

# Minority Stress, Structural Stigma, and Physical Health Among Sexual and Gender Minority Individuals: Examining the Relative Strength of the Relationships

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## Abstract

**Background** Sexual and gender minority (SGM; i.e., non-heterosexual and transgender or gender-expansive, respectively) people experience physical health disparities attributed to greater exposure to minority stress (experiences of discrimination or victimization, anticipation of discrimination or victimization, concealment of SGM status, and internalization of stigma) and structural stigma.

**Purpose** To examine which components of minority stress and structural stigma have the strongest relationships with physical health among SGM people.

**Methods** Participants (5,299 SGM people, 1,902 gender minority individuals) were from The Population Research in Identity and Disparities for Equality (PRIDE) Study. Dominance analyses estimated effect sizes showing how important each component of minority stress and structural stigma was to physical health outcomes.

**Results** Among cisgender sexual minority women, transmasculine individuals, American Indian or Alaskan Native SGM individuals, Asian SGM individuals, and White SGM individuals a safe current environment for SGM people had the strongest relationship with physical health. For gender-expansive individuals and Black, African American, or African SGM individuals, the safety of the environment for SGM people in which they were raised had the strongest relationship with physical health. Among transfeminine individuals, victimization experiences had the strongest relationship with physical health. Among Hispanic, Latino, or Spanish individuals, accepting current environments had the strongest relationship with physical health. Among cisgender sexual minority men prejudice/discrimination experiences had the strongest relationship with physical health.

**Conclusion** Safe community environments had the strongest relationships with physical health among most groups of SGM people. Increasing safety and buffering the effects of unsafe communities are important for SGM health.

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## Introduction

Sexual and gender minority (SGM, i.e., non-heterosexual and transgender/gender-expansive, respectively) people experience greater rates of mental [1, 2] and physical health [3–6] problems when compared to heterosexual or cisgender counterparts, respectively. The breadth of specific physical health disparities observed differ by sexual minority subgroup but among sexual minority women include poorer general physical health [7, 8], greater risk of obesity or being overweight [9, 10], as well as greater rates of diabetes [7], cardiovascular disease [10], and asthma [7, 8]. Sexual minority men or subgroups of sexual minority men have poorer overall physical health [10], greater activity limitations [7], and greater rates of diabetes [10], cancer [8], and asthma [11]. The literature is more limited for gender minority people, but studies have found greater rates of chronic disease [5, 6].

The minority stress model is the predominant model for understanding health disparities among sexual minority people [12, 13]. It has been expanded to explore the influence of minority stress on the mental health of gender minority people [14]. The minority stress model specifies that the additional stress burden that is specific to one's minority status, over and above typical stress experienced by non-minority people, is responsible for the health disparities observed among SGM people [12–14]. The minority stress model includes both distal and proximal stressors that are sources of enhanced stress. Distal stressors including experiences of prejudice or discrimination (e.g., being mistreated or victimized by others). Proximal stressors including expecting that one will experience prejudice or discrimination (e.g., anticipation that one will be mistreated or victimized in their everyday lives), concealing one's SGM status, and internalizing stigma related to SGM status (e.g., the internalization of negative messages about SGM people). In addition to the minority stress model, structural stigma—including policies and laws that negatively impact SGM people (e.g., no employment discrimination protections)—has been implicated in the health of SGM people [15].

A recent systematic review found that minority stress is associated with multiple biological and physical health outcomes among sexual minority people, though these relationships are not replicated in all analyses [16]. Components of minority stress such as experiences of prejudice and discrimination events [13, 17–19], expectations that one will experience prejudice from others [20, 21], concealment of sexual orientation [22–24], and internalized stigma [25] were related to physical health. Physical health outcomes that were related to minority stress components include poorer self-rated physical health [19], physical health problems [13, 22], pain and pain-related impairment [18], HIV progression [20, 23,

25], cancer treatment side effects [17], feeling rested after sleep [21], and body-mass index [24]. Furthermore, structural stigma, including both community policies and community attitudes, has been shown to be related to cortisol function, a biochemical measurement of stress [26]. Most of the studies cited within this systematic review examining minority stress in relation to physical health were conducted with either predominantly or presumably cisgender sexual minority people with some exceptions that also included gender minority people [18, 27]. Minority stress and structural stigma are also likely related to physical health among gender minority people due to many, but not all, parallel stress experiences. Most studies identified within the systematic review were concerned with a single component of minority stress (e.g., discrimination) in lieu of testing all components. One study examined the relationship between all minority stress components in relation to physical health problems and self-rated physical health [13]. Within this study, only experiences of prejudicial events were related to physical health problems, and none of the remaining components were related to self-rated physical health [13].

While the literature suggests that all components of minority stress and structural stigma are related to physical health outcomes in some studies, the mixed findings wherein some studies detect these relationships, while others do not detect these relationships [16] suggest that new methods may help identify the most important components of minority stress and structural stigma in the health of SGM people. Specifically, understanding the relative importance of the different components of minority stress and structural stigma in the health of SGM people is needed. However, when predictors that are highly correlated with each other are considered in a single regression-based model together (as is often the case), resulting effect sizes are not indicators of a components uniqueness. Fortunately, one analytic approach that has gained traction in recently years is called a dominance analysis—described below and in [28, 29], and is suited to answer just this question—*Which components of minority stress and structural stigma are most important to physical health outcomes*. Further, the mixed results of prior studies could be a function of the participant characteristics of these samples. For example, people of different racial and ethnic groups exhibit different relationships between minority stress and physical health outcomes [30], and there may also be differences in these relationships by gender as has been observed among cisgender or presumed cisgender sexual minority samples [21, 31]. This suggests that it may be important to account for gender and race and ethnicity when estimating the unique importance of key minority stress and structural stigma components in relation to physical health. Given that these effects have been primarily

tested among cisgender sexual minority participants, these relationships should be examined among gender minority people, a population that has been minimally included in these studies.

The purpose of this study was to clarify which of the multiple predictors that have been studied to date consistently show themselves to be more important to overall self-rated physical health among a national cohort of SGM adults. These predictors include distal minority stress (i.e., experiences of discrimination and victimization), proximal minority stress (i.e., anticipation of discrimination and victimization measured through individual appraisals of community acceptance and safety, respectively, for SGM people; outness; and internalized stigma), and structural stigma (i.e., community policies or laws relevant to SGM people). We estimated the components that have the strongest relationships with self-rated health among specific subgroups of SGM people by gender groupings: cisgender sexual minority men, cisgender sexual minority women, gender-expansive individuals, transfeminine individuals, and transmasculine individuals. We also estimated the components that have the strongest relationships with physical health among subgroups of SGM people based on racial and ethnic identities, specifically among SGM subgroups who endorse American Indian or Alaskan Native; Asian; Black, African American, or African; Hispanic, Latino, or Spanish; or White racial or ethnic identities.

## Methods

Data were collected using the 2018 Annual Questionnaire within The Population Research in Identity and Disparities for Equality (PRIDE) Study (collected between June 2018 and May 2019), a national online longitudinal cohort study of SGM adults within the United States (the PRIDE Study is described in detail elsewhere [32]). The PRIDE Study enrolls participants who meet the following inclusion criteria: (a) identify as lesbian, gay, bisexual, transgender, queer, or another sexual and/or gender minority, (b) are age 18 or older, (c) reside in the United States or its territories, and (d) are comfortable reading and writing in English as all study activities are conducted in English. Participants are enrolled through The PRIDE Study digital research platform, where they can access annual surveys (which began in 2017 and run from approximately June to May of the following year) about social, mental, and physical health as well as surveys exploring health topics in greater detail. Participants who are registered are invited via notifications of their choice (e.g., text messages, emails) to complete these surveys and participants decide whether or not to complete surveys while logged onto the digital

research platform. Participants who register for The PRIDE Study maintain eligibility to complete upcoming surveys even if they have not completed past surveys. Participants were included in this study if they participated in the 2018 Annual Questionnaire. Participants for The PRIDE Study have been recruited through multiple methods including through PRIDENet Community Partners consisting of health, community, and other LGBTQ+ organizations within the United States, online through direct recruitment and advertising on social media and other venues, and in-person at LGBTQ+ community events. The PRIDE Study human subjects activity is approved by the Institutional Review Boards of the University of California San Francisco and Stanford University.

