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Nicholas A. Livingston  
*University of Montana - Missoula*

Annesa Flentje  
*University of California - San Francisco*

Nicholas C. Heck  
*Marquette University, [nicholas.heck@marquette.edu](mailto:nicholas.heck@marquette.edu)*

Allen Szalda-Petree  
*University of Montana - Missoula*

Bryan N. Cochran  
*University of Montana - Missoula*

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# Ecological Momentary Assessment of Daily Discrimination Experiences and Nicotine, Alcohol, and Drug Use Among Sexual and Gender Minority Individuals

**Nicholas A. Livingston**

Veterans Affairs Boston Healthcare System, Boston, Massachusetts; Department of Psychiatry, Boston University School of Medicine; and Department of Psychology, University of Montana;

**Annesa Flentje**

Department of Community Health Systems, University of California, San Francisco

**Nicholas C. Heck**

Department of Psychology, Marquette University

**Allen Szalda-Petree**

Department of Psychology, University of Montana

**Bryan N. Cochran**

Department of Psychology, University of Montana

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Nicotine, alcohol, and drug use in the United States remain national public health concerns, with annual costs estimated at over 740 billion dollars due to crime, lost productivity, and increased health care needs ([Center for Behavioral Health Statistics & Quality, 2015](#); [National Institute on Drug Abuse, 2017](#)). Sexual and gender minority (SGM) populations evidence disproportionately high rates of nicotine and substance use compared to the general population ([Medley et al., 2016](#); [Green & Feinstein, 2012](#); [J. G. Lee, Griffin, & Melvin, 2009](#); [Marshal et al., 2008](#)). This disparity affects millions of individuals across the country; however, the fact that substance use is also linked to sexual risk-taking behavior ([Friedman et al., 2014](#)), suicide risk ([Mustanski, Andrews, Herrick, Stall, & Schnarrs, 2014](#); [Mereish, O'Cleirigh, & Bradford, 2014](#)), and psychiatric comorbidity ([Johnson et al., 2013](#)) heightens the significance of this disparity.

Experiences of adversity, referred to as minority stressors, are associated with higher rates of substance use among SGM individuals. Minority stressors include, but are not limited to, discrimination and victimization experienced throughout life ([Hendricks & Testa, 2012](#); [McCabe, Bostwick, Hughes, West, & Boyd, 2010](#); [Hatzenbuehler, 2009](#); [Meyer, 2003](#)). Discrimination experiences based on one's SGM identity or perceived orientation contribute to minority stress ([Meyer, 2003](#)), which in turn is associated with substance use disparities, coping-motivated substance use, and substance use-related problems among SGM individuals (e.g., withdrawal, social impairment, physical/medical complications; [Feinstein & Newcomb, 2016](#); [Talley et al., 2016](#); [Hendricks & Testa, 2012](#); [McCabe et al., 2010](#); [Hatzenbuehler, 2009](#)). It is important to note, however, that the pathology does not lie with the victim, but the system that created and upholds hetero- and cis-normative social pressures that disproportionately impact SGM individuals ([Riggs & Treharne, 2016](#); [Meyer, 2003](#); see also [Hendricks & Testa, 2012](#)).

Researchers studying these disparities have focused predominantly on the study of overt forms of discrimination experienced throughout life, which most often are measured using retrospective self-report and cross-sectional surveys (e.g., [Goldbach, Tanner-Smith, Bagwell, & Dunlap, 2014](#); [McCabe et al., 2010](#); [Hughes, McCabe, Wilsnack, West, & Boyd, 2010](#); [Livingston, Oost, Heck, & Cochran, 2015](#)). While extremely valuable, cross-sectional and retrospective studies prohibit finer-grained measurement of daily, and even subtle, discrimination experiences, and likewise, the possibility of detecting fluctuations in nicotine and substance use that may be associated with these adverse experiences ([Livingston, 2017](#)). Thus, less is currently known about the extent to which these adverse experiences confer risk for nicotine and substance use among SGM people within a given day ([Livingston, 2017](#)). Addressing this knowledge gap is important and may assist researchers as they attempt to understand the effects of minority stress, the mechanisms by which minority stress confers risk for substance use among SGM individuals, and identify and develop novel prevention and intervention strategies.

Daily SGM-based discrimination (hereinafter, "discrimination") has been linked to greater anger, anxiety, sadness, depression, shame, feelings of rejection, and lower self esteem ([Nadal et al., 2011](#); [Hatzenbuehler, Nolen-Hoeksema, & Dovidio, 2009](#); [Swim et al., 2009](#)); and longitudinal research supports a prospective association between past discrimination and subsequent substance use among SGM individuals ([Hatzenbuehler, Corbin, & Fromme, 2011](#); [Hatzenbuehler, 2009](#)). Researchers have also found a relationship between the

relatively stable structural forms of stigma (i.e., state level legal protections for SGM individuals) and daily tobacco and alcohol use, as measured through daily diary reports ([Pachankis, Hatzenbuehler, & Starks, 2014](#)). Furthermore, daily diary research conducted on non-SGM samples supports that mistreatment and interpersonal stress predict alcohol cravings and binge drinking behaviors ([DeHart, Longua-Peterson, Richeson, & Hamilton, 2014](#); [Carney, Armeli, Tennen, Affleck, & O'Neil, 2000](#)). Thus, it appears that daily discrimination may contribute to substance use risk among SGM individuals; however, researchers have yet to evaluate this empirically.

Additionally, college students and young adults evidence high rates of alcohol use, regardless of SGM status. A recent analysis of health screening data from 10,234 college students seeking medical treatment indicated that 57% of these students met criteria for at-risk drinking ([Zakletskaia, Wilson, & Fleming, 2010](#)). Similarly, data from the Monitoring the Future study involving young adults (modal age 19–20 years) revealed that 31.4% of participants had consumed five or more drinks in a row in the past two weeks ([Stern, Terry-McElrath, & Patrick, 2017](#)). Young adults between the ages of 18 and 25 who do not attend college are at even greater risk for substance misuse and represent an understudied population ([Davis, Smith, & Briley, 2017](#)). Because the present study sample was comprised primarily of college students and other young adults, it is important to note that this group is already at risk for significant substance use; that is, the additional health disparity imposed by one's SGM status results in a significant need to understand substance use among SGM young adults.

The purpose of this study is to examine the within day associations between discrimination and nicotine and substance use among SGM individuals using ecological momentary assessment (EMA). This methodology, which involves multiple within day measurements and, as such, is sensitive enough to detect momentary fluctuations over time, has been regarded as the “gold standard” in terms of in situ self-report methodologies ([Livingston, Hargrove, et al., 2015](#); [Robbins & Kubiak, 2014](#); [Kamarck, Shiffman, & Wethington, 2011](#)). It was expected that use of this methodology would enable detection of discrimination effects in real/near-real time, and provide insight into the duration of these effects as they relate to within day risk for nicotine and substance use. Consistent with the minority stress model, we hypothesized that recent, within day discrimination (experienced since participants' last measurement prompt) would be positively associated with nicotine and substance use reported during the same measurement period, after accounting for other forms of mistreatment, time of day, and day of week. We also hypothesized that discrimination experienced earlier in the day would predict subsequent, within day reports of nicotine and substance use.

