Associations Between Experienced HIV Stigma, Resulting Consequences, and the HIV Care Continuum: Moderating Effects of Two Resilience Characteristics Among Persons Living with HIV (PLWH) in Louisiana

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Abstract

Introduction HIV-related stigma continues to serve as a major barrier to HIV care. HIV stigma reduction interventions are urgently needed to promote and protect the health of persons living with HIV (PLWH). Resilience has been identified as a potential leverage to mitigate the impact of HIV-related stigma among PLWH.

Methods We examined whether two resilience measures (i.e., social support and resilience assets and resources [RAR]) moderated the relationship between experienced HIV stigma and the HIV care continuum as well as how they moderated the relationship between the consequences of experienced HIV stigma (CES) and the HIV care continuum among 300 PLWH in Louisiana. Separate bootstrapping analyses were conducted to test for evidence of moderated moderation.

Results Most participants were Black (79%) and had been living with HIV for 10 years or more. A relatively high sample of men who have sex with men (MSM) were enrolled (37%). The most common CES were depression (67%). The most common manifestation of experienced HIV stigma was being gossiped about (53%). Participants reported moderate levels of social support. In terms of RAR, most participants (71%) reported that they knew of groups that could support them in responding to experienced HIV stigma. After adjusting for potential covariates, social support and RAR both significantly moderated the

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relationship between experienced HIV stigma and length of time since their last HIV care visit, $B(SE) = .003(.001)$, $p = .03$. At high levels of RAR and high levels of social support, those with higher levels of experienced HIV stigma reported a longer length of time since their last HIV care visit than those who reported lower levels of experienced HIV stigma ($B(SE) = .17(.04)$, $p < .001$). RAR moderated the relationship between social support and HIV care, $B(SE) = .01(.004)$, $p < .001$. Those who experienced greater CES reported a longer length of time since their last doctor's visit $B(SE) = .04(.02)$, $p < .05$. Experienced HIV stigma was not significantly associated with viral load results. However, social support significantly moderated the relationship between experienced stigma and viral load results. At higher levels of social support, those who experienced lower levels of stigma were more likely to report an undetectable viral load than those who had higher levels of stigma, $B(SE) = -.13(.03)$, $p < .001$. Finally, both RAR and social support moderated the relationship between CES and viral load results. Those who reported higher levels of RAR $B(SE) = -.07(.02)$, $p < .001$, and social support, $B(SE) = -.02(.01)$, $p < .05$, also reported having an undetectable viral load at most recent HIV care visit. CES was not significantly related to reporting an undetectable viral load ($p = .61$).

Conclusions Enrolled PLWH already have some level of resilience which plays an important protective role within the context of the HIV care continuum up to a certain extent. Interventions to enhance the RAR and social support components may be useful especially among MSM and persons who have been living with HIV for a shorter period of time.

Introduction

Southern states such as Louisiana continue to be disproportionately impacted by HIV and AIDS in the United States (US) [1, 2]. With more than 21,000 persons living with HIV (PLWH) in the state, Louisiana ranks 3rd highest in AIDS case rates and 4th in HIV case rates in the nation [3]. HIV-related stigma coupled with limited awareness about HIV including its transmission, lower levels of education, high rates of sexually transmitted infections (STIs), high poverty, and limited access to health care services especially in rural areas exacerbate the HIV epidemic in the South [4, 5].

HIV-related stigma is the discounting, discrediting, and unfair treatment of PLWH or perceived to be living with HIV [6]. PLWH may experience various forms or dimensions of HIV-related stigma to include internalized (i.e., within), anticipated (i.e., expected), perceived (i.e., community stigma), and/or experienced HIV-related stigma (i.e., actual experiences of discrimination, devaluation, and prejudice) [7, 8] from external sources such as institutions (e.g., schools, medical providers, places of worship), individuals (e.g., health care workers, friends, family members, other PLWH, and sexual partners) [8, 9], and as a result of specific policies [10]. HIV-related stigma arises from a variety of factors including misconceptions about HIV transmission and from judgments placed upon social groups that are disproportionately impacted by HIV including men who have sex with men (MSM) and persons of color [11–13].

The examination of HIV-related stigma has received increasing attention given its role in negatively impacting a range of health outcomes including access to HIV and social services, HIV medication adherence, mental health, and quality of life [14, 15]. It has in fact been described as one of the greatest barriers to HIV care for PLWH [16]. Even though HIV-related stigma has been characterized as high in the Southern US [5, 17, 18], relatively few studies have documented the different forms and magnitude of HIV-related stigma in a consistent and comprehensive manner [5]. In addition, longitudinal studies of HIV-related stigma in the South are limited. Such information is needed to identify and monitor changes in HIV-related stigma over time [5]. Furthermore, there is also a dearth of evidenced-based and informed stigma reduction interventions in this region of the US [19–21].

A growing number of HIV stigma studies now show that various dimensions of HIV-related stigma (e.g., internalized, anticipated, perceived) influence each other, have different pathways or mechanisms of action, and are predictive of different health outcomes [7, 8, 22–27]. Thus, measuring and understanding the various HIV-related stigma dimensions, associated mechanisms, and resulting health outcomes can inform the development of more meaningful interventions to reduce the health-related impacts of HIV-related stigma among PLWH [5]. In the current study, we examine the different forms of experienced HIV stigma and resulting consequences associated with engagement in HIV care.