## Participants

Eligible participants included individuals who took The PRIDE Study's 2018 Annual Questionnaire measures between June 2018 and February 2019. Participants complete surveys on The PRIDE Study digital research platform, powered by Qualtrics, where they have a unique login and a unique survey link associated with their contact information. A specific survey for a specific participant can only be accessed by authenticating into The PRIDE Study digital research platform. From this sample, participants were categorized into 5 mutually exclusive gender groupings based on their self-reported current gender identity, sex assigned at birth, and sexual orientation. This method was used to be able to better understand the health of subgroups within SGM populations without omitting participants or classifying them as "another" gender, and include: (a) cisgender sexual minority men, (b) cisgender sexual minority women, (c) gender-expansive individuals of any sex assigned at birth and sexual orientation, (d) transfeminine individuals of any sexual orientation, and (e) transmasculine individuals of any sexual orientation. Cisgender sexual minority men reported their current gender identity as man or within the gender binary on the masculine spectrum, the sex assigned to them at birth as male, and any sexual orientation other than exclusively heterosexual. Cisgender sexual minority women reported their current gender identity as woman or within the gender binary on the feminine spectrum (e.g., gender femme), the sex assigned to them at birth as female, and any sexual orientation other than exclusively heterosexual. Gender-expansive individuals reported their current gender identity as genderqueer or another gender identity that was not reflective of a gender binary (e.g., agender) or selected more than one option for their current gender identity not reflective of the same gender binary (e.g., man *and* woman), any sex assigned at birth, and any

sexual orientation. Transfeminine individuals reported their current gender identity as transgender woman or reported their gender identity as woman or within the gender binary on the feminine spectrum and reported the sex assigned to them at birth as male, and any sexual orientation. Transmasculine individuals reported their current gender identity as transgender man or reported their gender identity as man or within the gender binary on the masculine spectrum and reported the sex assigned to them at birth as female, and any sexual orientation. The PRIDE Study has inclusive measures of gender identity and allows participants to select multiple genders ( $n = 974$  participants did here) and write-in their gender ( $n = 628$  participants did here). This method was used to ensure that participants could be included in this study in a manner which both accounted for and is responsive to their genders.

The sample consisted of 5,299 participants (Table 1); 64% ( $n = 3,397$ ) were cisgender sexual minority people and 36% ( $n = 1,902$ ) were gender minority people of any sexual orientation. Within the sample, 29% ( $n = 1,519$ ) were cisgender sexual minority men; 35% ( $n = 1,878$ ) were cisgender sexual minority women; 23% ( $n = 1,241$ ) were gender-expansive people; 5% ( $n = 242$ ) were transfeminine people; and 8% ( $n = 419$ ) were transmasculine people. Among gender-expansive people, 86% ( $n = 1,066$ ) had female sex assigned to them at birth. The five subgroups differed significantly on age ( $M = 41.58$ ,  $Mdn = 38.13$  among cisgender sexual minority men;  $M = 34.12$ ,  $Mdn = 30.79$  among cisgender sexual minority women;  $M = 29.90$ ,  $Mdn = 27.43$  among gender-expansive individuals;  $M = 41.36$ ,  $Mdn = 37.89$  among transfeminine people; and  $M = 31.18$ ,  $Mdn = 28.24$  among transmasculine people). Participants could select multiple race/ethnicity categories. Among all participants, 145 (2.7%) endorsed American Indian or Alaskan Native identity; 242 (4.6%) endorsed Asian identity; 157 (3.0%) endorsed Black, African American, or African identity; 326 (6.2%) endorsed Hispanic, Latino, or Spanish identity; 74 (1.4%) endorsed Middle Eastern or North African identity; 20 (0.4%) endorsed Native Hawaiian or other Pacific Islander identity; 4,858 (91.7%) endorsed White identity, and 92 (1.7%) indicated that none of these categories fully described them. Overall, 82.24% ( $n = 4,358$ ) of participants endorsed White identity alone. Sexual orientation, race/ethnicity, annual individual income, educational level, and health insurance status all differed across gender groups and are all summarized in Table 1.

## Measures

The PRIDE Study is a community-engaged research study with an active Participant Advisory Committee and multiple stakeholders that reviewed and informed

the adaptations of measures to be inclusive of SGM communities [32, 33]. The PRIDE Study iteratively integrates feedback directly from research participants. This ongoing and iterative feedback informs adaptations and expansion of measures that participants report as confusing, lack clarity, or fail to query important aspects of their experience. Within The PRIDE Study, some measures were administered to all participants. Other measures were specific for people who identify as sexual minority, gender minority, or both, which is decided by asking participants if they would like to complete measures for sexual minority people, gender minority people, or measures for both. Within this study, responses to items about gender minority experience were utilized for people classified as gender minority (gender-expansive, transfeminine, or transmasculine) of any sexual orientation (i.e., community acceptance and safety for gender minority people, outness about gender minority status, and internalized stigma about gender minority status), while responses to items about sexual minority experience were used for people classified as cisgender sexual minority (i.e., community acceptance and safety for sexual minority people, outness about sexual orientation, and internalized stigma about sexual orientation). Measures administered to and relevant for all participants (i.e., demographics, self-rated physical health, discrimination and victimization experiences, structural stigma) were used for both sexual and gender minority participants.

## Demographics

Demographic information included age, race/ethnicity, gender identity, sex assigned at birth, sexual orientation, highest level of education completed, and individual gross income. State of residence was collected via participant self-reported ZIP code. Gender identity was assessed with one question querying “what is your current gender identity?” with response options genderqueer, man, transgender man, transgender woman, woman, and another gender identity. Sex assigned at birth was assessed with a question “What was your sex assigned at birth, for example on your original birth certificate?” with response options female and male. Sexual orientation was measured through a question: “What is your current sexual orientation” with 10 response options (see Table 1 for response options). Race and ethnicity were measured by a categorical self-report variable. For gender identity, sexual orientation, and race/ethnicity participants could select more than one option and/or write in the relevant terminology if their identity characteristic was not represented in the list. In analyses where sexual orientation or race/ethnicity was included as a covariate, each of these sexual orientation categories or race/ethnicity categories were included in the analyses (coded 1 if endorsed and 0 if not endorsed) to account for endorsement of multiple

