ann. behav. med. (2022) 56:536–550
https://doi.org/10.1093/abm/kaab062

REGULAR ARTICLE

Daily Stressor Exposure and Daily Well-Being Among Sexual Minority and Heterosexual Adults in the United States: Results from the National Study of Daily Experiences (NSDE)

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Published online: 18 September 2021

Abstract

Background Daily stress plays a significant role in mental and physical health. Negative mood (e.g., hopelessness) and physical symptoms (e.g., headaches) are responses often associated with daily stressors. It is theorized that some people or populations are more vulnerable or reactive to daily stressors. We propose sexual orientation as one factor that is associated with daily stress exposure and reactivity.

Purpose To understand whether sexual minorities (SMs) differ from heterosexuals in their exposure and reactivity to general, non-sexual minority-specific stressors (e.g., arguments/disagreements, job concerns).

Methods We used daily diary data (n = 3,323 heterosexuals [52% identified as female and 85% identified as White]; n = 98 SMs [50% identified as female and 93% identified as White]) from the National Study of Daily Experiences (NSDE). Participants completed eight consecutive evening daily diary interviews (n days = 24,773; mean days completed = 7.24) and reported daily stress exposure and daily well-being. We used multilevel modeling as an approach to examine whether sexual orientation interacted with daily stressors to predict daily negative affect and physical health.

Results SMs tended to experience more daily stressors compared to heterosexuals; specifically, SMs reported at least one stressor on nearly half (48%) of the study days they completed, and heterosexuals reported at least one stressor on about two-fifths (41%) of the study days they completed. SMs also tended to experience more negative mood when they experienced a daily stressor compared to heterosexuals when they experienced a daily stressor.

Conclusion We emphasize the importance of SMs' exposure and reactivity to general daily stressors and the implications of our results for the day-to-day lives and health of SMs.

Keywords Daily stressors · Daily well-being · Sexual minorities · Discrimination · Daily diary

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Daily stressors play a significant role in mental and physical health [1, 2]. Over two decades of published research shows that day-to-day, frequent stressors (e.g., arguments with a friend, job concerns), rather than major, infrequent stressors (e.g., divorce, job loss) are often better predictors of mental and physical health outcomes [1–9]. Negative affect (e.g., hopelessness) and physical symptoms (e.g., headaches) are responses often associated with daily stressors and are referred to as *daily well-being* in Almeida (2005)'s prominent daily stress model [1]. Almeida's daily stress model [1] outlines a framework for understanding how individual differences (e.g., age, personality, socioeconomic status) predict people's exposure to daily stressors and their emotional and/or physical reactivity to them. For instance, people tend to report more negative affect and physical complaints on days when a stressor occurs compared to days when no stressor occurs [1, 2, 5, 9]. Heightened negative affect (i.e., reactivity) in response to daily stressors has been found to predict chronic illness, mental distress, and mortality risk [1, 4, 9]. It is theorized that some people or

populations are more vulnerable and/or reactive to daily stressors than others [1].

Chronic stress is one factor thought to relate to daily stress exposure (frequency and type) and reactivity (mental and physical responses) [10–12]. Ample research demonstrates that the presence of chronic stress (e.g., financial strain, serious illness, stigma) is associated with more day-to-day stress overall and the depletion of resources needed to successfully cope with day-to-day stress (e.g., emotion regulation strategies, social support, physical health, sense of environmental control, or mastery) [1, 13–17]. For instance, those with less versus more education (a proxy for financial status), report more mental and physical distress on any given day, and report more same-day physical and emotional reactivity to daily stressors [10–12]. We propose sexual minority status as one factor that is associated with daily stress exposure and reactivity.

Sexual minorities (SMs; those who identify as lesbian, gay, or bisexual) tend to report more chronic stress (stigma, serious illness, job concerns) compared to their heterosexual counterparts [18–25]. Recent research has examined associations between day-to-day, sexual minority-specific stressors and SMs' health as well as affect [26–35]. For example, Eldahan et al. found that stressors related to SM identity (e.g., "Today, being gay/bisexual stressed me out") predicted same-day and next-day lower positive affect and higher negative and anxious affect among gay and bisexual men [26]. Other studies have also found positive associations between day-to-day SM-specific stressors (e.g., heterosexism, microaggressions) and SMs' psychological distress [27, 32–35]. Further, associations exist between everyday substance use (e.g., tobacco, alcohol) and discrimination (e.g., bans on same-sex adoption) [35], stigma (e.g., identity concealment) [36], and general stress (e.g., arguments) [37]. We extend this research with data from the National Study of Daily Experiences (NSDE) [38] to understand whether SMs differ from heterosexuals in their exposure and reactivity to general, non-sexual minority-specific stressors (e.g., arguments/disagreements, job-related concerns) measured with the Daily Inventory of Stressor Events (DISE) [38]. We aim to examine the association between SMs' day-to-day stressor exposure and reactivity to understand correlates of health disparities observed in SMs. This research could help to elucidate how SM status affects daily-stress processes and in turn, influences physical and emotional health.

The Present Study

We had three goals for the present study. The first goal was to examine differences in daily stress exposure (frequency and type) between SMs and heterosexuals. **Hypothesis 1: Daily Stressor Frequency.** In line with the theory that people who experience more chronic stress also experience more daily stress because of similar exposure and vulnerability factors that play out in stressful ways both broadly and daily (e.g., socioeconomic status) [10–12], we expected SMs to experience more daily stressors compared to heterosexuals. **Hypothesis 2: Daily Stressor Type.** These analyses were exploratory. We did not have an *a priori* hypothesis for whether SMs and heterosexuals differ in the types of general, non-sexual minority-specific stressors they experience. The second goal of the present study was to examine differences in daily well-being (negative mood and physical symptoms) between SMs and heterosexuals. **Hypothesis 3: Daily Well-Being.** In line with the theory that populations with chronic stress (e.g., financial strain, stigma) tend to report more daily negative mood and physical symptoms on any given day, we expected SMs to report more daily negative mood and physical symptoms compared to heterosexuals [10–12]. The third goal of this study was to examine whether sexual orientation interacted with daily stress exposure to predict same-day stressor reactivity (negative mood and physical symptoms). **Hypothesis 4: Daily Stress Reactivity.** In line with the theory that populations with more chronic stress may be more reactive to stressors [10–12], we expected SMs to report more same-day negative mood and physical symptoms compared to heterosexuals on days when a stressor occurred.

Method

Sample and Procedure

Data are from the Midlife in the United States Study (MIDUS) [39]. MIDUS is a national sample of 7,108 English-speaking adults, ages 25–74, recruited through random digit dialing and designed to investigate factors associated with age-related changes in health [40]. Participants were first interviewed in 1995–1996 (MIDUS-1; 70% response rate) [41] and followed up for a second time in 2004–2006 (MIDUS-2; 75% mortality-adjusted retention rate) [42]. In 2011–2014, MIDUS was augmented with a newly recruited national sample of 3,577 participants (59% response rate) that were similar to MIDUS-1 participants on sociodemographic characteristics and this wave of data collection is known as the MIDUS Refresher (MIDUS-R) [43]. Data were collected at each MIDUS assessment via computer-assisted personal interviews and self-administered questionnaires. Data collection for the MIDUS studies were approved by Institutional Review Boards at each participating site, and all participants provided informed consent.