The study of resilience as a potential buffer against HIV-related stigma among PLWH has emerged as an important area for investigation and opportunity for intervention development within the context of HIV-related stigma [13, 28]. Resilience as a psychological construct is defined as a "dynamic process wherein individuals are capable of positive adaptation or resistance, recovery, coping, and success within the context of adversity" [29]. In order for individuals to be resilient, they must have experienced some form of adversity and utilized protective or promotive factors including assets and resources in order to adapt positively [30–32]. Furthermore, assets are viewed as positive factors that are internal to the individual. Resources, on the other hand, are

factors that are external to the individual such as support from other people and community-based organizations [30–32]. In the current study, we examined whether two resilience characteristics (i.e., social support and an asset/resource stigma–specific resilience measure) moderated the relationship between experienced HIV stigma, resulting manifestations or consequences of HIV stigma, and the HIV care continuum (i.e., engagement in HIV care and viral load results) among PLWH. Our study goals included the following:

Goal 1: Examine whether resilience factors moderated the relationship between experienced HIV stigma and engagement in HIV care.
Goal 2: Examine whether resilience factors moderated the relationship between consequences of experienced HIV stigma and engagement in HIV care.
Goal 3: Examine whether resilience factors moderated the relationship between experienced HIV stigma and viral load results.
Goal 4: Examine whether resilience factors moderated the relationship between the consequences of experienced HIV stigma and viral load results.

Methods

In 2015, the Louisiana Public Health Institute in New Orleans served as the lead research institution for the Louisiana HIV Stigma Index Project (LA HSIP), which was led by two co-ordinators living with HIV and a core group of PLWH. The LA HSIP was a 2-year community-based participatory research that (1) consisted of a baseline (i.e., cross-sectional) assessment of the various dimensions and magnitude of HIV-related stigma among PLWH in two Louisiana cities (i.e., New Orleans and Baton Rouge) via peer-led structured interviews with PLWH; (2) assessed needs and referred participants to medical care and supportive services during the interviews; and (3) developed city-specific HIV stigma reduction plans based on the interview results. The New Orleans and Baton Rouge region was selected given that they have the highest number and rate of new HIV diagnoses compared with other regions in the state [3]. The LA HSP was conducted from March 2015 to July 2017. The first 6 months of the study consisted of a planning phase to identify peer coordinators living with HIV to lead the project and administer the stigma questionnaire; convene a representative group of stakeholders (i.e., core group) from communities most impacted by HIV; develop and modify an existing HIV stigma questionnaire [33, 34]; develop a recruitment plan based on local context; and identify and train 12 PLWH to serve as study interviewers. An enrollment target of 300 PLWH was established based on lessons learned from an initial pilot study of 70 PLWH in

Detroit, MI [35]. City-specific enrollment targets were also aligned to reflect city-wide HIV prevalence estimates by demographic and risk group characteristics (e.g., enroll > 50% men in New Orleans given that the majority of PLWH in New Orleans are men).

In order to qualify for the study, individuals had to (1) self-report an HIV diagnosis; (2) self-report that they were currently living in the New Orleans or Baton Rouge metropolitan statistical area (MSA); (3) self-report that they were at least 18 years of age; (4) be able to conduct the study in English; and (5) be able to provide verbal consent. Individuals were excluded if (1) they had any condition that made participation in the study unsafe, complicated interpretation of study findings, and/or otherwise interfered with achieving the study goals and/or (2) were currently hospitalized or imprisoned. The study was approved by an external institutional review board and informed consent was obtained from eligible individuals prior to participation. A purposive sample of participants were recruited via word of mouth and by distributing recruitment materials (i.e., flyers and palm cards) at various community-based organizations. Participants completed a peer-assisted questionnaire with both closed and open-ended questions.

Study Measures

Demographic Characteristics

The following demographic characteristics were assessed: age, race/ethnicity, city of residence, sexual orientation (i.e., gay or bisexual) or whether male participants reported sex with other men were categorized as men who have sex with men (MSM), gender identity, sex at birth, insurance status, relationship status, education level, monthly household income, employment history, housing status, and years living with HIV.

HIV-Related Stigma Characteristics

We assessed two HIV-related stigma measures, which were pre-determined by the Global Network of People Living with HIV [33, 34] and were modified based on existing HIV stigma scales [36]. We report reliability information in the "Results" section.

Experienced HIV Stigma Participants reported whether or not they had experienced any of 11 discriminatory events within the last 12 months from other people to include being excluded from social gatherings, places of worship, and family activities, gossiped about, verbally insulted, physically harassed or threatened, physically assaulted, sexually rejected, mistreated by other people living with HIV, and discriminated

against by someone at an HIV service organization. Items were summed to create a total score, with higher scores indicating greater levels of experienced HIV stigma.

Consequences of Experienced HIV Stigma Participants were asked to indicate whether they experienced any of 11 potential negative consequences as a result of experienced HIV stigma within the last 12 months to include depression, anxiety, income loss, withdrawal from friends and family members, skipped medications, increased drug and alcohol intake, and avoided health care. Items of reported consequences were summed for each participant to create a total score with higher scores indicating greater consequences of experienced HIV stigma.

Resilience Characteristics

We assessed two resilience characteristics that were pre-determined by the Global Network of People Living with HIV [33, 34] and were modified based on existing scales [36]. We report reliability information in the "Results" section.

Social Support General social support was assessed using a modified 6-item instrument [37] measuring the availability of different forms of social support (i.e., emotional/informational, tangible, affectionate, and positive social interaction). Responses ranged from 0 (none of the time) to 4 (at all of the time). Points were summed and averaged to create a social support index score with higher scores indicating greater levels of social support.

Resilience Assets and Resources Participants responded to eight questions that were adapted from an existing stigma measure to assess resilience assets and resources (RAR) levels within the last 12 months [36]. The modified RAR scale assessed whether or not they challenged or educated someone who was stigmatizing or discriminatory against them and other PLWH, whether or not they knew of and had used community resources to resolve issues of stigma or discrimination, whether or not they had received and provided support to other PLWH, and whether or not they were involved in HIV advocacy. Participants indicated being an asset or using resources by responding "1 = yes" or "0 = no." All responses were summed to create a total RAR score with higher scores indicating greater resilience.

HIV Care Continuum

Two HIV care continuum outcomes were assessed in the study (i.e., engagement in HIV care and viral load results). Engagement in HIV care was self-reported as participants were asked to report when they had their last HIV care visit.