**Table 1.** Sample characteristics by gender identity subgroup ( $N = 5,299$ )

Variable	Cisgender sexual minority men ( $N = 1,519$ )	Cisgender sexual minority women ( $N = 1,878$ )	Gender-expansive ( $N = 1,241$ )	Transfeminine ( $N = 242$ )	Transmasculine ( $N = 419$ )	<i>P</i>
<i>Personal characteristics</i>						
Age, in years (mean, median, <i>SD</i> )	41.58, 38.13, 15.05	34.12, 30.79, 12.06	29.90, 27.43, 9.69	41.36, 37.89, 14.89	31.18, 28.24, 10.48	<b>&lt;0.0001</b>
Race/ethnicity <sup>a</sup> ( <i>n</i> , %)						<b>&lt;0.0001</b>
American Indian or Alaska Native	28 (1.84)	42 (2.24)	53 (4.27)	9 (3.72)	13 (3.10)	
Asian	68 (4.48)	79 (4.21)	73 (5.88)	5 (2.07)	17 (4.06)	
Black, African American, or African	44 (2.90)	51 (2.72)	37 (2.98)	6 (2.48)	19 (4.53)	
Hispanic, Latino, or Spanish	118 (7.77)	120 (6.39)	60 (4.83)	9 (3.72)	19 (4.53)	
Middle Eastern or North African	22 (1.45)	25 (1.33)	21 (1.69)	2 (0.83)	4 (0.95)	
Native Hawaiian or other Pacific Islander	4 (0.26)	7 (0.37)	8 (0.64)	0 (0)	1 (0.24)	
White	1,359 (89.47)	1,736 (92.49)	1,146 (92.34)	228 (94.21)	389 (92.84)	
None of these fully describe me	14 (0.92)	32 (1.70)	36 (2.90)	6 (2.48)	4 (0.95)	
Reported more than one race/ethnicity	117 (7.70)	194 (10.22)	162 (13.05)	19 (7.85)	43 (10.26)	
Sexual orientation <sup>a</sup> ( <i>n</i> , %)						<b>&lt;0.0001</b>
Asexual	24 (1.58)	138 (7.35)	270 (21.76)	30 (12.40)	48 (11.46)	
Bisexual	156 (10.27)	705 (37.56)	418 (33.68)	58 (23.97)	110 (26.25)	
Gay	1,359 (89.47)	211 (11.24)	204 (16.44)	17 (7.02)	126 (30.07)	
Lesbian	0 (0)	879 (46.83)	216 (17.41)	120 (49.59)	1 (0.24)	
Pansexual	45 (2.96)	326 (17.37)	323 (26.03)	58 (23.97)	82 (19.57)	
Queer	166 (10.93)	717 (38.20)	880 (70.91)	53 (21.90)	198 (47.26)	
Questioning	17 (1.12)	38 (2.02)	45 (3.63)	17 (7.02)	17 (4.06)	
Same-gender loving	52 (3.42)	75 (4.00)	97 (7.82)	16 (6.61)	21 (5.01)	
Straight/heterosexual	5 (0.33)	6 (0.32)	10 (0.81)	21 (8.68)	58 (13.84)	
Another sexual orientation	13 (0.86)	43 (2.29)	120 (9.67)	10 (4.13)	11 (2.63)	
Reported more than one sexual orientation	245 (16.13)	827 (44.04)	799 (64.38)	90 (37.19)	183 (43.68)	
<i>Socioeconomic status</i>						
Annual individual income ( <i>n</i> , %)						<b>&lt;0.0001</b>
≤\$20K	288 (21.04)	530 (31.89)	593 (52.15)	88 (39.29)	190 (49.22)	
\$20K to \$40K	280 (20.45)	385 (23.16)	277 (24.36)	40 (17.86)	84 (21.76)	
\$40K to \$60K	226 (16.51)	337 (20.28)	124 (10.91)	28 (12.50)	54 (13.99)	
≥\$60K	575 (42.00)	410 (24.67)	143 (12.58)	68 (30.36)	58 (15.03)	
Educational level ( <i>n</i> , %)						<b>&lt;0.0001</b>
No high school diploma	1 (0.07)	4 (0.23)	12 (1.04)	0 (0)	5 (1.27)	
High school/GED graduate or some college <sup>b</sup>	236 (16.92)	272 (15.93)	355 (30.76)	76 (33.19)	135 (34.35)	
College degree (2- or 4-year)	559 (40.07)	672 (39.37)	472 (40.90)	103 (44.98)	148 (37.66)	
Graduate degree <sup>c</sup>	599 (42.94)	759 (44.46)	315 (27.30)	50 (21.83)	105 (26.72)	
Health insurance status ( <i>n</i> , %)						<b>0.003</b>
Insured	1,331 (96.73)	1,633 (96.86)	1,075 (94.96)	195 (92.86)	362 (94.52)	

**Table 1.** Continued

Variable	Cisgender sexual minority men (N = 1,519)	Cisgender sexual minority women (N = 1,878)	Gender-expansive (N = 1,241)	Transfeminine (N = 242)	Transmasculine (N = 419)	P
PROMIS physical health (mean, SD)	51.73, 7.56	49.17, 7.58	46.36, 8.41	49.19, 7.38	47.99, 7.93	<0.0001
Prejudice or discrimination experiences related to sexual orientation, gender identity, or gender expression (n, %)	1,046 (75.31)	1,314 (77.16)	988 (85.69)	191 (83.77)	350 (89.29)	<0.0001
Victimization experiences related to sexual orientation, gender identity, or gender expression (n, %)	441 (31.75)	537 (31.53)	479 (41.54)	90 (39.47)	137 (34.95)	<0.0001
Accepting environment where raised (mean, SD)	1.22, 0.98	1.48, 1.06	0.80, 0.88	0.75, 0.98	0.90, 0.97	<0.0001
Accepting environment where currently reside (mean, SD)	3.03, 0.87	2.88, 0.93	2.22, 1.01	2.38, 1.04	2.29, 1.03	<0.0001
Safe environment where raised (mean, SD)	1.71, 1.03	1.85, 1.00	1.14, 0.96	1.04, 1.06	1.26, 1.03	<0.0001
Safe environment where currently reside (mean, SD)	2.99, 0.76	2.83, 0.76	2.24, 0.88	2.41, 0.99	2.29, 0.93	<0.0001
Outness (mean, SD)	6.64, 2.02	6.22, 2.03	3.86, 2.35	6.38, 2.42	5.77, 2.06	<0.0001
Internalized stigma (mean, SD)	1.59, 0.69	1.46, 0.59	1.95, 0.85	2.08, 0.86	2.11, 0.87	<0.0001
Presence of protective laws or policies (mean, SD)	20.00, 13.33	19.52, 12.54	20.46, 12.16	19.46, 13.03	18.43, 12.86	0.048

Notes: The number of participants who endorsed a given option (n) and percent (%) of overall gender identity subgroup.

<sup>a</sup>These categories are not mutually exclusive as participants could have selected more than one option.

<sup>b</sup>Also includes participants with trade, technical, or vocational training.

<sup>c</sup>Graduate degree = Master's, doctoral, or professional (e.g., MD, JD, MBA) degrees

categories. Age was calculated by subtracting birth date (required for enrollment in the study) from survey start date. Highest level of education was assessed by an ordinal 10-item question with options ranging from “no schooling” to “Professional degree.” In our analysis this was accounted for as a 4-level variable (i.e., “no high school diploma,” “high school/GED graduate or some college,” “college degree [2- or 4-year],” and “graduate degree”) and accounted for as an indicator variable in statistical models. Individual income was measured with an ordinal 11-item question that ranged from \$0 to \$100,000+ in \$10,000 increments, which were used in analysis in these increments (though collapsed in Table 1 for clarity).

#### Distal minority stressors

Experiences of prejudice or discrimination were captured across 10 items querying discrimination and victimization. Discrimination included seven types of discrimination experiences: in employment; in educational settings, in healthcare, related to housing, when

receiving services (e.g., in restaurants, stores, other businesses or agencies), in interactions with law enforcement, and through harassment from strangers (e.g., “Have you EVER experienced harassment or name calling from strangers in public?”). Victimization included three types of victimization experiences: physical attacks or injuries, violence from a romantic partner, and unwanted sexual contact (e.g., “Have you EVER been physically attacked or deliberately injured?”). A follow-up question queried if the victimization or discrimination experiences were perceived to be due to specific identity characteristics, with a directive to select all that apply, including: ability/disability status; age; body size, weight, or shape; gender expression; gender identity; race and/or ethnicity; sexual orientation; or something else (with a write in option). These items were adapted and expanded based on expert, participant, and Participant Advisory Committee feedback from items from the National HIV Behavioral Surveillance surveys [34] and were recoded to identify if the person had ever experienced one or more types of (a) discrimination and (b) victimization (coded as yes = 1 and no = 0). For the purposes of this study,

discrimination and victimization experiences were only coded yes if the participant endorsed one of these experiences and indicated they it was due to their (i) sexual orientation, (ii) gender identity, or (iii) gender expression. The original items from the National HIV Behavioral Surveillance surveys [34] were changed to: (a) be more conducive to an online survey that is given over multiple types of connected devices (e.g., the stems were added to the question to ensure participants could see question stems even if they scrolled down on their screens), (b) separate an attribution of why the event occurred into a separate question and allow attributions of discrimination based on multiple individual characteristics, (c) query both lifetime and past 12-month experiences (lifetime experiences were used in this study), and (d) include experiences beyond the original five items, which included name calling, poorer services, unfair treatment at work or school, denial or lower quality health care, and physical attack or injury [34]. These changes were made based on feedback from experts, participants, and The PRIDE Study Participant Advisory Committee over several iterations (e.g., guidance was given that unfair treatment at work and at school should be queried separately as people may have different experiences in these two settings, “deliberately” was added to the question about physical attack or injury due to concerns the question could be confusing to participants who may have been accidentally injured.)

