



Experienced HIV-Related Stigma and Psychological Distress in Peruvian Sexual and Gender Minorities: A Longitudinal Study to Explore Mediating Roles of Internalized HIV-Related Stigma and Coping Styles

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Abstract

Experiencing HIV-related stigma has important impacts on the mental health of people living with HIV, which has implications for treatment adherence, disease progression, and health outcomes. The impacts of stigma are particularly important to consider among sexual and gender minorities, who often face a disproportionate burden of HIV. To address the implications of stigma in these key populations, we leveraged a longitudinal study conducted among Peruvian sexual and gender minorities to compare the relative effects of multiple mediators affecting the relationship between experienced HIV-related stigma and psychological distress: internalized HIV-related stigma, adaptive coping, and maladaptive coping. HIV-related stigma, coping, and distress were measured, respectively, at 24 weeks, 36 weeks, and 48 weeks post-diagnosis for 145 participants from the Sabes Study. HIV-related maladaptive coping largely mediated the relationship between experienced HIV-related stigma and distress. Our findings suggest interventions targeting maladaptive coping may alleviate the mental health consequences of experiencing HIV-related stigma.

Keywords HIV · Stigma · Coping · Psychological distress

Introduction

Mental health plays a critical role in successful treatment adherence, delay of disease progression, and positive health outcomes for people living with HIV (PLWH) [1–6]. Importantly, during the 1st year after diagnosis, 37% of PLWH experience depressive symptoms and 54% report HIV-related psychological distress [7–13]. A major contributing

factor to mental health outcomes is HIV-related stigma [14–23]. HIV-related stigma is generally understood within Goffman’s seminal work [24], wherein stigma is defined as “an attribute that is significantly discrediting” to societies. Consequently, experienced HIV-related stigma or the societal, cultural, and interpersonal rejection of people living with this attribute (HIV seropositive status) is justified. A substantial body of literature has examined *how* living in societal contexts with negative attitudes toward PLWH, the ‘experienced’ facet of HIV-related stigma [25], is associated with mental health [12, 15–18, 20–23, 26–30]. A significant proportion of this literature has focused on the different contexts that subpopulations (e.g., racial/ethnic minorities, sexual and gender minorities, women) face within the United States [12, 15, 16, 21, 26–28]. There is also a growing body of literature examining how HIV-related stigma affects mental health across different populations in other countries and contexts [17, 18, 20, 22, 23, 29, 30]. Longitudinal data regarding this relationship would be particularly helpful for establishing causal relationships. Another need

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concerns comparing different theoretical mechanisms underlying the impact of experiencing negative attitudes toward HIV, including internationalization of those attitudes (internalized HIV-related stigma) and coping in response to one's diagnosis (HIV-related coping) [16–18, 21, 23, 26–28]. The current longitudinal study addresses these gaps in the literature by: (1) providing more information regarding the longitudinal relationship between HIV-related stigma and mental health among Peruvian sexual and gender minorities; and, (2) comparing relative effects of three potential mediators: internalized HIV-related stigma, HIV-related maladaptive coping, and HIV-related adaptive coping.

Peruvian HIV Disparities, Mental Health Among PLWH, and Experienced HIV-Related Stigma

We focus on the experiences of Peruvian men who have sex with men (MSM) and transgender women (TW), given the disproportionate burden of HIV MSM and TW face in Peru as well as the limited literature regarding stigma and depression among Peruvian populations. First, HIV prevalence rates for MSM and TW are 12.4% and 30–49%, respectively, compared to .4% for the general Peruvian population [31–33]. The concentration of the epidemic among MSM and TW is stark compared to other high-risk groups in Peru [e.g., cisgender female sex workers (HIV prevalence rate of 0.5%)] [34]. These disparities should be understood through the lens of HIV vulnerability [33, 35, 36], defined in terms of factors at individual, community, and societal levels [37]. At the individual level, the behavioral factors that contribute most to HIV disparities in Peru appear to be sexual rather than based on drug use, including low condom use, sex work, rape, number of sex partners, and comorbid infections (e.g., syphilis; [34, 35]). Recent modeling studies have further highlighted the importance of sexual roles with regard to Peru's specific epidemic, highlighting greater receptive-to-insertive partner transmission relative to the United States epidemic [38]. Such behavioral factors do not however occur in a vacuum. Indeed, negative societal attitudes toward MSM and TW may contribute to the sexual risk factors described above in terms of cultural perceptions (e.g., connecting insertive sex roles with masculinity and reduced HIV risk), power dynamics (e.g., low condom use due to forced sex and power dynamics with heterosexual-identified partners and/or socioeconomically affluent clients), and limited culturally astute healthcare centers [35]. Second, studies have shown wide variation in mental health among Peruvians living with HIV (e.g., 7–49% of samples with depressive symptoms; [39–41]). These high rates underscore the importance of identifying determinants of mental health problems among Peruvian PLWH. Yet, we are aware of only three cross-sectional studies that have explored how experienced HIV-related stigma is associated

with mental health outcomes among Peruvian PLWH [29, 30, 42]. Notably, studies have documented a relationship between stigma and mental health—specifically depression—but have had few, if any, MSM and TW represented in the sample [29, 30, 42]. These studies have not found significant differences by sexual and gender identity, potentially due to small sample sizes. This is surprising, given MSM and TW represent the majority of PLWH in Peru. Thus, our study offers important contributions noted above with regard to the literature on stigma and mental health overall, but also specifically offers insight into how these factors manifest and intersect for Peruvian MSM and TW.

Experienced HIV-Related Stigma and Mental Health: Theorized Mechanisms and Gaps

Understanding *how* experienced HIV-related stigma leads to poor outcomes, including mental health, is a major research priority and has been a focus for several, independent conceptual models [17, 21, 26–28]. Of which we are aware, the examination of factors that mediate the relationship between experienced HIV-related stigma and mental health has not been studied in Peru. Such work is warranted, given how experienced HIV-related stigma manifests, how people respond to negative experiences, and how that impacts their mental health may be dependent on populations' contexts.

