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Testing Cross-Sectional and Prospective Mediators of Internalized Heterosexism on Heavy Drinking, Alcohol Problems, and Psychological Distress Among Heavy Drinking Men Who Have Sex With Men

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ABSTRACT. Objective: Minority stress theory is one of the primary theories used to understand substance use among lesbian, gay, and bisexual populations. This study tested whether drinking to cope with stress (DTC), loneliness, and gay community participation (GCP) mediated the relationship between one type of minority stress (i.e., internalized heterosexism) and behavioral health outcomes. **Method:** Using secondary data analysis and the PROCESS procedure, relationships between internalized heterosexism, the mediators (DTC, loneliness, and GCP), and outcomes (heavy drinking, alcohol problems, and psychological distress) were explored, both cross-sectionally and in a lagged manner, among both treatment-seeking and non-treatment-seeking problem drinking men who have sex with men. Problem drinkers ($N = 187$) were assessed, provided brief normative feedback about their drinking, given the choice to receive brief alcohol use disorder treatment or change on their own, and then followed for 9 months. **Results:** Cross-sectional

findings revealed that internalized heterosexism was significantly associated with heavy drinking, alcohol problems, and psychological distress. DTC emerged as a significant mediator of internalized heterosexism for all the health outcomes. Loneliness and GCP were significant mediators of internalized heterosexism for alcohol problems and psychological distress. Multiple mediation models reveal that all three mediators significantly contribute to internalized heterosexism's effect on health outcomes. Lagged analyses did not yield any significant indirect effects. **Conclusions:** DTC, loneliness, and GCP all play an integral, mediational role in the relationship between internalized heterosexism and alcohol problems and psychological distress. Findings underscore the necessity of addressing internalized heterosexism in psychosocial interventions along with coping skills training, emphasizing culturally relevant social support and loneliness. (*J. Stud. Alcohol Drugs*, 78, 113–123, 2017)

LESBIAN, GAY, AND BISEXUAL (LGB; i.e., sexual minority) adults have higher levels of poorer mental health outcomes, including alcohol use and psychiatric disorders compared with heterosexual adults (King et al., 2008). Although these disparities are sometimes inconsistent for alcohol use (e.g., Drabble et al., 2005; McCabe et al., 2005; Mereish & Bradford, 2014), meta-analyses show that, compared with heterosexual adults, sexual minorities are twice as likely to meet criteria for alcohol dependence and 1.5 times as likely to meet criteria for depression and anxiety disorders (King et al., 2008). Alcohol use and psy-

chiatric disorders among sexual minority adults, particularly men who have sex with men (MSM), are linked to an array of additional public health concerns (e.g., risk of HIV and sexually transmitted infection [STI] exposure) (Safren et al., 2010; Woolf & Maisto, 2009). Together these provide evidence of a syndemic of co-occurring behavioral health problems among this population (Parsons et al., 2012). Thus, there is a need for understanding the underlying factors associated with problematic alcohol use and other poorer health outcomes to improve treatments for sexual minorities (Green & Feinstein, 2012; Mustanski et al., 2011).

One major theory used to understand health disparities among sexual minorities is minority stress theory (Meyer, 2003). Over and above general stressors, minority stress theory suggests that sexual minorities experience persistent, unique stress resulting from prejudice, discrimination, and stigmatization specific to their sexual orientation (i.e., minority stressors), which is associated with increased alcohol use and other psychiatric disorders. The theory posits that distal minority stressors (e.g., external stressors, discrimination) and proximal minority stressors (e.g., internalizing stress-

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ors, internalized heterosexism) are related to poor health outcomes. Alcohol use specifically is seen as a way to cope with this stress.

One form of proximal minority stress among sexual minority men is internalized heterosexism (Meyer, 2003). Internalized heterosexism is the internalization of sexual stigma (i.e., stigma regarding sexual minorities) into one's self-concept and is sometimes interchangeably referred to as internalized homophobia, internalized homonegativity, or self-stigma (Herek et al., 2009; Szymanski et al., 2008). The term *internalized heterosexism* is used here, as recommended by Szymanski and colleagues (2008).

Empirical evidence mostly supports the negative effects of internalized heterosexism on poorer mental health outcomes, such as alcohol use and psychiatric disorders (Green & Feinstein, 2012; Hatzenbuehler, 2009). Meta-analyses show that internalized heterosexism is associated with internalizing mental health problems, such as depression, and risky sexual behaviors among sexual minority men (Newcomb & Mustanski, 2010, 2011). In addition, internalized heterosexism is associated with an inability to moderate alcohol use at medically safe levels among MSM (Kuerbis et al., 2012), and with alcohol-related problems among sexual minorities (Amadio, 2006); however, there is a dearth of research examining mediating processes between internalized heterosexism and poorer health outcomes among MSM (Szymanski et al., 2008).

