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## Emotional health outcomes are influenced by sexual minority identity and HIV serostatus

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### ABSTRACT

For people living with HIV (PLWH) and sexual minorities (SM), the intersection of identities can compound experiences like stigma and discrimination resulting in poor emotional health. We investigated the separate and interactive associations of HIV serostatus and sexual identity with emotional health. Our dataset included 371 participants. Emotional health was assessed by the NIH Toolbox emotion battery which yields negative affect, social satisfaction, and psychological well-being. Regressions were conducted for each composite, with HIV serostatus, sexual identity, and their interaction as independent variables along with covariates. The HIV serostatus x SM identity interaction was statistically significant in the regression of Negative Affect ( $p = .01$ ): heterosexuals living with HIV had worse Negative Affect compared to heterosexual HIV-persons ( $p = .01$ ). The interaction terms were for social satisfaction and psychological well-being were not significant. However, among PLWH, sexual minorities reported better Social Satisfaction ( $p = .03$ ) and marginally better psychological well-being ( $p = .07$ ) compared to heterosexuals.

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Well-being; AIDS; negative affect; social satisfaction; psychological well-being; LGBTQ

## Introduction

Emotional health is an important component of overall well-being. Negative emotional functioning is closely associated with poorer physical health and everyday functioning, greater disabilities, and shorter lifespans (Boehm & Kubzansky, 2012; Chida & Steptoe, 2008; Ostir et al., 2000). Poor emotional outcomes are common among persons living with HIV (PLWH). Compared to HIV- individuals, PLWH are at greater risk for major depressive disorder (MDD; Berger-Greenstein et al., 2007) and experience worse health-related quality-of-life, depression, and anxiety (Miners et al., 2014). Some PLWH also face HIV-related stigma which can perpetuate disparities driven by race, gender, or sexuality (Parker & Aggleton, 2003) leading to intersectional disadvantages. Intersectionality theory suggests that multiple social identities can intersect in a way that reflects multiple social-structural disadvantages (Bowleg, 2012). Applied to emotional health, for example, PLWH who are also gay or bisexual (sexual minorities) may be at a higher risk of poor emotional outcomes compared to heterosexual PLWH or gay or bisexual HIV-seronegative

persons due to the compounding effects of discrimination related to sexual orientation and HIV serostatus (Fredriksen-Goldsen et al., 2014; O'Brien et al., 2016).

We investigated the separate and interactive effects of HIV serostatus and sexual minority (SM) status on emotional health outcomes. We hypothesized that HIV-seropositivity and sexual minority status would be independently and interactively associated with poorer emotional health outcomes.

## Methods

We performed secondary data analyses in a dataset of 371 adults from multiple cohort studies at the UC, San Diego HIV Neurobehavioral Research Program. All studies were reviewed and approved by the Institutional Review Board. Study details are published elsewhere (Heaton et al., 1995; Moore et al., 2013). For the present analyses, participants were included if data were available for: (1) sexual orientation, (2) HIV serostatus, and (3) the NIH Toolbox Emotion Battery (NIHTB-EB).

## Measures

**Emotional health:** The NIHTB-EB battery (Babakhanyan et al., 2018; Carlozzi et al., 2017; Salsman et al., 2014) yields three composites: (1) Negative Affect, (2) Social Satisfaction, and (3) Psychological Well-Being. Each were treated as separate continuous outcomes.

**HIV serostatus and SM identity:** HIV serostatus was determined by enzyme-linked immunosorbent assays with Western Blot for HIV RNA confirmation. Participants who self-identified as lesbian, gay, or bisexual were considered SM. Those who self-identified as heterosexual or straight were considered non-SM.

**Considered covariates:** Demographic data for age, race/ethnicity, years of education, gender, and Spanish language, were self-reported. Given evidence for acute and long-term effects of substance use on mood and affect (Buckner et al., 2015; Gomez-Coronado et al., 2018), we covaried for results from a urine drug screen and lifetime history of substance use disorders (SUD) based on the Composite International Diagnostic Interview (Wittchen et al., 1991) using the DSM-IV criteria for current or past abuse or dependence of alcohol, cannabis, and other substances. Alcohol and cannabis use disorders were examined as separate variables. Lifetime MDD was also ascertained via the CIDI (Wittchen et al., 1991). Neurocognitive impairment and mood disorders can co-occur in PLWH. Neurocognitive impairment was measured using a standardized neurocognitive test battery assessing verbal fluency, working memory, processing speed, verbal and visual learning and delayed recall, executive function, and complex motor function (Cysique et al., 2011). Raw test scores were transformed into age-, education-, sex-, and race/ethnicity-adjusted T-scores based on normative samples of HIV-seronegative participants (Heaton et al., 2004; Norman et al., 2011). T-scores were then converted to deficit scores, which were averaged across tests to obtain a Global Deficit Score (GDS) with 0.5 as the cutoff for impairment. Among PLWH, estimated duration of HIV infection and nadir CD4+ T-cell count were self-reported. CD4+ T-cells (flow cytometry) were performed at a Clinical Laboratory Improvement Amendments-certified laboratory. HIV RNA were measured in plasma by reverse transcriptase polymerase chain reaction (Roche Amplicor, v. 1.5; lower limit of quantification, 50 copies/ml).