We focus on psychological distress in this study, which includes two common theoretical and measured mental health indicators in the context of stigma: depressive symptoms and symptoms of trauma after receiving a positive HIV diagnosis [16–18, 21, 26–28]. In line with Goffman's work, we define experienced HIV-related stigma as discrimination, rejection, and exclusion at interpersonal and societal levels due to a positive HIV serostatus [11, 12, 21, 23, 43–49]. An interpersonal example of experienced HIV-related stigma would be a healthcare provider administering poor care due to knowledge of the patient's positive HIV status. A societal or structural example of experienced HIV-related stigma would be limiting government funds and resources available to facilitate PLWH's access to high quality healthcare. We draw on research which includes a number of different countries and contexts, in order to include a large, diverse body of research and theory regarding HIV-related stigma. Nonetheless, the relationships of HIV-related stigma to health outcomes likely vary between contexts and countries, due to how HIV-related stigma manifests (e.g., at what level, type of discrimination).

There are multiple potential mediators affecting the negative impacts of experienced HIV-related stigma on distress. The first potential mechanism underlying this relationship is *internalized stigma*, another facet of HIV-related stigma conceptualized by Goffman and other leaders in stigma research [11, 14, 15, 19, 21, 25, 32]. For the current study,

we define internalized HIV-related stigma as the internalization of negative societal attitudes and patients' subsequent self-rejection and blame. Under this theoretical scenario, experienced HIV-related stigma may cause high levels of internalized HIV-related stigma, resulting in negative emotional consequences and poorer mental health (e.g., depression, psychological distress). Some empirical literature supports this scenario [12, 15, 16, 19–21, 27, 28, 50].

Other potential mechanisms underlying the relationship between experienced HIV-related stigma and psychological distress are coping styles [50], including *HIV-related adaptive coping* and *maladaptive coping*. Coping strategies are defined here as adaptive if they have been associated with reduced distress (e.g., active coping, planning, and social support; [28]). Coping strategies are defined here as maladaptive if associated with greater distress (e.g., denial and substance use [6]). Experienced HIV-stigma is theorized to result in greater maladaptive coping and less adaptive coping, leading to worse mental health outcomes [16, 18, 19, 28, 43, 49]. Some empirical data exists to support these theoretical relationships, although most literature has identified substance use coping as particularly important as an HIV-related maladaptive coping strategy [18, 19, 32, 47] and social support coping as particularly important as an HIV-related adaptive coping strategy [16, 18, 19, 50, 51]. It should be noted that another way to classify coping strategies is as problem- or emotion-focused [52]. Under this classification, strategies are conceptualized in terms of whether coping is used to mitigate stressors directly (problem-focused) versus reducing negative emotional reactions to the stressors (emotion-focused). For the current study, we focus on adaptive and maladaptive emotion-focused coping strategies (i.e., coping with reactions to one's HIV seropositive diagnosis), given our interests in understanding the impact of experienced HIV-related stigma on distress, an affective outcome.

Multiple gaps exist in the literature concerning mechanisms underlying experienced HIV-related stigma and

psychological distress. First, most work has been cross-sectional in nature [15, 18, 20–22, 43, 50]. Relatively little work has had access to and leveraged longitudinal data to explore the temporal associations between experienced HIV-related stigma, internalized HIV-related stigma, HIV-related coping, and distress. Second, most research has focused on a single mediator at a time [16, 19, 21, 23, 49, 50]. Relatively little research has compared different mechanisms simultaneously, especially internalized stigma and coping. Such information is important; predominant mechanisms may be particularly helpful to target in intervention and program delivery.

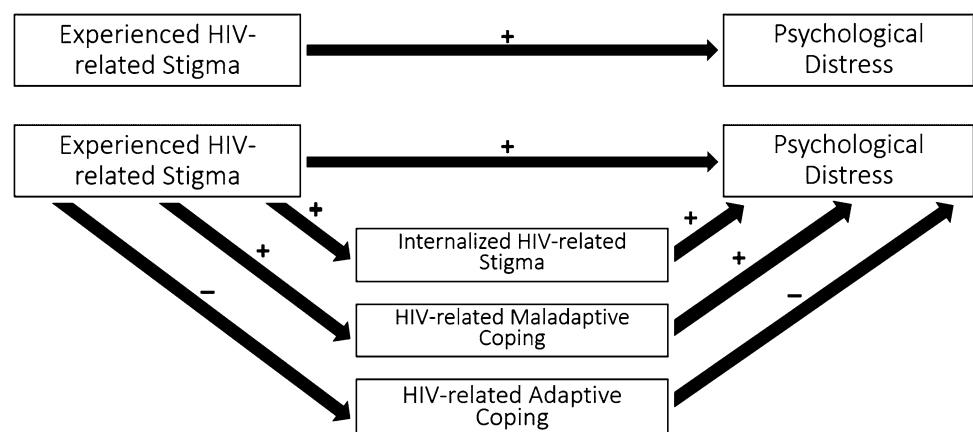
Current Study

The objectives of the current study were to: (1) characterize the relationship between HIV-related stigma and mental health among Peruvian sexual and gender minorities across time; and, (2) compare relative effects of three potential mediators: internalized HIV-related stigma, HIV-related maladaptive coping, and HIV-related adaptive coping. To achieve these objectives, we leveraged longitudinal data from the Sabes Study, a Seek-Test-Treat-Retain (STTR) cohort study that enrolled recently HIV-infected MSM and TW in Lima, Peru. Figure 1 depicts our overarching conceptual model, including the predictor, mediators, and outcome as well as the hypothesized direction of each relationship. We hypothesize that within this cohort:

H1 Experienced HIV-related stigma will be associated with higher levels of internalized HIV-related stigma and, consequently, lead to higher levels of distress over time.