A subset of 4,303 participants from MIDUS-1 (n = 1,499), MIDUS-2 (n = 2,022), and MIDUS-R (n = 782), were randomly selected to participate in a

subproject called the National Study of Daily Experiences (NSDE; response rates were 81% for NSDE-1, 66% for NSDE-2, and 61% for NSDE-R) [38]. Participants completed telephone interviews for 8 consecutive evenings and answered questions about their daily experiences.

Analytic sample.

Participants were part of the present analyses if they completed a daily diary assessment and identified their sexual orientation. Given that MIDUS is longitudinal, 793 participants of the 4,303 completed a daily diary assessment at MIDUS-1 and MIDUS-2. We retained assessments at MIDUS-1 and excluded duplicate assessments at MIDUS-2 to avoid violation of the independent observations assumption, which resulted in daily diary assessments from 3,510 participants. Of these 3,510 participants, 89 did not provide data on their sexual orientation and therefore, were excluded from analyses. Our final analytic sample was 3,421 participants who completed 7.24 of 8 interview days, on average, and which resulted in 24,773 days of data on their daily experiences (90.52% response rate; see Supplemental Table S1 for description of response rates presented by sexual orientation). Participants identified their sexual orientation as heterosexual (n = 3,323), homosexual (n = 58), or bisexual (n = 40). Given "homosexual" is deemed an outdated and offensive term by many guiding organizations (e.g., the American Psychological Association, Gay and Lesbian Alliance Against Defamation, the *New York Times*), we herein refer to those who selected the "homosexual" response option with the overarching phrasing of "lesbian/gay." We acknowledge that the "lesbian/gay" identity label is an imperfect fit with the response options provided to participants, but our adoption of "lesbian/gay" allows us to avoid pathologizing terminology. Participants' mean age was 50.04 years (SD = 13.33; range = 20–83), and 85.18% identified their race as White, 9.24% identified as Black or African American, and 5.58% identified as Other. Participants were female (51.89%; n = 1,775) or male (43.17%; n =1,477) and 169 (4.94%) did not indicate their sex. To maximize statistical power, we combine those who identified as homosexual or bisexual into one sexual minority (SM) category, such that our analytic sample was 3,323 heterosexuals and 98 SMs. Of the 3,323 heterosexuals, 1,726 (51.94%) were female, 1,428 (42.97%) were male, 169 (5.09%) did not report their sex and these individuals identified their race as White (n = 2,823; 84.95%), Black or African American (n = 315; 9.48%), Other (n = 156; 4.69%), and 29 (0.88%) did not indicate their race. Of the 98 SMs, 49 (50.0%) were female, 49 (50.0%) were male, and identified as White, (n = 91; 92.86%), Black or African American (n = 1; 1.02%), and Other (n = 6; 6.12%). See Table 1 for sociodemographic and health characteristics by SM status.

Table 1 Comparison of sociodemographic and health characteristics by SM status (N = 3,421)

Characteristics	SM (n = 98)	Heterosexual (n = 3,323)	t/χ^2
Demographics			
Age (in years; M [SD])	44.68 (12.36)	50.19 (13.33)	4.34***
Sex (%)			
Female	50.00	51.94	0.86
Male	50.00	42.97	
Missing		5.09	
Sexual minority status (%)			
Lesbian/gay	59.18		
Bisexual	40.82		
Education (%)			5.94
High school or less	22.45	30.45	
Some college	27.55	31.32	
College graduate or more	50.00	38.13	
Missing		.10	
Race (%)			
White	92.86	84.95	4.03*
Black or African American	1.02	9.48	
Other	6.12	4.69	
Missing		.88	
Married (%)	20.41	68.88	98.48***
Self-reported health (%)			
Poor	9.5	2.7	
Fair	23.8	8.4	
Good	23.8	29.7	
Very good	38.1	42.8	
Excellent	4.8	16.4	
Mean self-reported health (SD)	3.52 (0.94)	3.58 (1.02)	0.59

Note. SM = sexual minority.
*p < .05, **p < .01, ***p < .001.

Measures

Person-Level Variables

Covariates: Age, sex, race, education, marital status, physical health, neuroticism, and MIDUS data wave

Covariates in the present analyses were selected based on previous research that demonstrates their associations with daily stress and well-being: age [13, 44], sex [45], race [46], education [1], marital status [47], physical health [5], and personality/trait neuroticism [8]. Prior to the daily diary assessment, participants reported their age (in years), sex (coded as: 0 = male, 1 = female), race

(coded as: 0 = non-White, 1 = White), education (coded as: 0 = high school or less, 1 = some college or more), marital status (coded as: 0 = other, 1 = married), and subjective physical health (coded as: 0 = poor/fair, 1 = good/very good/excellent). These variables have been dichotomized similarly in previous studies that have analyzed MIDUS data [12, 46, 48–50]. For trait neuroticism, participants rated how often they felt moody, worried, nervous, and calm on a 4-point Likert scale from 1 (*a lot*) to 4 (*not at all*). We also controlled for the wave of MIDUS in which participants completed the daily diary assessment (coded as: Wave-1: MIDUS-2 and MIDUS-R = 0, MIDUS-1 = 1; Wave-2: MIDUS-1 and MIDUS-R = 0, MIDUS-2 = 1).

Sexual orientation

A single item measured sexual orientation: "How would you describe your sexual orientation? Would you say you are heterosexual (sexually attracted only to the opposite sex), homosexual (sexually attracted only to your own sex), or bisexual (sexually attracted to both men and women)?" To maximize statistical power, we combine those who identified as lesbian/gay and bisexual into one SM category and participants were coded as [0] heterosexual and [1] SM.

Day-Level Variables

Daily stress exposure (frequency and type)

Participants were asked on each of the 8 study days whether they experienced any stressor event in the Daily Inventory of Stressor Events (DISE) [38]. The DISE includes seven types of stressors: (a) arguments or disagreements, (b) avoided arguments or disagreements, (c) work/school stressors, (d) home stressors, (e) discrimination (e.g., on the basis of race, sexuality, or sex), (f) network stressors (e.g., something that happened to a friend/relative), and (g) other stressors. Participants' exposure to these stressors was coded and analyzed in three ways: First, we calculated the mean number of stressors each individual reported across their completed study days to reflect *number of stressors*. Second, for each day an individual reported at least one stressor, that day was coded as 1 (yes) or otherwise 0 (no) and *any stressors* reflects the percentage of days each participant reported at least one stressor out of the total number of days they completed a daily diary assessment. Third, for each day an individual reported two or more stressors, that day was coded as 1 (yes) or otherwise 0 (no) and *multiple stressors* reflects the percentage of days each participant reported two or more stressors out of the total number of days they completed a daily diary assessment.