Hatzenbuehler (2009) proposed an integrated mediational framework that postulates that stigma-related stress (i.e., minority stress) is associated with impaired psychological processes, such as maladaptive coping and interpersonal difficulties, potentially increasing risk for psychopathology among sexual minorities. These mechanisms are especially important to study among MSM because they are also associated with increased risk of HIV and STI exposure. Among sexual minorities, internalized heterosexism is associated with maladaptive coping behaviors (Galupo & Bauerband, 2016; Puckett et al., 2015a; Szymanski et al., 2014), decreased coping efficacy (Denton et al., 2014), and poor interpersonal outcomes (e.g., loneliness, decreased community connectedness; Mereish & Poteat, 2015; Puckett et al., 2015a, 2015b). Despite these associations, little research examines maladaptive coping (e.g., coping with stress) and interpersonal processes (e.g., loneliness and decreased gay community involvement) as mediators of the relationship between internalized heterosexism and health outcomes among MSM.

Identification of psychological mediators of the relationship between internalized heterosexism and poor health outcomes is also limited (Szymanski et al., 2008). Within the context of alcohol use, only one prospective study found that discrimination was indirectly associated with more alcohol-related problems through alcohol coping motives (Hatzenbuehler et al., 2011); however, this study excluded the effects of other types of minority stressors, such as in-

ternalized heterosexism, on alcohol use or alcohol-related problems, and relationships between internalized heterosexism and drinking behaviors were not examined over time. Within mental health research, studies document that poorer social supports, LGB community relationships and connectedness, loneliness, and maladaptive coping behaviors (e.g., rumination, internalization) are potential mediators between internalized heterosexism and psychological distress (Lehavot & Simoni, 2011; Mereish & Poteat, 2015; Puckett et al., 2015a; Szymanski & Kashubeck-West, 2008; Szymanski et al., 2014). A major limitation of most of these studies is the overreliance on cross-sectional data. A systematic literature review on internalized heterosexism found that 93.5% of 201 studies identified had a cross-sectional design (Berg et al., 2016).

To address the limitations of existing literature and using the mediational framework of minority stress theory (Hatzenbuehler, 2009), the purpose of this study was to explore how coping (i.e., drinking to cope [DTC] with stress) and social factors (loneliness, gay community participation [GCP]) mediate the relationships between internalized heterosexism and health outcomes, specifically, heavy drinking, alcohol problems, and psychological distress. It was hypothesized that these factors would significantly mediate the relationship between internalized heterosexism and each of the health outcomes, both cross-sectionally and prospectively, over 9 months.

Both cross-sectional and lagged mediation analyses were performed for several reasons. Findings from the cross-sectional analyses provide a context in which to evaluate mediational relationships within this sample to previous cross-sectional studies. Without this point of comparison, both the current cross-sectional and lagged analyses cannot be adequately compared to the majority of the scientific literature in this area. In addition, no current hypothesis exists within minority stress theory that suggests the timing of when minority stress may affect the mediators and subsequent outcomes. The cross-sectional and lagged models test only two potential types of timing for the mediated relationships posited more generally in minority stress theory.

Method

Secondary data analyses were performed on data collected from a comparison trial study investigating an intervention designed to help at-risk, HIV-negative MSM reduce their alcohol use and risky sexual behavior (Morgenstern et al., 2007). All procedures were reviewed by an institutional review board.

Participants

Recruitment strategies included online and community-based advertising in the New York Tri-State Area. Inclusion

criteria were (a) biologically male sex, (b) self-reported negative HIV status, (c) self-reported sexual activity with men within the past 3 months, (d) met *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 1994), diagnostic criteria for alcohol use disorder (AUD) in the previous year, (e) drank alcohol in the last 30 days, and (f) had no thought disorder or cognitive impairment. Individuals were excluded who met the criteria for drug dependence at greater severity than AUD, reported injection drug or crack cocaine use in the past 6 months, were unavailable for study follow-up, or reported current participation in substance abuse treatment.

HIV-negative MSM ($N = 198$) were enrolled in the study. Participants were about 36 years old; 39.6% were non-Hispanic White, 28.9% were non-Hispanic Black, and 23.5% were Hispanic. The typical participant had completed some college and was employed full time (40.6%). Almost one fifth (19.3%) were unemployed and looking for work. Eighty-eight percent of the sample satisfied criteria for an alcohol dependence diagnosis, 11% satisfied criteria for alcohol abuse, and 3 individuals did not qualify for either. The mean number of drinks per drinking day at baseline was 10.4 standard drinks ($SD = 7.7$).

Procedures

After the baseline assessment, participants were provided with feedback about their health behaviors and given the option to receive treatment for AUD and HIV prevention or encouraged to change on their own. Of the 198 men enrolled in the study, 89 elected to receive treatment. Participants were randomly assigned to two possible 12-week treatments: (a) 4 sessions of motivational interviewing or (b) 12 sessions of motivational interviewing plus behavioral self-control therapy. All groups were followed at equivalent time points. Follow-up interviews were implemented at 3 and 9 months after baseline. Retention rates ranged from 86.4% to 96% across time points.

Measures

Sociodemographics. Demographics (i.e., age, race/ethnicity, education, and sexual orientation) were used as covariates in this analysis.

Treatment condition. A dichotomous variable indicated treatment condition (i.e., no treatment or treatment).