H2 Experienced HIV-related stigma will be associated with higher levels of maladaptive HIV-related coping and, consequently, lead to higher levels of distress over time.

Fig. 1 Conceptual framework



H3 Experienced HIV-related stigma will be associated with lower levels of adaptive HIV-related coping, which will be associated with lower levels of distress over time.

Methods

The Sabes Study was a NIH-funded collaboration between American and Peruvian researchers. In total, there were four study sites wherein participants could enroll and complete pre-diagnosis survey questionnaires. There were two study sites for post-diagnosis procedures for participants who received a positive diagnosis and remained enrolled in the parent study.

Details regarding this study design have been published previously [53]. In short, a total of 3337 participants were recruited by peer educators from clinics and communities in Lima, Peru, where disparities in HIV infection are particularly great [11, 14, 31]. Participants were eligible if they were assigned male sex at birth, reported sex with a male partner in the previous 12 months, were ≥ 18 years of age, were unaware of their HIV status, and were at high risk for HIV acquisition (i.e., inconsistent condom use, self-identification as sex worker). We conducted point-of-care HIV antibody testing (Alere Determine™ HIV-1/2) and RNA testing (IQuum's lab-in-a-tube test for plasma HIV-1 RNA) after providing informed consent and completing a baseline survey via a computer-assisted self-interview (CASI) at one of four study sites. Of those who tested HIV uninfected at screening, 2109 individuals agreed to participate in HIV testing at monthly intervals. Participants who tested positive in point-of-care assays at baseline and had a recent documented prior negative HIV test, as well as those who tested positive during follow-up, were immediately referred to the study clinic. Results from HIV RNA tests were available within 1 day of testing and participants who tested positive were also linked to the study clinic.

The 244 individuals who received a new HIV-positive diagnosis were subsequently screened to be enrolled into a randomized ART study at one of two study sites. The median number of days between study enrollment and date of diagnosis was 6. Eligibility criteria were: recently acquired HIV

infection, defined as either acute infection (HIV seronegative and positive for HIV RNA) or recent infection (HIV seropositive with a documented negative HIV test within the past 3 months); no prior ART exposure; normal hematological, renal and liver function; and providing informed consent to participate in a randomized ART study. There were 216 participants who met these criteria and agreed to participate in a study on effects of timing of ART initiation.

Eligible participants were enrolled in a 48 week study in which they were randomized one-to-one to start ART immediately or to defer ART initiation for 24 weeks. In total, 104 (48%) participants were randomized to the immediate arm and 111 (51%) to the deferred arm. ART was initiated prior to 24 weeks for some participants in the deferred ART arm who met local criteria for ART initiation. Thus, all participants, regardless of randomization arm, received ART at or before they met Peruvian ART initiation criteria [CD4+ cell counts ≤ 500 cells/mm³ (changed from ≤ 350 cells/mm³ in December 2014) or their illness was diagnosed as meeting WHO clinical stage 3 or 4]. In the first 2 months following randomization, clinical visits occurred at 1, 2, 4, 6, and 8 weeks. For the remaining follow-up period, clinical visits occurred at monthly intervals (12, 16, 20, 24, 28, 32, 36, 40, 44 and 48 weeks post-randomization). Surveys were completed at pre-diagnosis enrollment (demographic factors), post-diagnosis randomization (HIV-related distress, HIV-related coping (adaptive, maladaptive), 24 weeks post-randomization (HIV-related stigma), 36 weeks post-randomization (HIV-related distress, HIV-related coping), and 48 weeks post-randomization (depressive symptoms, HIV-related distress; Table 1). Participants were provided with fifteen soles (approximately 5.75 dollars) and transportation costs for each study visit.

The current study extracted measures on level of distress, and coping strategies at the 24, 36, and 48 week study clinic visit, and collected information on experienced stigma, internalized stigma, and symptoms of depression at the 24 and 48 week study clinic visit respectively. We include participants that had completed at least 80% of survey instruments concerning HIV-related stigma, HIV-related coping, and psychological distress at the time points of interest. Of note, participants were enrolled at four study sites; after HIV

Table 1 Sabes Study timing of survey administration

Study visit	Constructs
Pre-diagnosis study enrollment/initial HIV testing	Demographic factors (age, education, income sexual/gender identity)
Post-diagnosis randomization	HIV-related distress HIV-related coping (adaptive, maladaptive)
24 Weeks	HIV-related stigma (experienced, internalized)
36 Weeks	HIV-related distress HIV-related coping (adaptive, maladaptive)
48 Weeks	Depressive symptoms HIV-related distress

diagnosis, participants were followed at two of these sites. Thus, baseline data were collected at four sites and post-diagnosis data on HIV-related stigma, HIV-related coping, and psychological distress was collected at two of these sites. Study team assistance of interviewees was standardized and consistent. Participants who tested HIV+ at the initial visit completed the post-diagnosis survey instruments shortly thereafter, whereas participants who acquired HIV during follow-up attended an additional 1–20 monthly testing visits (which did not collect data on coping and stigma) prior to completing the post-diagnosis surveys.

Measures

Demographic, Clinical/Study-Related, and Psychosocial Covariates

During the initial HIV screening visit but before HIV testing itself, participants answered standard demographic questions (age, education, sexual/gender identities, monthly income). Study records were used to obtain clinical information and information pertaining to the study (diagnosis at initial versus subsequent visits, recent or acute infection, randomization-study arm). We also used measurements of HIV-related coping (Carver's Brief COPE, see below; Cronbach's alphas: 0.72–0.86) and HIV-related distress (Impact of Events Scale-Revised, see below; Cronbach's alpha=0.96) at the time of randomization as covariates in models.