Daily negative affect

On each of the 8 study days, participants were asked to indicate on a scale from 0 (*none of the time*) to 4 (*all of the time*), how often over the past 24 hr they experienced negative feelings on an adapted version of the Non-Specific Psychological Distress Scale [51]. In MIDUS-1, daily negative affect was measured with 12 items: *feeling depressed, restless or fidgety, so restless you could not sit still, nervous, so nervous nothing could calm you down, worthless, so sad nothing could cheer you up, tired out for no good reason, everything was an effort, hopeless, angry or irritable,* and *in good spirits*. In MIDUS-2 and MIDUS-R, daily negative affect was measured with 14 items: *feeling restless or fidgety, nervous, worthless, so sad nothing could cheer you up, everything was an effort, hopeless, lonely, afraid, jittery, irritable, ashamed, upset, angry*, and *frustrated*. Negative affect scores were almost perfectly correlated (r = .96) with and without the two additional negative affect items; thus, we retained responses from the two additional items in MIDUS-2 and MIDUS-R. Daily negative affect was calculated as each participant's average frequency of negative emotions felt across their completed study days. Higher values reflect more frequent negative affect.

Daily physical symptoms

Participants were asked on each study day whether they experienced 22 physical symptoms in the Physical Symptoms Checklist [5, 7]. In MIDUS-1, participants reported on three groups of symptoms: pain (headaches, backaches, and muscle soreness), gastrointestinal (poor appetite, nausea and upset stomach, constipation and diarrhea), and flu and respiratory (sore throat, runny nose, fever, chills, and congestion). In MIDUS-2 and MIDUS-R, the same symptoms were measured plus chest pain or dizziness (symptoms associated with cardiovascular diseases) and an open-ended response for other physical symptoms. Daily physical symptoms were almost perfectly correlated (r = .98) with and without the additional items; thus, we retained responses from the additional physical symptom items in MIDUS-2 and MIDUS-R. Higher values reflect more physical symptoms.

Analytic Plan

Goals 1 and 2: Daily stress exposure and well-being in SMs and heterosexuals.

To test differences in daily stress exposure (i.e., frequency and type) and daily well-being (i.e., negative affect and physical symptoms) between SMs and heterosexuals, we conducted linear regression in R using the *lm* function [52]. This method was optimal because we could include covariates.

Goal 3. Daily stress reactivity in SMs and heterosexuals.

To examine whether SM status moderated associations between daily stress exposure and well-being, we followed multilevel modeling procedures [52, 53] using SAS PROC MIXED in SAS version 9.4. In our models, daily negative affect and physical symptoms were outcome variables, daily stress exposure (within-person; coded as: 0 = no stressor day, 1 = stressor day) was a level-1 predictor and duration in the study (coded as: day 1 = 1, day 2 = 2, …, day 8 = 8) and day of week (coded as: Monday = 1, Tuesday = 2, …, Sunday = 7) were level-1 covariates. The mean number of days each participant reported at least one stressor across the 8 study days was calculated as a between-person daily stress exposure variable and included as a level-2 predictor. Furthermore, SM status (0 = heterosexual, 1 = SM) and between-person covariates (i.e., age, sex, race, education, marital status, trait neuroticism, subjective physical health, and MIDUS data wave) were also entered as level-2 predictors. We first tested the main effect of SM status on negative affect and physical symptoms, controlling for within-person and between-person daily stress exposure, duration in the study, and day of week (Model 1). Next, we added to our model the cross-level interaction between SM status and within-person daily stress exposure to test the effect of this interaction on negative affect and physical symptoms (Model 2). Finally, we added the remaining level-2 covariates into the final model (Model 3). As an example, below is the final multilevel model used to examine whether SM status predicted negative affect and/or moderated any associations between daily stress exposure and negative affect:

Level-1:

$$NEG_{ij} = \beta_{0i} + \beta_{1i}\text{ANYSTRESS} + \beta_{2i}\text{STUDY-DAY} + \beta_{3i}\text{DAY-WEEK} + e_{ij}$$

Level-2:

$$\beta_{0i} = \gamma_{00} + \gamma_{01}SM + \gamma_{02}BP\text{-}ANYSTRESS + \gamma_{03}AGE + \gamma_{04}SEX + \gamma_{05}EDUCATION + \gamma_{06}RACE + \gamma_{07}MARITAL + \gamma_{08}HEALTH + \gamma_{09}NEUROTICISM + \gamma_{10}WAVE\text{-}1 + \gamma_{11}WAVE\text{-}2 + u_1$$

$$\beta_{2i} = \gamma_{20}$$

$$\beta_{3i} = \gamma_{30}$$

where in level-1 (day-level), negative affect (NEG_{ij}) was modeled as a function of person-specific intercepts (β_{0i}), person-specific stress reactivity (β_{1i}; the level to which an individual's negative affect changes in response to a stressor), duration in the study (β_{2i}), day of week (β_{3i}), and residual errors (e_{ij}). In level-2 (person-level), the intercept was modeled as a function of SM status and covariates (between-person daily stress exposure, age, sex, education, race, marital status, subjective physical health, trait neuroticism, and MIDUS data wave). We were especially interested in the main effect of SM status on the person-specific intercepts of negative affect (γ_{01}). Stress reactivity was modeled as a function of SM status to test the cross-level interaction between SM status and daily stress exposure on daily negative affect (γ_{11}).

Results

Descriptive Statistics

Descriptive statistics for the current sample are presented by SM status in Table 1. SM adults were younger, on average, than heterosexuals, more likely to identify as White, and less likely to be married. Sex, education, and subjective physical health did not differ between SMs and heterosexuals. Bivariate correlations between study variables can be found in Table S2 of the Supplemental Material.

Linear Regression Analyses

Goals 1 and 2: Daily stress exposure and well-being in SMs and heterosexuals.

In Table 2, we present comparisons between SM and heterosexual adults on daily stress exposure (frequency and type) and well-being (negative affect and physical symptoms). Overall, SMs tended to experience more daily stressors across their completed study days compared to heterosexuals. SMs were also more likely than heterosexuals to experience at least one stressor on a study day; specifically, SMs reported at least one stressor on nearly half (48%) of the study days they completed compared to heterosexuals who reported at least one stressor on about two-fifths (41%) of the study days they completed. Lastly, SMs experienced two or more stressors on 14% of their completed study days and heterosexuals reported two or more stressors on 11%; however, this difference was not statistically significant.

There were some significant differences between SMs and heterosexuals in the types of daily stressors experienced. SMs reported more daily stress at work/school and more discrimination compared to heterosexuals. Although SMs reported more instances of each of the other types of daily stressors (i.e., arguments or disagreements, avoiding arguments or disagreements, home stressors, network stressors, other stressors), there were no other statistically significant differences in the types of daily stressors experienced by SMs and heterosexuals. Finally, SMs reported more daily negative affect (e.g., sadness) and physical symptoms (e.g., pain) compared to heterosexuals.