Internalized heterosexism. Internalized heterosexism was measured using the 26-item Reactions to Homosexuality Scale (Ross & Rosser, 1996). Items were scored on a Likert scale of 1 (*strongly disagree*) to 5 (*strongly agree*). Recently, this scale has been modified to a shorter, 7-item version (Smolenski et al., 2010). Given high internal consistency and greater variability of the original scale than the short-

ened version, the original scale was used here. Cronbach's α ranged from .77 to .82 across time points.

Outcome variables.

(A) *HEAVY DRINKING:* The Timeline Followback Interview (TLFB; Sobell et al., 1980) assessed quantity and frequency of alcohol use during the previous 90 days at baseline and at each follow-up assessment (3 and 9 months). The TLFB demonstrates good agreement with collateral reports (Dillon et al., 2005) and convergent validity (Vinson et al., 2003). For this study, percentage of heavy drinking days (PHDD) within the month was calculated for each of the months preceding each assessment. A heavy drinking day was defined as more than 5 standard drinks.

(B) *ALCOHOL PROBLEMS:* Consequences resulting from alcohol use were measured using the Short Inventory of Problems (SIP; Miller et al., 1995). The SIP is a 15-item self-report measure of negative consequences of drinking and has strong psychometric properties (Kenna et al., 2005). Higher SIP scores indicate greater alcohol-related problems. Cronbach's α for all time points ranged between .93 and .95.

(C) *PSYCHOLOGICAL DISTRESS:* The General Severity Index (GSI) from the Brief Symptom Inventory (Derogatis, 1993; Derogatis & Melisaratos, 1983) measured psychological distress. The normalized outpatient t scores were used. Higher scores indicate greater distress.

Potential mediators.

(A) *DRINKING TO COPE WITH STRESS:* A decisional balance measure was adapted from two measures to create a culturally relevant measure for MSM. Items were taken from the Alcohol and Drug Consequences Questionnaire (Cunningham et al., 1997) and the Decisional Balance for Immoderate Drinking Scale (Migneault et al., 1999). All responses were on a 5-point Likert scale, anchored by *not important* and *extremely important*. Six items (three from each scale) related to using alcohol to cope with stress (e.g., "Drinking helps me deal with problems"). Items were tested for internal consistency to create a scale for using alcohol to cope with stress. After we removed two items, the α significantly improved, causing it to range from .74 to .82 across all time points. Higher scores indicate that a person places higher importance on using alcohol to cope with stress.

(B) *LONELINESS:* Loneliness was assessed using the UCLA Loneliness Scale (Russell, 1996). Higher scores indicate greater loneliness. Items included questions such as, "How often do you feel completely alone?" The response set ranged from *never* to *often*. Internal consistency for this scale was very strong (Cronbach's $\alpha = .91$ to $.93$ across time points).

(C) *GAY COMMUNITY PARTICIPATION:* GCP was measured by a count of the number of activities, organizations, or hobbies directly related to the queer/gay male community with

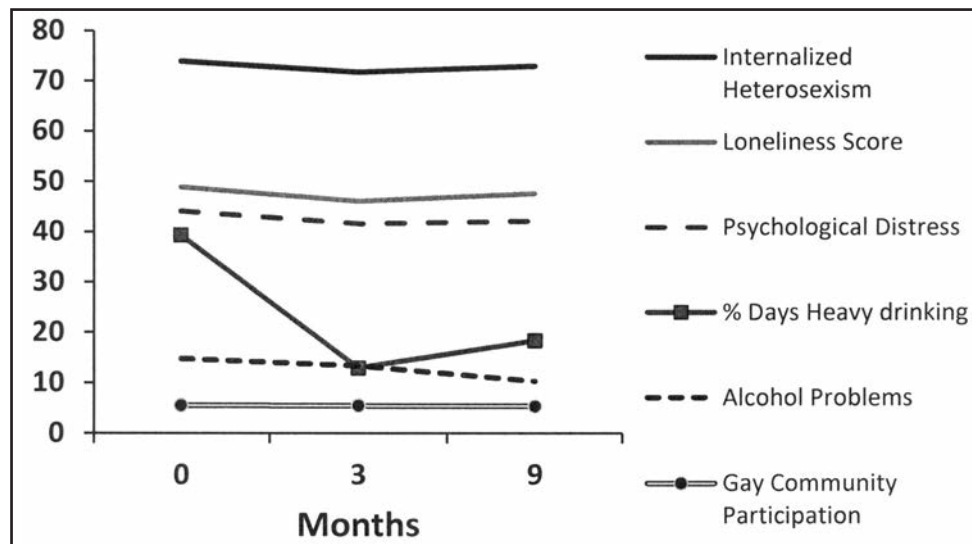


FIGURE 1. Mean scores of outcome variables, internalized heterosexism, and mediator variables over 9 months

which a participant was involved (Mills et al., 2001). More endorsed items indicate greater community involvement, with a maximum of 14. Internal consistency for this scale was adequate (Cronbach's $\alpha = .69$ to $.79$ across time points).