Experienced and Internalized HIV-Related Stigma at 24 Weeks Post-diagnosis

HIV-related stigma was measured at the study visit 24 weeks after diagnosis with an instrument containing sub-scales for experienced and for internalized stigma that had been developed for HIV-positive Latino gay, bisexual, and transgender (GBT) individuals in the US [54, 55]. Experienced HIV-stigma was the sum of responses to 13-items (examples include "Some friends have grown more distant from me after they learned I have HIV/AIDS" and "I have encountered embarrassing situations because I have HIV/AIDS."). Internalized stigma was the sum of 8-items (examples include "I sometimes feel ashamed of having HIV/AIDS" and "I feel that I am a burden to others because I have HIV/AIDS."). All response categories were provided on a 4-point Likert scale (0="Strongly disagree" to 3="Strongly agree."). Scree plots, exploratory factor analysis and parallel analysis on the parent study's sample suggested a 2-factor solution best fit the data (eigenvalues: 9.9, 1.9; factor loadings: >0.40). The Cronbach's alphas for this sample for experienced and internalized HIV-related stigma at 24 weeks were respectively 0.91 and 0.89. Scores and distributions in

our sample were comparable to previous research among US-based Latino GBT individuals.

HIV-Related Coping at 36 Weeks Post-diagnosis

At the randomization and 36 weeks post-diagnosis study visits, we collected responses to the eleven 2-item subscales from Carver's Brief COPE to assess participants' coping styles in relation to how they were handling their HIV diagnosis [56]. Before the instrument was provided, participants read a prompt that noted there are multiple ways to cope with problems and that the study team was interested in learning how they were coping with their new HIV diagnosis. This instrument has been validated in Spanish [57]. Response categories were provided on a 4-point Likert scale (1="I haven't been doing this at all" to 4="I've been doing this a lot"). Items for these subscales were summed, such that greater summary scores indicated greater frequency of using a particular type of coping style. We classified scales as adaptive and maladaptive, based on previous studies [28, 44, 57] and higher-order exploratory factor analyses with promax rotation, as recommended by Carver [56].

Across the different time points, a 2-factor solution appeared to fit the data best (eigenvalues: 3.7 and 2.1 at randomization, 4.8 and 2.2 for 36 weeks; factor loadings of ≥ 0.40). Adaptive and maladaptive coping summary scores represent standardized composite scores based on the exploratory factor analyses, wherein the mean is set to zero. Individual coping styles that positively loaded onto the higher-order adaptive coping factor included: self-distraction ("I focused on continuing to work, or continuing to do other activities or things to distract my mind"); adaptive coping ("I concentrated my efforts on doing something about the situation I found myself in"); emotional support ("I've been getting comfort and understanding from someone"); planning ("I tried to create a strategy to know what to do"); acceptance ("I accepted the reality of what had occurred"); spirituality ("I tried to find support in my/a religion or in my spiritual beliefs"); positive reappraisal ("I've been looking for something good in what is happening"); and, humor ("I've been making jokes about it"). Individual coping styles that positively loaded onto the higher-order maladaptive coping factor included: denial ("I've been saying to myself this isn't real"); substance use ("I drank alcohol or used drugs to feel better"); and, behavioral disengagement ("I didn't confront the situation I found myself in"). Cronbach's alphas for adaptive and maladaptive coping at 36 weeks were respectively 0.91 and 0.79.

Psychological Distress at 48 Weeks Post-diagnosis

We used two instruments to measure psychological distress at the 48 week visit.

To measure depressive symptoms, we used the 10-item Center for Epidemiologic Studies Depression Scale (CES-D 10). The items in the CES-D tool were scored with a 4-point Likert scale (0 = “Rarely or none of the time” to 3 = “Most of the time”). Two sample items for CES-D are “I felt depressed” and “I felt that everything I did was an effort”.

To measure HIV-related distress, we used the Impact of Events Scale-Revised (IES-R). Both have been validated among Spanish-speaking populations [58–61]. The CES-D 10 was measured at 24 and 48 weeks. The IES-R was measured at the randomization visit (week 0) and every 12 weeks afterward. Participants were asked to consider different symptoms of trauma related to their HIV-related diagnosis. Two sample items for IES-R were “I thought about it [HIV-related diagnosis] when I didn’t mean to” and “I was aware that I still had a lot of feelings about it [HIV-related diagnosis], but I didn’t deal with them.” The IES-R tool was scored with a 5-point Likert scale (0 = Not at all to 4 = Extremely).

Preliminary analyses suggested a high correlation ($r = 0.68$). Given this, we created a standardized composite score for 48 weeks, based on the exploratory factor analyses with the CES-D and IES-R. We did however conduct sensitivity analyses wherein we examined each factor separately. The Cronbach’s alpha for the psychological distress composite at 48 weeks (IES-R and CES-D items) was 0.96.

Missingness and Statistical Analysis

Missingness with regard to covariates, including demographics, study-related variables, and levels of HIV-related coping and psychological distress at the time of enrollment into the ART phase of the study, was < 5% for our analytic

sample. For age, we imputed the mean age at enrollment for the 1 participant missing age data. For the 6 individuals missing HIV-related coping and/or psychological distress at randomization, we assumed 0% change across time and used participants’ coping and psychological distress data at 36 and 48 weeks post-diagnosis. This is a simplistic method but adequate, wherein the time point is based on the closest temporal measurement [62].