Response options included "within the last year, within the last 6 months, within the last 3 months, more than a year ago, and 'I have never received care related to HIV.'" Viral load results were self-reported as participants were asked to report the results of their most recent viral load test if they had completed one. Response options were "1, undetectable"; "0, detectable"; and "I don't know." Those who did not know their viral load results were excluded from the analyses ($n = 46$).

Data Analysis

We conducted a series of preliminary analyses. Descriptive statistics including means, standard deviations (SD), and Pearson and Spearman correlations among variables were performed. Separate bootstrapping analyses with bias-corrected 95% confidence intervals (CIs) were conducted to examine demographic differences (e.g., city of enrollment, years living with HIV) by key study variables (HIV-related stigma measures, resilience measures, and the HIV care continuum outcomes) by testing for evidence of moderated moderation [38] using the PROCESS macro in SPSS [39] with standard errors estimated using 5000 bootstrapped samples. Models included all two- and three-way interactions among the resilience-specific measure in response to HIV stigma, social support, and experienced HIV stigma to evaluate whether these factors moderated the association between HIV stigma and the HIV care continuum outcomes, and whether this moderation effect varied by levels of social support. We also adjusted for years living with HIV given that persons who have been living with HIV for a longer period of time are more likely to have been exposed to HIV-related stigma, thus, developing adaptive ways to respond to HIV-related stigma [40]. In addition, we adjusted for both race and MSM status as prior research has shown that MSM and African Americans living with HIV may experience intersectional HIV-related stigma based on multiple identities or characteristics to include sexual orientation, race, and HIV status [41–45]. Finally, we included city as a covariate given potential city-specific differences. All analyses were conducted using the IBM SPSS Version 24 software [39].

Results

Demographic Characteristics A total of 300 PLWH were enrolled in the study. Study characteristics are described in Table 1. Most participants were Black (79%), had limited education (63%), were cis gender males (59%), and were unemployed or not working at all (53%). Half of all the participants made ≤ $1000/month and were single, divorced, or widowed. A little over half of all participants had been living with HIV for 10 years or more (60%). Middle-aged and

Table 1 Demographic, HIV stigma, resilience, and health-related characteristics overall and by city of enrollment, Louisiana HIV Stigma Index Project (LA HSP), (N = 300) 2015–2017

Participant characteristics	New Orleans (n, %)	Baton Rouge (n, %)	Total sample (N, %)
Demographic characteristics			
Age			
18–24	6 (4%)	10 (7%)	16 (6%)
25–29	6 (4%)	22 (15%)	28 (9%)
30–39	21 (14%)	34 (23%)	55 (18%)
40–49	46 (31%)	36 (24%)	82 (27%)
50+	71 (47%)	48 (32%)	119 (40%)
Race/ethnicity			
Black	114 (76%)	123 (82%)	237 (79%)
White	24 (16%)	24 (16%)	48 (16%)
Hispanic/Latino	9 (6%)	1 (1%)	10 (3%)
Native American	3 (2%)	0 (0%)	3 (1%)
Missing	0 (0%)	2 (1%)	2(0.7%)
Insurance status			
Uninsured	4 (3%)	15 (10%)	19 (6%)
Medicaid	43 (29%)	35 (23%)	78 (26%)
Medicare	4 (3%)	7 (5%)	11 (4%)
Ryan White	9 (6%)	26 (17%)	35 (12%)
Private insurance	2 (1%)	18 (12%)	20 (7%)
Transgender identity			
Transgender man	1 (0.7%)	0 (0%)	1 (0.3%)
Transgender woman	6 (4%)	7 (5%)	13 (4%)
Sex at birth			
Male	97 (65%)	81 (54%)	178 (59%)
Female	50 (33%)	58 (39%)	108 (36%)
Missing	3 (2%)	11 (7%)	14 (5%)
Men who have sex with men (MSM)	57 (38%)	53 (35%)	110 (37%)
Relationship status			
Married/in a relationship	35 (23%)	71 (47%)	106 (35%)
Single, divorced, or widowed	92 (61%)	57(38%)	149 (50%)
Education			
High school or less	101 (67%)	89 (59%)	190 (63%)
Some college or more	49 (23%)	61(41%)	110 (37%)
Household income (monthly)			
≤ $1000	94 (63%)	56 (37%)	150 (50%)
$1001–$2000	34 (23%)	63 (42%)	97 (32%)
> $2000	14 (9%)	30 (20%)	44 (15%)
Employment status			
Employed (full, part-time, occasional)	38 (25%)	76 (51%)	114 (38%)
Unemployed and not working at all	93 (62%)	66 (44%)	159 (53%)
Looking for work	19 (13%)	8 (5%)	27 (9%)
Housing status			
Homeless presently	24 (16%)	6 (4%)	30 (10%)
Homeless previously	60 (40%)	56 (37%)	116 (39%)
Not homeless	51 (34%)	59 (39%)	110 (37%)
Length of time living with HIV			
Less than 1 year	7 (5%)	8 (5%)	15 (5%)
1–4 years	17 (11%)	31 (21%)	48 (16%)
5–9 years	26 (17%)	30 (20%)	56 (19%)
10–14 years	27 (18%)	36 (24%)	63 (21%)
15+ years	73 (49%)	45 (30%)	118 (39%)
HIV-related stigma characteristics			
Experienced HIV stigma (score and SD)	1.75 (SD = 2.12)	1.73 (SD = 2.47)	1.74 (SD = 2.30)
CES (score and SD)	2.89 (SD = 2.63)	2.67 (SD = 2.76)	2.78 (SD = 2.69)

Table 1 (continued)

Participant characteristics	New Orleans (n, %)	Baton Rouge (n, %)	Total sample (N, %)
Resilience characteristics			
Social support (score and SD)	2.48 (SD = 1.22)	2.85 (SD = 1.02)	2.67 (SD = 1.14)
RAR (score and SD)	3.14 (SD = 2.11)	4.30 (SD = 2.54)	3.73 (SD = 2.40)
HIV care continuum			
HIV care visit within the last 12 months			
Within last 3 months	129 (86%)	102 (68%)	231 (77%)
Within last 6 months	13 (9%)	17 (11%)	30 (10%)
Within last year	5 (3%)	9 (6%)	14 (5%)
More than a year ago	2 (1%)	15 (10%)	17 (6%)
I have never received care for HIV	1 (1%)	7 (5%)	8 (3%)
Self-reported viral load results			
Undetectable	119 (79%)	110 (73%)	229 (76%)
Detectable	14 (9%)	10 (7%)	24 (8%)

CES = consequences of experienced HIV stigma

elderly individuals accounted for the largest proportion (40%) of participants by age group. A relatively high sample of MSM participated in the study (37%; Table 1).