Analytic plan

Cross-sectional and lagged mediation analyses were performed using the PROCESS procedure (Hayes, 2013) in IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY). For the cross-sectional analyses, mediation of internalized heterosexism by DTC, loneliness, and GCP on heavy drinking, drinking consequences, and psychological distress, respectively, was explored using only baseline values for each of the variables. Independent, simple mediation models were used to test each mediator with each outcome to isolate independent relationships and their respective effect sizes. Age, race, education, and sexual orientation were added as covariates, given their associations to poor health outcomes. Education and sexual orientation were not significant in any of the models and were subsequently removed. Once independent mediation was identified, multiple parallel mediation models were tested, where more than one mediator had emerged as significant.

For the lagged mediation analysis (MacKinnon, 2008), we examined the impact of internalized heterosexism at baseline on the mediators at 3 months (controlling for their baseline values) and on outcomes at 9 months (controlling for their values at 3 months). Each mediator was tested independently, and multiple parallel mediation models were tested, where appropriate. In addition to the aforementioned covariates, treatment condition was added to the lagged analyses. Because of attrition, only 187 participants of 198 had complete

data for the lagged analysis. There were no significant differences between the smaller sample for the lagged analysis and the larger sample on demographics or drinking.

For both sets of analyses, we examined models with each of the treatment groups independently. Because findings were equivalent for the nontreatment and treatment groups, we report findings based on the entire sample to maximize power. In the cases where the total effect was larger than the indirect effect and they shared the same sign, the ratio of indirect to total effect of x on y (Hayes, 2013) is provided. Preacher and Kelly's kappa squared (Preacher & Kelley, 2011) was also calculated, where appropriate, in all of the models without covariates (Hayes, 2013). Within multiple parallel mediation models, pairwise comparisons between the mediators with bootstrapping were used to identify whether the indirect effects were different from one another, where possible.

Results

Descriptives and correlations

Figure 1 shows means across time of internalized heterosexism, the potential mediators, and the outcomes. Table 1 shows the means, standard deviations, and correlations between the primary variables entered into the mediation models.

Cross-sectional mediation models

Percentage of heavy drinking days. The total effect of internalized heterosexism on PHDD was significant ($b = 0.004$, $SE = 0.002$, $p < .05$). Table 2 presents the results for

TABLE 1. Descriptives and correlations of internalized heterosexism, mediators, and outcome variables

	<i>M (SD)</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. IH baseline	73.9 (11.5)	–														
2. DTC baseline	10.2 (4.3)	.25 ^a	–													
3. DTC 3 months	8.7 (3.9)	.19 ^b	.49 ^a	–												
4. Loneliness baseline	48.9 (10.3)	.38 ^a	.44 ^a	.19 ^c	–											
5. Loneliness 3 months	46.2 (10.1)	.47 ^a	.39 ^a	.25 ^a	.72 ^a	–										
6. GCP baseline	5.5 (2.5)	-.34 ^a	.07	-.04	-.05	-.16 ^c	–									
7. GCP 3 months	5.5 (2.9)	-.34 ^a	.04	-.12	-.10	-.23 ^b	.70 ^a	–								
8. PHDD baseline	0.39 (0.30)	.16 ^c	.29 ^a	.26 ^b	.05	.03	.00	.08	–							
9. PHDD 3 months	0.21 (0.23)	.07	.15	.25 ^b	.06	.04	-.04	-.04	.46 ^a	–						
10. PHDD 9 months	0.18 (0.23)	.04	.02	.07	-.14	-.13	-.02	-.12	.28 ^a	.41 ^a	–					
11. SIP baseline	14.7 (9.7)	.26 ^a	.46 ^a	.28 ^a	.41 ^a	.34 ^a	.13	-.04	.32 ^a	.29 ^a	.09	–				
12. SIP 3 months	13.3 (10.4)	.24 ^a	.35 ^a	.44 ^a	.37 ^a	.36 ^a	-.07	-.19 ^c	.25 ^a	.29 ^a	.11	.66 ^a	–			
13. SIP 9 months	10.2 (9.7)	.22 ^c	.12	.25 ^b	.19 ^c	.21 ^b	.00	-.10	.26 ^a	.41 ^a	.35 ^a	.26 ^a	.60 ^a	–		
14. GSI baseline	44.1 (11.1)	.24 ^a	.51 ^a	.30 ^a	.65 ^a	.60 ^a	.12	.01	.17 ^c	.09	-.08	.53 ^a	.46 ^a	.30 ^a	–	
15. GSI 3 months	41.6 (11.2)	.25 ^a	.45 ^a	.36 ^a	.62 ^a	.66 ^a	.03	-.04	.16	.14	-.11	.47 ^a	.48 ^a	.33 ^a	.79 ^a	–
16. GSI 9 months	42.1 (10.0)	.17 ^c	.23 ^b	.19 ^c	.48 ^a	.46 ^a	-.01	.00	.08	.11	.17	.33 ^a	.36 ^a	.45 ^a	.60 ^a	.69 ^a

Notes: IH = Internalized heterosexism scale; DTC = drinking to cope; GCP = gay community participation; PHDD = percentage of heavy drinking days in the previous month; SIP = Short Inventory of Problems; GSI = Global Severity Index of the Brief Symptom Inventory. ^a*p* < .001; ^b*p* < .01; ^c*p* < .05.

the simple mediation models for PHDD. Only DTC emerged with a significant indirect effect (*ab* = 0.002, 95% confidence intervals [CI] [0.001, 0.003]) on PHDD. Based on the ratio of indirect effect to total effect (0.445, 95% CI [0.16, 2.21]), 44.5% of the effect of internalized heterosexism on PHDD operated via DTC.

