRESSION AMONG A SAMPLE OF PEOPLE LIVING WITH HIV IN FLORIDA

	Nonadherence <sup>a</sup>						Nonsuppression <sup>a</sup>						
	OR	CI	p	AOR	CI	p	OR	CI	p	AOR	CI	p	
Health care-specific enacted HIV-related stigma													
Not experienced	—	—	—	—	—	—	—	—	—	—	—	—	—
Experienced	<b>1.84</b>	<b>1.15–2.94</b>	<b>0.011</b>	<b>2.27</b>	<b>1.24–4.17</b>	<b>0.008</b>	1.08	0.66–1.80	0.754	<b>2.06</b>	<b>1.12–3.76</b>	<b>0.020</b>	

Bold values indicate  $p<0.05$ .

<sup>a</sup>Models adjusted for age group, race, ethnicity, sex, sexual orientation, mental health, socioeconomic status, social support, noninjection drug use, injection drug use, usual place of care.

Our findings imply that interventions with aims to improve both ART adherence and viral suppression should focus on populations with mental health risk and noninjection 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 on young men, but future interventions that want to improve ART adherence specifically with a larger community impact should focus on black and Hispanic communities.

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, health care-specific HIV-related stigma was significantly associated with both ART nonadherence and nonsuppression. There is a need to develop and evaluate interventions for health care workers who intend to reduce experience stigma among PLWH.

### 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. In addition, the stigma measure did not clarify the time when enacted stigma occurred (recent or past), or by specific types of health care worker (e.g., provider, nurse, clinical staff). Moreover, the modified version of the Herek's enacted HIV-related stigma scale has not been validated, but internal reliability was considered acceptable ( $\alpha = 0.89$ ). 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 nonconforming 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 a HIV clinic. In light of our findings on health care-specific enacted stigma, this may have introduced bias. Finally, some variables in the model created by Mugavero et al. were not collected in the study (spirituality, coping, resiliency, etc.) and may be important to models predicting HIV continuum outcomes.<sup>5</sup> Future studies should continue to study and report on these factors.

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No competing financial interests exist.

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*(Appendix follows →)*

Appendix

APPENDIX TABLE A1. VARIABLE LIST OF SURVEY COVARIATES USED TO CREATE HIV CONTINUUM OF CARE INDICES

<i>Socioecological level<sup>a</sup></i>	<i>Variables</i>	<i>Assessment tool</i>	<i>Categorization</i>	<i>Factor loading</i>
Individual Predisposing	Mental health			
	Anxiety	GAD-7 <sup>A1</sup>	0. No (score <10) 1. Yes (score ≥10)	Mental health
	Depression	PHQ-8 <sup>A2</sup>	0. No (score <10) 1. Yes (score ≥10)	Mental health
	PTSD	PC-PTSD <sup>A3</sup>	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
	Noninjection drug use past 12 months	Self-report	0. No 1. Yes	Noninjection drug use <sup>b</sup>
	Marijuana use past 3 months	Self-report	0. No 1. Yes	
	Hazardous drinking past 12 months	Self-report	0. No 1. Yes	Noninjection drug use <sup>b</sup>
	Enabling	Insurance status	Self-report	0. No 1. Yes
	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 <sup>A4</sup>	0. Below poverty level 1. Above poverty level	<sup>b</sup>
	Education	Self-report	0. <High school 1. High school 2. >High school	Socioeconomic status
Perceived need	Social support	MOS-SSS <sup>A5</sup>	Inverse of total score	Social support
	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	<sup>b</sup>
	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	<sup>b</sup>

(continued)

(Appendix continues →)

APPENDIX TABLE AT1. (CONTINUED)

<i>Socioecological level<sup>a</sup></i>	<i>Variables</i>	<i>Assessment tool</i>	<i>Categorization</i>	<i>Factor loading</i>
Relationships	HIV-disclosure	Self-report	0. Multiple groups 1. Disclose to only one of the following: friend/family/partner 2. No one	b
	Current HIV case manager	Self-report	0. Yes 1. No/not sure	b
Community	Usual place for HIV care	Self-report	0. Yes 1. No	Usual place of HIV care
	Employment	Self-report	0. Employed 1. Unemployed/ unable to work/ disabled	Socioeconomic status
	Neighborhood	Based on US Census classification of recruitment site County <sup>A6</sup>	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 min 1. 30–60 min 2. 1–2 h 3. 2+ h	Social support

<sup>a</sup>Based off of the model by Mugavero et al.<sup>A7</sup>

<sup>b</sup>Removed as deleterious to Cronbach's alpha. PTSD, post-traumatic stress disorder.

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