HIV-Related Stigma Characteristics The overall *experienced HIV stigma* score was 1.74 (standard deviation [σ] = 2.30, range = 0–10). Reliability analysis indicated that the 11 items had good internal consistency (Cronbach's α = 0.84). We also present these results by city in Table 1. The most common manifestations of experienced HIV stigma were being gossiped about (53%); verbally insulted, harassed, or threatened (46%); and being excluded from social gatherings or activities (37%). Participants also experienced HIV stigma from individuals who worked for HIV/AIDS service organizations (19%) and from other PLWH (22%).

Consequences of Experienced HIV Stigma Overall consequences of experienced HIV stigma (CES) score was 2.78 (σ = 2.69, range = 0–11). Reliability analysis showed that the 11-item scale had good consistency (Cronbach's α = 0.87). We present the results by city in Table 1. The most common CES were depression (67%), anxiety (59%), and withdrawal from friends and family (33%).

Resilience Characteristics The overall general *social support* score was 2.67 (σ = 1.14, range = 0–4). Reliability analysis showed that the 6 items had very good internal consistency (Cronbach's α = 0.91). The overall *RAR* was 3.73 (SD = 2.40, range = 0–8). Reliability analysis showed that the 8 items had good internal consistency (Cronbach's α = 0.81). We also present these results by city in Table 1. The most common manifestation of RAR was that most participants knew of groups that could support them in responding to experienced HIV stigma (71%).

HIV Care Continuum Outcomes Almost all participants (92%) self-reported an HIV care visit within the last 12 months (Table 1). More than two thirds of participants had seen a doctor for HIV care in the last 3 months (77%; see Table 1). The majority of participants self-reported that their most recent viral load result was undetectable (76%; see Table 1).

Bivariate Associations

The following groups were more likely to report high levels of RAR: participants living in Baton Rouge $r(298)$ = .24, $p < .001$; participants who had been living with HIV for a longer period of time $r(298)$ = .14, $p < .05$; those who reported higher levels of social support $r(298)$ = .39, $p < .001$; those reported an HIV care visit within 3 months $r(298)$ = − .28, $p < .001$; and those who reported an undetectable viral load at their last HIV care visit $r(298)$ = − .32, $p < .001$.

The following groups were more likely to report high levels of social support: participants living in Baton Rouge $r(298)$ = .17, $p < .001$; those who identified as MSM $r(298)$ = − .15, $p < .05$; those who reported higher levels of RAR $r(298)$ = .39, $p < .001$; those reporting fewer consequences of experienced HIV stigma $r(298)$ = − .39, $p < .001$; those who reported lower levels of experienced HIV stigma $r(298)$ = − .38, $p < .001$; those reported an HIV care visit within 3 months $r(298)$ = − .24, $p < .001$; and those who reported an undetectable viral load at their last HIV care visit $r(298)$ = − .27, $p < .001$.

The following groups were more likely to report lower levels of experienced HIV stigma: individuals that do not identify as MSM $r(298)$ = .30, $p < .001$; those who reported higher levels of social support $r(298)$ = − .38, $p < .001$; those who reported an HIV care visit within 3 months $r(298)$ = .18,

$p < .001$; and those who reported an undetectable viral load at their last HIV care visit $r(298) = .14$, $p < .05$. The following groups were more likely to report lower CES: participants who had been living with HIV for a longer period of time $r(298) = -.13$, $p < .05$; individuals that do not identify as MSM $r(298) = .25$, $p < .001$; those who reported higher levels of social support $r(298) = -.39$, $p < .001$; those who reported lower levels of experienced HIV stigma $r(298) = .63$, $p < .001$; and those who reported an undetectable viral load at their last HIV care visit $r(298) = .16$, $p < .001$.

The following groups were more likely to report a recent HIV care visit within the last 3 months: participants living in New Orleans $r(298) = .25$, $p < .001$; those who had been living with HIV for a longer period of time $r(298) = -.33$, $p < .001$; individuals that do not identify as MSM $r(298) = .17$, $p < .001$; those who reported higher RAR levels $r(298) = -.28$, $p < .001$; those who reported higher levels of social support $r(298) = -.24$, $p < .001$; those reporting fewer consequences of experienced HIV stigma $r(298) = .23$, $p < .001$; and those who reported lower levels of experienced HIV stigma $r(298) = .18$, $p < .001$.

The following groups were more likely to be report an undetectable viral load at their last HIV care visit: those who had been living with HIV for a longer period of time $r(298) = -.3$, $p < .001$; those who did not identify as MSM $r(298) = .12$, $p < .05$; those who reported higher RAR levels $r(298) = -.32$, $p < .001$; those who reported higher levels of social support $r(298) = -.27$, $p < .001$; those reporting fewer consequences of experienced HIV stigma $r(298) = .16$, $p < .001$; those who reported lower levels of experienced HIV stigma $r(298) = .14$, $p < .05$; and those who had a more recent HIV care visit within the last 3 months $r(298) = .6$, $p < .001$. See Table 2 for a description of these and other associations.