Table 2 Comparison of daily stress exposure and daily well-being by SM status (N = 3,421)

Variable	SM (n = 98)			Heterosexual (n = 3,323)			F^a
	M	*SD*	Ranges	*M*	*SD*	Ranges	
Daily stress exposure							
Number of stressors	0.68	0.47	0–2	0.55	0.48	0–5	5.57*
Any stressors[b]	0.48	0.26	0–1	0.41	0.27	0–1	7.15**
Multiple stressors[b]	0.14	0.19	0–1	0.11	0.18	0–1	1.25
Type of daily stressor[b]							
Arguments or disagreements	0.12	0.18	0–1	0.10	0.15	0–1	2.20
Avoiding arguments or disagreements	0.18	0.19	0–1	0.16	0.18	0–1	0.73
Work/school stressors	0.13	0.17	0–.75	0.09	0.16	0–1	5.12*
Home stressors	0.09	0.13	0–.67	0.08	0.14	0–1	0.21
Discrimination	0.02	0.06	0–.43	0.01	0.04	0–.57	4.88*
Network stressors	0.06	0.10	0–1	0.05	0.11	0–1	0.53
Other stressors	0.07	0.07	0–1	0.05	0.10	0–1	3.56
Daily well-being							
Negative affect	0.30	0.37	0–1.9	0.21	0.28	0–3.32	14.05***
Physical symptoms	1.56	1.56	0–7	1.32	1.69	0–14	4.92*

Note. SM = sexual minority.

[a]Covariates: age (in years), sex (0 = male, 1 = female), race (0 = non-White, 1 = White), education (0 = high school or less, 1 = some college or more), marital status (0 = other, 1 = married), subjective physical health (0 = poor/fair, 1 = good/very good/ excellent), trait neuroticism (continuous), and wave of study (MIDUS-R is the reference);

[b]Represents fractions of study days. For example, for the variable *any stressors*, a value of 1 means that a participant always reported at least one stressor in each study day they completed.

*p < .05, **p < .01, ***p < .001.

Multilevel Model Analyses

Goal 3. Daily stress reactivity in SMs and heterosexuals.

We conducted three linear mixed models to test associations between SM status, daily stress exposure, and stress reactivity (negative affect and physical symptoms). The results of these analyses are presented in Table 3.

Daily negative affect.

The intraclass correlation (ICC) for negative affect was .54, which indicated that nearly half of the total variation in negative affect was within-person variation and the other half was between-person variation. An ICC of .54 is moderate in size and indicated that we could proceed with our multilevel analysis [54] to examine whether the ICC changed as we added variables to our model. In Model 1, we examined the main effect of SM status (0 = heterosexual, 1 = SM) and daily stress exposure (within-person) on daily negative affect, and we controlled for duration in the study, day of week, and between-person daily stress exposure. The main effect of any stressors on daily negative affect was significant, such that participants reported more negative affect on days they reported a stressor compared to days they reported no stressor (B = 0.13, SE = 0.01, p < .001). However, the main effect of SM status on daily negative affect was not significant (B = −0.004, SE = 0.03, p > .05). Next, in Model 2, we entered the cross-level interaction between SM status and within-person daily stress exposure. The interaction between SM status and within-person daily stress exposure significantly predicted daily negative affect (B = 0.05, SE = 0.03, p < .05) and this interaction remained significant after the remaining covariates were added (Model 3; B = 0.07, SE = 0.03, p < .05). The decomposition of this interaction (in Fig. 1) indicated that SMs reported more negative affect when they experienced a daily stressor compared to heterosexuals when they experienced a daily stressor. The unstandardized simple slopes were 0.19 (SE = 0.03, p < .001) for SMs and 0.12 (SE = 0.01, p < .001) for heterosexuals. There were no differences in daily negative affect between SMs and heterosexuals on days when no stressors were reported.

In an exploratory analysis, we investigated whether higher affective reactivity to daily stressors among SMs compared to heterosexuals was driven by a subset of individuals we placed into the SM category (i.e., lesbian/gay and bisexual participants; see Table 3) and/or by sex. We used dummy codes to separately compare lesbian/gay and bisexual participants to heterosexuals. We repeated the procedure above (Models 1, 2, and 3) with this coding scheme for negative affect and physical

Table 3 Summary of multilevel models predicting daily negative affect (N = 3,421)

	Model 1: Main effect of SM status or sexual orientation[a]	Model 2: Interaction between SM status or sexual orientation and daily stress exposure[a]	Model 3: Interaction between SM status or sexual orientation and daily stress exposure with all covariates[b]
SM (n = 98) vs. heterosexual (n = 3,323)			
Fixed effects			
Intercept	0.14 (0.01)***	0.14 (0.01)***	0.15 (0.03)***
Any stressors (0 = no, 1 = yes)	0.13 (0.01)***	0.12 (0.01)***	0.12 (0.01)***
SM status (0 = heterosexual, 1 = SM)	−0.004 (0.03)	−0.02 (0.03)	−0.03 (0.02)
Any stressors*SM status		0.05 (0.03)*	0.07 (0.03)*
Variance components			
Between-person (level 2) variance (Intercept)	0.04 (0.001)***	0.04 (0.002)***	0.03 (0.001)***
Within-person across days (level-1) variance (Intercept)	0.07 (0.001)***	0.07 (0.001)***	0.06 (0.001)***
Any stressors	0.04 (0.001)***	0.04 (0.002)***	0.04 (0.002)***
Model fit			
AIC	11020.6	11019.6	9099.0
BIC	11075.8	11080.9	9214.3
Lesbian/gay (n = 58) and bisexual (n = 40) vs. heterosexual (n = 3,323)			
Fixed effects			
Intercept	0.14 (0.01)***	0.14 (0.01)***	0.15 (0.03)***
Any stressors (0 = no, 1 = yes)	0.13 (0.01)***	0.12 (0.010)***	0.12 (0.01)***
Sexual orientation			
Lesbian/gay vs. heterosexual	0.01 (0.03)	−0.003 (0.03)	−0.02 (0.03)
Bisexual vs. heterosexual	0.01 (0.04)	−0.01 (0.04)	−0.06 (0.04)
Interactions			
Any stressors*lesbian/gay		0.05 (0.04)	0.06 (0.04)
Any stressors*bisexual		0.09 (0.05) *	0.09 (0.05)*
Variance components			
Between-person (level 2) variance (Intercept)	0.04 (0.002)***	0.04 (0.001)***	0.03 (0.001)***
Within-person across days (level-1) variance (Intercept)	0.07 (0.001)***	0.07 (0.001)***	0.06 (0.001)***
Any stressors	0.04 (0.002)***	0.04 (0.002)***	0.04 (0.002)***
Model fit			
AIC	11022.5	11020.6	9102.1
BIC	11083.8	11094.2	9229.6
SM females (n = 49) vs. heterosexual females (n = 1,726)			
Fixed effects			
Intercept	0.14 (0.01)***	0.14 (0.01)***	0.11 (0.04)**
Any stressors (0 = no, 1 = yes)	0.13 (0.01)***	0.13 (0.01)***	0.13 (0.01)***
SM status (0 = heterosexual, 1 = SM females)	0.01 (0.03)	−0.01 (0.04)	−0.03 (0.03)
Any stressors*SM status		0.09 (0.05)†	0.08 (0.05)†
Variance components			
Between-person (level 2) variance (Intercept)	0.04 (0.002)***	0.04 (0.002)***	0.03 (0.002)***
Within-person across days (level-1) variance (Intercept)	0.07 (0.001)***	0.07 (0.001)***	0.07 (0.001)***
Any stressors	0.04 (0.003)***	0.04 (0.003)***	0.04 (0.003)***
Model fit			
AIC	6583.5	6582.0	6384.5
BIC	6632.9	6636.8	6477.5