## Method

### Participants

Individuals were recruited between February and May of 2016 from an undergraduate psychology research volunteer pool, and through the broader campus, at an inland northwest U.S. university. A cloud-based participant recruiting software, SONA, which is designed to manage recruitment lists and course credit assignment for research participation, was used to recruit undergraduate psychology students. We also recruited others on campus using paper recruitment flyers. We estimated that approximately 60 participants would be needed to achieve sufficient power; however, funding only supported 50 participants. Inclusion criteria specified anyone 18 or older who identified as lesbian, gay, bisexual, pansexual, queer, questioning, or fluid; those who reported other nonheterosexual identities in an open-response option, to a question regarding sexual orientation, were also included. Individuals who selected “heterosexual” as their identity were asked a follow up, yes/no, question regarding whether they identified as exclusively heterosexual at the time of measurement. Those who answered “no,” indicating that they did not identify as exclusively heterosexual, were invited to participate in the EMA study. Additionally, individuals who identified their gender as transgender (i.e., transman, transwoman), gender queer, agender, gender fluid, or who entered an open-response identity in the

“other” box were also included, regardless of sexual orientation. The only individuals excluded were those who identified as cisgender and exclusively heterosexual at the time of measurement. No data regarding current or past nicotine or substance use were gathered at the prescreening phase (see the Results section and [Table 1](#) for demographic information).

Table 1  
*Demographic Characteristics of the Sample*

Variable	<i>M</i>	<i>SD</i>
Age	21.82	4.70
	<i>n</i>	<i>%</i>
Gender		
Male	10	20
Female	31	62
Transgender	2	4
Gender queer	1	2
Agender	4	8
Gender fluid	2	4
Sexual Orientation		
Gay	3	6
Lesbian	10	20
Bisexual	14	28
Pansexual	5	10
Queer	2	4
Questioning	2	4
Fluid	2	4
Heterosexual/straight	6	12
Other (e.g., demisexual, asexual)	6	12
Race/ethnicity		
White/Caucasian	42	84
African American	0	0
Asian	0	0
Hispanic	0	0
Native American/Alaskan native	1	2
Multiple races/ethnicities	7	14
Relationship status		
Married/domestic partner	3	6
Committed relationship	20	40
Separated/divorced	0	0
Single, currently dating	9	18
Single, not currently dating	15	30
Other	3	6
Education		
Middle school, some high school	0	0
High school degree or equivalent	5	10
Some college, no degree	37	74
Associate's degree	1	2
Bachelor's degree	6	12
Graduate or professional degree (M.S./M.A., Ph.D., M.D., J.D.)	1	2

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## Procedure

Study procedures were approved by the university's institutional review board. Eligible participants identified through the online prescreening survey were invited to participate in an EMA study. Eligible and interested participants were contacted and invited to a 90-min, in-person orientation and baseline measurement session, during which they provided informed consent to participate in the EMA study. During the orientation, participants were instructed about the proper use of our EMA devices and presented with further information about the study. Orientation included clarification regarding classes of drugs included in each EMA prompt, and benchmarks for "standard drinks" to be recorded (i.e., "one 12-oz. beer/wine cooler, 5-oz. glass of wine, one cocktail, or a shot [1.25 oz.] of hard liquor"). At the end of the orientation each participant was provided a Samsung Galaxy EMA device, charger, and an informational packet (e.g., device instructions, study staff contact information). The EMA portion of the study began the Thursday following participants' respective orientation session, and ended following the final prompt on the second Wednesday of their participation (i.e., 14 days later). At the end of the two-week study period, each participant earned \$60 and was provided research credit for classes, if applicable.

The application installed onto each device was programmed using Basic for Android. The application was programmed to prompt participants randomly within two-hr intervals (between 10:00 a.m. and 10:00 p.m.), six times daily, for 14 days. The application was also programmed to allow participants to delay (i.e., "snooze") a given prompt two times, for 10 min each. Thus, the amount of lapsed time between prompts was variable and, in this study, ranged from 33 min to 3:48 hours ( $M = 2:03$ ,  $SD = 0:41$ ). When prompted, participants were instructed to only provide updated information since their last measurement prompt, or from the last two to three hours (corresponding to the average length of time between prompts) if they missed their previous prompt(s). Data were coded as missing following failure to respond to a survey (i.e., failing to respond to third prompt following second "snooze"). If a prompt was missed or skipped, participants were not prompted again until the next two-hour measurement window.

## Measures

Participants were asked to provide demographic information regarding age, education, race/ethnicity, relationship status, sexual orientation (identity), and gender identity at prescreening. Participants provided further information regarding sex assigned at birth and current gender identity (using two-step method; [Reisner et al., 2014](#)) during EMA orientation session. When prompted, participants were asked to report whether they had experienced any from a list of 11 common daily upsets (e.g., "Treated with less courtesy or respect than others"; "Avoided, excluded, or ignored"; "Threatened or harassed"; adapted from [Williams et al., 1997](#); [Swim et al., 2007](#); [Wright & Wegner, 2012](#); [Nadal, 2013](#)), including an open-ended "other" option, since their last prompt, or within the last two to three hours if they missed or did not complete their last prompt. Participants were allowed to select any/all that applied. Each "yes" response was followed up with a question regarding whether participants believed the experience(s) was/were related to characteristics of their identity, including their known or assumed sexual orientation; transgender identity, or gender nonconforming behavior; race/ethnicity; disability; mental health; physical health; "other" (open ended); or none/not applicable, to capture experiences unrelated to participants' identity (e.g., perpetrator was in a bad mood). Participants were also asked to report the number of cigarettes or cigars smoked; number of times they used nicotine via e-cigarettes, hookah, or chew; number of alcoholic "standard drinks" consumed; and whether or not they had used other substances since their last prompt. The alcohol use question included the following description: "one 12-oz. beer/wine cooler, 5-oz. glass of wine, one cocktail, or a shot (1.25 oz.) of hard liquor." The list of other substances included marijuana, nonprescribed medication/nonprescribed use of medication, club drugs (e.g., MDMA/ecstasy/"molly," GHB), hallucinogens (e.g., mushrooms, LSD), cocaine, opiates (e.g., heroin, morphine), or methamphetamine (adapted from [C. M. Lee, Neighbors, & Woods, 2007](#), and [Patrick, Schulenberg, O'Malley,](#)

[Johnston, & Bachman, 2011](#)) since their last prompt, or within the last two to three hours if they missed their last prompt. Participants were also given the option of selecting “other” to report use of other substances not included on the list.

## Data Handling and Analytic Strategy

The discrimination variable included experiences attributed to one’s known or assumed sexual orientation, transgender status, and/or gender-nonconforming behavior. This variable was coded as zero (no experiences) or one (any experiences). Other forms of mistreatment included experiences that were attributed to gender (separate from transgender identity but included to capture experienced sexism), race/ethnicity, disability, mental health, physical health, “other,” or none/not applicable (i.e., to any of the previous statuses) were also aggregated and coded as zero (no experiences) or one (any experiences). This “other mistreatment experiences” variable was included as a covariate to adjust for the effects of daily mistreatment experiences that were believed to be unrelated to participants’ known or assumed sexual orientation, transgender status, or gender-nonconforming behavior. Both mistreatment variables were then partitioned into their within and between subjects components to allow for examination of within person effects while controlling for between person differences regarding average discrimination and mistreatment experiences ([Bolger & Laurenceau, 2013](#)). Between and within person discrimination and mistreatment experience variables were centered between and within persons, respectively. Within day lag models were tested by lagging SGB-based discrimination and other forms of mistreatment variables within day to test whether experiences reported earlier in the day predicted subsequent nicotine and substance use. This method allowed for tests of lagged effects but also resulted in missing values on the lagged variables, as lags are created by shifting variables downward in a data set. That is, lagging discrimination means moving its values down a row for every lagged period. This procedure results in missing data for earlier periods of the day for each lagged variable. Thus, models lagged one versus two periods have missing data from the first and second daily prompts, respectively. Variables were lagged within and not across days to highlight within day patterns, and to prevent inclusion of a 12-hour lag (e.g., discrimination and mistreatment experienced the night before paired with morning reports of substance use).