#### *Proximal minority stressors*

Expectations that one will experience discrimination or victimization were measured through self-reported perceived community acceptance and perceived community safety, respectively. Given that minority stress burden may be impacted and shaped by early experiences, participants were queried separately about their perceptions of community acceptance and safety for two time periods and/or places: (a) where they were raised, and (b) where they currently live. Each of these items were tested separately, resulting in four separate items for sexual minority participants and a parallel four items for gender minority participants. These items used a 5-point Likert-type response (e.g., “overall, how safe for *gender minority* people is the community in which you *currently live*?” with response options ranging from 0 to 4, ranging from “extremely unsafe” to “extremely safe” (with a parallel scale for accepting environments). Based on the iterative feedback process, these items were adapted from Heck et al. [35]) by changing the wording from “LGBT people” to be specific to sexual minority or gender minority people and to query the two time periods and/or places (where they were raised and where they currently live).

The Nebraska Outness Scale [36], a 10-item measure of outness, was utilized to capture the participants’ outness in regard to their SGM status, adapted to be inclusive

for GM people (Cronbach’s  $\alpha = 0.84$  for SM people in present sample and Cronbach’s  $\alpha = 0.88$  for GM people in present sample). In previous literature, the Nebraska Outness Scale was found to have good convergent validity ( $r = 0.73$ – $0.84$ ) and internal consistency of  $\alpha = 0.89$  [36]. This adaptation included referencing gender identity as opposed to sexual orientation for GM people, and providing GM-relevant examples within questions such as: “e.g., not correcting people when they use a name or pronoun that is not accurate for you” in place of original wording relevant to SM people: “e.g., not talking about your significant other, changing your mannerisms.” On the Nebraska Outness Scale higher scores are representative of greater outness.

The revised Internalized Homophobia Scale (IHP-R), a scale that was previously validated among sexual minority people [37] was used to assess internalized stigma, adapted to be inclusive for SGM people, where higher scores are indicative of greater internalized stigma. This revision included expanding sexual minority items to be inclusive of sexual minority people of sexual orientations not included in the original scale (i.e., including “gay/lesbian/bisexual/sexual minority”), as the original terms gay/lesbian/bisexual were no longer used by many sexual minority people at the time of data collection (Cronbach’s  $\alpha = 0.68$  in present SM sample). The IHP-R was also adapted to be inclusive of GM experience (e.g., “I wish I weren’t genderqueer, transgender, or gender minority.” Cronbach’s  $\alpha = 0.76$  in present GM sample).

All adaptations were undertaken because brief measures of these constructs that were acceptable to SGM communities were not available at the time of data collection. Adaptations were made initially by the Research Advisory Committee of The PRIDE Study to ensure inclusive language (e.g., adding additional identity terms) then underwent intensive community review and revision processes by both the Participant Advisory Committee and other SGM experts and community members prior to administration to participants.

#### *Structural stigma*

Structural stigma was assessed through state-level laws or policies that protect SGM people using data from the Movement Advancement Project (MAP) [38], obtained in March of 2019 to be contemporaneous with data collection. MAP assigns each state a score (continuous variable from  $-10$  to  $37$ ; higher score indicates more legal protections [38]) that reflects the number of SGM-supportive and -harmful laws and policies within the following domains: marriage and relationship recognition, adoption and parenting, protections from discrimination, safe schools, health and safety, and the option for transgender people to obtain identity documents that accurately reflect their gender.

### Physical health

Physical health was assessed using the Patient-Reported Outcome Measurement Information System (PROMIS) Global Physical Health Scale (v1.2) [39], which measured overall physical health, physical function, pain, and fatigue using four items. Three items were measured using a 5-point Likert-type response and one item assessed pain using a scale 0–10; these items are then converted to t-scores per standard procedures with higher scores indicating better health [40]. This PROMIS scale has been tested in the U.S. general population and exhibited evidence of validity, reliability, and was found to be an efficient measure of physical health [41–45]. In our sample, internal consistency for the PROMIS Physical Health Scale was acceptable (Cronbach's  $\alpha = 0.76$ ).

### Analytical Plan

All analyses were run using Stata 16 [46]. Chi-square and analysis of variance were used to examine differences across SGM identity subgroups. Correlations were calculated between minority stress variables, the structural stigma variable, and the physical health variable. Dominance analysis utilizing linear regression analyses [28] identified the relative importance of minority stress predictors of physical health using the Stata package *domin* [47] with multiple imputation for missing values. Dominance analysis is a pair-wise regression-based approach where each predictor competes against every other predictor in determining which predictor consistently accounts for the most variance. Dominance analysis is an ensemble method based on fitting multiple models for comparing each potential combination of predictors of interest [29]. Within this study the minority stress and structural stigma predictors were used within this dominance analysis, with relevant covariates entered in all models but not compared for dominance (i.e., the constrained case of dominance analysis [29]). This method is preferred for measuring relative importance over other regression-based approaches because effect sizes are not impacted by all of the other components of minority stress or structural stigma within the model [29].

Dominance analysis yields output to show us if a single predictor contributed the greatest proportion of variance in every comparison to every other predictor in all subsets, which represents the strongest level of evidence of relative importance. This is when a variable *completely dominates* another variable [29]. There are lesser levels of evidence available through dominance analysis (i.e., conditionally dominates and generally dominates) but here we focus on which predictors completely dominate other predictors, representing the highest level of evidence of relative importance. The effect size in dominance analysis is the *general dominance statistic*, which

is the average proportion of variability accounted for by each predictor across all models. The *standardized dominance statistic* is the proportion of the total  $R^2$  for the model accounted for by the given predictor's general dominance statistic. The dominance statistic is simply an average squared semi-partial correlation coefficient. Previously defined standards of effect size were established by Cohen and were defined as 0.02 for small, 0.13 for medium, and 0.26 for large for the squared semi-partial correlation coefficient [48]. After the dominance analyses, multiple regression models were run and are reported both with a single minority stress or structural stigma predictor in the model adjusted for covariates and with all minority stress and structural stigma predictors entered into the model, though the latter models should be interpreted with caution due to the relationships between predictors within those models.