Table 3 Continued

	Model 1: Main effect of SM status or sexual orientation[a]	Model 2: Interaction between SM status or sexual orientation and daily stress exposure[a]	Model 3: Interaction between SM status or sexual orientation and daily stress exposure with all covariates[b]
SM males (n = 49) vs. heterosexual males (n = 1,428)			
Fixed effects			
Intercept	0.14 (0.01)***	0.14 (0.02)***	0.17 (0.04)***
Any stressors (0 = no, 1 = yes)	0.11 (0.01)***	0.11 (0.01)***	0.11 (0.01)***
SM status (0 = heterosexual, 1 = SM males)	−0.001 (0.03)	−0.01 (0.04)	−0.04 (0.04)
Any stressors*SM status		0.03 (0.04)	0.06 (0.04)
Variance components			
Between-person (level 2) variance (Intercept)	0.04 (0.002)***	0.04 (0.002)***	0.03 (0.001)***
Within-person across days (level-1) variance (Intercept)	0.06 (0.001)***	0.06 (0.001)***	0.05 (0.001)***
Any stressors	0.03 (0.003)***	0.03 (0.003)***	0.03 (0.003)***
Model fit			
AIC	2962.3	2963.6	2516.4
BIC	3010.0	3016.6	2611.3

Note. SM = sexual minority.

[a]Covariates: duration in the study (day 1 = 1, day 2 = 2, …, day 8 = 8), day of week (Monday = 1, Tuesday = 2, …, Sunday = 7), between-person stress exposure;

[b]Covariates: duration in the study (day 1 = 1, day 2 = 2, …, day 8 = 8), day of week (Monday = 1, Tuesday = 2, …, Sunday = 7), between-person stress exposure, age (in years), sex (0 = male, 1 = female), race (0 = non-White, 1 = White), Education (0 = high school or less, 1 = some college or more), marital status (0 = other, 1 = married), subjective physical health (0 = poor/ fair, 1 = good/ very good/ excellent), neuroticism trait (score), and wave of study (MIDUS-R is the reference).

$^{\dagger}p < .10$, $*p < .05$, $**p < .01$, $***p < .001$.

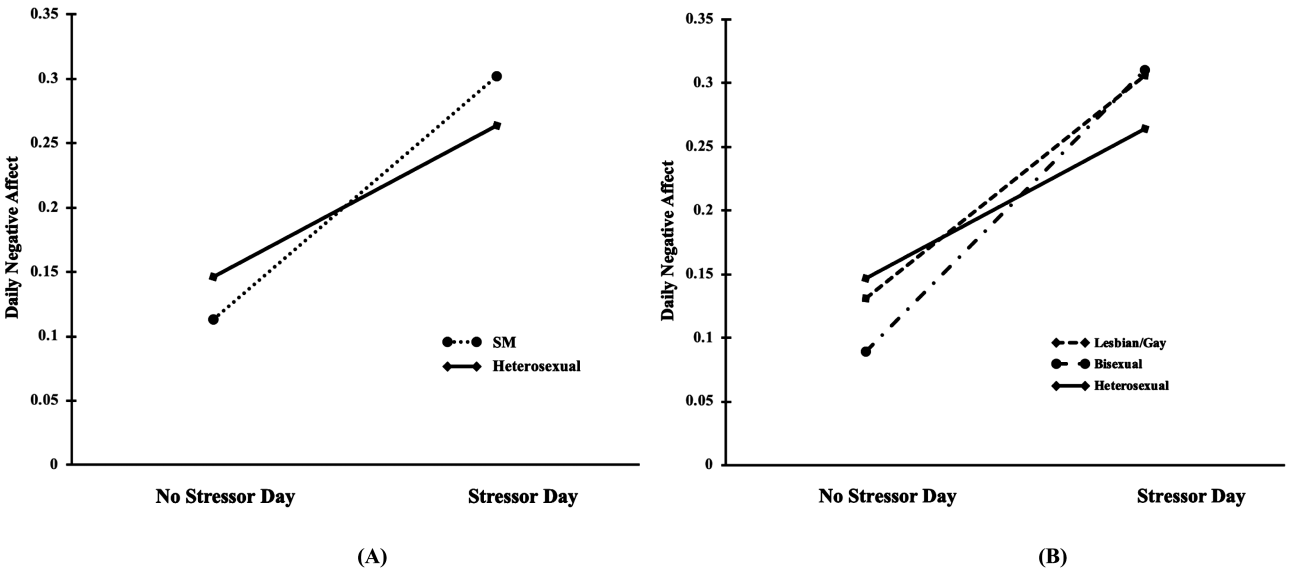

Fig. 1. Reports of daily negative affect by whether a stressor was encountered and SM status and sexual orientation, respectively. (A) There was a significant cross-level interaction between daily stress exposure (0 = no stressor day, 1 = stressor day) and SM status (0 = heterosexual, 1 = SM), such that SMs were more reactive (i.e., had higher negative affect) when they experienced a daily stressor compared to heterosexuals when they experienced a daily stressor (B = 0.07, SE = 0.03, $p < .05$). (B) Higher reactivity among SMs on stressor days was especially driven by bisexuals (B = 0.09, SE = 0.05, $p < .05$). SM = sexual minority.

symptoms. In Model 1, daily negative affect was similar between heterosexuals and lesbian/gay participants ($B = 0.01$, $SE = 0.03$, $p > .05$) as well as those who identified as bisexual ($B = 0.01$, $SE = 0.04$, $p > .05$). In Model 2, the interaction between a lesbian/gay status and daily stress exposure did not significantly predict daily negative affect ($B = 0.05$, $SE = 0.04$, $p > .05$), which suggests that, on stressor days, heterosexuals and lesbian/gay participants had similar negative affect. However, the interaction between a bisexual identity and daily stress exposure significantly predicted daily negative affect ($B = 0.09$, $SE = 0.05$, $p < .05$) and this association remained significant after the addition of all covariates ($B = 0.09$, $SE = 0.05$, $p < .05$), such that on stressor days, bisexuals reported more negative affect than heterosexuals. The unstandardized simple slopes were 0.21 ($SE = 0.05$, $p < .001$) for lesbian/gay participants and 0.26 ($SE = 0.03$, $p < .001$) for bisexual participants (Fig. 1). We also stratified our SM versus heterosexual analyses by sex to examine whether the significant interaction between daily stress exposure and SM status on negative affect may have been driven by male or female participants (see Table 3). After all covariates were entered, the interaction between daily stress exposure and SM status was not statistically significant for male ($B = 0.06$, $SE = 0.04$, $p > .05$) or female participants ($B = 0.08$, $SE = 0.05$, $p > .05$), which suggests that the effect is likely being driven by both sexes. However, these exploratory analyses should be interpreted with caution because we did not have the appropriate statistical power with our SM sample size to adequately examine whether SMs higher reactivity to daily stress compared to heterosexuals was driven by a subset of SMs or by sex.