Goal 1: Examining Whether Social Support and RAR Both Moderated the Relationship Between Experienced HIV Stigma and Length of Time Since HIV Care Visit

A moderated moderation was used to examine hypothesis 1 (Table 3). After adjusting for city of residence, time living with HIV, race, and MSM category, experienced HIV stigma was positively associated with length of time since last doctor's visit $B(SE) = .05(.02)$, $p = .03$, such that those reporting higher levels of experienced HIV stigma reported a longer length of time since their last doctor's visit. RAR was negatively associated with length of time since last doctor's visit. Participants who reported greater levels of RAR reported a shorter length of time since their last HIV care visit $B(SE) = -.10(.03)$, $p < .001$. It was also found that RAR moderated the relationship between social support and length of time since last HIV care visit, $B(SE) = .01(.004)$, $p < .001$. As well, social support significantly moderated the relationship between experienced HIV stigma and time since last HIV care visit $B(SE) = .01(.003)$, $p = .01$. There was also a significant three-way interaction between experienced HIV stigma, social support, and RAR, $B(SE) = .003(.001)$, $p = .03$. Interaction terms are shown in Fig. 1.

Bootstrap analyses demonstrated that at high levels of RAR, social support and experienced HIV stigma significantly affected the length of time since last doctor's visit. At high levels of RAR and high levels of social support, those with higher levels of experienced HIV stigma reported a longer length of time since their last HIV care visit than those who reported lower levels of experienced HIV stigma $(B(SE) = .17(.04)$, $p < .001)$. However, at high levels of RAR and low levels of social support, experienced HIV stigma did

Table 2 Bivariate associations between study variables ($N = 298$)

	City	Time living with HIV	MSM	RAR	Social support	CES	Experienced HIV stigma	HIV care visit	Viral load	Race
City (ref = New Orleans)	1	−.166**	−.013	.242**	.165**	−.040	−.098	.250**	.107	−.080
Time living with HIV (ref = < 1 year)		1	−.092	.143*	.101	−.134*	−.042	−.329**	−.301**	−.124*
MSM (ref = MSM participants)			1	.037	−.147*	.251**	.303**	.167**	.117*	.173**
RAR (ref = low RAR)				1	.387**	−.075	−.034	−.278**	−.321**	−.088
Social support (ref = low social support)					1	−.387**	−.379**	−.235**	−.269**	−.069
CES (ref = low CES)						1	.629**	.225**	.160**	.035
Experienced HIV stigma (ref = low experienced HIV stigma)							1	.183**	.140*	.009
HIV care visit (ref = within 3 months)								1	.611**	.013
Viral load (ref = undetectable viral load)									1	.063
Race (ref = Black participants)										1

MSM = men who have sex with men, RAR = resilience assets and resources, CES = consequences of experienced HIV stigma, ref = reference group, $*p < .05$, $**p < .001$

Table 3 The moderating effects of social support and RAR on the relationship between experienced HIV stigma and time since last HIV care visit

Experienced HIV stigma and last HIV care visit ($N = 294$)

Model summary

R			R^2	MSE	F	df1	df2	p
.59			.35	.67	13.89	11	282	.00**

Model

	B	SE	t	p	LLCI	ULCI
Constant	1.08	.30	3.60	.00**	.49	1.68
RAR	− .10	.03	− 4.04	.00**	− .15	− .05
Experienced HIV stigma	.05	.02	2.13	.03*	.004	.09
Experienced HIV stigma × RAR	.005	.01	.51	.61	− .01	.02
Social support	− .01	.01	.86	.39	− .02	.01
Experienced HIV stigma × social support	.01	.003	2.78	.01*	.003	.02
RAR × social support	.01	.004	3.46	.00**	.005	.02
Experienced HIV stigma × social support × RAR	.003	.001	2.14	.03*	.002	.01
New Orleans vs. Baton Rouge	.63	.10	6.05	.00**	.42	.84
Length of time living with HIV	− .15	.04	− 3.65	.00**	− .23	− .07
MSM	.25	.10	2.39	.02*	.04	.45
Race	− 12	.12	− .93	.35	− .36	.13

RAR = resilience assets and resources, *MSM* = men who have sex with men, *$p < .05$, **$p < .001$

not influence the length of time since their last HIV care visit (B(SE) $= − .05(.05)$, $p = .31$). At low levels of RAR, the relationship between experienced HIV stigma and length of time since last HIV care visit did not depend on levels of social support (p's $> .25$).

Goal 2: Examining Whether Social Support and RAR Both Moderated the Relationship Between CES and Length of Time Since Last Doctor's Visit

A moderated moderation was used to examine whether social support and RAR both moderated the relationship between CES and length of time since last HIV care visit (Table 4).

After controlling for city of residence, length of time living with HIV, race, and MSM category, CES was positively associated with length of time since last doctor's visit. Those who experienced greater CES reported a longer length of time since their last doctor's visit B(SE) $= .04(.02)$, $p < .05$. RAR was also negatively associated with length of time since last doctor's visit. Those with greater levels of RAR reported a shorter length of time since their last doctor's visit B(SE) $= − .11(.03)$, $p < .001$. However social support neither independently nor collectively moderated the relationship between CES and length of time since last doctor's visit (p's $> .35$). There was a significant interaction between social support and RAR, B(SE) $= .01(.004)$, $p < .05$. Bootstrap analyses