Data were analyzed using IBM SPSS, version 21. First, descriptive statistics were calculated for our sample. Second, we examined relationships of potential covariates (demographic, study/clinical, coping and distress at randomization) with our predictor (experienced HIV-related stigma at 24 weeks), mediators (internalized HIV-related stigma at 24 weeks, HIV-related adaptive coping at 36 weeks, HIV-related maladaptive coping at 36 weeks), and outcome (psychological distress at 48 weeks) (Fig. 2). For each predictor/mediator/outcome, we conducted a multivariable linear regression model. These analyses guided our covariate selection. Third, we conducted a mediation model using an SPSS macro, INDIRECT [63]. This macro leverages the Preacher and Hayes bootstrap method that involves sampling from the data set multiple times (5000 for the current study) to generate a sampling distribution. Prior to testing for mediation, we examined the possibility of that internalized HIV-related stigma, maladaptive HIV-related coping, and adaptive HIV-related coping may moderate the relationship between experienced HIV-related stigma and psychological distress. Preliminary analyses did not confirm moderating effects ($ps = 0.48–0.91$). In terms of handling the temporal nature of the data, we use data obtained at different periods of time for the predictor (24 weeks; experienced HIV-related stigma),

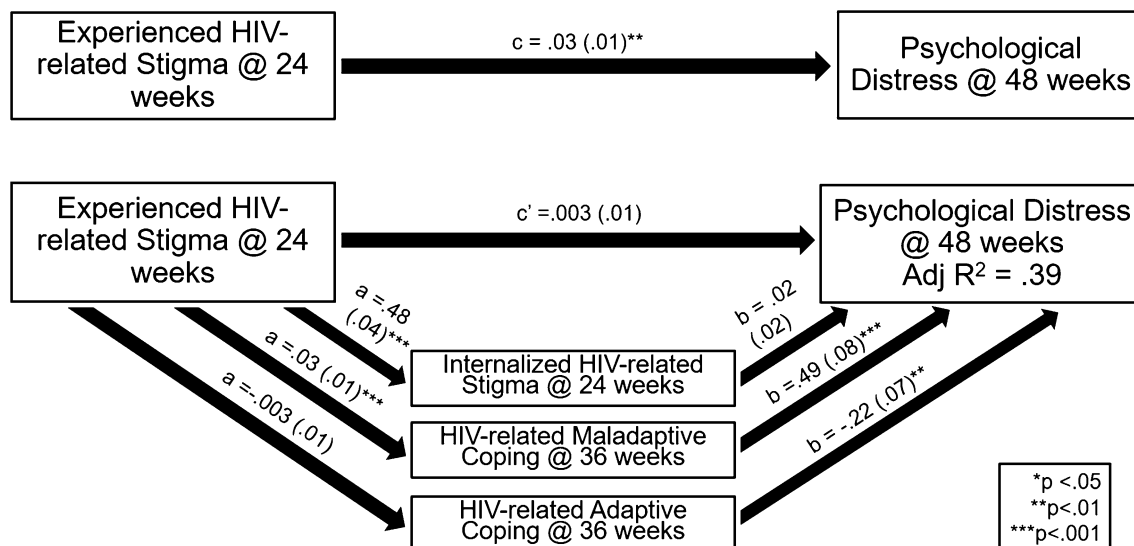


Fig. 2 Mediation model¹ ($n = 145$). ¹Covariates included: age, type of infection, diagnosis in relation to study, HIV-related maladaptive coping at randomization, HIV-related adaptive coping at randomization, and HIV-related distress at randomization

one of the mediators (36 weeks: HIV-related coping), and outcome (48 weeks; distress), while including baseline levels of coping and distress as covariates. Of note, the other mediator was collected at the same time point as the predictor (24 weeks: internalized HIV-related stigma). We calculated non-standardized regression coefficients and 95% confidence intervals (95% CI). This model included experienced HIV-related stigma as the predictor; the composite psychological distress score as the outcome; and, internalized HIV-related stigma, HIV-related maladaptive coping, and HIV-related adaptive coping as separate mediators. This method is considered useful when comparing the relative strength of different mediators and when testing mediation among small to moderate sample sizes [63]. For effect size, we calculated κ^2 values as the indirect effect divided by the maximum possible indirect effect [64]. Effect sizes are comparable to coefficients of determination. Finally, we conducted sensitivity analyses wherein we repeated models with: HIV-related distress and depressive symptoms as separate outcomes; with each mediator included separately; all demographic, study/clinical and, psychosocial variables at randomization as covariates; and, non-imputed data only.

Results

Comparisons Between Analytic Sample and Excluded Individuals

Our analytic sample included the 145 participants that completed at least 80% of survey instruments concerning HIV-related stigma, HIV-related coping, and psychological distress at the time points of interest. The 71 individuals who were excluded from the current study largely did not have any data for at least one survey, because they did not attend the targeted visits (24 weeks, 36 weeks, 48 weeks). Of those in the excluded sample, 50 missed one of these visits, 9 missed 2 visits, and 12 missed 3 visits. The visit most participants in the excluded sample missed was the 48 week study visit. If participants attended visits and were administered the survey, they generally answered all survey items. Relative to individuals who were excluded, individuals in the analytic sample were more likely to identify as cisgender/gay ($p=0.02$) and to have been randomized to receive immediate treatment ($p=0.02$). Differences in type of infection, receipt of diagnosis at initial versus subsequent visits, HIV-related stigma, HIV-related coping, and psychological distress were not significant ($p=0.16$ – 0.97).

Analytic Sample Characteristics

Table 2 depicts study sample characteristics. The average age was 27.18 years (Standard Deviation: 7.25). Approximately

62% identified as cisgender male/gay, 72% had at least some post-secondary education, and 61% made at least minimum wage. With regard to study/clinical-related variables, 76% received their HIV diagnosis during a visit subsequent to their initial testing for the study, 68% were diagnosed with a recent infection. In terms of randomization, 54% of participants were in the deferred treatment study arm. The averages, standard deviations, and ranges for HIV-related stigma, HIV-related coping, and psychological distress are provided in Table 2. All were normally distributed (kurtosis and skew ± 1.00).