## Statistical analyses

Analyses were conducted using JMP software package (version 12.1.0) with critical alpha set at 0.05, unless otherwise specified. Differences in sample characteristics

across groups were examined using ANOVA, chi-square, or t-tests where appropriate.

First, separate linear regressions examined the relationship between HIV serostatus, SM status, and their interaction on each NIHTB-EB composite score. The interaction was removed from subsequent models if it was not statistically significant. Next, models were repeated while adjusting for covariates. Covariates that were not significant at  $p \leq .10$  were removed from the final model. Significant interactions were probed via stratified analyses by SM status. Lastly, we ran models on the PLWH subset adjusting for HIV disease characteristics in addition to other significant covariates.

## Results

Participant characteristics are presented in Table 1. There were significant differences across groups by gender, years of education, race/ethnicity, Spanish language, lifetime MDD, and nadir CD4.

### Negative affect

In the final model adjusting for lifetime MDD and lifetime SUD, the HIV serostatus x SM interaction remained significant (Table 2). In stratified analyses among heterosexuals, PLWH had poorer Negative Affect ( $B = 5.42$ ,  $SE = 2.11$ ,  $p = .01$ ) than HIV seronegative persons (Figure 1). HIV serostatus was not associated with Negative Affect among sexual minorities ( $B = -2.14$ ,  $SE = 2.11$ ,  $p = .31$ ). Among PLWH, SM status was not associated with Negative Affect ( $B = -3.29$ ,  $SE = 2.19$ ,  $p = .14$ ) after adjusting for HIV disease characteristics, lifetime MDD, and lifetime SUD.

### Social satisfaction

HIV serostatus and SM status were not significant in the final model adjusting for gender, Spanish-speaking, and lifetime MDD (Table 2). Among PLWH, sexual minorities had better Social Satisfaction compared to heterosexuals ( $B = 6.22$ ,  $SE = 2.92$ ,  $p = .03$ , Figure 2) after adjusting for HIV disease characteristics and significant covariates.

### Psychological well-being

In the final model adjusting for lifetime MDD and Spanish-speaking, HIV serostatus ( $p = .05$ ) was significantly associated with Psychological Well-Being but SM status was not ( $p = .97$ ). In analyses restricted to PLWH and adjusted for HIV disease characteristics and significant covariates, sexual minorities had marginally better

**Table 1.** Participant characteristics by SM status and HIV serostatus ( $N = 371$ ).

	SM PLWH (A) ( $n = 203$ )	SM HIV- (B) ( $n = 39$ )	Non-SM PLWH (C) ( $n = 52$ )	Non-SM HIV- (D) ( $n = 77$ )	<i>p</i> -value
Demographics					
Age ( <i>M</i> , <i>SD</i> )	53.0 (11.4)	49.9 (17.3)	54.9 (9.5)	51.2 (14.0)	0.20 <sup>a</sup>
Gender (% male)	99.5%	71.8%	42.3%	45.5%	<.0001 <sup>1,b</sup>
Years of education ( <i>M</i> , <i>SD</i> )	14.1 (2.6)	15.1 (2.6)	12.1 (3.8)	13.9 (2.3)	<.0001 <sup>2,a</sup>
Race/ethnicity					
Non-Hispanic White	62.1%	64.1%	40.4%	46.8%	
Non-Hispanic Black/AA	12.3%	5.1%	23.1%	20.8%	
Hispanic/Latino	23.2%	25.6%	36.5%	23.4%	
Other	2.5%	5.1%	0%	9.1%	
Spanish-speaking (%)	3.9%	0%	19.2%	1.3%	<.0001 <sup>4,b</sup>
Psychiatric Characteristics (%)					
LT MDD	60.7%	32.4%	55.1%	28.2%	<.0001 <sup>5,b</sup>
Positive toxicology test	8.3%	8.6%	13.6%	4.8%	.46 <sup>b</sup>
LT alcohol use disorder	55.7%	51.4%	49.0%	42.3%	.28 <sup>b</sup>
LT cannabis use disorder	26.8%	29.7%	32.7%	23.9%	.74 <sup>b</sup>
LT other substance use disorder	46.8%	35.9%	42.3%	37.7%	.41 <sup>b</sup>
Neurocognitive impairment (%)	43.2%	37.9%	48.0%	42.6%	.90 <sup>b</sup>
HIV Disease Characteristics					
Current CD4 cell count, cells/ $\mu$ l ( <i>M</i> , <i>SD</i> )	644.2 (292.5)	-	657.7 (283.5)	-	.77 <sup>c</sup>
Nadir CD4 cell count, cells/ $\mu$ l ( <i>m</i> , <i>SD</i> )	217.1 (179.0)	-	152.3 (189.1)	-	.03 <sup>c</sup>
Estimated years of HIV infection ( <i>M</i> , <i>SD</i> )	17.4 (16.1)	-	16.2 (8.3)	-	.47 <sup>c</sup>
HIV RNA <50 copies/ml (%)	82.7%	-	95.0%	-	.08 <sup>c</sup>