Fig. 1 Three-way interaction of experienced HIV stigma, social support, and RAR on HIV care visits. The conditional influence of experienced stigma on length of time since last HIV-related doctor's visit as a function of social support and resilience assets and resources (RAR). High and Low correspond to values of Social Support, Experienced Stigma, and RAR equal to 1 standard deviation above and 1 standard deviation below the mean. Higher scores on length of time since doctor's visits correspond to longer report time since last HIV care visit
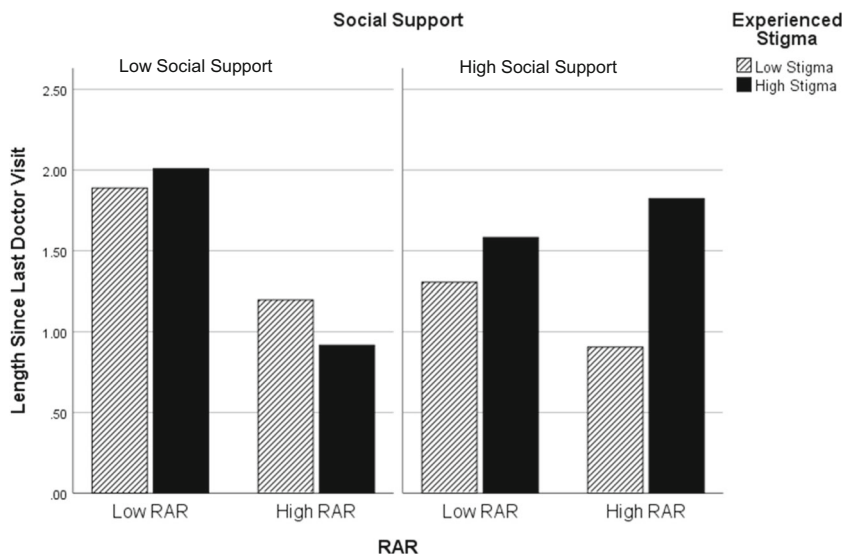
Table 4 The moderating effects of social support and RAR on the relationship between CES and length of time since last HIV care visit

CES and time since last HIV care visit (N = 296)

Model summary

R	R^2	MSE	F	df1	df2	p
.57	.32	.71	12.15	11	282	.00

Model

	B	SE	t	p	LLCI	ULCI
Constant	1.16	.31	3.75	.00**	.55	1.77
RAR	− .11	.03	− 4.52	.00**	− .16	− .06
CES	.04	.02	1.96	.05*	.00	.09
CES × RAR	− .00	.01	− .49	.62	− .02	.01
Social support	− .01	.01	− .85	.40	− .02	.01
CES × social support	.003	.003	.78	.44	− .004	.01
RAR × social support	.01	.004	2.80	.005*	.003	.02
CES × RAR × social support	.001	.001	.66	.51	− .002	.004
New Orleans vs. Baton Rouge	.57	.11	5.37	.00*	.36	.77
Length of time living with HIV	− .15	.04	− 3.68	.00**	− .23	− .07
MSM	.26	.10	2.46	.01*	.05	.46
Race	− .12	.13	− .91	.36	− .37	.13

RAR = resilience assets and resources, CES = consequences of experienced HIV stigma, MSM = men who have sex with men, *p < .05, **p < .001

demonstrated that at lower levels of social support, those with low levels of RAR reported a longer length of time since last doctor's visit than those with higher RAR levels, B(SE) = .01(.004), p = .004 (see Fig. 2).

Goal 3: Examine Whether Resilience Factors Moderated the Relationship Between Experienced HIV Stigma and Viral Load Results

A moderated moderation was used to examine whether social support and RAR both moderated the relationship between experienced HIV stigma and viral load result (Table 5). After controlling for city of residence, years living with HIV, race, and MSM category, RAR B(SE) = − .09(.02), p < .001, was significantly related to reporting an undetectable viral load. Those who reported higher levels of RAR reported having an undetectable viral load at last visit. Experienced HIV stigma was not significantly related to reporting an undetectable viral load (p = .15). There was a significant interaction between experienced HIV stigma and social support, B(SE) = .005(.002), p < .05. Bootstrap analyses demonstrated that at higher levels of social support, those who experienced

Fig. 2 Interaction of social support and RAR on length of time since HIV care visit. The conditional influence of social support on length of time since last HIV-related doctor's visit as a function of resilience assets and resources (RAR). High and Low correspond to values of Social Support and RAR equal to 1 standard deviation above and 1 standard deviation below the mean. Higher scores on length of time since doctor's visits correspond to longer report time since last HIV care visit
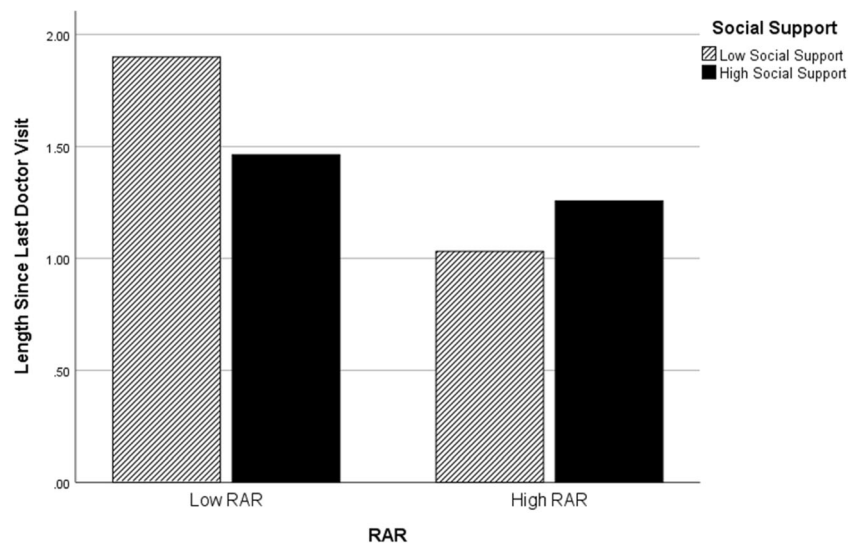
Table 5 The moderating effects of social support and RAR on the relationship between experienced HIV stigma and undetectable viral load

Experienced HIV stigma and undetectable viral load ($N = 293$)

Model summary

R	R^2	MSE	F	df1	df2	p
.48	.23	.44	7.83	11	281	.0000

Model

	B	SE	t	p	LLCI	ULCI
Constant	1.40	.24	5.77	.00**	.92	1.88
RAR	− .09	.02	− 4.38	.00**	− .01	− .06
Experienced HIV stigma	.03	.02	1.45	.15	− .01	.06
Experienced HIV stigma × RAR	− .01	.01	− .82	.41	− .02	.01
Social support	− .01	.01	− 1.78	.08	− .03	.001
Experienced HIV stigma × social support	.005	.002	2.07	.04*	.00	.01
RAR × social support	.002	.002	.60	.55	− .004	.01
Experienced HIV stigma × social support × RAR	.00	.001	. 31	.90	− .002	.002
New Orleans vs. Baton Rouge	.26	.09	3.11	.002*	.09	.43
Length of time living with HIV	− .12	.03	− 3.53	.00**	− .18	− .05
MSM	.12	.08	1.47	.14	− .04	.29
Race	− .005	.10	− .05	.96	− .20	.19

RAR = resilience assets and resources, CES = consequences of experienced HIV stigma, MSM = men who have sex with men, *$p < .05$, **$p < .001$

lower levels of stigma were more likely to report an undetectable viral load than those who higher had levels of stigma, $B(SE) = − .13(.03)$, $p < .001$ (see Fig. 3).