Short Inventory of Problems. The total effect of internalized heterosexism on SIP was significant (*b* = 0.19, *SE* =

0.06, *p* < .01). Table 3 presents the results for the simple mediation models for SIP. All three variables emerged as mediators of internalized heterosexism on SIP, with significant, independent, indirect effects (DTC: *ab* = 0.086, 95% CI [0.04, 0.15]; loneliness: *ab* = 0.114, 95% CI [0.07, 0.18]; GCP: *ab* = -0.067, 95% CI [-0.12, -0.03]). When tested independently, the ratios of indirect effects to total effects indicated 45.3% of the effect of internalized heterosexism

TABLE 2. Independent mediation models for percentage of heavy drinking days (PHDD)

Variable		Cross-sectional model							Lagged model							
		Mediator at baseline			Outcome at baseline				Mediator at 3 months			Outcome at 9 months				
		<i>M</i> (DTC)			<i>Y</i> (PHDD)				<i>M</i> (DTC)			<i>Y</i> (PHDD)				
		<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
<i>X</i> (IH)	<i>a</i>	0.09	0.03	<.001	<i>c'</i>	0.00	0.00	.20	<i>a</i>	0.03	0.03	.37	<i>c'</i>	-0.00	0.00	.89
<i>M</i> (DTC)		–	–	–	<i>b</i>	0.02	0.01	<.001		–	–	–	<i>b</i>	-0.01	0.01	.38
		<i>R</i> ² = .06			<i>R</i> ² = .21				<i>R</i> ² = .34			<i>R</i> ² = .23				
		<i>F</i> (3, 188) = 4.0, <i>p</i> < .01			<i>F</i> (4, 187) = 12.4, <i>p</i> < .001				<i>F</i> (6, 109) = 9.21, <i>p</i> < .01			<i>F</i> (7, 108) = 4.57, <i>p</i> < .001				
		<i>K</i> ² = .07, 95% CI [.03, .12]														
		<i>M</i> (loneliness)			<i>Y</i> (PHDD)				<i>M</i> (loneliness)			<i>Y</i> (PHDD)				
<i>X</i> (IH)	<i>a</i>	0.34	0.06	<.001	<i>c'</i>	0.004	0.002	<.05	<i>a</i>	0.19	0.06	<.01	<i>c'</i>	0.001	0.002	.77
<i>M</i> (loneliness)		–	–	–	<i>b</i>	0.001	0.002	.74		–	–	–	<i>b</i>	-0.001	0.002	.15
		<i>R</i> ² = .14			<i>R</i> ² = .14				<i>R</i> ² = .53			<i>R</i> ² = .29				
		<i>F</i> (2, 188) = 9.8, <i>p</i> < .001			<i>F</i> (4, 187) = 7.4, <i>p</i> < .001				<i>F</i> (6, 108) = 20.3, <i>p</i> < .001			<i>F</i> (7, 107) = 5.0, <i>p</i> < .001				
		<i>M</i> (GCP)			<i>Y</i> (PHDD)				<i>M</i> (GCP)			<i>Y</i> (PHDD)				
<i>X</i> (IH)	<i>a</i>	-0.07	0.02	<.001	<i>c'</i>	0.01	0.002	<.05	<i>a</i>	0.01	0.02	.79	<i>c'</i>	-0.001	0.001	.51
<i>M</i> (GCP)		–	–	–	<i>b</i>	0.01	0.01	.13		–	–	–	<i>b</i>	0.001	0.01	.96
		<i>R</i> ² = .123			<i>R</i> ² = .148				<i>R</i> ² = .471			<i>R</i> ² = .221				
		<i>F</i> (3, 187) = 8.8, <i>p</i> < .001			<i>F</i> (4, 186) = 8.1, <i>p</i> < .001				<i>F</i> (6, 108) = 16.0, <i>p</i> < .001			<i>F</i> (7, 107) = 4.3, <i>p</i> < .001				

Notes: IH = internalized heterosexism; DTC = drinking to cope; GCP = gay community participation; PHDD = percentage of heavy drinking days in a month; CI = confidence interval. All coefficients are unstandardized coefficient. *K*² indicates the size of the indirect effect compared to its maximum possible value. In the case of DTC, it is 6.5% the size of its maximum possible value. Age and race were entered as covariates for all models. In the lagged models, treatment condition, baseline values of the mediators, and 3-month values of the outcomes were entered as additional covariates.

