Published online: 2 May 2023

Physical and Mental Health Disparities at the Intersection of Sexual and Gender Minority Statuses: Evidence From Population-Level Data

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ABSTRACT Sexual and gender minorities (SGM) experience detriments across many physical and mental health outcomes compared with heterosexual and cisgender people. But little is known about health outcomes for those who are both gender minorities and sexual minorities. Motivated by theories of double disadvantage and leveraging advancements in data collection and measurement, we examine physical and mental health disparities across sexual and gender minority statuses: cisgender heterosexuals, gender minority heterosexuals, cisgender sexual minorities, and people who are both gender and sexual minorities. Using Gallup's National Health and Well-Being Index ($N=93,144$) and the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System ($N=543,717$), we estimate multivariable logistic regression models to examine how sexual and gender minority statuses are associated with poor/fair self-rated health, functional limitations, and diagnosed depression. Regression models adjusting for sociodemographic characteristics show marked physical and mental health disparities: people who are both gender and sexual minorities report greater odds of poor/fair self-rated health, functional limitations, and depression relative to cisgender heterosexuals and, in some cases, relative to gender minority heterosexuals and cisgender sexual minorities. Our results add to a growing body of research documenting the association between multiple disadvantaged statuses and health and provide novel information on SGM health disparities.

KEYWORDS Physical health • Mental health • Double disadvantage • Gender • Sexuality

Introduction

Evidence across the social sciences—spanning the fields of demography, sociology, public health, and psychology—documents physical and mental health disparities for sexual minority populations across many outcomes relative to heterosexuals (Hsieh and shuster 2021; Liu and Reczek 2021; Meyer 2003). This body of work has proliferated in the past decade, no doubt because of innovations in measurement and data collection and the implementation of such measures to identify sexual and gender minority (SGM)

populations in state-level and national surveys. Such innovation has pushed the field past its infancy (Gorman et al. 2015). In general, studies have detailed disparities across many physical and mental health outcomes for sexual minorities relative to heterosexual populations (Gorman et al. 2015; Liu and Reczek 2021; Meyer 2003; Stacey et al. 2022). At the same time, burgeoning research has demonstrated that gender minorities bear the burden of worse physical and mental health relative to the cisgender population (Lagos 2018; Stacey et al. 2022). However, population-level data on gender minorities are sparse because of the use of binary sex (male/female) or gender (man/woman) measures in national surveys (Lagos and Compton 2021; Westbrook and Saperstein 2015), reflecting shortcomings of heteronormative and cisnormative thinking (Westbrook and Saperstein 2015; Westbrook et al. 2022).

Although both sexual and gender minorities appear to experience health disadvantages across several measures relative to heterosexual and cisgender individuals, respectively, the extant literature lacks insight into health disparities at the *intersection* of sexual and gender minority statuses. Uncovering how the intersection of these identities relates to health is important, given theoretical evidence about how multiple disadvantaged statuses shape health and well-being (Denise 2014; Gorman et al. 2015) and empirical evidence outlining the compounding health consequences of homophobia, heteronormativity, and transphobia (Gorman et al. 2015; Meyer 2003; Speight 1995). In this study, we provide a comprehensive look at health disparities at the intersection of sexual and gender minority statuses, motivated by the question, How are sexual and gender minority statuses associated with physical and mental health? We pay particular attention to the health of people who are both gender and sexual minorities.

To answer our research question holistically, we conceptualize health using broad measures, ranging from global indicators of health (e.g., self-rated health) to more specific measures (e.g., functional limitations, diagnosed depression). Our outcomes span physical and mental health, providing breadth and depth. This research is also innovative in leveraging recent population-level data (collected between 2018 and 2020) from Gallup's National Health and Well-Being Index (NHWI) and the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS). Using two large-scale, population-level data sources makes our work exceptionally suited for documenting health disparities, provides robust findings, and better enables practical application in addressing such disparities among SGM populations (Gates 2013, 2017).