Goal 4: Examine Whether Resilience Factors Moderated the Relationship Between the Consequences of Experienced HIV Stigma and Viral Load Results

A moderated moderation was used to examine whether social support and RAR both moderated the relationship between CES and viral load results (Table 6). After adjustment, RAR, $B(SE) = − .07(.02)$, $p < .001$, and social support, $B(SE) = − .02(.01)$, $p < .05$, were significantly related to reporting an undetectable viral load. Those who reported higher RAR and social support levels also reported having an undetectable viral load at most recent HIV care visit. CES was not significantly related to reporting an undetectable viral load ($p = .61$). It was also found that social support and RAR both moderated the relationship between CES and viral load. This interaction term was statistically significant between social support and RAR, $B(SE) = .006(.003)$, $p < .05$, and between CES, RAR, and social support, $B(SE) = .002(.001)$, $p < .05$. Bootstrap analyses demonstrated that at lower RAR levels and higher levels of social support, those with greater CES were more likely to report an undetectable viral load at last visit than those who reported lower levels of CES ($B(SE) = − .09(.04)$, $p = .04$). However, at low RAR levels and low levels

of social support, CES did not influence viral load result at last visit, $B(SE) = .03(.02)$, $p = .25$. At high RAR levels, the relationship between CES and viral load result did not depend on the levels of social support (p's $> .40$; see Fig. 4).

Discussion

In general, RAR was protective for regular HIV care visits. That is, participants who reported greater levels of RAR reported a shorter length of time since their last HIV care visit. However, even at high resilience levels for both RAR and social support, those reporting high levels of experienced HIV stigma were more likely to report delays in HIV care visits (goal 1). This may point to the limiting protective effects of these resilience characteristics. Participants reporting greater consequences of stigma also reported delays in HIV care visits. Compared with social support, RAR may be more protective in the relationship between CES and delays in HIV care visits (goal 2).

Surprisingly, we did not find an association between experienced HIV stigma and viral results. This may be in part due to the fact that the majority of our sample had been living with HIV for a longer period of time and had already developed some level of resilience in response to HIV stigma as we observed an association between RAR and likelihood of reporting an undetectable viral load, with higher levels of RAR associated with a greater likelihood of reporting an

Fig. 3 Interaction of experienced stigma and social support on viral load at last visit. The conditional influence of experienced stigma on length of time since last HIV-related doctor's visit as a function of social support. High and Low correspond to values of Experienced Stigma and Social Support equal to 1 standard deviation above and 1 standard deviation below the mean. Higher scores on viral load at last doctor's visits correspond to detectable viral load
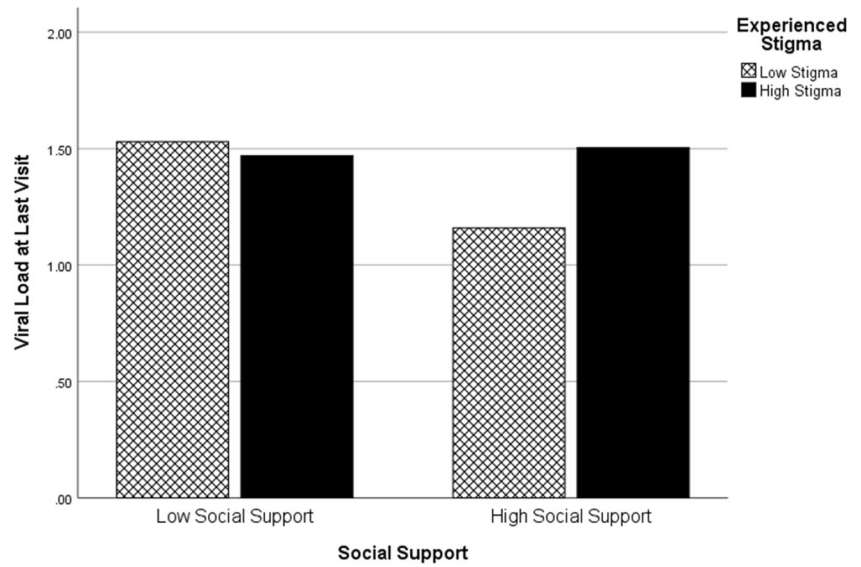
undetectable viral load. Compared with social support, RAR may also be protective in the relationship between experienced HIV stigma and likelihood of reporting an undetectable viral load (goal 3). We also did not find an association between CES and viral load results. However, both RAR and social support may be protective in the relationship between CES and viral load results (goal 4).

This is one of few HIV stigma–specific studies in the South [5]. A predominantly older African American sample with low socio-economic circumstances (e.g., income,

education, housing instability) was enrolled in the LA HSIP study. The most common experience of HIV stigma was being gossiped about. As in previous research, our findings indicate that experienced HIV stigma manifests in suboptimal consequences (e.g., depression and social isolation) as these were the most common consequences of experienced HIV stigma [23, 27]. The most common manifestation of RAR was that most participants knew of groups that could support them in responding to HIV stigma. Moderate levels of social support were also reported among study participants.