TABLE 3. Independent mediation model for alcohol problems (as measured by the Short Inventory of Problems)

Variable	Cross-sectional model									Lagged model						
	Mediator at baseline			Outcome at baseline			Mediator at 3 months			Outcome at 9 months						
	M (DTC)			Y (SIP)			M (DTC)			Y (SIP)						
	b	SE	p	b	SE	p	b	SE	p	b	SE	p				
X (IH)	a	0.09	0.03	<.001	c'	0.1	0.06	.06	a	0.02	0.03	.49	c'	0.07	0.07	.30
M (DTC)	–	–	–	b	0.94	0.15	<.001	–	–	–	b	-0.01	0.23	.97		
		R ² = .06 F(3, 188) = 3.97, p < .01				R ² = .25 F(4, 187) = 15.3, p < .001 K ² = .107, 95% CI [.05, .18]				R ² = .35 F(6, 113) = 9.91, p < .001				R ² = .41 F(7, 112) = 11.1, p < .001		
		M (loneliness)				Y (SIP)				M (loneliness)				Y (SIP)		
X (IH)	a	0.34	0.06	<.001	c'	0.08	0.06	.21	a	0.18	0.06	<.01	c'	0.08	0.07	.31
M (loneliness)	–	–	–	b	0.34	0.07	<.001	–	–	–	b	-0.07	0.11	.54		
		R ² = .16 F(2, 188) = 9.8, p < .001				R ² = .20 F(4, 187) = 11.5, p < .001 K ² = .135, 95% CI [.08, .20]				R ² = .53 F(6, 113) = 21.6, p < .001				R ² = .41 F(7, 112) = 11.1, p < .001		
		M (GCP)				Y (SIP)				M (GCP)				Y (SIP)		
X (IH)	a	-0.07	0.02	<.001	c'	0.25	0.06	<.001	a	0.01	0.02	.56	c'	0.12	0.07	.14
M (GCP)	–	–	–	b	0.91	0.27	<.01	–	–	–	b	0.15	0.37	.69		
		R ² = .12 F(3, 187) = 8.8, p < .001				R ² = .13 F(4, 186) = 7.1, p < .001 K ² = .086, 95% CI [.04, .15]				R ² = .50 F(6, 112) = 18.6, p < .001				R ² = .42 F(7, 111) = 11.6, p < .001		

Notes: IH = internalized heterosexism; DTC = drinking to cope; GCP = gay community participation; SIP = Short Inventory of Problems; CI = confidence interval. All coefficients are unstandardized coefficient. K^2 indicates the size of the indirect effect compared to its maximum possible value. In the case of DTC, it is 10.7% the size of its maximum possible value. Age and race were entered as covariates for all models. In the lagged models, treatment condition, baseline values of the mediators, and 3-month values of the outcomes were entered as additional covariates.

on SIP operated via DTC (0.453, 95% CI [0.20, 1.01]), and 60% of the effect of internalized heterosexism on SIP operated via loneliness (0.60, 95% CI [0.31, 1.57]). Because of differences in sign, the ratio could not be reliably calculated for GCP (Hayes, 2013).

General Severity Index. The total effect of internalized heterosexism on GSI was significant ($b = 0.25$, $SE = 0.07$, $p < .001$). All three variables emerged as mediators of internalized heterosexism on GSI, with significant indirect effects (DTC: $ab = 0.116$, 95% CI [0.05, 0.19]; loneliness: $ab = 0.235$, 95% CI [0.14, 0.33]; GCP: $ab = -0.07$, 95% CI [-0.14, -0.02]; Table 4). When tested independently, the ratio of indirect effect to total effect indicated that 47% of the effect of internalized heterosexism on GSI operated via DTC (0.47, 95% CI [0.23, 0.91]). The ratio for loneliness indicated that 95% of the effect of internalized heterosexism on GSI operates via loneliness (0.95, 95% CI [0.61, 1.65]). Because of differences in sign, the ratio could not be reliably calculated for GCP.

Multiple, parallel mediation models. Multiple mediation models were run for those outcomes with more than one independently significant mediator, which are presented in Table 5. The model for SIP explained 31% of the variance in alcohol problems. All three mediators were significant

contributors to the total effect of internalized heterosexism on SIP (indirect effects—DTC: $ab = 0.061$, 95% CI [0.03, 0.11]; loneliness: $ab = 0.073$, 95% CI [0.03, 0.13]; GCP: $ab = -0.05$, 95% CI [-0.09, -0.01]). Pairwise comparisons revealed no significant differences between mediators.

Similarly for psychological distress, all three mediators were significant contributors to the total effect of internalized heterosexism on psychological distress (indirect effects—DTC: $ab = 0.065$, 95% CI [0.03, 0.12]; loneliness: $ab = 0.193$, 95% CI [0.12, 0.28]; GCP: $ab = -0.043$, 95% CI [-0.09, -0.01]). This model explained 51% of the variance in GSI. Pairwise comparisons revealed a significant difference between DTC and loneliness (-0.13, 95% CI [-0.24, -0.04]), such that for one unit difference on internalized heterosexism, DTC yields .13 units less of GSI than loneliness.

Lagged mediation models

Percentage of heavy drinking days. The total effect of internalized heterosexism at baseline on PHDD at 9 months was not significant. None of the lagged mediation models were significant (Table 2).