Demographic variables (e.g., age, gender, sexual orientation, ethnicity) were initially included as covariates, but subsequently removed when we found they were not associated with either dependent variable of nicotine or substance use. Omission also helped maintain model parsimony. Five dummy-coded variables were created to adjust for time across measurement prompts. The earliest prompt of the day served as the reference, or the earliest available prompt, given the lag structure, in lagged analyses. A “weekend” variable was created by coding prompts occurring between Monday and Thursday as zero, and Friday through Sunday as one. This variable was included in each model to account for weekend versus weekday substance use patterns ([O’Hara et al., 2014](#); [Dvorak, Pearson, & Day, 2014](#); [Studer et al., 2014](#)). Our weekday versus weekend classification was empirically based (see Results), but also was consistent with prior research ([Piasecki et al., 2014](#)).

Dependent variables included self-reported nicotine and substance use. Nicotine use included the number of cigarettes smoked, and number of times participants used cigars, e-cigarettes, hookah, or chew. Since they were measured differently, and we did not gather exact nicotine quantities, these items were combined and then coded zero (no use) or one (any use) to overcome metric differences. We did the same for alcohol (i.e., number of drinks) and drug use (binary variable). We collapsed alcohol into a binary variable to reduce measurement error associated with estimating “standard drinks” ([Kerr, Greenfield, Tujague, & Brown, 2005](#)), and to create a single substance use variable. Our substance use variable included endorsement of alcohol, marijuana, cocaine or “crack” cocaine, methamphetamine, club drugs (e.g., GHB, MDMA), hallucinogens, opiates, recreational use of prescription medications, or “other.” These raw scores were combined and then binary coded into zero (no use) or one (any use) per prompt in order to examine the occurrence of use after discrimination and mistreatment experiences.



Chi-square tests were performed to evaluate differences between participants recruited through SONA versus the broader campus regarding categorical variables (i.e., gender, assigned sex at birth, sexual orientation, race/ethnicity, and education). Comparisons were also run to evaluate differences regarding reported age, discrimination, other forms of mistreatment, nicotine and substance use between these two groups. Dependent-samples *t* tests were performed to evaluate differences in sum of reported SGM-based discrimination, other forms of mistreatment, nicotine and substance use between week one and week two of the EMA study.

## Multilevel Modeling Strategy

Multilevel models with fixed effects were specified to test hypotheses and to account for the nested nature of these data (i.e., repeated within person measurements). This approach is robust in the presence of missing data, autocorrelation, and unevenly spaced measurements ([Mroczek, 2007](#); [Kamarck et al., 2011](#); [Bolger & Laurenceau, 2013](#)), which were expected and planned features of the current research design. We specified a spatial power term (i.e., “sp(pow)”) to estimate and account for autocorrelation. In addition to reducing resultant Type I error inflation (i.e., correlated residuals leading to underestimation of standard errors and inflated test statistics [Bolger & Laurenceau, 2013](#)), this specification also adjusts for the unevenly spaced nature of participants’ measurement prompts in the current design ([Bolger & Laurenceau, 2013](#); [Wolfinger, 1993](#)). Degrees of freedom were manually specified based on  $N = 50$ , rather than the number of observations, to produce highly conservative tests of statistical significance ([Bolger & Laurenceau, 2013](#)).

Models were run separately for the dependent variables of nicotine and substance use. Independent variables included in each model included contemporaneous reports (i.e., reports collected during the same measurement prompt) of discrimination and other forms of mistreatment (separated into between and within person variables to account for between person experience/reporting differences), time of day, day of week (i.e., weekday vs. weekend), and a spatial power term to adjust for autocorrelation. Lagged models were run separately and sequentially by adding lagged discrimination and other mistreatment experiences as predictors. The simultaneous inclusion of all forms of mistreatment, and lagged and contemporaneous discrimination and other mistreatment variables, allowed for examination of discrimination effects over and above other forms of mistreatment, and lagged effects over and above contemporaneous discrimination and other forms of mistreatment effects.

We first examined contemporaneous discrimination and other forms of mistreatment variables as predictors of both dependent variables. Then we ran lagged discrimination and mistreatment experience models to examine the degree to which discrimination reported earlier in the day related to future reports of nicotine and substance use, after adjusting for other forms of mistreatment. Separate lagged models were run for each lagged discrimination effect to isolate each lagged effect, and to retain observations that might otherwise be lost due to missing responses or missing data due to lagging variables. That is, given the nature of lagged variables (i.e., missing data due to shifting data down rows in the data set), models including discrimination and other mistreatment experiences lagged one, two, three, four, and five periods represent EMA reports spanning 12–10 p.m., 2–10 p.m., 4–10 p.m., 6–10 p.m., and 8–10 p.m., respectively.

## Results

### Descriptive Results

Participants in this study were between 18 and 45 ( $M = 21.82$ ,  $SD = 4.70$ ). Sixty-six percent were between 18 and 21, 18% were between 22 and 25, and 16% were over the age of 26. The sample varied in terms of sexual orientation, gender, and relationship status; the largest proportion identified as female and reported currently being in a committed relationship. The majority of the sample (84%) identified as White/Caucasian. Most

participants had at least some college education; however, some reported high school or equivalent as their highest level of education (potentially in their first semester of college), and some reported holding Bachelor's degrees or higher. The variability in education among this sample may be due to opening recruitment to all individuals on campus, which resulted in a more heterogeneous sample in terms of educational attainment. See [Table 1](#) for specific demographic information.

Participants completed an average of 68.02% of prompts ( $n = 57.17$ ,  $SD = 14.99$ ; range: 25–78 out of 84 total prompts), with a trend suggesting greater compliance in week one versus week two,  $t(49) = 5.38$ ,  $p < .001$  ( $M = 30.52$  vs.  $M = 26.62$  prompts out of 42 delivered each week). Thirty-seven reported zero discrimination experiences and 14 reported zero other forms of mistreatment. Among reporters, there were a total of 93 discrimination experiences recorded across 63 prompts, and 210 other mistreatment experiences across 137 prompts, over the two-week study period. The average proportions of discrimination and other forms of mistreatment reported, relative to completed prompts for each individual, were 2.08% ( $SD = 6.08\%$ , range = 0%–37%) and 4.95% ( $SD = 5.57\%$ , range = 0–23%), respectively. The sums of reported discrimination,  $r(48) = .68$ ,  $p < .001$ , and other forms of mistreatment,  $r(48) = .42$ ,  $p = .002$ , were strongly and moderately consistent (i.e., reliable), respectively, from week one to week two.

Thirty-two individuals (64%) reported zero nicotine use and 10 (20%) reported no substance use over the two-week period. Nicotine and substance use were reported across 243 and 420 prompts, respectively. The latter was comprised of alcohol ( $n = 166$ ), marijuana ( $n = 263$ ), nonprescribed prescription medication ( $n = 8$ ), cocaine ( $n = 3$ ), hallucinogen ( $n = 2$ ), and club drug use ( $n = 2$ ). The average proportions of nicotine and substance use prompts among all participants, relative to completed prompts, were 9.33% ( $SD = 22.96\%$ , range = 0%–86% [10%–86% among nicotine users]) and 14.04% ( $SD = 18.19\%$ , range = 0%–79% [20%–79% among substance users]), respectively. The sums of reported nicotine,  $r(45) = .97$ ,  $p < .001$ , and substance use,  $r(48) = .83$ ,  $p < .001$ , were very reliable between weeks one and two.

We tested for instrumentation effects by comparing the number of prompts including reports of discrimination, other forms of mistreatment, and nicotine, alcohol, and drug use in week one versus week two. Other forms of mistreatment were reported less often in week two relative to week one,  $t(49) = 2.05$ ,  $p = .046$  ( $M = 1.66$  vs.  $M = 1.08$ ). No other differences emerged. There were also no detectable differences between participants recruited through SONA or the broader campus regarding gender, assigned sex at birth, sexual orientation, race/ethnicity, education, age, or reported discrimination, other forms of mistreatment, nicotine or substance use at the  $p < .05$  level.