All models were adjusted for age, race/ethnicity (except in analyses among specific race/ethnicity groups), income, and highest level of education due to their known relationships with health outcomes [49–52]. Models were run separately for each gender grouping (cisgender sexual minority men, cisgender sexual minority women, gender-expansive individuals, transfeminine individuals, and transmasculine individuals) as these groups have different health outcomes [53, 54], and then separately by race/ethnicity for individuals who identify with specific racial/ethnic groups, as different racial/ethnic groups have differential responses to minority stress [30]. In determining which racial/ethnic groups to analyze, we first identified groups with at least 200 individuals who endorsed a specific race/ethnicity (either exclusively or non-exclusively), a sample size that typically provides adequate power for dominance analysis [55]. Within our sample, groups of individuals who endorsed Asian; Hispanic, Latino, or Spanish; or White race/ethnicity met this criterion. In addition, we ran analyses by race/ethnicity for groups with at least 100 individuals who endorsed a specific race/ethnicity (either exclusively or non-exclusively) with the understanding that these analyses were more exploratory. Groups of individuals who endorsed American Indian or Alaskan Native or Black, African American, or African met this criterion. Multiracial identity was covaried within these models and individual participants were included in each model for which they endorsed a specific race or ethnicity (e.g., individuals who endorsed both Asian and Black/African American race/ethnicity would be included in each of these separate models). Sexual orientation was adjusted for in models tested among cisgender men, cisgender women, and models among racial/ethnic groups using each of the sexual orientation identities endorsed. Sexual minority status (sexual minority versus heterosexual only) was adjusted for in models tested among transfeminine, transmasculine, and gender-expansive

groups. Sex assigned at birth was adjusted for in the model run among gender-expansive individuals, and the models run among specific racial/ethnic groups.

**Results**

Minority stress variables, structural stigma, and physical health differed across the gender groups (see Table 1). Pairwise correlations between key variables of interest (minority stress components, structural stigma, and physical health) are in Table 2. Results of multiple regression models are in Tables 3 and 4. When relationships were detected between minority stress or structural stigma and physical health, all components of minority stress and structural stigma were in the anticipated direction, meaning that less minority stress burden (i.e., no experiences of prejudice and discrimination, no experiences of victimization, more accepting and safe environments [both where raised and currently reside], more outness, and less stigma) and less structural stigma (i.e., greater policy protections) were related to better physical health.

**Dominance Analysis by Gender Groupings**

Full results of dominance analysis by gender grouping are found in Table 3.

*Cisgender sexual minority men*

Among cisgender sexual minority men, experiences of prejudice or discrimination had the strongest relationship with physical health, completely dominating victimization experiences, a safe and accepting environment where they were raised, and the presence of protective laws or policies, which were the least dominant predictors. The second most dominant predictor in physical health among cisgender sexual minority men was an accepting environment where they currently reside, which completely dominated all of the predictors dominated by prejudice or discrimination experiences aside from experiences of prejudice or discrimination.

*Cisgender sexual minority women*

Among cisgender sexual minority women, a safe current environment had the strongest relationship with physical health, completely dominating all but the second most

**Table 2.** Correlations and *n* for each correlation between components of minority stress, structural stigma and self-reported physical health among sexual and gender minority individuals within the PRIDE Study

	1	2	3	4	5	6	7	8	9	10
1. Physical health	–									
2. Prejudice or discrimination experiences related to sexual orientation, gender identity, or gender expression	–0.11** 4708	–								
3. Victimization experiences related to sexual orientation, gender identity, or gender expression	–0.14** 4708	0.25** 4893	–							
4. Accepting environment where raised	0.14** 4511	–0.15** 4666	–0.17** 4666	–						
5. Accepting environment where currently reside	0.25** 4518	–0.06** 4674	–0.09** 4674	0.27** 4663	–					
6. Safe environment where raised	0.19** 4508	–0.19** 4664	–0.23** 4664	0.74** 4665	0.23** 4661	–				
7. Safe environment where currently reside	0.28** 4518	–0.11** 4674	–0.11** 4674	0.26** 4663	0.76** 4671	0.33** 4663	–			
8. Outness	0.18** 4385	0.10** 4489	0.00 4489	0.16** 4479	0.32** 4487	0.14** 4478	0.29** 4486	–		
9. Internalized stigma	–0.17** 4438	0.03* 4566	0.05** 4566	–0.19** 4554	–0.24** 4563	–0.17** 4552	–0.21** 4562	–0.38** 4429	–	
10. Presence of protective laws or policies	0.08** 4861	0.09** 4840	0.03* 4840	0.07** 4618	0.25** 4626	0.04* 4616	0.18** 4626	0.08** 4444	–0.05** 4521	–

\**p* < .05, \*\**p* ≤ .001.

**Table 3.** Results of dominance analyses examining components of minority stress and structural stigma in relation to self-reported physical health by gender identity subgroup, including *n* for each analysis<sup>a</sup>

Primary predictors	<i>B, p</i> , predictor considered as only minority stress/ structural stigma predictor in adjusted model	<i>B, p</i> , predictor in presence of all minority stress and structural stigma predictors in adjusted model	General dominance statistic	General dominance % of <i>R</i> <sup>2</sup>	Predictor completely dominates:
<b>Cisgender sexual minority men, <i>n</i> = 1,401</b>					
1. Prejudice or discrimination experiences	-2.16, <.001	-1.96, <.001	0.012	0.079	6, 7, 8, 9
2. Accepting environment where currently reside	1.38, <.001	0.70, .038	0.011	0.075	3, 6, 7, 8, 9
3. Safe environment where currently reside	1.49, <.001	0.49, .201	0.009	0.061	8, 9
4. Internalized stigma	-1.22, <.001	-0.61, .068	0.006	0.040	8, 9
5. Outness	0.39, .001	0.27, .035	0.006	0.039	9
6. Victimization experiences	-1.38, .002	-0.77, .084	0.004	0.027	
7. Safe environment where raised	0.71, .001	0.17, .537	0.003	0.018	
8. Accepting environment where raised	0.64, .002	0.05, .850	0.002	0.012	
9. Presence of protective laws or policies	0.04, 0.20	0.01, .461	0.001	0.009	
<b>Cisgender sexual minority women, <i>n</i> = 1,726</b>					
1. Safe environment where currently reside	1.99, <.001	1.44, <.001	0.020	0.118	3, 4, 5, 6, 7, 8, 9
2. Safe environment where raised	1.20, <.001	0.41, .118	0.009	0.051	6, 8, 9
3. Accepting environment where currently reside	1.26, <.001	0.15, 0.603	0.008	0.048	9
4. Victimization experiences	-1.98, <.001	-1.16, .003	0.008	0.046	7, 8, 9
5. Internalized stigma	-1.44, <.001	-1.01, .001	0.007	0.043	8, 9
6. Accepting environment where raised	1.06, <.001	0.32, .196	0.007	0.041	8, 9
7. Prejudice or discrimination experiences	-1.90, <.001	-1.19, .007	0.007	0.038	8, 9
8. Outness	0.21, .037	-0.07, .518	0.001	0.004	
9. Presence of protective laws or policies	0.03, .076	0.00, .917	0.001	0.003	
<b>Gender-expansive individuals, <i>n</i> = 1,149</b>					
1. Safe environment where raised	1.73, <.001	1.23, .003	0.019	0.085	4, 5, 6, 7, 8, 9
2. Safe environment where currently reside	1.72, <.001	1.66, <.001	0.019	0.084	4, 5, 6, 7, 8, 9
3. Internalized stigma	-1.42, <.001	-1.13, <.001	0.013	0.059	6, 7, 8, 9
4. Prejudice or discrimination experiences	-3.42, <.001	-2.12, .004	0.011	0.050	5, 6, 7, 8, 9
5. Victimization experiences	-2.25, <.001	-1.24, .012	0.009	0.042	6, 7, 8, 9
6. Accepting environment where raised	1.14, <.001	-0.35, .390	0.005	0.022	9
7. Accepting environment where currently reside	0.83, .001	-0.61, .115	0.004	0.019	9
8. Outness	0.23, .042	0.01, .917	0.001	0.006	9
9. Presence of protective laws or policies	0.01, .560	0.00, .903	0.000	0.001	
<b>Transfeminine individuals, <i>n</i> = 217</b>					
1. Victimization experiences	-4.04, <.001	-3.52, .003	0.047	0.232	2, 3, 4, 5, 6, 7, 8, 9
2. Accepting environment where raised	1.55, .006	1.24, .208	0.015	0.075	5, 7, 8, 9