Short Inventory of Problems. The total effect of internalized heterosexism at baseline on SIP at 9 months was not

TABLE 4. Independent mediation model for psychological distress (as measured by the GSI)

Variable	Cross-sectional model							Lagged model									
	Mediator at baseline			Outcome at baseline				Mediator at 3 months			Outcome at 9 months						
	M (DTC)			Y (GSI)				M (DTC)			Y (GSI)						
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p		
X (IH)	a	0.09	0.03	<.001	c'	0.13	0.06	<.05	a	0.02	0.03	.63	c'	0.02	0.07	.75	
M (DTC)	-	-	-	b	1.27	0.17	<.001	b	-	-	-	b	-0.06	0.22	.79		
			R ² = .06 F(3, 188) = 4.0, p < .01				R ² = .29 F(4, 187) = 18.9, p < .001 K ² = .126, 95% CI [.06, .20]				R ² = .32 F(6, 106) = 8.2, p < .001			R ² = .47 F(7, 105) = 13.1, p < .001			
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X (IH)	a	0.34	0.06	<.001	c'	0.01	0.06	.83	a	0.19	0.06	<.01	c'	0.00	0.07	.98	
M (loneliness)	-	-	-	b	0.70	0.06	<.001	b	-	-	-	b	-0.01	0.11	.92		
			R ² = .14 F(2, 188) = 9.8, p < .001				R ² = .43 F(4, 187) = 35.0, p < .001 K ² = .262, 95% CI [.17, .35]				R ² = .60 F(6, 105) = 26.5, p < .001			R ² = .48 F(7, 104) = 13.6, p < .001			
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X (IH)	a	-0.07	0.02	<.001	c'	0.32	0.07	<.001	a	0.01	0.02	.65	c'	0.03	0.07	.65	
M (GCP)	-	-	-	b	0.95	0.33	<.01	b	-	-	-	b	0.25	0.36	.49		
			R ² = .12 F(3, 187) = 8.8, p < .001				R ² = .11 F(4, 186) = 5.6, p < .001 K ² = .086, 95% CI [.04, .15]				R ² = .48 F(6, 105) = 16.1, p < .001			R ² = .49 F(7, 104) = 14.0, p < .001			

Notes: IH = internalized heterosexism; DTC = drinking to cope; GCP = gay community participation; GSI = General Severity Index of the Brief Symptom Inventory; CI = confidence interval. All coefficients are unstandardized coefficient. K² indicates the size of the indirect effect compared to its maximum possible value. In the case of DTC, it is 12.6% the size of its maximum possible value. Age and race were entered as covariates for all models. In the lagged models, treatment condition, baseline values of the mediators, and 3-month values of the outcomes were entered as additional covariates.

significant. None of the lagged mediation models were significant (Table 3).

General Severity Index. The total effect of internalized heterosexism at baseline on GSI at 9 months was not significant. None of the lagged mediation models were significant (Table 4).

Post hoc analyses

We tested for a moderated mediation effect of receipt of treatment on the mediators for all outcomes, in both the cross-sectional and lagged analyses. We found no effect in any model. In addition, we tested whether treatment directly moderated internalized heterosexism's impact on the outcomes of interest, both cross-sectionally and with lagged models. There was no moderated effect of treatment on internalized heterosexism for any outcome.

Discussion

This is the first study to simultaneously test cross-sectional and lagged mediation models of minority stress theory among sexual minority men. It is also the first true longitudinal test of mediation of internalized heterosexism on

health outcomes. Hypotheses were only partially supported. Consistent with previous studies that used cross-sectional data, proximal minority stress—operationalized as internalized heterosexism—was associated with more heavy drinking, alcohol problems, and psychological distress among our sample of heavy drinking MSM. Our study contributed to the extant cross-sectional literature by documenting that internalized heterosexism appears to be mediated by a tendency to use alcohol to cope with stress and social factors simultaneously in its relationship to both alcohol problems and psychological distress.

Within the cross-sectional analyses, using alcohol to cope with stress was the only mediator of the associations between internalized heterosexism and all the health outcomes. This is consistent with a previous study with college students (Hatzenbuehler et al., 2011), which found an association of distal minority stress (i.e., discrimination) and alcohol problems. Using alcohol or other drugs to cope with stress is a common motivator for substance use across populations (Armeli et al., 2007; Park et al., 2004). More research is needed to unpack the influence of a self-medication model of problem drinking among MSM and to examine how minority stressors and other stressors may affect DTC and consequent problem drinking.

TABLE 5. Multiple parallel mediation model coefficients for alcohol problems (as measured by the Short Inventory of Problems) and psychological distress (as measured by the General Severity Index of the Brief Symptom Inventory)

Variable		Outcome					
		Y (SIP)			Y (GSI)		
		<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
<i>X</i> (IH)	<i>c'</i>	0.10	0.06	.09	0.03	0.06	.60
<i>M</i> ₁ (DTC)	<i>b</i> ₁	0.67	0.15	<.001	0.72	0.15	<.001
<i>M</i> ₂ (loneliness)	<i>b</i> ₂	0.22	0.07	<.01	0.58	0.06	<.001
<i>M</i> ₃ (GCP)	<i>b</i> ₃	0.66	0.25	<.01	0.58	0.25	<.05
		<i>R</i> ² = .31			<i>R</i> ² = .51		
		<i>F</i> (6, 184) = 13.7, <i>p</i> < .001			<i>F</i> (6, 184) = 32.1, <i>p</i> < .001		

Notes: Parameter estimates reported here are those generated controlling for race and age. IH = Internalized heterosexism; DTC = drinking to cope with stress; GCP = gay community participation; SIP = Short Inventory of Problems; GSI = General Severity Index of the Brief Symptom Inventory. Coefficients are unstandardized. Age and race were entered into the models as covariates.