## Nicotine Use

Experiencing one or more discrimination experiences since participants' last prompt was associated with a 299% greater odds of using nicotine during the same measurement window (odds ratio [OR] = 2.99,  $p = .015$ , 95% confidence interval [CI] [1.24, 7.21]). This effect remained after adjusting for other forms of mistreatment also occurring during the same measurement window (see [Table 2](#)). Other mistreatment experiences, which were included in the model, were also associated with greater odds of contemporaneous nicotine use (OR = 2.02,  $p = .023$ , 95% CI [1.10, 3.69]), but to a lesser extent. Between person differences regarding reported discrimination and other mistreatment experiences over the two-week period were not associated with nicotine use. There was no significant difference regarding weekday versus weekend nicotine use. During the day, and irrespective of discrimination or other forms of mistreatment, nicotine use was reported more frequently between 10:00 a.m. and 12:00 p.m. (reference period), relative to 12–2 p.m. and 4–8 p.m. There was no difference between morning nicotine use and use between 2 and 4 p.m. and 8 and 10 p.m.

**Table 2**  
*Fixed and Random Effect Parameter Estimates Regarding Contemporaneous Nicotine Use*

Effects	Estimate	SE	t	p	OR	[95% CI]
Fixed Effects						
Intercept <sup>a</sup>	-4.89***	.61	-7.93	<.001	—	—
Within person effects						
SGM-based discrimination	1.09*	.43	2.50	.015	2.99	[1.24, 7.21]
Other mistreatment	.70*	.29	2.34	.023	2.02	[1.10, 3.69]
Between person covariates						
SGM-based discrimination	8.30	9.28	.90	.375	>999.00	[<.00, >999.00]
Other mistreatment	-2.11	10.47	-.20	.841	.12	[<.00, >999.00]
Time						
Period 1 (reference)	—	—	—	—	—	—
Period 2	-.57*	.22	-2.50	.016	.56	[.35, .89]
Period 3	-.33	.22	-1.49	.142	.71	[.46, 1.12]
Period 4	-.92***	.22	-4.07	<.001	.39	[.25, .62]
Period 5	-.55*	.22	-2.45	.017	.57	[.36, .90]
Period 6	-.29	.22	-1.35	.182	.74	[.47, 1.15]
Weekend	.01	.12	.04	.965	1.00	[.77, 1.29]
Random Effects						
Level 2						
Intercept <sup>b</sup>	13.02***	3.24	4.01	<.001	—	[6.66, 19.37]
Level 1						
Autocorrelation	-.01	.02	-.50	.309	—	[-.04, .02]
Residual	.29***	.01	36.25	<.001	—	[.27, .30]

*Note.* Period lags were dummy coded with Period one (10 a.m. to 12 p.m.) serving as the reference. SGM = sexual and gender minority.  
<sup>a</sup> Intercept represents average nicotine use value for participants' first prompt of the day (reference, coded 0) on a weekday (coded 0). <sup>b</sup> This parameter estimate represents between person variance regarding average nicotine use (fixed intercept estimate).  
 \*  $p < .05$ . \*\*\*  $p < .001$ .

**Table 2. Fixed and Random Effect Parameter Estimates Regarding Contemporaneous Nicotine Use**

Effects	Estimate	SE	t	p	OR	[95% CI]
Fixed Effects						
Intercept <sup>a</sup>	4.89***	.61	7.93	<.001	—	—
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Other mistreatment	-2.11	10.47	-.20	.841	.12	[<.00, >999.00]
Time						
Period 1 (reference)	—	—	—	—	—	—
Period 2	-.57*	.22	-2.50	.016	.56	[.35, .89]
Period 3	-.33	.22	-1.49	.142	.71	[.46, 1.12]
Period 4	-.92***	.22	-4.07	<.001	.39	[.25, .62]
Period 5	-.55*	.22	-2.45	.017	.57	[.36, .90]
Period 6	-.29	.22	-1.35	.182	.74	[.47, 1.15]
Weekend	.01	.12	.04	.965	1.00	[.77, 1.29]
Random Effects						
Level 2						
Intercept <sup>b</sup>	13.02***	3.24	4.01	<.001	—	[6.66, 19.37]
Level 1						
Autocorrelation	-.01	.02	-.50	.309	—	[-.04, .02]
Residual	.29***	.01	36.25	<.001	—	[.27, .30]

*Note.* Period lags were dummy coded with Period one (10 a.m. to 12 p.m.) serving as the reference. SGM = sexual and gender minority. <sup>a</sup> Intercept represents average nicotine use value for participants' first prompt of the day (reference,

coded 0) on a weekday (coded 0). <sup>b</sup> This parameter estimate represents between person variance regarding average nicotine use (fixed intercept estimate).

\*  $p < .05$ . \*\*\*  $p < .001$

Contemporaneous discrimination experiences were positively associated with greater nicotine use across lagged models (see Table 3). With the exception of within the “Lagged 1 Period” model, other mistreatment experiences were also positively associated with contemporaneous nicotine use reports across lagged models. However, the magnitudes of associations regarding other forms of mistreatment were consistently and significantly smaller relative to discrimination effects included in each model. Other mistreatment experiences reported two ( $OR = 2.96, p = .023, 95\% CI [1.16, 7.50]$ ) and five prompts prior ( $OR = 19.99, p = .023, p = .026, 95\% CI [1.42, 277.21]$ ) were positively associated with reports of nicotine use since participants’ previous prompt. After accounting for same-period discrimination, which predicted greater odds of nicotine use, discrimination reported four ( $OR = .18, p = .014, 95\% CI [.04, .70]$ ) and five ( $OR = .05, p = .034, 95\% CI [.00, .79]$ ) prompts prior were negatively associated with current nicotine use. As a follow-up analysis, these models were run again without contemporaneous discrimination and other forms of mistreatment. Discrimination lagged four and five periods were no longer significant predictors of subsequent nicotine use. Finally, the relationship between contemporaneous discrimination and nicotine use increased considerably throughout the day, suggesting that the link between discrimination and use becomes stronger throughout the day, but especially later in the day/evening. This was after accounting for within and across day nicotine use variation.

Table 3  
Contemporaneous and Lagged Reports of SGM-Based Discrimination, Other Forms of Mistreatment, and Nicotine Use