In another exploratory analysis, we investigated whether higher levels of daily negative affect among SMs were driven by the types of stressors that SMs reported more exposure to compared to heterosexuals—stressors at work/school and discrimination (see Supplemental Materials). First, we examined the independent effect of discrimination and its interaction with SM status on daily negative affect (see Supplemental Table S3) and, with all covariates, this interaction did not significantly predict daily negative affect ($B = -0.02$, $SE = 0.19$, $p > .05$). Second, we examined the independent effect of work/school stress and its interaction with SM status on daily negative affect (see Supplemental Table S4) and, with all covariates, this interaction did not significantly predict daily negative affect ($B = -0.01$, $SE = 0.04$, $p > .05$). Finally, we examined the interaction between SM status and daily stress exposure—excluding discrimination and work/school stressors—on daily negative affect (see Supplemental Table S5) and, with all covariates, this interaction significantly predicted daily negative affect ($B = 0.09$, $SE = 0.03$, $p < .05$). Similarly, the cross-level interaction between bisexual status and daily stress exposure remained significant when we excluded discrimination and work/school stressors (see Supplemental Table S5; $B = 0.12$, $SE = 0.05$, $p < .05$). These results indicate that SMs, especially bisexuals, experienced more negative affect than heterosexuals on days they reported a stressor, regardless of the type of stressor.

Lastly, we explored the possibility that stress on any given day predicted next-day negative affect among SMs. The interaction between SM status and daily stress exposure was not significantly associated with next day negative affect ($B = 0.02$, $SE = 0.02$, $p > .05$).

Daily physical symptoms.

In Table 4, we followed the same multilevel model analyses for physical symptoms as we did for negative affect. The ICC for daily physical symptoms was .70, which indicated that 70% of the total variation in daily physical symptoms was between-person. In Model 1, the main effect of SM status on daily physical symptoms was not significant ($B = -0.03$, $SE = 0.15$, $p > .05$). Similarly, the interaction between SM status and daily stress exposure (Model 2) was not significantly associated with daily physical symptoms ($B = 0.10$, $SE = 0.12$, $p > .05$). The non-significant cross-level interaction between SM status and daily stress exposure on daily physical symptoms remained non-significant ($B = 0.18$, $SE = 0.11$, $p > .05$) after the addition of all covariates (Model 3; Fig. 2).

In exploratory analyses, daily physical symptoms (Model 1) were similar between heterosexuals and lesbian/gay participants ($B = -0.08$, $SE = 0.19$, $p > .05$) as well as those who identified as bisexual ($B = 0.14$, $SE = 0.23$, $p > .05$). In Model 2, the interactions between daily stress exposure and having a lesbian/gay ($B = 0.05$, $SE = 0.14$, $p > .05$) and bisexual identity ($B = 0.26$, $SE = 0.18$, $p > .05$) did not significantly predict daily negative affect, which suggests that, on stressor days, lesbian/gay and bisexual participants had similar physical symptoms as heterosexuals, even after covariates (Model 3). We repeated the supplementary analyses that we conducted for daily negative affect and none of the cross-level interactions significantly predicted (at $p < .05$) daily physical symptoms (see Supplemental Tables S6–S8).

Lastly, we explored the possibility that stress on any given day predicted next-day physical symptoms among SMs. The interaction between SM status and daily stress exposure was not significantly associated with next day physical symptoms ($B = -0.10$, $SE = 0.10$, $p > .05$).

Discussion

In the current study, we examined daily stress exposure and well-being (negative affect and physical symptoms) in a national (predominantly White) sample of SMs and

Table 4 Summary of multilevel models predicting daily physical symptoms (N = 3,421)

	Model 1: Main effect of SM status or sexual orientation[a]	Model 2: Interaction between SM status or sexual orientation and daily stress exposure[a]	Model 3: Interaction between SM status or sexual orientation and daily stress exposure with all covariates[b]
SM (n = 98) vs. heterosexual (n = 3,323)			
Fixed effects			
Intercept	0.91 (0.05)***	0.92 (0.05)***	1.25 (0.17)***
Any stressors (0 = no, 1 = yes)	0.19 (0.02)***	0.19 (0.02)***	0.16 (0.02)***
SM status (0 = heterosexual, 1 = SM)	−0.03 (0.15)	−0.07 (0.16)	−0.04 (0.14)
Any stressors*SM status		0.10 (0.12)	0.18 (0.11)
Variance components			
Between-person (level 2) variance (Intercept)	1.87 (0.05)***	1.87 (0.05)***	1.27 (0.04)***
Within-person across days (level-1) variance (Intercept)	1.27 (0.01)***	1.27 (0.01)***	1.24 (0.01)***
Any stressors	0.29 (0.03)***	0.29 (0.03)***	0.22 (0.03)***
Model fit			
AIC	84871.3	84872.5	78024.1
BIC	84926.5	84933.9	78139.4
Lesbian/gay (n = 58) and bisexual (n = 40) vs. heterosexual (n = 3,323)			
Fixed effects			
Intercept	0.91 (0.05)***	0.91 (0.05)***	1.25 (0.17)***
Any stressors (0 = no, 1 = yes)	0.19 (0.02)***	0.19 (0.02)***	0.16 (0.02)***
Sexual orientation			
Lesbian/gay vs. heterosexual	−0.08 (0.19)	−0.09 (0.19)	−0.01 (0.18)
Bisexual vs. heterosexual	0.14 (0.23)	0.05 (0.24)	−0.08 (0.21)
Interactions			
Any stressors* lesbian/gay		0.05 (0.14)	0.10 (0.14)
Any stressors*bisexual		0.26 (0.18)	0.30 (0.18)†
Variance components			
Between-person (level 2) variance (Intercept)	1.87 (0.05)***	1.87 (0.05)***	1.27 (0.04)***
Within-person across days (level-1) variance (Intercept)	1.27 (0.01)***	1.27 (0.01)***	1.24 (0.01)***
Any stressors	0.29 (0.03)***	0.29 (0.03)***	0.22 (0.03)***
Model fit			
AIC	84872.8	84874.5	78027.3
BIC	84934.2	84948.2	78154.8
SM females (n = 49) vs. heterosexual females (n = 1,726)			
Fixed effects			
Intercept	0.95 (0.07)***	0.95 (0.07)***	1.14 (0.24)***
Any stressors (0 = no, 1 = yes)	0.16 (0.03)***	0.16 (0.03)***	0.16 (0.03)***
SM status (0 = heterosexual, 1 = SM)	−0.06 (0.21)	−0.14 (0.22)	−0.06 (0.20)
Any stressors*SM status		0.21 (0.16)	0.22 (0.16)
Variance components			
Between-person (level 2) variance (Intercept)	1.81 (0.07)***	1.81 (0.07)***	1.39 (0.06)***
Within-person across days (level-1) variance (Intercept)	1.39 (0.02)***	1.39 (0.02)***	1.40 (0.02)***
Any stressors	0.19 (0.04)***	0.19 (0.04)***	0.19 (0.04)***
Model fit			
AIC	45059.4	45059.8	44227.9
BIC	45108.8	45114.6	44320.9