Background

Health Disparities for Sexual and Gender Minority Populations

This study builds on extant literature demonstrating relatively worse health outcomes for SGM populations. Compared with cisgender and heterosexual populations, SGM populations report marked differences in health outcomes and health behaviors across numerous dimensions (Hsieh and shuster 2021). For example, relative to heterosexuals, sexual minorities experience worse self-rated health (Fredriksen-Goldsen et al. 2017; Gorman et al. 2015) and more functional limitations hampering daily life (Cohchran et al. 2017). Lesbian, gay, and bisexual populations experience adverse

mental health outcomes relative to heterosexuals, reporting greater rates of mental distress and depression (Gonzales and Henning-Smith 2017). Eleven percent of lesbian, gay, and bisexual people report a suicide attempt, compared with only 4% of heterosexual people (Hottes et al. 2016).

The literature also speaks to the relative health disadvantages of gender minorities relative to cisgender individuals. Notably, gender minorities experience disadvantages in global overall assessments of health and more specific outcomes. One study, based on the first multistate sample of the BRFSS in 2014 when the first Sexual Orientation and Gender Identity (SOGI) Module was implemented, showed that the population of transgender and gender-nonconforming individuals experienced elevated odds of poor physical and mental health relative to cisgender populations (Meyer et al. 2017; see also Stacey et al. 2022). More specifically, relative to cisgender populations, gender minorities reported worse self-rated health (Lagos 2018), greater functional limitations (Cicero et al. 2021), and elevated rates of depression (Hyde et al. 2014). Results from the 2015 U.S. Transgender Discrimination Survey demonstrated that a whopping 41% of gender minorities reported attempting suicide, compared with only 1.6% of the general population (Grant et al. 2011). Hughes et al. (2022) used private health insurance data to examine all-cause mortality of U.S. individuals from 2011 to 2019 and found that transgender people were nearly twice as likely to die over the period than their cisgender counterparts—an extreme example of disadvantage among gender minorities. In sum, gender minorities tend to experience worse physical and mental health relative to cisgender populations (Lagos 2018; Stacey et al. 2022).

Self-rated health, functional limitations, and mental health disparities for SGM populations are well-documented in the social sciences. But what about health disparities for those people who are *both* gender and sexual minorities? What might health disparities at these intersections (i.e., cisgender heterosexual, gender minority heterosexual, cisgender sexual minority, both gender minority and sexual minority) reveal about population-level health patterns that have been obscured by analyzing health disparities for sexual minorities relative to heterosexuals or for gender minorities relative to cisgender populations? Shortcomings in population-level surveys' use of binary sex or gender measures (but not both) and small sample sizes in national surveys when SGM populations are identifiable have precluded an in-depth look at physical and mental health disparities at the *intersection* of sexual and gender minority statuses. What little evidence exists on health disparities at this intersection came recently from Finnish population-level data (Källström et al. 2022). Källström and colleagues' study showed that although sexual and gender minorities reported worse mental health than did cisgender and heterosexual people, people who were both sexual and gender minorities were no more likely to experience depression or anxiety than sexual or gender minorities.

In the current study, we build on past work and examine physical and mental health disparities at the intersection of gender minority status and sexual minority status. Empirical evidence outlining disadvantages in global and specific health outcomes for sexual minorities and gender minorities individually implies that those who are marginalized in terms of their gender *and* sexuality might experience worse health than those who are not or those who experience marginalization in their gender *or* sexuality. As Gorman and colleagues (2015) argued, merely summing the number of disadvantaged statuses among sexual and/or minority groups to examine

associations with health can obscure heterogeneity (see also Lagos 2018). Therefore, we instead adopt an intercategorical approach and model associations *separately* for cisgender heterosexuals, gender minority heterosexuals, cisgender sexual minorities, and people who are both gender and sexual minorities.

Theories of Double and Multiple Disadvantage

Scholars have developed the *double disadvantage* hypothesis to advance the notion that health is not determined wholly in the context of one system of stratification (Cho et al. 2013; Dowd and Bengston 1978), such as sexism or racism. Instead, systems of stratification overlap and intersect, disproportionately exposing individuals to disadvantage (Denise 2014; Shi and Wu 2020) and directly and indirectly shaping health and well-being across the life course. Theories of intersectionality (Collins 1990; Crenshaw 1989, 1990) have largely developed independently of theories outlining variegated determinants of health and health disparities (Bauer 2014). Yet, many studies examining health disparities at various intersections (e.g., race, gender, sexual orientation) have implicitly or explicitly drawn on central tenets of intersectionality (Denise 2014; Gorman et al. 2015). For instance, some have acknowledged the ways health is shaped by a number of interacting forces (Bowleg 2012), such as racism, sexism, and homophobia. Disproportionate exposure to disadvantage has also been articulated recently in structural perspectives on health, such as in Everett and colleagues' (2022) notion of "structural heteropatriarchy," which draws attention to the systemic privilege conferred to cisgender men *and* heterosexual individuals.