**Table 3.** Continued

Primary predictors	<i>B, p</i> , predictor considered as only minority stress/ structural stigma predictor in adjusted model	<i>B, p</i> , predictor in presence of all minority stress and structural stigma predictors in adjusted model	General dominance statistic	General dominance % of <i>R</i> <sup>2</sup>	Predictor completely dominates:
3. Safe environment where currently reside	1.22, .023	1.79, .055	0.015	0.072	6, 7, 8, 9
4. Internalized stigma	-1.45, .023	-0.98, .139	0.014	0.069	7, 8, 9
5. Safe environment where raised	1.15, .029	-0.68, .452	0.007	0.034	
6. Accepting environment where currently reside	0.77, .134	-1.39, .125	0.006	0.029	
7. Prejudice or discrimination experiences	-2.23, .131	-0.98, .527	0.005	0.026	
8. Presence of protective laws or policies	0.04, .387	0.04, .281	0.004	0.020	
9. Outness	0.21, .351	0.09, .709	0.002	0.011	
<b>Transmasculine individuals, <i>n</i> = 388</b>					
1. Safe environment where currently reside	1.94, <.001	1.21, .077	0.022	0.089	2, 3, 4, 5 6, 7, 8, 9
2. Accepting environment where currently reside	1.50, <.001	0.32, .602	0.013	0.053	
3. Safe environment where raised	1.14, .004	0.93, .140	0.009	0.038	7, 8, 9
4. Prejudice or discrimination experiences	-2.57, .046	-1.96, .126	0.007	0.028	8, 9
5. Presence of protective laws or policies	0.07, .025	0.04, .180	0.006	0.026	8, 9
6. Outness	0.44, .027	0.19, .354	0.005	0.021	8, 9
7. Accepting environment where raised	0.91, .031	-0.38, .566	0.003	0.014	
8. Internalized stigma	-0.61, .196	-0.14, .766	0.001	0.005	
9. Victimization experiences	-0.83, 0.342	-0.04, .967	0.001	0.003	

<sup>a</sup> Models adjusted for age, race/ethnicity, income, and level of education. In models tested among cisgender sexual minority individuals, sexual orientation was added as a covariate, in models tested among gender minority individuals, sexual minority status (sexual minority versus only heterosexual) was entered as a covariate, and in models run among gender-expansive individuals, sex assigned to the participant at birth was also included as a covariate. Predictors are in the order of their average contribution to self-reported physical health and numbers indicate these rank orders. Predictor completely dominates column indicates that the predictor on a given row completely dominates the predictor identified by a rank number within the group of analysis.

dominant predictor, a safe environment where they were raised. The least dominant predictors of physical health were outness and the presence of protective laws or policies, neither of which were completely dominant over any other predictors.

*Gender-expansive individuals*

Among gender-expansive individuals, a safe environment where raised had the strongest relationship with physical health. A safe environment where raised and a safe current environment evidenced complete dominance over all predictors except for internalized stigma. Among gender-expansive individuals the presence of

protective laws or policies was the least dominant predictor, which did not completely dominate any other predictors.

*Transfeminine individuals*

Among transfeminine individuals, victimization experiences had the strongest relationship with physical health, completely dominating all other predictors in relation to physical health. The least dominant predictors were outness, presence of protective laws or policies, experiences of prejudice or discrimination, accepting environment where currently reside, and safe environment where raised, all of which did not completely dominate any other predictors.

### *Transmasculine individuals*

Among transmasculine individuals, a safe current environment had the strongest relationship with physical health, completely dominating all other predictors in its relationship with physical health outcomes. Victimization experiences, internalized stigma, and an accepting environment where raised were the least dominant predictors, none of which completely dominated any other predictors.

### **Dominance Analysis by Race/Ethnicity**

Full results of dominance analysis by race and ethnicity are found in [Table 4](#).

### *American Indian or Alaskan Native SGM individuals*

Among SGM individuals who identified as American Indian or Alaskan Native, a safe current environment was the most dominant predictor, completely dominating all other predictors except for the second most dominant predictor, an accepting environment where raised. Experiences of prejudice or discrimination and outness were the least dominant predictors and did not completely dominate any other predictors. An accepting environment where they currently reside did not completely dominate any other predictors but was the third most dominant predictor. As the sample size for these analyses was <200, these results should be interpreted as exploratory.

### *Asian SGM individuals*

Among SGM individuals who identified as Asian, a safe current environment was the most dominant predictor of physical health, completely dominating all other predictors. The presence of protective laws or policies was the second most dominant predictor. Experiences of prejudice or discrimination, outness, and an accepting environment where raised were the least dominant predictors, completely dominating no other predictors. An accepting environment where they currently reside did not completely dominate any other predictors but evidenced a stronger relationship with physical health than a safe environment where they were raised or internalized stigma.

### *Black, African American, or African SGM individuals*

Among SGM individuals who identified as Black, African American, or African, a safe environment where they were raised had the strongest relationship with physical health, completely dominating an accepting environment where they were raised, presence of protective laws or policies, an accepting environment where

they currently reside, outness, and victimization experiences. A safe current environment evidenced the second strongest relationship with physical health, completely dominating experiences of prejudice or discrimination, the presence of protective laws or policies, an accepting environment where they currently reside, outness, and victimization experiences. As the sample size for these analyses was <200, these results should be interpreted as exploratory.

### *Hispanic, Latino, or Spanish SGM individuals*

Among SGM individuals who identified as Hispanic, Latino, or Spanish, an accepting environment where they currently reside, was the most dominant predictor, completely dominating a safe current environment, experiences of prejudice or discrimination, the presence of protective laws or policies, an accepting environment where raised, and outness. Outness and an accepting environment where raised were the least dominant predictors of physical health.

### *White SGM individuals*

Among SGM individuals who identified as White, a safe current environment was the most dominant predictor of physical health, completely dominating all other predictors other than a safe environment where they were raised. The presence of protective laws or policies, outness, an accepting environment where raised, and an accepting environment where currently reside were the least dominant predictors, none of which completely dominated any other predictors.

## **Discussion**

This study is the first to examine the relationship between all distal and proximal minority stress components and structural stigma in relation to self-rated health among five gender groupings—cisgender sexual minority men, cisgender sexual minority women, gender-expansive individuals of any sex assigned at birth and sexual orientation, transfeminine individuals of any sexual orientation, and transmasculine individuals of any sexual orientation and among five racial/ethnic identity groups. Overall, as expected, we found that less minority stress and structural stigma was related to better physical health in unadjusted correlations and when relationships were detected between minority stress and structural stigma and physical health in adjusted models. These results provide further evidence of the usefulness of the minority stress model and of structural stigma in understanding the physical health of SGM people. Our results suggest that the components of minority stress and structural stigma

**Table 4.** Results of dominance analyses examining components of minority stress and structural stigma in relation to self-reported physical health by racial or ethnic identity subgroup, including *n* for each analysis<sup>a</sup>