Table 4 Continued

	Model 1: Main effect of SM status or sexual orientation[a]	Model 2: Interaction between SM status or sexual orientation and daily stress exposure[a]	Model 3: Interaction between SM status or sexual orientation and daily stress exposure with all covariates[b]
SM males (n = 49) vs. heterosexual males (n = 1,428)			
Fixed effects			
Intercept	0.88 (0.07)***	0.88 (0.07)***	1.66 (0.24)***
Any stressors (0 = no, 1 = yes)	0.17 (0.03)***	0.16 (0.03)***	0.16 (0.03)***
SM status (0 = heterosexual, 1 = SM)	0.18 (0.19)	0.15 (0.20)	0.06 (0.19)
Any stressors*SM status		0.06 (0.15)	0.14 (0.15)
Variance components			
Between-person (level 2) variance (Intercept)	1.48 (0.06)***	1.48 (0.06)***	1.10 (0.04)***
Within-person across days (level-1) variance (Intercept)	1.06 (0.02)***	1.06 (0.02)***	1.06 (0.02)***
Any stressors	0.29 (0.04)***	0.29 (0.04)***	0.25 (0.04)***
Model fit			
AIC	34775.0	34776.9	33599.8
BIC	34822.7	34829.8	33694.7

Note. SM = sexual minority.

[a]Covariates: duration in the study (day 1 = 1, day 2 = 2, …, day 8 = 8), day of week (Monday = 1, Tuesday = 2, …, Sunday = 7), between-person stress exposure;

[b]Covariates: duration in the study (day 1 = 1, day 2 = 2, …, day 8 = 8), day of week (Monday = 1, Tuesday = 2, …, Sunday = 7), between-person stress exposure, age (in years), sex (0 = male, 1 = female), race (0 = non-White, 1 = White), Education (0 = high school or less, 1 = some college or more), marital status (0 = other, 1 = married), subjective physical health (0 = poor/ fair, 1 = good/very good/ excellent), neuroticism trait (score), and wave of study (MIDUS-R is the reference).

$^{\dagger}p < .10$, $*p < .05$, $**p < .01$, $***p < .001$.

heterosexuals in the United States. We expected SMs to experience excess stress from day-to-day compared to heterosexuals and to report more day-to-day negative mood and physical symptoms. We found that SMs, compared to heterosexuals, tended to report more daily stressors across the study days and they also reported at least one daily stressor on a higher percentage of the study days. A similar pattern emerged for negative mood and physical symptoms, such that SMs tended to report more frequent negative affect (e.g., sadness) and physical symptoms (e.g., headache) across the study days. We discuss the implications of our results for the everyday lives and health of SM adults in the United States. It is critically important, however, to note that our heterosexual and SM samples were mostly White, and our results should not serve as a stand-in for the experiences of non-White people, a critical point we discuss in the limitations section.

Daily Stress Exposure (Frequency and Type)

Heterosexuals in the current study reported at least one daily stressor on 41% of the study days, which closely mirrors the national prevalence of daily stress exposure found in previous research [1, 12, 13, 38, 55]. However, SMs' prevalence of daily stressors differed from heterosexuals and from the national prevalence. SMs reported at least one daily stressor on 48% of the study days and our results indicate that SMs are significantly more likely than heterosexuals, on average, to experience a daily stressor. Though the difference may seem small, these results imply that, within an average month, heterosexuals would experience some form of daily stressor on 12 days, and SMs on 14 days. Within an average year, SMs would experience 24 additional days (nearly a month) in which they experience a stressor. Such differences in daily stress exposure between heterosexuals and SMs over time could account for long-term mental and physical health problems in SMs [18–20, 22, 56, 57]. It is possible that the repetitive nature of daily stressors faced by SMs puts a strain on their health. Considerable research has shown that cumulative stressors and stressor pile-up can lead to the development of serious health problems, such as high blood pressure and cardiovascular disease [6, 9], depression [4], and physiological dysregulation [58–60].

We subsequently examined the percentage of study days that heterosexuals and SMs reported the stressors measured. SMs tended to report a higher proportion of daily discrimination (e.g., being treated with less respect than others) and workplace/school stressors than

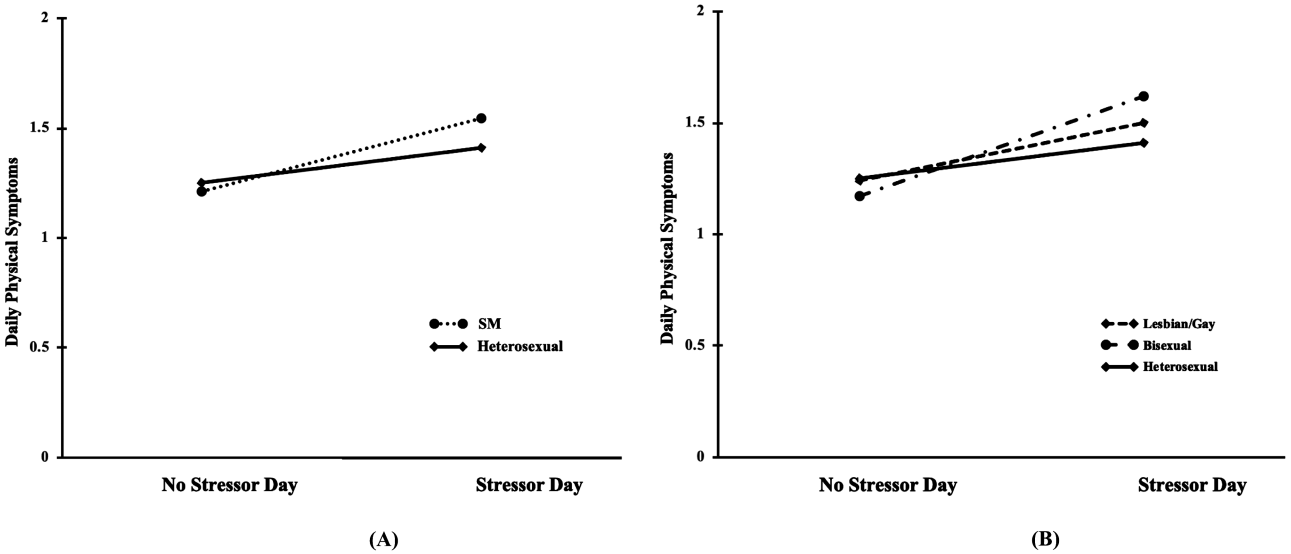

Fig. 2. Reports of daily physical symptoms by whether a stressor was encountered and SM status and sexual orientation, respectively. (A) The cross-level interaction between daily stress exposure (0 = no stressor day, 1 = stressor day) and SM status (0 = heterosexual, 1 = SM) was not significant ($B = 0.18$, SE = 0.11, $p > .05$). (B) Physical reactivity among lesbian/gay ($B = 0.10$, SE = 0.14, $p > .05$) and bisexual participants ($B = 0.30$, SE = 0.18, $p > .05$) was not significantly different from heterosexuals. SM = sexual minority.