Many studies have tested the double disadvantage hypothesis empirically, examining how the number of minoritized statuses (e.g., woman, racial minority, sexual minority) is associated with health disparities (Denise 2014). Studies have generally supported evidence of double and multiple disadvantage for sexual orientation. For instance, Black sexual minorities tend to report worse health than White sexual minorities (Choi et al. 2021; Liu et al. 2017). In this body of work, scholars often consider sex/gender to be an important axis of stratification along which material and social resources are unevenly distributed, and this distribution is associated with and shapes men's and women's population-level health. That is, women are disadvantaged in double/multiple disadvantage theory. Gorman and colleagues (2015) examined health at the intersection of gender and sexual orientation, finding a disadvantage for bisexual men and bisexual women relative to heterosexual men, heterosexual women, and gays/lesbians. As Lagos (2018) argued, however, the analysis of population-level health disparities must go beyond "male" and "female" to consider sex/gender in the context of cisgender and transgender and provide a comprehensive health profile at the intersection of sexual minority and gender minority statuses.

There are three primary theoretical reasons to expect accumulating disadvantage at the intersection of sexual and gender minority status and thus to expect that people who are both gender and sexual minorities will experience worse physical and mental health than cisgender heterosexuals and even those who are gender or sexual minorities. The first reason is the greater incidence and severity of discrimination. People who are gender *and* sexual minorities are likely to confront more discrimination relative to gender *or* sexual minorities and relative to cisgender and heterosexual people.

Discrimination is inversely associated with health (Denise 2014; Meyer 2003), allowing us to deduce that more discrimination will translate to a larger health disadvantage for people who are both gender and sexual minorities relative to other groups. Sexual minorities and gender minorities experience considerable interpersonal discrimination (e.g., homophobia and transphobia in personal networks and families-of-origin; Reczek and Bosley-Smith 2022) and structural discrimination (e.g., labor market discrimination, wage penalties, discrimination in the doctor's office; Doan and Grace 2022; Mishel 2016; Mize 2016; Seiler-Ramadas et al. 2021; shuster 2021; Tilcsik 2011). Thus, all else being equal, people who are both gender and sexual minorities will be exposed to more and worse discrimination than people who are only gender minorities, only sexual minorities, and cisgender and heterosexual people, undermining health more often and more powerfully. At the same time, relative to cisgender and heterosexual populations or those who are singly disadvantaged, people who are both gender minorities and sexual minorities likely anticipate more and worse incidents of discrimination, which undermine health, as explained in minority stress theory (Brooks 1981; Meyer 2003).

A second reason to expect worse physical and mental health for people who are both gender and sexual minorities relative to other groups is a greater likelihood of misclassification. Gender and sexuality, in interaction, are performed by social actors and are then perceived by others (West and Zimmerman 1987; Westbrook and Schilt 2014). Incongruence between self-perceived and other-perceived gender classifications appears to matter for health and well-being: being incorrectly classified is associated with worse health (Hart et al. 2019; Lagos 2019). In a recent study, transgender men who were auditorily misclassified as women in a telephone survey experienced poorer self-rated health than transgender men whose gender was not misclassified (Lagos 2019). This study, based on an exploitation of a survey error, suggests an important relationship between gender classification and subjective assessments of health (see also Miller and Grollman 2015). At the same time, gender nonconformity is negatively linked with self-rated health when a person's perceptions of their gender do not align with how they believe others perceive them (Hart et al. 2019). Similarly, a heteronormative society assumes that sexual minorities are heterosexual (Pfeffer 2014; Solebello and Elliott 2011). These classifications can be damaging and stressful (Borinca et al. 2021), undermining health. In sum, people who are both gender and sexual minorities have a greater likelihood of experiencing misclassification, which can influence their health and create considerable stress.