Table 6 The moderating effects of social support and RAR on the relationship between CES and undetectable viral load

CES and undetectable viral load ($N = 254$)

Model summary

R	R^2	MSE	F	df	d	p
.50	.25	.49	8.35	11	282	.0000

Model

	B	SE	t	p	LLCI	ULCI
Constant	1.38	.26	5.37	.00**	.88	1.89
RAR	−.07	.02	−3.51	.00**	−.11	−.03
CES	−.01	.02	−.50	.61	−.05	.03
CES × RAR	.008	.008	.98	.33	−.01	.02
Social support	−.02	.01	−2.43	.02*	−.03	−.003
CES × social support	−.003	.003	−1.08	.28	−.01	.002
RAR × social support	.006	.003	1.97	.05*	.00	.01
CES × social support × RAR	.002	.001	2.08	.04*	.00	.005
New Orleans vs. Baton Rouge	.20	.09	2.32	.02*	.03	.38
Length of time living with HIV	−.11	.03	−3.05	.003	−.17	−.04
MSM	.17	.09	1.91	.06	−.005	.34
Race	−.03	.11	−.24	.81	−.23	.18

RAR = resilience assets and resources, CES = consequences of experienced HIV stigma, MSM = men who have sex with men, *$p < .05$, **$p < .001$

Fig. 4 Three-way interaction of experienced HIV stigma, social support, and RAR on viral load at last visit. The conditional influence of experienced stigma on viral load at last HIV-related doctor's visit as a function of social support and resilience assets and resources (RAR). High and Low correspond to values of Social Support, Experienced Stigma, and RAR equal to 1 standard deviation above and 1 standard deviation below the mean. Higher scores on viral load at last doctor's visits correspond to detectable viral load
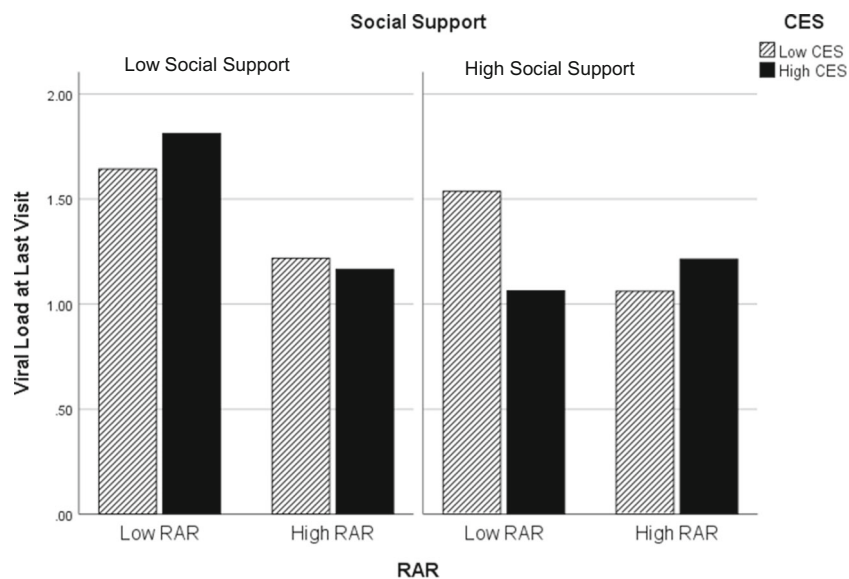
Study Limitations

There are several limitations to our study. First, our analyses were conducted with a convenience sample of 300 PLWH; thus, our results are limited to the experiences of these participants enrolled in the LA HSIP and cannot be generalized to a broader population of PLWH. Second, the cross-sectional nature of the study also limits our conclusions about causal inferences between the constructs examined. Third, most participants were recruited from HIV service providers and are thus more reflective of PLWH in HIV care. Fourth, previous studies have identified other resilience characteristics such as stigma dismissal or using spirituality to cope with the stigmatizing experience [46–50]. These characteristics were not assessed in the current study. Fifth, we used a general social support measure and did not specifically assess the source of the support and an individual's satisfaction with the support within the context of HIV stigma [46, 51]. This may be particularly relevant for individuals with intersecting marginalized identities (e.g., Black men who have sex with men) who may seek out different sources of social support that are not tied to rejection of their HIV status and/or sexuality [46, 51, 52]. Lastly, HIV care engagement and viral load results were self-reported and not confirmed with other supporting or clinical data that may have resulted in social desirability bias in the responses.

Conclusions

Future longitudinal research should be conducted to examine the extent to which these resilience characteristics

act as moderators of the associations between HIV stigma and the HIV care continuum. The current study used two measures of resilience including a resilience-specific measure within the context of HIV stigma. The current work has implications for intervention development. First, these findings indicate that there already exists some level of resilience among a provider-based/clinic population of PLWH. Moreover, resilience likely plays an important protective role within the context of HIV care. In addition, we find that there may be some limitations to resilience that require multi-component or more intensive interventions that move beyond resilience only interventions. For example, interventions that enhance the RAR and social support components might be useful, particularly among MSM, and persons who have been living with HIV for a shorter period of time, both which seemed to experience high levels of HIV stigma and report lower levels of resilience in this analysis. There are several social support type interventions that engage PLWH in their care that might be leveraged in this type of context [53, 54]. For example, Project nGage was found to improve HIV care through the utilization of an organic social support network [53]. Project nGage focused on the intersection of identities that seem to be highly relevant from the current analysis, namely Black and sexual and gender minority individuals [53]. Project nGage did not include resilience type interventions and while improving retention in HIV care did not impact viral load results. To increase the impact of our interventions, we may need combination interventions, such as a combination of social support and resilience type interventions which would be considered to have a greater impact on most vulnerable communities. Research to example the dimensions of

RAR and social support as it relates to HIV stigma would also be beneficial.

Compliance with Ethical Standards

Conflict of Interest   Dr. Brewer currently serves as an advisor to ViiV Healthcare's Accelerate Initiative.

Ethical Approval   All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Institutional Review Board approval was obtained for the study.

Informed Consent   Informed consent was obtained from all interviewed participants in the study.

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