heterosexuals. Our discrimination measure was not specific to SMs and was designed to capture more broad experiences of unfair treatment (e.g., "you are threatened or harassed") that could result from identities outside of SM status such as race, age, and education. We suspect (but cannot know) that this difference in discrimination between SMs and heterosexuals has at least some connection to sexual orientation, particularly because we controlled for other characteristics (i.e., race, age, education) that could result in unfair treatment [61, 62]. Moreover, we found that 13% of SMs and 9% of heterosexuals' total daily stressors stemmed from the workplace and/or school. Although our scale item measured workplace *or* school-related stressors, the majority of individuals were likely responding to stressors in their workplace rather than school because the average age of our sample was 50.04 years old. These results are consistent with recent research that has documented vulnerabilities in the workplace (e.g., unwanted touch) as major sources of stress for SMs [25, 63, 64]. Though we were unable to assess the context of workplace/school stressors beyond whether a stressor occurred or not (yes/no), future research should aim to identify how workplaces and schools can be transformed into cordial and supportive spaces for SMs.

In the other daily stressors that we measured, SMs and heterosexuals appeared to share these at similar rates. SMs and heterosexuals in the current study reported comparable rates of daily exposure to disagreements or avoiding disagreements, stressors at home, network stressors, and any other stressors. Other than workplace/school stressors, consistent with previous daily stress research [45], interpersonal arguments and tensions (i.e., disagreements or avoiding disagreements) were the most common day-to-day stressors reported by SMs and heterosexuals and accounted for over half of all reported stressors for each group. Thus, to some extent, White SMs and heterosexuals experience similar daily stressors, particularly interpersonal tensions, but these stressors are further compounded by daily discriminatory experiences and workplace/school issues. We were unable to assess whether the content of interpersonal disagreements or who they involved were different between SMs and heterosexuals, but it is an important topic for future research on SMs' interpersonal relationships and stress. For instance, SM adults are less likely than their heterosexual counterparts to be married and to have children because marriage and adoption were not always legal options [65, 66]; therefore, individuals with whom they have tensions or disagreements may differ from heterosexual people.

Daily Stress Exposure and Well-Being: Negative Affect and Physical Symptoms

Daily stress exposure has been linked with negative affect and physical symptoms [1–9]. We expected SMs to experience more negative affect and physical symptoms compared to heterosexuals because previous research suggests that populations with more chronic stress (e.g., those with lower socioeconomic status) are more likely to experience greater physical and psychological reactions to daily stressors, such as interpersonal tensions [10–12]. We found that, on days when no stressors occurred, SMs and heterosexuals reported comparable levels of negative affect. However, on days when a stressor occurred, SMs reported higher levels of negative mood, on average,

compared to heterosexuals. Researchers have theorized that these elevated physical and psychological reactions to daily stressors are a result of chronic stress (e.g., financial strain, serious illness, stigma) that over time depletes the resources needed to cope well with day-to-day stress, such as strategies to regulate emotions [1, 13–17]. Repeated exposure to daily stressors has been shown to increase stressor reactivity in some people [8, 67], and thus it is possible that SMs in the current study tended to experience more negative affect than heterosexuals on days when stressors occurred because they reported more daily stressors in general than heterosexuals. Future research should examine factors that may buffer associations between daily stressors and emotional reactivity in SMs because repeated reactivity to stress can lead to wear and tear on the body and predispose people to chronic illness and premature death [68]. For instance, support from friends [28] and attachment style [33] have been found to buffer the link between daily minority stress and negative affect for SMs.

We found no significant difference in physical health symptoms between SMs and heterosexuals on days when a stressor occurred versus on days when no stressor occurred. These results may suggest that SMs experience more everyday physical health symptoms in general, compared to heterosexuals, as we found in our analyses, but that these elevated physical symptoms are not tied to whether or not a stressor occurred in their day. It is instead possible that the physical symptoms observed in SMs are reflective of more long-term processes, such as pile-up of daily stressors over time [6, 9], or structural stigma (e.g., policies) and barriers (e.g., healthcare access) [69, 70].

Limitations

Results from this study should be considered in light of its limitations. It is crucial to note that our sample was predominantly White (92.86% SM; 84.95% heterosexual) and our results cannot and should not be generalized to non-White SMs because there are almost certainly racial/ethnic differences in daily stress and health. Future research on SMs' daily stress and health should include adequate racial/ethnic diversity to understand identities at highest risk for daily stress reactivity and generate accurate knowledge and implications for the daily stress experiences of non-White people. Moreover, nearly 3% of the MIDUS daily diary sample were categorized as SMs and this percentage is slightly lower than the national prevalence of 3.5% of people who identify as SMs in the United States [71]. Nonetheless, the small number of SM respondents in our sample precluded us from the ability to conduct properly powered analyses stratified by sexual orientation to examine whether lesbian/gay or bisexual individuals differed from each other in their daily experiences. While we ran these analyses on an exploratory basis and they should be interpreted with caution, we did find that bisexuals (and not lesbian/gay participants) tended to experience more negative affect in response to a daily stressor compared to heterosexuals. Future research with larger samples of SMs should examine whether subpopulations of SMs drive the tendency for SMs to experience more daily stressor-related negative affect. Lastly, we cannot infer causation or directionality from our study design and it is possible that our data function in the opposite direction to what we hypothesized, such that SMs' higher levels of negative affect led them to perceive more stressors or hassles in their day or that unmeasured factors might explain these associations (e.g., depression). Experimental studies and micro-longitudinal studies with SMs in which researchers can examine lagged-effects (e.g., next-day and residual reactions to a daily stressor) should be conducted to fill this gap.

Implications and Conclusions

Stressors encountered by SMs from day-to-day may be reoccurring, systematic, and seemingly minor, but when taken together, their contribution to SMs' well-being exposes the need for reducing the number of daily stressors faced by SMs as well as their emotional reactions to these stressors. Future research should focus on how to better equip SMs to handle daily stressors through targeting SMs' strategies for emotion regulation.

Supplementary Material

Supplementary material is available at *Annals of Behavioral Medicine* online.

Acknowledgments

Funding Britney M. Wardecker was partially supported by the National Institute on Aging Grant T32 AG049676 to The Pennsylvania State University at the time of this research. Agus Surachman was partially supported by the National Institute on Aging Grant T32 AG049676 to The Pennsylvania State University at the time of this research. Since 1995 the MIDUS study has been funded by the John D. and Catherine T. MacArthur Foundation Research Network and by the National Institute on Aging Grants P01-AG020166 and U19-AG051426.

Compliance with Ethical Standards

Authors' Statement of Conflict of Interest and Adherence to Ethical Standards Authors Britney M. Wardecker, Agus Surachman, Jes L. Matsick, and David M. Almeida declare that they have no conflict of interest. All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation

(institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

Primary Data

Authors' Contributions All authors were involved in the preparation of this manuscript and read and approved the final version.

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

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

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