Primary predictors	<i>B, p</i> , predictor considered as only minority stress/ structural stigma predictor in adjusted model	<i>B, p</i> , predictor in presence of all minority stress and structural stigma predictors in adjusted model	General dominance statistic	General dominance % of <i>R</i> <sup>2</sup>	Predictor completely dominates:
<b>American Indian or Alaskan Native SGM Individuals, <i>n</i> = 131</b>					
1. Safe environment where currently reside	2.42, .006	2.27, .091	0.028	0.061	3, 4, 5 6, 7, 8, 9
2. Accepting environment where raised	1.60, .048	2.11, .155	0.018	0.039	5, 6, 7, 8, 9
3. Accepting environment where currently reside	1.83, .024	−0.44, .742	0.014	0.030	
4. Presence of protective laws or policies	0.11, .057	0.06, .263	0.011	0.025	9
5. Internalized stigma	−1.62, .160	−1.64, .184	0.011	0.024	9
6. Victimization experiences	−2.47, .109	−1.72, .281	0.010	0.022	9
7. Safe environment where raised	1.15, .163	−1.04, .491	0.007	0.016	9
8. Outness	−0.13, .749	−0.47, .271	0.006	0.012	
9. Prejudice or discrimination experiences	−0.18, .938	1.53, .514	0.002	0.004	
<b>Asian SGM Individuals, <i>n</i> = 219</b>					
1. Safe environment where currently reside	2.95, <.001	2.48, .011	0.046	0.130	2, 3, 4, 5, 6, 7, 8, 9
2. Presence of protective laws or policies	0.12, .005	0.10, .016	0.025	0.069	5, 6, 7, 8, 9
3. Victimization experiences	−2.68, .013	−2.23, .043	0.017	0.049	6, 7, 8, 9
4. Accepting environment where currently reside	1.87, .001	0.37, .654	0.016	0.044	
5. Safe environment where raised	1.33, .010	0.98, .152	0.014	0.039	7, 8, 9
6. Internalized stigma	−1.28, .044	−0.84, .192	0.011	0.030	7, 8, 9
7. Accepting environment where raised	0.77, .142	−0.55, .448	0.003	0.010	
8. Outness	0.33, .237	0.16, .581	0.003	0.009	
9. Prejudice or discrimination experiences	−0.93, .449	0.33, .790	0.001	0.002	
<b>Black, African American, or African SGM Individuals, <i>n</i> = 138</b>					
1. Safe environment where raised	1.73, .010	1.25, .264	0.024	0.087	5, 6, 7, 8, 9
2. Safe environment where currently reside	1.64, .048	1.83, .187	0.018	0.068	4, 6, 7, 8, 9
3. Internalized stigma	−1.60, .094	−1.19, .240	0.015	0.054	4, 6, 7, 8, 9
4. Prejudice or discrimination experiences	−2.52, .140	−2.10, .247	0.012	0.043	6, 7, 8, 9
5. Accepting environment where raised	1.43, .029	−0.39, .724	0.011	0.042	
6. Presence of protective laws or policies	0.07, .166	0.06, .255	0.010	0.035	7, 8, 9
7. Accepting environment where currently reside	0.95, .204	−0.88, .474	0.006	0.020	9
8. Outness	0.15, .688	0.15, .707	0.002	0.008	
9. Victimization experiences	−0.58, .699	0.54, .731	0.001	0.003	

**Table 4.** Continued

Primary predictors	<i>B, p</i> , predictor considered as only minority stress/ structural stigma predictor in adjusted model	<i>B, p</i> , predictor in presence of all minority stress and structural stigma predictors in adjusted model	General dominance statistic	General dominance % of $R^2$	Predictor completely dominates:
<b>Hispanic, Latino, or Spanish, <math>n = 296</math></b>					
1. Accepting environment where currently reside	1.50, .004	0.97, .193	0.013	0.043	4, 5, 7, 8, 9
2. Safe environment where raised	1.22, .015	1.07, .110	0.011	0.037	5, 6, 7, 8, 9
3. Internalized stigma	-1.69, .022	-1.21, .131	0.011	0.036	5, 6, 7, 8, 9
4. Safe environment where currently reside	1.59, .011	0.29, .744	0.008	0.028	
5. Prejudice or discrimination experiences	-2.32, .062	-1.48, .255	0.006	0.022	8, 9
6. Victimization experiences	-1.70, .111	-1.24, .255	0.006	0.019	9
7. Presence of protective laws or policies	0.07, .082	0.04, .346	0.005	0.016	8, 9
8. Accepting environment where raised	0.69, .195	-0.53, .449	0.003	0.009	
9. Outness	0.03, .919	-0.20, .448	0.001	0.005	
<b>White, <math>n = 4,493</math></b>					
1. Safe environment where currently reside	1.73, <.001	1.26, <.001	0.016	0.076	2, 4, 5, 6, 7, 8, 9
2. Internalized stigma	-1.31, <.001	-0.89, <.001	0.008	0.039	8, 9
3. Safe environment where raised	1.18, <.001	0.46, .007	0.008	0.038	7, 9
4. Prejudice or discrimination experiences	-2.19, <.001	-1.47, <.001	0.007	0.035	8, 9
5. Victimization experiences	-1.88, <.001	-1.11, <.001	0.007	0.033	8, 9
6. Accepting environment where currently reside	1.14, <.001	0.00, .987	0.006	0.030	
7. Accepting environment where raised	1.00, <.001	0.18, .303	0.005	0.023	
8. Outness	0.28, <.001	0.07, .230	0.002	0.008	
9. Presence of protective laws or policies	0.03, .003	0.01, .443	0.001	0.003	

<sup>a</sup>An individual was placed in a model if they identified with a given racial or ethnic identity, even if they did not exclusively identify with a given racial or ethnic identity. As such, an individual may be represented in more than one model if they endorsed multiple identities. Multiracial status was covaried in models. Models were adjusted for age, sexual orientation, gender grouping, sex assigned at birth, multi-racial status, income, and level of education. Predictors are in the order of their average contribution to self-reported physical health and numbers indicate these rank orders. Predictor completely dominates column indicates that the predictor on a given row completely dominates the predictor identified by a rank number within the group of analysis.

that had the strongest relationships with physical health may differ based on gender and race/ethnicity.

Having a safe current environment, a proximal minority stressor, was the most robust predictor of physical health among cisgender sexual minority women and transmasculine individuals, American Indian or Alaskan Native individuals, Asian individuals, and White individuals, and it was the second most robust predictor among Black and African American SGM individuals, with safety of the environment where *they were raised* being

the most robust predictor among this group. Community safety for SGM people is difficult to intentionally influence on an individual level. Yet with rapid changes in views and attitudes toward SGM communities (e.g., changing attitudes towards same-sex marriage [56] and changing attitudes among healthcare professionals toward transgender people [57]), we may find that in time, increased safety may help to reduce health disparities among SGM people. For gender-expansive individuals and Black, African American, or African SGM

individuals we found that the safety of the environment for SGM people in which they were raised was the most robust predictor of physical health. In intervention development work to reduce minority stress, conscious and mindful reassessment of the safety of one's environment is necessary, as people can maintain avoidance of behaviors (e.g., holding hands with one's partner) or environments (e.g., locations where discrimination has occurred) due to a static and cognitively unchallenged perception that the behavior or environment is unsafe [58]. Some assessments of current safety may be accurate, and some assessments may be more strongly related to past experiences in environments than to present-day experiences. As such, conscious and deliberate reassessment (e.g., mindful awareness exercises) of the safety and acceptance of one's environment (a method used in interventions such as the AWARENESS intervention to reduce minority stress [58]) should be tested as a means to improve health. Further, trauma-informed approaches may help to reduce inequities by allowing individuals to feel safe engaging with healthcare or in their communities [59].

Notably, unlike other identity subgroups, among transfeminine individuals the most robust predictor of physical health was victimization experiences. Further, the effect size observed in this relationship was the largest observed in this study (general dominance statistic = 0.047). Prejudice and discrimination experiences had one of the weakest relationships with the physical health of transfeminine participants, suggesting that prejudice-based experiences that are more violent in nature have a greater relationship with overall physical health among transfeminine individuals. The Human Rights Campaign has been tracking fatal violence against gender minority people for the prior 7 years; nearly 9 out of every 10 gender minority people who are victims of homicide are transfeminine people [60]. The relationship between experiences of victimization and both suicidality and substance use among transfeminine people have been documented [61], clarifying that the impact of victimization on health for transfeminine individuals appears to be substantial. In addition, interventions to reduce the incidence of and impacts of victimization among this group should be developed and tested. These interventions could be based upon those currently in development for transfeminine people such as *Sheroes*, an empowerment and affirmation intervention that introduces coping skills [62] and could be expanded on to reduce the impacts of violence.