Variable	Nicotine use OR [95% CI]				
	Lagged 1 period (12 pm to 10 pm)	Lagged 2 periods (2 p.m. to 10 p.m.)	Lagged 3 periods (4 p.m. to 10 p.m.)	Lagged 4 periods (6 p.m. to 10 p.m.)	Lagged 5 periods (8 p.m. to 10 p.m.)
SGM discrimination (btw.)	19.06 [ $<.00, >999.00$ ]	9.36 [ $<.00, >999.00$ ]	.16 [ $<.00, >999.00$ ]	.11 [ $<.00, >999.00$ ]	.15 [ $<.00, >999.00$ ]
Other mistreatment (btw.)	.00 [ $<.00, >999.00$ ]	.00 [ $<.00, >999.00$ ]	.00 [ $<.00, >999.00$ ]	.00 [ $<.00, >999.00$ ]	.00 [ $<.00, >999.00$ ]
SGM discrimination (cont.)	2.83 [1.00, 7.96]*	17.22 [2.09, 141.34]*	50.11 [5.23, 479.42]**	146.47 [6.42, >999.00]**	216.41 [9.64, >999.00]**
Other mistreatment (cont.)	.44 [.13, 1.49]	7.67 [3.00, 19.63]***	11.17 [4.45, 28.01]***	4.74 [1.51, 14.84]**	21.35 [2.42, 187.79]**
SGM discrimination Lag 1	1.76 [.83, 3.76]				
Other mistreatment Lag 1	1.44 [.73, 2.86]				
SGM discrimination Lag 2		2.21 [.83, 5.89]			
Other mistreatment Lag 2		2.96 [1.16, 7.50]*			
SGM discrimination Lag 3			.48 [.16, 1.45]		
Other mistreatment Lag 3			1.25 [.57, 2.76]		
SGM discrimination Lag 4				.18 [.04, .70]*	
Other mistreatment Lag 4				2.72 [.96, 7.70]†	
SGM discrimination Lag 5					.05 [.00, .79]*
Other mistreatment Lag 5					19.99 [1.42, 277.21]*
Time Period 2	—				
Time Period 3	1.53 [1.00, 2.33]*	—			
Time Period 4	.57 [.37, 2.77]*	.50 [.34, .88]*	—		
Time Period 5	1.32 [.85, 7.69]	.88 [.56, 1.36]	1.62 [1.00, 2.61]*	—	
Time Period 6	1.54 [1.01, 12.36]*	.95 [.61, 1.48]	2.14 [1.36, 3.36]**	1.23 [.77, 1.95]	—
Weekend	1.00 [.76, 2.02]	1.40 [1.03, 1.90]*	1.82 [1.27, 2.60]**	1.84 [1.17, 2.88]**	1.41 [.75, 2.67]
n	1711	1333	981	644	331

Note. Period lags were dummy coded with Period two (12 p.m. to 2 p.m.), three (2 p.m. to 4 p.m.), four (4 p.m. to 6 p.m.), and five (6 p.m. to 8 p.m.), respectively, serving as references. This corresponds to data lost due to lagging variables, which results in narrower time intervals throughout the day. SGM discrimination/other mistreatment (btw.) = between person centered variables; SGM discrimination/other mistreatment (cont.) = contemporaneous variables; contemporaneous and lagged within person mistreatment variables were mean-centered within person. SGM = sexual and gender minority.  
†  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Table 3 Contemporaneous and Lagged Reports of SGM-Based Discrimination, Other Forms of Mistreatment, and Nicotine Use

Variable	Lagged 1 period	Lagged 2 periods	Lagged 3 periods (4 p.m. to 10 p.m.)	Lagged 4 periods (6 p.m. to 10 p.m.)	Lagged 5 periods (8 p.m. to 10 p.m.)
			Nicotine use OR [95% CI]		

	(12 pm to 10 pm)	(2 p.m. to 10 p.m.)			
SGM discrimination (btw.)	19.06 [<.00, >999.00]	9.36 [<.00, >999.00]	.16 [<.00, >999.00]	.11 [<.00, >999.00]	.15 [<.00, >999.00]
Other mistreatment (btw.)	.00 [<.00, >999.00]	.00 [<.00, >999.00]	.00 [<.00, >999.00]	.00 [<.00, >999.00]	.00 [<.00, >999.00]
SGM discrimination (cont.)	2.83 [1.00, 7.96]*	17.22 [2.09, 141.34]**	50.11 [5.23, 479.42]**	146.47 [6.42, >999.00]**	216.41 [9.64, >999.00]**
Other mistreatment (cont.)	.44 [.13, 1.49]	7.67 [3.00, 19.63]***	11.17 [4.45, 28.01]***	4.74 [1.51, 14.84]**	21.35 [2.42, 187.79]**
SGM discrimination Lag 1	1.76 [.83, 3.76]				
Other mistreatment Lag 1	1.44 [.73, 2.86]				
SGM discrimination Lag 2		2.21 [.83, 5.89]			
Other mistreatment Lag 2		2.96 [1.16, 7.50]*			
SGM discrimination Lag 3			.48 [.16, 1.45]		
Other mistreatment Lag 3			1.25 [.57, 2.76]		
SGM discrimination Lag 4				.18 [.04, .70]*	
Other mistreatment Lag 4				2.72 [.96, 7.70]†	
SGM discrimination Lag 5					.05 [.00, .79]*
Other mistreatment Lag 5					19.99 [1.42, 277.21]*
Time Period 2	—				
Time Period 3	1.53 [1.00, 2.33]* —				
Time Period 4	.57 [.37, 2.77]* .	50 [.34, .88]*	—		
Time Period 5	1.32 [.85, 7.69]	.88 [.56, 1.36]	1.62 [1.00, 2.61]*	—	
Time Period 6	1.54 [1.01, 12.36]*	.95 [.61, 1.48]	2.14 [3.36, 3.36]**	1.23 [.77, 1.95]	—
Weekend	1.00 [.76, 2.02]	1.40 [1.03, 1.90]*	1.82 [1.27, 2.60]**	1.84 [1.17, 2.88]**	1.41 [.75, 2.67]
n	1711	1333	981	644	331

Note. Period lags were dummy coded with Period two (12 p.m. to 2 p.m.), three (2 p.m. to 4 p.m.), four (4 p.m. to 6 p.m.), and five (6 p.m. to 8 p.m.), respectively, serving as references. This corresponds to data lost due to lagging variables, which results in narrower time intervals throughout the day. SGM discrimination/other mistreatment (btw.) = between person centered variables; SGM discrimination/other mistreatment (cont.) = contemporaneous variables; contemporaneous and lagged within person mistreatment variables were mean-centered within person. SGM = sexual and gender minority. † $p < .10$ . \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

## Alcohol and Drug Use

After adjusting for other forms of mistreatment measured contemporaneously, and as depicted in [Table 4](#), any discrimination experiences since participants' last measurement prompt were associated with 359% greater odds of engaging in some form of substance use within the same measurement window ( $OR = 3.59$ ,  $p < .001$ , 95% CI [1.93, 6.69]). Other mistreatment experiences, which were included in the model, were also associated with same-period substance use ( $OR = 1.63$ ,  $p = .037$ , 95% CI [1.03, 2.59]), but to a lesser degree. Between subject differences in discrimination and other mistreatment experiences over the two-week period were not associated with substance use. Substance use was 66% more likely to occur on weekends (Friday–Sunday) compared to weekdays ( $OR = 1.66$ ,  $p < .001$ , 95% CI [1.30, 2.12]). Relative to the first measurement period of the day (i.e., between 10:00 a.m. and 12:00 p.m.), and regardless of whether discrimination or other forms of

mistreatment were reported, substance use was reported less frequently during prompts spanning 12–6 p.m., and more frequently after 6 p.m.

Table 4  
Fixed and Random Effect Parameter Estimates Regarding Contemporaneous Substance Use

Effects	Estimate	SE	t	p	OR	[95% CI]
Fixed Effects						
Intercept <sup>a</sup>	-2.60***	.29	-8.71	<.001	—	—
Within person effects						
SGM-based discrimination	1.28***	.30	4.14	<.001	3.59	[1.93, 6.69]
Other mistreatment	.49*	.22	2.14	.037	1.63	[1.03, 2.59]
Between person covariates						
SGM-based discrimination	4.42	4.20	1.05	.298	83.24	[.01, >999.00]
Other mistreatment	7.48	4.61	1.62	.111	>999.00	[.16, >999.00]
Time						
Period 1 (reference)	—	—	—	—	—	—
Period 2	-.93***	.20	-4.56	<.001	.39	[.26, .59]
Period 3	-.78***	.20	-3.82	<.001	.45	[.30, .69]
Period 4	-.73***	.20	-3.53	<.001	.47	[.31, .72]
Period 5	.30 <sup>†</sup>	.18	1.69	.098	1.35	[.94, 1.95]
Period 6	.67***	.16	3.98	<.001	1.96	[1.39, 2.76]
Weekend	.50***	.12	4.20	<.001	1.66	[1.30, 2.12]
Random Effects						
Level 2						
Intercept <sup>b</sup>	3.10***	.76	4.07	<.001	—	[1.61, 4.58]
Level 1						
Autocorrelation	.10***	.02	5.00	<.001	—	[.06, .13]
Residual	.75***	.02	37.50	<.001	—	[.71, .78]

Note. Period lags were dummy coded with Period one (10 a.m. to 12 p.m.) serving as the reference. SGM = sexual and gender minority.