The third theoretical reason to expect double disadvantage at the intersection of sexual and gender minority status is compounding misalignment in the sex–gender–sexuality system (Seidman 1995). Extant sexual identity labels (e.g., lesbian, gay, heterosexual) rely on and reinscribe the gender binary when deployed in social life. For example, classification schemes of sexual identity no longer cohere once taken outside the context of the gender binary. What might "gay" or "heterosexual" mean in the context of a genderqueer or gender-nonbinary person? The theoretical linkages between the sex–gender–sexuality system—the myriad forces suggesting that only two genders exist, gender must always reflect biological sex, and only sexual attraction between those two genders is normal and natural (Schilt and Westbrook 2009)—might lead to heightened dysphoria and stress for individuals who experience misalignment between their sex assigned at birth and current gender identity and sexual identity.

The sex–gender–sexuality system is a powerful disciplinary power, considerably shaping cultural and social forces that could very well be associated with health.

These elements reveal numerous empirical and theoretical reasons to expect accumulating disadvantages at the intersection of sexual and gender minority status. More and worse discrimination, a greater likelihood of misclassification, and compounding misalignment in the sex–gender–sexuality system lead us to expect worse physical and mental health for people who are both gender and sexual minorities relative to cisgender heterosexuals and even relative to gender minority heterosexuals and cisgender sexual minorities. Our study asks, How are sexual and gender minority statuses associated with physical and mental health?

Methods

Data

We draw on proprietary data from Gallup's National Health and Well-Being Index and publicly available data from the CDC's Behavioral Risk Factor Surveillance System.[1] The NHWI survey was fielded beginning in 2008, employing a repeated cross-sectional design to sample respondents daily on topics such as health and well-being. Gallup sampled individuals via an address-based sampling frame containing a representative list of all U.S. households in all 50 states and the District of Columbia. NHWI data have been collected from U.S. adults aged 18 and older using a dual mail- and web-based methodology since 2018. The response rate in 2018 was 17.3%. We limit our analysis to data from 2018 and 2019, when detailed sexual and gender identity measures were implemented, permitting analyses to examine health disparities at the intersection of sexual and gender minority statuses.

The BRFSS contains a plethora of physical and mental health information. The longest-running repeated cross-sectional health survey in the United States, the BRFSS recruited respondents via random digit dialing of landline and cellular phones using a household-based probability design. We draw on BRFSS data collected between 2018 and 2020 to draw comparable samples across historical time, garner large enough sample sizes to permit analyses at the intersection of sexual and gender minority statuses across our two data sources, and follow the Gender Identity in U.S. Surveillance (GenIUSS) Group's recommendations for minimizing bias from random and nonrandom error. Administered by each U.S. state and territory's public health department, the BRFSS is a nationwide health survey sampling noninstitutionalized U.S. adults. Starting in 2014, the BRFSS implemented optional Sexual Orientation and Gender Identity Modules with measures to identify transgender and sexual minority respondents. Between 2018 and 2020, 41 states and one U.S. territory included the SOGI Module (see the online appendix, Table S1), permitting a potential sample size of 786,083.

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[1] To our knowledge, Gallup's National Health and Well-Being Index data are not publicly available. At the time of our study, our university (The Ohio State University) had a contract with Gallup granting faculty, staff, and students free access to the Gallup data. Many universities have similar contracts with Gallup, so those interested in working with the data could check with their university or Gallup to inquire.

Sexual and Gender Minority Status

The NHWI measured sexual identity by asking, "Which of the following do you consider yourself to be? You may select one or more." Response categories included straight or heterosexual, lesbian, gay, bisexual, queer, and same-gender loving. Gender identity was assessed via sex assigned at birth (male or female); current gender identity (man, woman, or transgender); and, for respondents identifying as transgender, "trans woman (male-to-female)," "trans man (female-to-male)," or "nonbinary/genderqueer."