Notes: Group comparisons based on follow-up tests (with Tukey's correction when applicable): <sup>1</sup>A > B > C, D; <sup>2</sup>A, B, D > C; <sup>3</sup>Proportion Black/AA = C, D > A, B; <sup>4</sup>C > A, B, D; <sup>5</sup>A, C > B, D. AA = African Americans. LT = lifetime. MDD = major depressive disorder. *M* = mean. *SD* = standard deviation.

<sup>a</sup>*P*-values derived from ANOVA.

<sup>b</sup>*P*-values derived from chi-square tests.

<sup>c</sup>*P*-values derived from *t*-tests.

**Table 2.** Final adjusted models for emotional outcomes: negative affect, social satisfaction, and psychological well-being.

	Negative affect <sup>a</sup>		Social satisfaction <sup>b</sup>		Psychological well-being <sup>c</sup>	
	B (SE)	<i>p</i>	B (SE)	<i>p</i>	B (SE)	<i>p</i>
SM	5.63 (2.28)	.01	0.71 (1.62)	.66	0.05 (1.27)	.97
HIV+	5.38 (2.12)	.01	-1.56 (1.55)	.32	-2.60 (1.34)	.05
SGM x HIV	-7.50 (2.91)	.01	-	-	-	-
LT SUD (no)	-4.24 (1.25)	.001	-	-	-	-
LT MDD (no)	-5.58 (1.28)	<.0001	4.40 (1.26)	.001	3.40 (1.12)	0.003
Female	-	-	3.05 (1.81)	0.09	-	-
Spanish language	-	-	-7.07 (2.83)	0.01	-5.46 (2.46)	0.03

Notes: The SGM x HIV interaction term was not statistically significant for Social Satisfaction and Psychological Well-Being in unadjusted models and was dropped from the final adjusted model.

<sup>a</sup>For overall model:  $F(5, 327) = 10.16, p < .0001$ , Adjusted  $R^2 = 0.12$ .

<sup>b</sup>For overall model:  $F(5, 334) = 5.75, p < .0001$ , Adjusted  $R^2 = 0.07$ .

<sup>c</sup>For overall model:  $F(4, 334) = 5.45, p = .0003$ , Adjusted  $R^2 = 0.05$ .

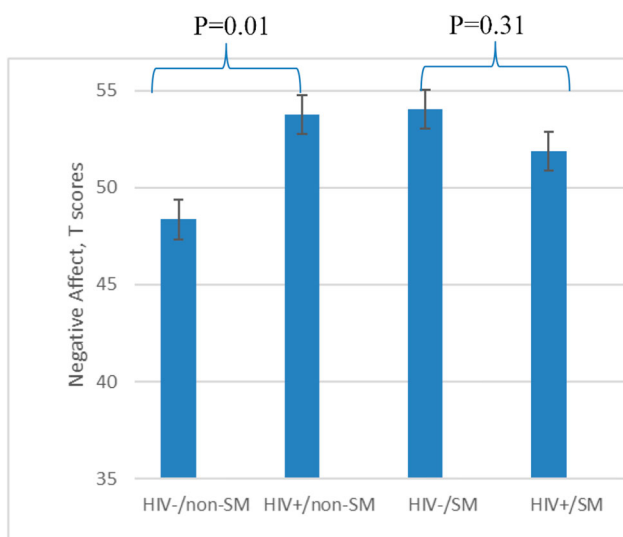
Psychological Well-Being compared to heterosexuals ( $B = 3.30, SE = 1.84, p = .07$ ) (Figure 3).