<sup>a</sup> Intercept represents average substance use value for participants' first prompt of the day (reference, coded 0) on a weekday (coded 0). <sup>b</sup> This parameter estimate represents between person variance regarding average substance use (fixed intercept estimate).

<sup>†</sup>  $p < .10$ . \*  $p < .05$ . \*\*\*  $p < .001$ .

Table 4 Fixed and Random Effect Parameter Estimates Regarding Contemporaneous Substance Use

Effects	Estimate	SE	t	p	OR	[95% CI]
Fixed Effects						
Intercept <sup>a</sup>	2.60***	.29	8.71	<.001	—	—
Within person effects						
SGM-based discrimination	1.28***	.30	4.14	<.001	3.59	[1.93, 6.69]
Other mistreatment	.49 <sup>†</sup>	.22	2.14	.037	1.63	[1.03, 2.59]
Between person covariates						
SGM-based discrimination	4.42	4.20	1.05	.298	83.24	[.01, >999.00]
Other mistreatment	7.48	4.61	1.62	.111	>999.00	[.16, >999.00]
Time						
Period 1 (reference)	—	—	—	—	—	—
Period 2	-.93***	.20	-4.56	<.001	.39	[.26, .59]
Period 3	-.78***	.20	-3.82	<.001	.45	[.30, .69]
Period 4	-.73***	.20	-3.53	<.001	.47	[.31, .72]
Period 5	.30 <sup>†</sup>	.18	1.69	.098	1.35	[.94, 1.95]
Period 6	.67***	.16	3.98	<.001	1.96	[1.39, 2.76]
Weekend	.50***	.12	4.20	<.001	1.66	[1.30, 2.12]
Random Effects						
Level 2						
Intercept <sup>b</sup>	3.10***	.76	4.07	<.001	—	[1.61, 4.58]
Level 1						
Autocorrelation	.10***	.02	5.00	<.001	—	[.06, .13]
Residual	.75***	.02	37.50	<.001	—	[.71, .78]

Note. Period lags were dummy coded with Period one (10 a.m. to 12 p.m.) serving as the reference. SGM = sexual and gender minority. <sup>a</sup> Intercept represents average substance use value for participants' first prompt of the day (reference, coded 0) on a weekday (coded 0). <sup>b</sup> This parameter estimate represents between person variance regarding average substance use (fixed intercept estimate).  
<sup>†</sup>  $p < .10$ . \*  $p < .05$ . \*\*\*  $p < .001$ .

Lagged models (see Table 5) further support the relationship between discrimination and substance use, and, in the case of the "Lagged 2 Periods" model, support a prospective relationship between discrimination reported up to two measurements prior and substance use reported in the current prompt ( $OR = 2.73, p = .024, 95\% CI [1.14, 6.52]$ ). Other mistreatment experiences only predicted contemporaneous substance use in the "Lagged 3 Periods" model, spanning 4–10 p.m. There was also a trend across lagged models, wherein the odds ratios for contemporaneous discrimination experiences generally increased over time. As with nicotine use, this pattern throughout the day suggests that the relationship between discrimination and substance use may increase throughout the day/evening, which was after controlling for within and across day substance use variation.

Table 5  
*Contemporaneous and Lagged Reports of SGM-Based Discrimination, Other Forms of Mistreatment, and Substance Use*

Variable	Substance use OR [95% CI]				
	Lagged 1 period (12 p.m. to 10 p.m.)	Lagged 2 periods (2 p.m. to 10 p.m.)	Lagged 3 periods (4 p.m. to 10 p.m.)	Lagged 4 periods (6 p.m. to 10 p.m.)	Lagged 5 periods (8 p.m. to 10 p.m.)
SGM discrimination (btw.)	22.68 [.00, >999.00]	12.49 [.00, >999.00]	13.17 [.00, >999.00]	65.08 [.01, >999.00]	431.00 [.09, >999.00]
Other mistreatment (btw.)	209.47 [.01, >999.00]	151.64 [.00, >999.00]	399.16 [.03, >999.00]	>999.00 [.17, >999.00]	374.03 [.02, >999.00]
SGM discrimination (cont.)	4.43 [1.74, 11.28]**	2.36 [.88, 6.27] <sup>†</sup>	3.25 [1.13, 9.36]*	6.38 [1.73, 23.53]**	5.25 [1.16, 23.69]*
Other mistreatment (cont.)	.80 [.37, 1.72]	1.18 [.55, 2.55]	2.20 [1.08, 4.49]*	1.16 [.52, 2.60]	1.41 [.41, 4.81]
SGM discrimination Lag 1	1.21 [.49, 3.00]				
Other mistreatment Lag 1	1.72 [.90, 3.29] <sup>†</sup>				
SGM discrimination Lag 2		2.73 [1.14, 6.52]*			
Other mistreatment Lag 2		1.05 [.49, 2.23]			
SGM discrimination Lag 3			.32 [.08, 1.28]		
Other mistreatment Lag 3			1.39 [.61, 3.17]		
SGM discrimination Lag 4				.71 [.25, 2.06]	
Other mistreatment Lag 4				1.39 [.48, 3.95]	
SGM discrimination Lag 5					1.71 [.46, 6.33]
Other mistreatment Lag 5					1.86 [.58, 6.01]
Time Period 2	—				
Time Period 3	1.36 [.79, 2.33]	—			
Time Period 4	1.57 [.89, 2.77]	1.10 [.67, 1.83]	—		
Time Period 5	4.53 [2.67, 7.69]***	3.34 [2.08, 5.35]***	3.35 [2.07, 5.42]***	—	
Time Period 6	7.39 [4.42, 12.36]***	5.45 [3.41, 8.71]***	4.56 [2.81, 7.37]***	1.58 [1.11, 2.27]*	—
Weekend	1.47 [1.06, 2.02]*	1.63 [1.17, 2.27]**	1.82 [1.26, 2.62]**	2.18 [1.44, 3.30]***	2.39 [1.41, 4.04]**
<i>n</i>	1808	1397	1029	677	350

Note. Period lags were dummy coded with Period two (12pm-2pm), three (2pm-4pm), four (4pm-6pm), and five (6pm-8pm), respectively, serving as references. This corresponds to data lost due to lagging variables, which results in narrower time intervals throughout the day. SGM discrimination/other mistreatment (btw.) = between person centered variables; SGM discrimination/other mistreatment (cont.) = contemporaneous variables; contemporaneous and lagged within person mistreatment variables were mean-centered within person. SGM = sexual and gender minority.  
<sup>†</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Table 5 *Contemporaneous and Lagged Reports of SGM-Based Discrimination, Other Forms of Mistreatment, and Substance Use*

Variable	Lagged 1 period 10 p.m. (.)	Lagged 2 periods 10 p.m.)	Lagged 3 periods 10 p.m.)	Lagged 4 periods 10 p.m.)	Lagged 5 periods 10 p.m.)
Substance use OR [95% CI]					
SGM discrimination (btw.)	22.68 [.00, >999.00]	12.49 [.00, >999.00]	13.17 [.00, >999.00]	65.08 [.01, >999.00]	431.00 [.09, >999.00]
Other mistreatment (btw.)	209.47 [.01, >999.00]	151.64 [.00, >999.00]	399.16 [.03, >999.00]	>999.00 [.17, >999.00]	374.03 [.02, >999.00]
SGM discrimination (cont.)	4.43 [1.74, 11.28]**	2.36 [.88, 6.27]*	3.25 [1.13, 9.36]*	6.38 [1.73, 23.53]**	5.25 [1.16, 23.69]*