The BRFSS assessed sexual identity by asking respondents, "Which of the following best represents how you think of yourself?" Response categories included lesbian or gay,[2] straight (not gay), bisexual, something else, or don't know. For gender identity, the survey asked respondents, "Do you consider yourself to be transgender?" Respondents who replied affirmatively were asked, "Do you consider yourself to be male-to-female, female-to-male, or gender-nonconforming?"[3] If a respondent was confused about the definition of these terms, interviewers were instructed to provide definitions. If respondents replied negatively, interviewers moved on to other questions.

On the basis of the branching of the (trans)gender measure in both the NHWI and BRFSS, we can identify only those gender minorities who first identified as transgender: nonbinary/genderqueer respondents in the NHWI and gender-nonconforming respondents in the BRFSS indicated that they identified as transgender before identifying with more specific gender minority terms. Some gender-nonbinary, genderqueer, and gender-nonconforming people consider themselves to belong under the transgender umbrella, and others do not; we return to this limitation in the Discussion section. Also important is that the sex/gender measures in the NHWI and BRFSS were worded differently, with the SOGI Module in the BRFSS directly asking people if they identified as transgender and the NHWI survey asking respondents for their sex assigned at birth and current gender identity. Such wording variations might lead to slightly different sample sizes of gender minority respondents and could influence the results.

We created a combined *sexual and gender minority status* variable from these indicators in the NHWI and BRFSS. Respondents were categorized as (1) cisgender heterosexuals if they reported alignment between their sex assigned at birth and their current gender identity or indicated that they were not transgender and identified as straight/heterosexual; (2) gender minority heterosexuals if they reported that their current gender identity did not match their sex assigned at birth or identified as transgender and straight/heterosexual; (3) cisgender sexual minorities if they reported alignment between their sex assigned at birth and their current gender identity or that they were not transgender and identified as anything but straight/heterosexual; or (4) people who

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[2] Only those who were identified as female were given the response category of "lesbian or gay." Those identified as male were given only "gay" as a response category.

[3] In both the NHWI and BRFSS, wording of the gender/transgender indicators and accompanying response categories rely on anachronistic terms (e.g., female-to-male) to describe transgender and gender minority individuals and therefore include potentially stigmatizing language. Although these measures permit identification of gender minority populations, and despite the rapid evolution of language to describe sexual and gender minority subpopulations, we echo others' sentiments in encouraging the use of nonstigmatizing language that is as current as possible as it relates to transgender identification processes in national and other surveys (Westbrook and Saperstein 2015).
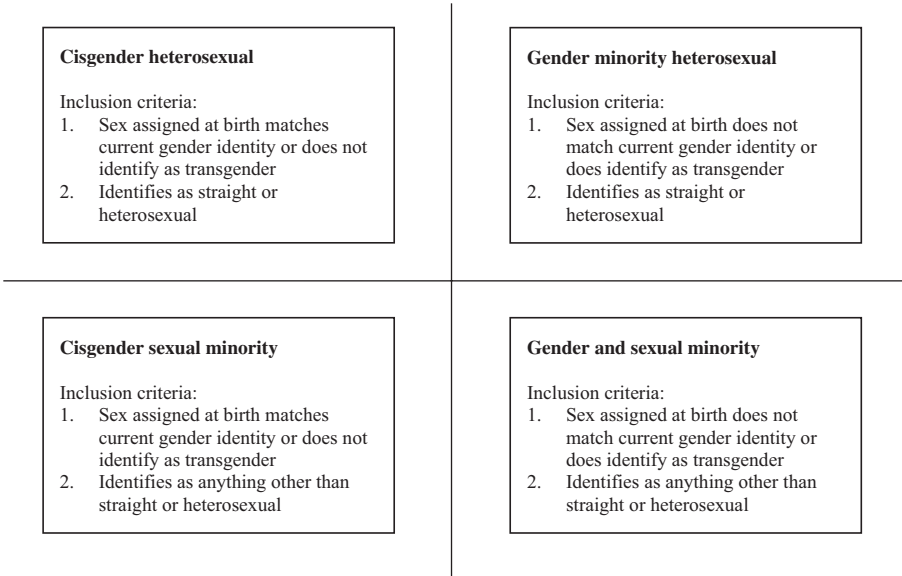
Cisgender heterosexual Inclusion criteria: 1. Sex assigned at birth matches current gender identity or does not identify as transgender 2. Identifies as straight or heterosexual	**Gender minority heterosexual** Inclusion criteria: 1. Sex assigned at birth does not match current gender identity or does identify as transgender 2. Identifies as straight or heterosexual
Cisgender sexual minority Inclusion criteria: 1. Sex assigned at birth matches current gender identity or does not identify as transgender 2. Identifies as anything other than straight or heterosexual	**Gender and sexual minority** Inclusion criteria: 1. Sex assigned at birth does not match current gender identity or does identify as transgender 2. Identifies as anything other than straight or heterosexual