Loneliness and GCP are crucial social factors in determining health outcomes based on internalized heterosexism. The more shame and stigma one feels, the less connected one is to others (Mereish & Poteat, 2015). Addressing loneliness as a potential risk factor for alcohol problems may be crucial for MSM in preventing alcohol problems and psychological distress. Family support and positive experiences with disclosing sexual identity can help to mitigate the potential risk of alcohol problems (Burton et al., 2014; Rosario et al., 2009). An experience of acceptance rather than prejudice or stigma may provide some level of protection against using or abusing substances and subsequent mental health problems (Rosario et al., 2009) by reducing levels of loneliness and/or internalized heterosexism.

Although there are other prospective studies examining the impact of stigma on health outcomes (e.g., Hatzenbuehler et al., 2008, 2010; Liao et al., 2015), this study is the only lagged, longitudinal test of mediation examining the relationship between proximal minority stress, coping and social mediators, and health outcomes. Hatzenbuehler et al. (2011) found that the relationship between discrimination and alcohol problems 6 months later was mediated by DTC; however, discrimination and DTC were measured at the same time. Thus, the current study's cross-sectional findings confirm a similar cross-sectional relationship between internalized heterosexism and DTC in Hatzenbuehler and colleagues' study, but it does not confirm a longitudinal relationship between internalized heterosexism and alcohol problems. This lack of a longitudinal relationship between internalized heterosexism specifically and health outcomes is consistent with another prospective study of bereaved caregivers that found that internalized heterosexism was not associated with later drug abuse (Hatzenbuehler et al., 2008).

The nonsignificant longitudinal findings, contrasted with the cross-sectional findings, add novel information about the relationships of these constructs over time. It may be that the

length of time between lagged time points is not an accurate reflection of the dynamic processes between internalized heterosexism, the mediators, and subsequent outcomes. Cross-sectional analyses may more accurately reflect the nature of timing between these variables (MacKinnon, 2008). Indeed, studies that have looked at daily, proximal, repeated measures of these constructs have found that daily changes in health behavior occur in response to daily variations in experiences of stigma (Hatzenbuehler et al., 2009; Pachankis et al., 2014).

The lack of a longitudinal relationship between internalized heterosexism and health outcomes may also relate to the specific sample. Longitudinal studies that demonstrate significant relationships between discrimination, internalized heterosexism, and health outcomes use college-age samples. In studies where no relationship is found, samples tend to be older, with a mean age of 40 years (e.g., Hatzenbuehler et al., 2008). It is plausible that internalized heterosexism predicts the initial development of alcohol problems and psychological distress but then stabilizes after late adolescence. This sample was already drinking heavily and experiencing alcohol problems, missing this window of development. Future studies should examine the prospective relationships between internalized heterosexism and health outcomes in more heterogeneous samples to inform preventive interventions and the potential etiology of alcohol problems among sexual minority men.

Limitations

This study has several limitations, and findings should be interpreted accordingly. We were not able to take into account distal minority stressors (e.g., discrimination), structural stigma (Hatzenbuehler et al., 2014), or how internalized heterosexism may mediate the relations between distal stressors and problem drinking. Furthermore, we only tested one type of proximal minority stress (i.e., internalized

heterosexism). We were unable to examine other proximal minority stressors, such as sexual orientation concealment or rejection sensitivity, or to distinguish minority stress from other general stressors (e.g., financial stress).

Timing between assessments was not equivalent, a factor that can be problematic in testing longitudinal models (Cole & Maxwell, 2003). We consider this a small weakness because there was very little variability in most of the variables across time. There is no reason to assume that internalized heterosexism interacts with the mediators differentially within 3 versus 6 months.

This was a sample of men with existing alcohol problems in a specific urban area—preventing generalizability to all sexual minorities who use alcohol. Findings are also only generalizable to individuals who identified as MSM and were recently sexually active with other men.

Future research

Future research must expand on these findings by testing these models using heterogeneous samples—in terms of substances used, level of substance use disorder, identification of sexual orientation, and sexual behaviors. In addition, a study that combines both proximal and distal minority stressors would greatly expand our understanding of how minority stress affects sexual minorities' health. Future research must also account for the impact of minority stress across generations, as societal attitudes toward sexual minorities evolve over time. In addition, studies that test alternative theories that explain substance use among LGB individuals simultaneously to understand their interconnection and/or independent contributions are sorely needed. For example, understanding the interplay of minority stress with potentially learned or reinforced social behaviors will be crucial for initiating the most effective interventions, whether at a macro or a micro level (Green & Feinstein, 2012).

Conclusion

Despite limitations, this study is the first investigation that tests mediation of internalized heterosexism both cross-sectionally and longitudinally with a sample of adult MSM with AUD. Findings revealed that internalized heterosexism does not significantly change over time, even in the context of a psychosocial treatment. Given the above findings, interventions that target internalized heterosexism, loneliness, and GCP may be key to supporting positive health outcomes among sexual minority men.

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