Other mistreatment (cont.)	.80 [.37, 1.72]	1.18 [.55, 2.55]	2.20 [1.08, 4.49]*	1.16 [.52, 2.60]	1.41 [.41, 4.81]
SGM discrimination Lag 1	1.21 [.49, 3.00]				
Other mistreatment Lag 1	1.72 [.90, 3.29] <sup>†</sup>				
SGM discrimination Lag 2		2.73 [1.14, 6.52]*			
Other mistreatment Lag 2		1.05 [.49, 2.23]			
SGM discrimination Lag 3			.32 [.08, 1.28]		
Other mistreatment Lag 3			1.39 [.61, 3.17]		
SGM discrimination Lag 4				.71 [.25, 2.06]	
Other mistreatment Lag 4				1.39 [.48, 3.95]	
SGM discrimination Lag 5					1.71 [.46, 6.33]
Other mistreatment Lag 5					1.86 [.58, 6.01]
Time Period 2	—				
Time Period	3 1.36 [.79, 2.33]	—			
Time Period	4 1.57 [.89, 2.77]	1.10 [.67, 1.83]	—		
Time Period	5 4.53 [2.67, 7.69]***	3.34 [2.08, 5.35]***	3.35 [2.07, 5.42]***	—	
Time Period	6 7.39 [4.42, 12.36]***	5.45 [3.41, 8.71]***	4.56 [2.81, 7.37]***	1.58 [1.11, 2.27]*	—
Weekend	1.47 [1.06, 2.02]*	1.63 [1.17, 2.27]**	1.82 [1.26, 2.62]**	2.18 [1.44, 3.30]***	2.39 [1.41, 4.04]*
<i>n</i>	1808	1397	1029	677	350

*Note.* Period lags were dummy coded with Period two (12pm-2pm), three (2pm-4pm), four (4pm-6pm), and five (6pm-8pm), respectively, serving as references. This corresponds to data lost due to lagging variables, which results in narrower time intervals throughout the day. SGM discrimination/other mistreatment (btw.) = between person centered variables; SGM discrimination/other mistreatment (cont.) = contemporaneous variables; contemporaneous and lagged within person mistreatment variables were mean-centered within person. SGM = sexual and gender minority.

<sup>†</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

## Discussion

The aims of this study were to examine the immediate and delayed within day relationships between discrimination and nicotine and substance use. We hypothesized, and found support for, both contemporaneous and prospective relationships between discrimination and nicotine and substance use within day. Specifically, nicotine and substance use were both related to discrimination experiences reported contemporaneously (i.e., experienced within the last 0.5 to 3.75 hours, approximately). Discrimination reported up to two measurement periods prior was associated with greater odds of substance use in the last measurement period, among SGM individuals in this predominantly young adult, college student sample. An interesting, albeit unexpected, result was that the contemporaneous associations between discrimination and both nicotine and substance use became stronger throughout the day. Though we accounted for time-of-day and weekend versus weekday nicotine and substance use, discrimination effects over time might relate to the opportunity to engage in both nicotine and substance use later in the day (e.g., after daily responsibilities or work), or an accumulation of factors such as cognitive fatigue, rumination, or negative affect throughout the day (Lydon-Staley et al., 2017; Aldridge-Gerry et al., 2011).



It is important to note that other forms of mistreatment were also related to nicotine and substance use. Although the odds ratios were themselves quite large, suggesting that these events may also be important both clinically and in future research, these relationships were less consistent and of a smaller magnitude compared to discrimination. The relative strength of discrimination versus other forms of mistreatment (which included sexism, racism, and ableism) may be due to lack of variability in terms of participants' demographics (e.g., race/ethnicity, religion, or ability status) in the current study. It may be useful in future research to also consider including non-SGM participants to compare the effects of other forms of mistreatment between SGM and non-SGM individuals. For now, we believe these results speak to the particularly distressing nature of discrimination on the basis of one's sexual and/or gender minority status, and to the importance of ongoing research, education, and outreach efforts aimed at reducing SGM-based discrimination.

The results of this study support, but also add temporal specificity to, existing minority stress models ([Meyer, 2003](#); [Hatzenbuehler, 2009](#)) by extending their application to the within day level of analysis. Although our results support the minority stress model linking within day discrimination and other forms of mistreatment to immediate and subsequent risk for nicotine and substance use overall, some of the nicotine use results were unexpected. One unexpected finding was that discrimination reported earlier in the day was negatively associated with current nicotine use reports. This relationship remained significant after accounting for (a) lagged other mistreatment experiences, (b) contemporaneous discrimination, and (c) other contemporaneous mistreatment—all of which were associated with greater odds of nicotine use. A possible explanation for this finding is that discrimination and nicotine use reports were strongly linked together in time. Given the ample opportunity for individuals to use nicotine, relative to drugs and alcohol, throughout a given day, there may be less delay between experiencing discrimination and engaging in nicotine use. If, for instance, nicotine is used as an immediate coping strategy in response to a discrimination experience, it may be less necessary to use nicotine again later in the day in relation to the prior event(s). It also is possible that, given the strong contemporaneous relationship between discrimination and nicotine use, nicotine use that occurs earlier in the day due to discrimination events may result in reduced use later in the day. This finding is consistent with previous research showing that higher tobacco use earlier in the day is related to reduced cravings later ([Chandra, Scharf, & Shiffman, 2011](#)).

These data suggest that discrimination is linked to within day nicotine and substance use, yet it is possible that negative affect, psychological distress, or coping motives represent missing links between discrimination experiences and nicotine and substance use. For example, in a recent daily diary study [Eldahan and colleagues \(2016\)](#) found that experiencing sexual orientation–related stress or insecurity predicted higher negative affect and lower positive affect within and across days among gay and bisexual men. [Eldahan and colleagues \(2016\)](#) did not report whether these negative self-appraisals were related to experiences of discrimination, though it is plausible that such experiences would be related to stress and insecurity about one's SGM status. To this extent, a possible mechanism through which daily discrimination elevates risk for nicotine and substance use within day is by evoking feelings of shame and personal dissatisfaction—in addition to feelings of anger, anxiety, sadness, and depression ([Hatzenbuehler et al., 2009](#); [Swim et al., 2009](#))—which may result in using substances to manage these feelings. This pathway is supported by cross-sectional and longitudinal findings linking discrimination to substance use directly and indirectly through the mediated path of psychological distress ([Livingston, Christianson, & Cochran, 2016](#)), and through coping motives for use ([Kuerbis et al., 2017](#); [Boyle, LaBrie, Costine, & Witkovic, 2017](#); [Feinstein & Newcomb, 2016](#)). This pathway is also consistent with [Hatzenbuehler's \(2009\)](#) mediational model of health disparity, which postulates that the link between discrimination and substance use is mediated by cognitive and affective responses to discrimination, including negative self-schemas, positive substance use expectancies, and coping motives for use. However, additional research is needed to evaluate this model at the within day level of analysis. In the meantime, further clinical research and development are needed to develop innovative interventions and technologies suited to the needs of SGM

individuals, which may support the development of alternative coping strategies for dealing with discrimination events.