## Discussion

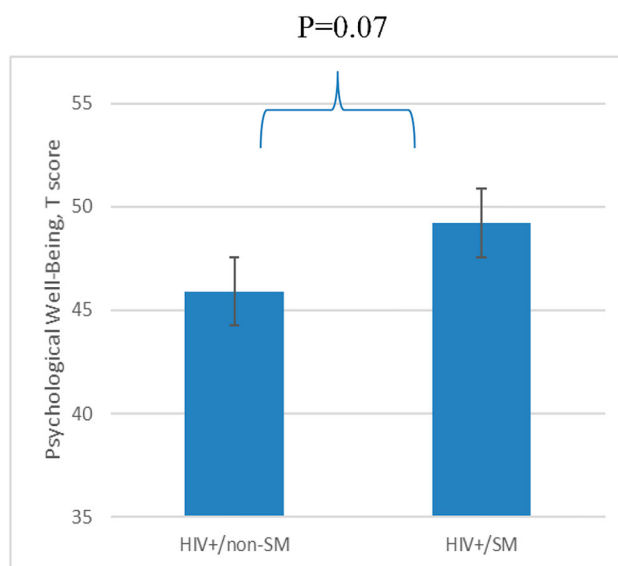
We hypothesized that HIV-seropositivity and SM status would have adverse compounding, interactive effects on emotional health among those with dual identities. Contrary to our hypothesis, significant interactive effects of HIV-serostatus and SM status on Negative Affect revealed that PLWH had worse Negative Affect among heterosexuals, but not among sexual minorities. Moreover, among PLWH, sexual minorities had higher Social Satisfaction and marginally better Psychological Well-

being compared to heterosexuals. Some studies have also found evidence of a beneficial effect of SM status on emotional health among PLWH. Older gay and bisexual men living with HIV have better mental health-related quality-of-life and coping compared to heterosexuals (Brennan et al., 2013). Sexual minorities living with HIV may experience lower levels of internalized stigma compared to heterosexuals living with HIV (Lee et al., 2002). Brener et al. (2013) found that heterosexuals living with HIV perceived greater negative reactions to their HIV serostatus compared to gay men living with HIV.

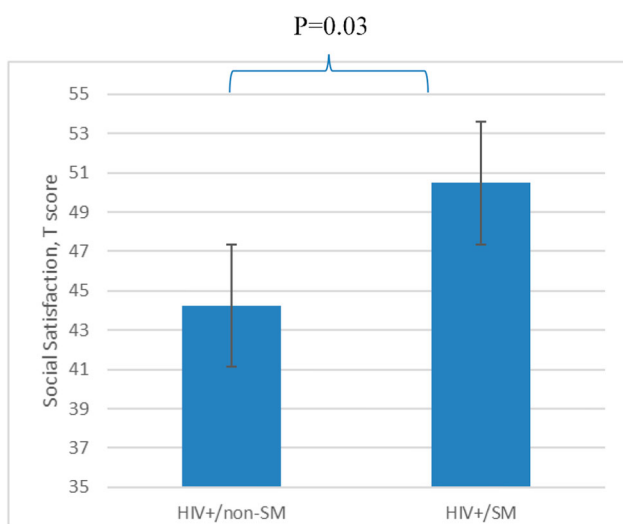
Although we were unable to account for protective psychological factors in our analyses, some studies



**Figure 1.** Adjusted mean NIHTB-EB negative affect T-scores, with terms for HIV status, after adjusting for LT MDD and LT SUD, and stratified by SM group.



**Figure 3.** Adjusted mean psychological well-being scores between SM and non-SM among PLWH after adjusting for HIV disease characteristics and other significant covariates (language, LT MDD, nadir CD4, CD4 count, viral load, duration of infection).



**Figure 2.** Adjusted mean social satisfaction scores between SM and non-SM among PLWH after adjusting for HIV disease characteristics and other significant covariates (gender, language, LT MDD, nadir CD4, CD4 count, viral load, duration of infection).

have characterized high levels of resilience among sexual minorities living with HIV. Emlet et al. (2017) found longer duration of HIV infection to be associated with higher levels of mastery among gay and bisexual men. Fumaz et al. (2015) found high levels of resilience among long-term survivors which was related to better emotional well-being. Grit, a factor related to resilience, is associated with better neurocognitive outcomes and everyday functioning among PLWH (Moore et al., 2018).

Our findings that heterosexuals living with HIV had worse Social Satisfaction and Psychological Well-being compared to sexual minorities may also be a function of sex differences. Whereas, women comprised 23% of our total sample, they were 56% of heterosexuals. Although we covaried for gender, our models may not have fully accounted for these effects. Women living with HIV tend to experience more psychological stressors like anxiety and depression, compared to men (Heckman et al., 1997; Kennedy et al., 1995).

Study limitations include small sample sizes of some subgroups which limits statistical power. Although gender-stratified analyses would be informative, we were unable to do so due to sample size restrictions. We were unable to account for all psychological factors that may be protective of emotional health and analyses were cross-sectional which limits conclusions about causality.

## Conclusion

Findings suggest that sexual minorities living with HIV may be less vulnerable to poor emotional health compared to heterosexuals living with HIV. It is important to recognize and identify the positive factors and resources that can exist among groups that face social and health vulnerabilities. Future research should identify ways in which protective factors that enhance resilience and emotional health interact with HIV-serostatus and sexual identity.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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