In sum, among all gender groupings except for cisgender sexual minority men the most dominant predictors of health were safety (either of current environments or where they were raised) or victimization. For

cisgender sexual minority men, prejudice or discrimination experiences were the most dominant predictors of physical health, and safety still had a robust relationship with physical health, being the third most dominant predictor. This important distinction between cisgender sexual minority men and all other SGM subgroups indicates the importance of considering the differential effects of minority stress and structural stigma across subgroups of SGM people. A sample that was mostly comprised of cisgender sexual minority men, for example, may have diluted the emergence of the effects of safety and violence.

Structural stigma, operationalized here as the presence of protective laws or policies was among the top predictors of health for Asian SGM individuals, being the second most robust predictor for this group. These laws and policies were scored at the state-level and do not reflect the unique differences that can occur at the community level. The degree to which laws and policies are reflective of the day-to-day experiences of minority stress remains unknown. The assessment of one's environment as a proxy of the effect of laws and policies may be better measured through self-report than through measurement of policies. Self-report of lived experience is likely a more important predictor of health than knowledge of the local policy landscape where they live and should be assessed as such by clinical providers. Furthermore, we do not yet understand the best environmental proxy measure of minority stress or structural stigma, future work may investigate this.

An individual's outness about their SGM status was one of the two least robust predictors for all racial and ethnic groups as well as for cisgender sexual minority women, gender-expansive individuals, and transfeminine individuals. Among cisgender sexual minority men and transmasculine individuals, it had the fifth and sixth strongest relationship, respectively, with physical health of nine total predictors. Conceptualizations of outness among GM people are different than outness among SM people, and additional research in this area will help to better understand these constructs. Prior work indicated that, among sexual minority men, the relationship between outness and physical symptoms was moderated by socioeconomic status, with men of higher socioeconomic status experiencing greater health benefits related to outness; men of moderate socioeconomic status evidencing no relationship between outness and health; and men of lower socioeconomic status having poorer health in relation to outness [63]. While the results reported here were adjusted for socioeconomic status, we did not explore the moderating effects of socioeconomic status, though that could be a focus of future work.

Among the three most important predictors of physical health in each gender identity and racial/ethnic

identity subgroup, we observed effect sizes ranging from 0.008 to 0.047 for the relationships between components of minority stress or structural stigma and physical health. While 0.008 would be considered very small, 0.047 is larger than a small effect, per previous standards established by Cohen [48]. This represents a noteworthy amount of variability in the outcome measured here: overall physical health. These effect sizes could be used to inform intervention targets, with larger sample sizes needed to detect effects and changes in these effects through intervention. In other work on the impacts of discrimination at the population level, it has been argued that small effects can have a significant impact at the societal level when they (a) effect a lot of people, or (b) effect the same people repeatedly [64]. Putting these into context, these small effects can have a large impact on the health of SGM people at the population level.

There are many paths through which minority stress may be related to physical health that have been elaborated in prior work [16]. Minority stress can impact health indirectly through behaviors such as smoking and substance use, which have been shown to increase after exposure to minority stress [65]. Health care providers should be prepared to assess for these behaviors and provide support to patients to reduce the health impacts of these behaviors to ameliorate the impacts of minority stress. Furthermore, coping may reduce the impact of minority stress [16]. Minority stress may also have direct effects on health through allostatic overload and changes in transcriptional regulation affecting biological function (e.g., immune function, inflammation) that ultimately impact clinical outcomes (e.g., cancer, high blood pressure) [16]. SGM people with existing physical health problems may encounter minority stress in healthcare settings, which in turn can lead to care avoidance that may further exacerbate physical health problems [66].

## Limitations

Limitations of our findings include the exclusive focus on associations of minority stress components with the physical health of SGM people; such stressors only account for a small proportion of variance on their overall physical health. Other factors (e.g., diet, smoking, genetics, preexisting health conditions) likely explain a larger proportion of the variance. Furthermore, this study focused on minority stress related to SGM status and did not examine the stress related to the intersection of other individual characteristics such as race, ethnicity, or ability status. Participants may not have been able to identify the source of the minority stress experienced, thus some SGM-specific minority stress identified may have been

related to other individual characteristics, or there may have been experiences that were related to SGM status but were not attributed as such, thus were not captured here. Further, the limitations of the accuracy of attributions [67] mean that some events captured as minority stress here may not have been minority stressors, while others may have gone unreported as the reason for the mistreatment may not have been clear. Furthermore, this study did not measure other components of the minority stress model such as general stressors. The measures of minority stress used here have not been validated for gender-expansive, transfeminine, and transmasculine individuals although they did undergo extensive community and participant review. Discrimination and victimization measures were based on survey measurement of these constructs [34] and have not been fully validated. These measures lack dimensionality and only indicated if an individual experienced one or more types of discrimination or victimization related to sexual orientation, gender identity, or gender expression, rather than the quantity of these experiences. Measures that capture the quantity of these experiences or longitudinal analysis over time may be able to better unpack the pervasiveness and cumulative burden of these stressors and their relation to physical health outcomes. Effect sizes observed between dimensional measures and physical health outcomes may be larger than the effects observed here. Unfortunately, brief measures that can be used longitudinally to measure many relevant SGM-health constructs need to be developed. Here, we used a measure of outness, which while clearly related to concealment is not equivalent. In this study we analyzed measures of safety, acceptance, outness, and internalized stigma that were designed for sexual minority people for the cisgender sexual minority men and women, and measures of these same constructs designed for gender minority people for the transfeminine, transmasculine, and gender-expansive groups. This method means that sexual minority-based minority stress related to these constructs that is experienced by gender minority people was not accounted for here. While we allow participants within The PRIDE Study to opt in to complete these measures for sexual minority people, gender minority people, or both, there are not established methods for accounting for multiple measures of minority stress related to different identity characteristics within single analyses (i.e., determining if these measures should be averaged, if the measure representing the worse level of minority stress should be used, or if a single measure related to identity status should be used as we did here). Future research is needed to elucidate the best methodology for these scenarios and to verify the equivalence or

non-equivalence of these constructs between these groups. Further, MAP data were not intended for the purpose of measuring structural stigma and may take into account local ordinances that may not be relevant at the state level. Additional measures at the state or ZIP code level may be more accurate in assessing minority stress or social climate and should be an area of future research. Physical health was measured only by a brief, 4-item measure, though this measure has been extensively validated [41–44]. A more robust quantification of health may yield different results. Within this study, most individuals in the gender-expansive group were assigned female sex at birth, thus our findings may be more indicative of this group and less relevant to gender-expansive people assigned male sex at birth. In our sample, our gender groupings differed by age. While we covaried age in our analyses, differences between current safety and acceptance and safety and acceptance where they were raised may be closer in time for some groups. Furthermore, the samples of Native American or Alaskan Native SGM individuals and Black, African American, or African SGM individuals were smaller than what would typically be recommended for dominance analysis, indicating that these results are exploratory and should be replicated within larger samples. Furthermore, analyses of SGM subgroups were predominantly White, thus the differential results by gender-based groups may not be generalizable to groups of SGM people with larger representation of other races and ethnicities, though we did covary race and ethnicity within these models to attempt to account for these differences. Within the sample, 82% of the sample identified as White alone, which is greater than the estimated 60% of the United States population that are White alone [68]. The differences in our sample from other SGM samples (e.g., lower observed reported rates of HIV) suggest that the sample may differ from SGM people overall. Within this sample the participants had higher levels of education than the U.S. population; this is also a potential limitation. This study was also cross-sectional in design, and future research should investigate the prospective relationships between minority stress and health.

## Summary

In sum, our work suggests that minority stress is an important predictor of physical health among SGM people. Safe community environments, either past or present, and experiences of victimization emerged with the strongest relationships with physical health among all subgroups of SGM people with the exception of cisgender sexual

minority men. Increasing safety and buffering the effects of unsafe communities are important for SGM health.

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