## Clinical Implications

Sexual and gender minority individuals seek substance use treatment more frequently than heterosexual individuals ([McCabe, West, Hughes, & Boyd, 2013](#)), and are more likely to present with comorbid physical or mental health conditions ([Flentje, Heck, & Sorensen, 2014](#); [Flentje, Livingston, & Sorensen, 2016](#); [Cochran & Cauce, 2006](#)). Sexual and gender minority individuals also receive less adequate health care coverage ([Buchmueller & Carpenter, 2010](#); [Dilley et al., 2010](#)), and have fewer options for securing SGM-specific substance use treatment services ([Cochran, Peavy, & Robohm, 2007](#)). Although efforts to address unmet clinical need among SGM individuals are underway (see [Pachankis, Hatzenbuehler, Rendina, Safren, & Parsons, 2015](#); [Maguen, Shipherd, & Harris, 2005](#); [Heck, 2015](#); [Heck, Croot, & Robohm, 2015](#)), further research is needed to address unmet need among SGM individuals who experience minority stress, and those who are currently using, or at risk of using, nicotine and substances beyond recommended limits.

Our study has important clinical implications for clinicians providing care for SGM people. Specifically, our study suggests that minority stressors experienced in a given moment precede substance use, presumably as a coping mechanism. Clinicians who are working with SGM individuals may want to inquire about these types of experiences as potential “triggers” and work with their clients to implement alternative coping strategies that could be effective in the moment. Additionally, discrimination experiences may have a delayed impact on substance use that could be related to rumination about the negative experience and persistent negative affect. Clinicians could work with SGM clients to use strategies to improve affect and to process the discrimination experience cognitively in an adaptive manner.

One avenue for future research may be the integration of technology into clinical care. For example, experience and substance use monitoring could be accomplished using electronic devices similar to those used in the current study, or by developing similar applications and making them available for download onto individuals’ existing smart phone devices. Such monitoring, which is itself a form of intervention ([McCambridge & Kypri, 2011](#)), could accomplish the goal of helping individuals to identify the cognitive, affective, and behavioral consequences of minority stress experiences, as well as factors associated with substance use risk throughout a given day or week. Additional intervention support might also come from developing software that includes self-guided therapeutic modules designed to increase motivation to manage problematic use, facilitate goal setting, mood management, support seeking, craving/urge management, and healthy coping ([Brief et al., 2013](#)), particularly in response to minority stress.

Further innovation might include leveraging technology, such as global positioning and machine learning algorithms, to identify individuals at risk for substance use (e.g., [Ahn, Ramesh, Moeller, & Vassileva, 2016](#)) and develop real-time prevention and intervention support to SGM individuals managing high risk situations (e.g., [Marsch, 2012](#)). Practically speaking, if an individual were to report experiencing minority stress, or cravings or urges to use, the application could present suggestions for managing urges in the moment. These prompts might include guided breathing, mindfulness, or distraction techniques. Applications could also suggest coping strategies and social supports one might reach out to via phone or text, or provide inspirational reminders consistent with individuals’ goals around managing nicotine and substance use.

## Limitations

These data were drawn from a nonclinical, university-based and predominantly White/Caucasian and young adult sample. As such, results should be interpreted within this context and additional research is needed to generalize these results to individuals that are more diverse. We attempted to be as inclusive as possible in the

current study by inviting heterosexually identified individuals to participate, so long as they denied being exclusively heterosexual currently. This effort resulted in an  $n$  of five who identified as both cisgender male or female and heterosexual (one heterosexual individual identified as transgender); these participants were retained in the analysis. It should be noted however that their experiences of minority stress may differ from those who do not identify as heterosexual and/or cisgender men or women; this possibility should be clarified through future research. Although we used the two-step approach to assessing gender during EMA orientation session ([Reisner et al., 2014](#)), we did not do so for the prescreening. This oversight may have resulted in underrepresentation of gender diverse participants in the EMA study. Recruiting a more gender-diverse sample would allow researchers to further examine the roles of sexual versus gender minority stress, and intersecting identities and sociocultural contexts, regarding substance use among gender minority individuals ([Talley et al., 2016](#); [Reisner et al., 2016](#)).

A strength of the measurement method used within this study stems from its highly repeated, within person nature. On the other hand, response burden may have led to missing data. The average EMA completion rate of 68.02% is consistent with prior EMA studies (e.g., [Morgenstern et al., 2016](#); [Schüz, Walters, Frandsen, Bower, & Ferguson, 2014](#); [Buckner et al., 2011](#)). Nevertheless, future research would benefit from efforts aimed at increasing response rates, especially over time, to capture a more complete representation of SGM individuals' experiences. Future research would benefit from gathering data from a larger sample, as well as potentially increasing the measurement period to cover a longer period of time throughout the day/night (e.g., substance use after 10 p.m.).

Another potential limitation may stem from how discrimination and other mistreatment experiences were measured. Participants were given the opportunity to make their own attributions, which has several benefits (e.g., response freedom, reduced likelihood of influencing participant reports or their daily perceptions and experiences), but this might have also led to misattribution to the degree that participants were unable to identify reasons for the experience(s). On the other hand, some might be more or less likely to attribute mistreatment to sexual orientation or gender identity. Unfortunately, this is an individual difference characteristic we are unable to account for in the current study.

In order to keep prompts as brief as possible, we did not include, and therefore cannot account for, all relevant measures associated with nicotine or substance use (e.g., availability, academic stress, current substance use disorder). Furthermore, the way in which mistreatment constructs were measured precludes direct attributions of nicotine or substance use to particular discrimination or other mistreatment experiences. This was a deliberate aspect of our research design and was expected to lower the probability of introducing instrumentation effects (e.g., reinforcing or creating a spurious link between SGB-based discrimination and substance use). Relatedly, conclusions regarding reasons or motives for engaging in nicotine and substance use are also limited by not accounting for attributions for why use may have occurred. The current results support [Meyer's \(2003\)](#) minority stress model; however, individuals in this study may have used nicotine and substances for a variety of reasons (e.g., sexual reasons, experimentation). Another potential limitation relates to loss of sensitivity as alcohol use and drug use were collapsed into a single binary variable. The decision to do so in the current study was motivated by a desire to create an overall substance use variable, which required that alcohol use be converted into a binary variable. This decision was also based on our desire to overcome measurement error associated with imperfect estimation of "standard drinks" ([Kerr, Greenfield, Tujague, & Brown, 2005](#)), and lack of controls for other variables such as body mass index, tolerance, and substance use disorder. We believe these controls are important when it comes to accurate interpretation of alcohol and drug use quantities.

Finally, though the current study design did not require a control group, future research might benefit from including control conditions to more formally examine potential instrumentation effects related to EMA among

SGM individuals. Another option might be to begin EMA by first collecting nicotine and substance use data, prior to introducing questions regarding discrimination or other forms of mistreatment, to examine differences once mistreatment and attribution questions are introduced. However, the fact that we did not observe an increase in nicotine, substance use, and reported discrimination suggests little to no reactivity over the two-week study period. Previous studies have also demonstrated little to no adverse reactivity to EMA methods ([Husky et al., 2014](#); [Shrier et al., 2014](#); [Shiffman, Stone, & Hufford, 2008](#); [Hufford, Shields, Shiffman, Paty, & Balabanis, 2002](#)).

## Conclusion

Individuals who identify as SGM continue to experience elevated rates of minority stress and substance use relative to their heterosexual and cisgender counterparts. This study indicates that discrimination is a daily experience for some, and that these experiences are positively and prospectively linked to nicotine and substance use risk. This relationship remained even after accounting for other forms of mistreatment, suggesting that SGM-based discrimination may be particularly disruptive for SGM individuals. We believe this is an important acknowledgment given the pervasiveness of prejudicial attitudes that disproportionately disadvantage SGM individuals, and the fact that these within day occurrences are linked to immediate and delayed nicotine and substance use. Additional work is needed to further explicate the dynamic relationship between minority stress and health, and to develop strategies for reducing the burden of minority stress and associated risk for SGM individuals.

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