Relationships Between Potential Covariates and Study Variables of Interest

Table 3 depicts the results from our 5 multivariable linear regressions concerning experienced HIV-related stigma at 24 weeks, internalized HIV-related stigma at 24 weeks, HIV-related maladaptive coping at 36 weeks, HIV-related adaptive coping at 36 weeks, and psychological distress at 48 weeks respectively. Demographic and study/clinical factors were largely not significant predictors, although there were non-significant associations with age (older age associated with greater psychological distress at 48 weeks), type of infection (recent infection associated with greater HIV-related adaptive coping relative to acute infection), and study visit when HIV was diagnosed (diagnosis during follow-up visits associated with less psychological distress at 48 weeks). There were significant positive associations between HIV-related maladaptive coping at the randomization visit and at 36 weeks; HIV-related adaptive coping at the randomization visit and at 36 weeks; and, HIV-related distress at the randomization visit and psychological distress at 48 weeks. In addition, HIV-related maladaptive coping at the randomization visit was positively associated with HIV-related adaptive coping at 36 weeks. HIV-related adaptive coping at randomization was positively associated with HIV-related distress at 48 weeks. HIV-related distress at the randomization visit was positively associated with both experienced and internalized HIV-related stigma at 24 weeks.

Mediation Model

Finally, we conducted one mediation model. The major predictor of psychological distress at 48 weeks post diagnosis was experienced HIV-related stigma at 24 weeks post diagnosis. The mediators were internalized HIV-related stigma at 24 weeks, HIV-related maladaptive coping at 36 weeks, and HIV-related adaptive coping at 36 weeks. Covariates included were: age, type of infection, time of diagnosis (initial study visit or during follow-up), HIV-related maladaptive coping at randomization, HIV-related adaptive coping at randomization, and HIV-related distress at randomization.

Table 2 Study sample characteristics (n = 145)

		n (%)
Demographics		
Gender/sexual identity		
Cisgender male/gay		90 (62)
Cisgender male/bisexual		39 (27)
Transgender woman		16 (11)
Education		
No post-secondary education		40 (28)
At least some post-secondary education		105 (72)
Monthly income		
< Minimum wage (< 708 soles/\$219 USD a month)		56 (39)
≥ Minimum wage (≥ 708 soles/\$219 USD a month)		89 (61)
Study variables		
HIV diagnosis in relation to study		
Initial visit		35 (24)
Subsequent visits		110 (76)
Type of HIV infection at diagnosis		
Acute		46 (32)
Recent		99 (68)
Study arm		
Immediate		67 (46)
Deferred		78 (54)
	Mean (SD)	Range
Age (years)	27.18 (7.25)	18.20, 54.10
Psychosocial data at randomization		
HIV-related maladaptive coping at randomization ^a	0.00 (1.00)	− 2.44, 2.07
HIV-related adaptive coping at randomization ^a	0.00 (1.00)	− 1.63, 3.48
HIV-related distress at randomization ^b	21.60 (14.28)	0.00, 60.00
Study variables of interest		
Experienced HIV-related stigma at 24 weeks ^c	25.32 (8.94)	13.00, 52.00
Internalized HIV-related stigma at 24 weeks ^c	15.28 (5.91)	8.00, 31.00
HIV-related maladaptive coping at 36 weeks ^a	0.00 (1.00)	− 1.22, 4.03
HIV-related adaptive coping at 36 weeks ^a	0.00 (1.00)	− 2.64, 1.65
Psychological distress at 48 weeks ^d	0.00 (1.00)	− 1.29, 3.37

^aVariable is a standardized composite score (i.e., the mean is set to zero and the standard deviation to 1) of the subscales from Carver's Brief COPE, which were sums of 2 items with 4-point Likert response categories (1 = "I haven't been doing this at all" to 4 = "I've been doing this a lot")

^bImpact of Events-Revised (IES-R) scale. Variable is sum of 15 items with 5-point Likert response categories (0 = Not at all to 4 = Extremely)

^cVariable is a sum of with 4-point Likert response categories (0 = Strongly disagree to 3 = Strongly agree)

^dRegression-based standardized composite of the Impact of Events-Revised (IES-R) scale and the 10-item Center for Epidemiologic Studies Depression (CES-D 10) Scale

As indicated in Table 4 and Fig. 2, the relationship between experienced HIV-related stigma and psychological distress was completely mediated. As shown in Fig. 2, experienced HIV-related stigma was positively associated with internalized HIV-related stigma. Internalized HIV-related stigma was not associated with psychological distress. Experienced HIV-related stigma was not associated with HIV-related adaptive coping. HIV-related adaptive coping was however

associated with psychological distress. HIV-related maladaptive coping, however emerged as a significant mediator between experienced HIV-related stigma and psychological distress. The κ^2 value for the pathway was 0.50, which is considered a large effect.

This pattern persisted across sensitivity analyses, as shown in Table 4. The mediating effects of maladaptive coping appeared to be greater for HIV-related distress relative

Table 3 Multivariable linear regressions concerning HIV-related stigma, HIV-related coping, and psychological distress (n = 145)

	Study variables of interest									
	Experienced HIV-related stigma at 24 weeks		Internalized HIV-related stigma at 24 weeks		HIV-related maladaptive coping at 36 weeks		HIV-related adaptive coping at 36 weeks		Psychological distress at 48 weeks	
	Std B	p value	Std B	p value	Std B	p value	Std B	p value	Std B	p value
Demographics										
Age	0.02	0.87	0.12	0.18	0.01	0.87	-0.08	0.37	<i>0.17</i>	<i>0.06</i>
Gender/sexual identity										
Cisgender male/gay	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Other	-0.06	0.50	-0.06	0.47	-0.12	0.13	-0.02	0.79	0.01	0.92
Education										
< College education	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
≥ College education	-0.08	0.34	-0.12	0.16	-0.04	0.63	0.03	0.73	0.09	.027
Income	-0.05	0.58	-0.06	0.51	-0.05	0.59	-0.04	0.65	-0.07	0.45
Study variables										
Diagnosis in relation to study										
Initial visit	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Subsequent visits	0.10	0.25	0.02	0.82	0.01	0.94	0.113	0.17	<i>-0.15</i>	<i>0.07</i>
Type of HIV infection										
Acute	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Recent	0.02	0.81	0.03	0.69	-0.05	0.53	<i>0.14</i>	<i>0.09</i>	-0.13	0.10
Study arm										
Immediate	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Deferred	0.08	0.37	0.02	0.85	0.07	0.40	-0.002	0.98	0.04	0.61
Psychosocial variables at randomization										
HIV-related maladaptive coping at randomization	-0.04	0.76	-0.01	0.87	0.32	0.001	-2.15	0.03	0.04	0.66
HIV-related adaptive coping at randomization	0.03	0.67	-0.04	0.68	0.07	0.40	0.33	<0.0001	0.25	0.002
HIV-related distress at randomization	0.29	0.003	0.35	<0.0001	0.14	0.11	0.09	0.34	0.25	0.008

Significant results (p < 0.05) are marked in bold
 Associations with p < 0.10 are italicized

to depressive symptoms. Inclusion of mediators separately, inclusion of all potential covariates and use of non-imputed data did not result in significant attenuation of the patterns described above.

Discussion

Our findings offer some interesting contributions to a substantial and ever-growing body of literature regarding HIV-related stigma and mental health. First, our work adds to a growing body of literature regarding the relationship of experienced HIV-related stigma, coping, and psychological outcomes within Peruvian contexts specifically. Second, when comparing different potential mechanisms, we found that HIV-related maladaptive coping largely mediated the relationship between experienced HIV-related stigma on psychological distress. Notably, both types of coping styles

were associated with mental health, but adaptive HIV-related coping was not associated with experienced HIV-related stigma. Our findings align with prior studies suggesting that experienced HIV stigma may be more strongly associated with decisions to engage in maladaptive coping than decisions to use adaptive coping styles [16, 19, 27, 28]. HIV-related adaptive coping could serve more as a moderator or “buffer” that dampens the adverse effects of experienced HIV-related stigma [65]. Yet, literature directly assessing moderation and comparing the relative mediating and moderating effects of social support coping has not supported this alternative [28, 51]. Further, preliminary analyses suggested that HIV-related adaptive coping did not moderate the relationship between experienced HIV-related stigma and psychological distress in our sample.

We add to a growing theoretical debate about whether internalized stigma is a mediator of experienced HIV-related stigma or a related but separate predictor of health [15, 19,

Table 4 Analyses of internalized HIV-related stigma, HIV-related maladaptive coping, HIV-related adaptive coping as mediators of the relationship between experienced HIV-related stigma and psychological distress (n = 145)

Primary model ^a —psychological distress composite as outcome	Bootstrap results for mediation effects (5000 samples)		
	Mediated effect (A × B)	Lower 95% CI	Upper 95% CI
Internalized HIV-related stigma @ 24 weeks	0.01	−0.005	0.03
HIV-related maladaptive coping @ 36 weeks	0.02	0.006	0.03
HIV-related adaptive coping @ 36 weeks	0.001	−0.003	0.006
Total mediated effect	0.03	0.01	0.05
Sensitivity analyses—HIV-related distress as the only outcome			
Internalized HIV-related stigma @ 24 weeks	0.17	−0.07	0.43
HIV-related maladaptive coping @ 36 weeks	0.01	0.08	0.40
HIV-related adaptive coping @ 36 weeks	0.21	−0.03	0.43
Total mediated effect	0.38	0.12	0.70
Sensitivity analyses—each mediator included separately			
Internalized HIV-related stigma @ 24 weeks-only	0.001	−0.003	0.006
HIV-related maladaptive coping @ 36 weeks-only	0.07	0.002	0.01
HIV-related adaptive coping @ 36 weeks-only	−0.003	−0.004	0.001
Sensitivity analyses—depressive symptoms as the only outcome			
Internalized HIV-related stigma @ 24 weeks	0.07	−0.04	0.17
HIV-related maladaptive coping @ 36 weeks	0.09	0.03	0.18
HIV-related adaptive coping @ 36 weeks	0.004	−0.02	0.04
Total mediated effect	0.16	0.04	0.29
Sensitivity analyses—all demographic, study/clinical, and psychosocial data at randomization covariates included			
Internalized HIV-related stigma @ 24 weeks	0.01	−0.003	0.03
HIV-related maladaptive coping @ 36 weeks	0.02	0.005	0.03
HIV-related adaptive coping @ 36 weeks	0.01	−0.003	0.01
Total mediated effect	0.03	0.01	0.05
Sensitivity analyses—non-imputed data only (n = 138)			
Internalized HIV-related stigma @ 24 weeks	0.01	−0.01	0.03
HIV-related maladaptive coping @ 36 weeks	0.02	0.01	0.03
HIV-related adaptive coping @ 36 weeks	0.0002	−0.004	0.005
Total mediated effect	0.03	0.001	0.05

^aCovariates included: age, type of infection, diagnosis in relation to study, HIV-related maladaptive coping at randomization, HIV-related adaptive coping at randomization, and HIV-related distress at randomization

Significant results ($p < 0.05$) are marked in bold

21]. On the one hand, experienced HIV-related stigma was associated with internalized HIV-related stigma. This finding is unsurprising, given that most research has suggested the distinct dimensions overlap and are connected [54, 66]. Yet, internalized HIV-related stigma was not associated with mental health outcomes, contrary to several other studies, including those using this instrument with Latino GBT [15, 16, 19–21, 24, 27–29, 50]. This is particularly surprising, as recent frameworks have highlighted the strong relationship between internalized HIV-related stigma and affective/mental health outcomes (e.g., [27]). One potential explanation may be that maladaptive coping mediates the relationships between experienced and internalized HIV-related stigma with distress. Yet, internalized stigma was not a significant

mediator when included as the only mediator in sensitivity analyses. Another potential explanation concerns a more temporal “cyclic” and complex relationship between mental health and internalized HIV-related stigma, such that individuals with worse mental health before receiving a positive HIV diagnosis may be more likely to internalize negative societal attitudes toward PLWH, which would ultimately result in worse mental health. In this case, controlling for mental health at baseline may have affected our results. Yet, ancillary analyses suggest that the relationship between internalized HIV-related stigma and distress was also only significant in unadjusted models and was attenuated with inclusion of any other variable (data not shown). Future work is warranted to explore this pattern more fully.

Limitations

There are many limitations to be considered with this study. First, our secondary analysis is not likely to be generalizable, given MSM and TW patients were enrolled using peer educators in Lima, Peru and were enrolled in a “multiple touch” clinical study for their care. Relatedly, we used standardized CASI methodologies, which allowed participants to complete self-administered questionnaires consistently throughout the course of the parent study. Yet, some individuals may have completed questionnaires at 2 different study sites, if they completed pre-diagnosis data at one of the two sites that did not collect post-diagnosis data. Second, given the design of the parent study, there are limitations on our ability to test causality. The parent study’s focus on HIV-related stigma concerned examining changes in multiple dimensions across time; given that, both experienced and internalized HIV-related stigma were measured at the same time points (24 weeks, 48 weeks). For the current secondary analysis, to establish temporality, internalized HIV-related stigma should have been ideally measured at 36 weeks. Finally, our decisions to pursue the specific constructs and relationships depicted in Fig. 1 represent one manner to understand HIV-related stigma and its impacts on mental health. It should be noted that there are other conceptual frameworks regarding stigma and health. As noted above, some colleagues [15, 19, 21, 27] have theorized that experienced HIV-related stigma does not necessarily cause but may be a correlate of internalized HIV-related stigma. Assessing the causal relationship between different stigma dimensions via strategic longitudinal designs (e.g., multiple, different time points) is a critical next step.

Future Considerations

In relation to future observational research, we believe that the inclusion of longitudinal data will be helpful as we begin to test causal pathways in terms of experienced HIV-related stigma and health. Future studies could explore mechanisms of other coping styles. We focused on adaptive and maladaptive coping in response to handling one’s HIV seropositive diagnosis, but other dimensions that should be explored in the future include emotional and problem focused coping in relation to experiencing HIV stigma. Relatedly, our study found positive associations between coping scores at different time points as well as between the two types of coping. These patterns might reflect a use of multiple strategies, which may have differential impacts on health. Future research can also

explore the contributions of different types of stigma (e.g., stigma associated with sexual/gender minority status) as well as other dimensions of HIV-related stigma (e.g., anticipated or perceived stigma; [23]). It may also be worthwhile to consider other aspects of individuals’ social environments in these models, including other characteristics associated with one’s sexual/gender identity (e.g., disclosure, family social support). In addition, HIV care and knowledge, including one’s initial prognosis, access to accurate information regarding HIV and HIV care, access to supportive medical services, and mental health outcomes are important variables for future study within alternative conceptual models. More complex modeling can incorporate time, other mechanisms that lead to poorer health and well-being (e.g., interpersonal factors, psychological resources, stress processes [27]), and factors that work together as a whole to explain relationships between experienced HIV-related stigma and mental health (e.g., mediated moderation). Evidence supporting the mediating effects of maladaptive coping on psychological distress suggests that interventions should be developed to reduce maladaptive coping styles in response to experienced HIV-related stigma and to promote more adaptive coping, which was associated with less distress. There is also a need to examine how these relationships vary between different subpopulations of Peruvian gender and sexual minorities, including examining variation between TW and MSM groups. Finally, we believe there is a need to measure explicitly the role of Peruvian culture in the relationships described above, as stigma associated with HIV and with sexual identity have been reported as barriers to accessing HIV testing and care [67]. As mentioned above, there is a sizable body of literature linking HIV-related stigma to mental health. This relationship has been studied across multiple contexts. Future studies may consider examining the extent to which this relationship and associated mediators may vary between populations, countries, and other types of contexts. Such analyses may benefit from the inclusion of instruments that examine specific Peruvian cultural norms and attitudes regarding sexual and gender minorities as well as HIV. They may also benefit from incorporating how HIV vulnerability specifically manifests within Peru.

In relation to current and future intervention research, addressing HIV-related stigma and coping strategies is common in mental health programs for PLWH [68–71], including in Peru. We believe our study suggests a priority focus to mitigate the adverse effects of societal HIV-related stigma to reduce maladaptive coping strategies, including substance use, denial, and behavioral disengagement. By prioritizing interventions that reduce maladaptive coping, we may be able to disrupt the negative impacts of experienced HIV-related stigma on psychological distress and mental health among

PLWH. Simultaneously, policy and community-level interventions are warranted that address structural and interpersonal levels of experienced HIV-related stigma in Peru [68, 69]. Indeed, recent HIV prevention and control efforts have sought to leverage community mobilization and resources in Peru [36, 72]. These interventions may complement individual-level interventions and be crucial in decreasing the likelihood of experiencing HIV-related stigma and thus engaging in maladaptive coping among Peruvian MSM and TW living with HIV.

Conclusion

This longitudinal study adds to a growing body of knowledge about experienced HIV-related stigma and mental health. First, we characterized the relationship between experienced HIV-related stigma and psychological distress among Peruvian MSM and TW living with HIV, using a longitudinal design. Second, we compared three potential mechanisms regarding this association: internalized HIV-related stigma, HIV-related maladaptive coping, and HIV-related adaptive coping. Our findings suggest that reducing HIV-related maladaptive coping may, in particular, reduce the psychological distress associated with HIV-related stigma for Peruvian MSM and TW.

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Compliance with Ethical Standards

Conflict of interest Rachel Rinehart declares that she has no conflict of interest. Deepa Rao declares that she has no conflict of interest. Rivet Amico declares that she has no conflict of interest. Eduardo Ruiz declares that he has no conflict of interest. Peter Brandes declares that he has no conflict of interest. Cecilia Correa declares that she has no conflict of interest. Siavash Pasalar declares that he has no conflict of interest. Javier Lama declares that he has no conflict of interest. Ann Duerr declares that she has no conflict of interest. Yamile Molina declares that she has no conflict of interest.

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.

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

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