Fig. 1 Conceptual diagram explaining inclusion criteria for each of the sexual and gender minority statuses

are both gender and sexual minorities if they reported that their current gender identity did not match their sex assigned at birth or identified as transgender and indicated that they were anything but straight/heterosexual (see Figure 1). *Sexual minority* refers to all those who identified as lesbian, gay, bisexual, queer, same-gender loving, or "something else." *Heterosexual* refers to those who identified exclusively as straight or heterosexual. *Gender minority* refers to those whose current gender identity does not align with their sex assigned at birth or those who identified as transgender. *Cisgender* captures those whose current gender identity matches their sex assigned at birth or those who did not identify as transgender. Using these indicators, we can identify unweighted samples of cisgender heterosexuals (NHWI *n*=88,133; BRFSS *n*=514,244), gender minority heterosexuals (NHWI *n*=90; BRFSS *n*=1,162), cisgender sexual minorities (NHWI *n*=4,752; BRFSS *n*=27,326), and people who are both gender and sexual minorities (NHWI *n*=169; BRFSS *n*=985).

Dependent Variables

We assess physical and mental health with three outcomes: self-rated health, functional limitations, and diagnosed depression.[4]

In the NHWI and BRFSS, *self-rated health* was measured with a question asking respondents to indicate the general quality of their health as excellent, very good, good, fair, or poor. We dichotomized self-rated health (0 = excellent, very good, or

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[4] In the BRFSS, each state and U.S. territory included self-rated health, functional limitations, and depressive disorders measures as part of core general health, disability, and chronic health modules.

good; 1 = fair or poor). Self-rated health is an independent predictor of mortality and morbidity and is a robust and important global dimension of health status (Idler and Benyamini 1997; Jylhä 2009).

In the NHWI, the presence of *functional limitations* was operationalized via the question, "Do you have any health problems that prevent you from doing any of the things people your age normally can do?" We categorized individuals in the BRFSS sample as having functional limitations if they responded yes to any one of the following questions: (1) "Do you have serious difficulty walking or climbing stairs?"; (2) "Do you have difficulty dressing or bathing?"; and (3) "Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?" This variable, for both surveys, is measured dichotomously (0 = no functional limitation; 1 = has functional limitation).

For *diagnosed depression*, respondents in the NHWI were asked whether a doctor, nurse, or other health professional ever told them that they had depression. Respondents in the BRFSS were asked if they were ever told they had "a depressive disorder (including depression, major depression, dysthymia, or minor depression)." For both surveys, this variable is measured dichotomously (0 = no; 1 = yes).

Covariates

We first adjust for age (in years), race and ethnicity (0 = White; 1 = Black; 3 = Latinx; 4 = other), region of the country (0 = South; 1 = non-South), and survey year (0=2018; 1=2019; 2=2020).[5] We then adjust for current employment status (0 = not employed; 1 = employed), education (0 = less than college; 1 = college education or more), annual household income (0 = less than $60,000 in the NHWI and less than $50,000 in the BRFSS; 1 = $60,000 or more in the NHWI and $50,000 or more in the BRFSS), health insurance coverage (0 = yes; 1 = no), marital status (0 = not married; 1 = married), and whether the respondent has any residential children (0 = no; 1 = yes).

Models adjust for sociodemographic, socioeconomic, and family characteristics that might confound the relationship between sexual and gender minority statuses and health. We adjust for age to account for birth cohort differences in sexual and gender minority identification and the well-established relationship between aging and declines in health (Hammack et al. 2018; Liu and Reczek 2021). Race and ethnicity have been shown to influence health because of racism and other structural forces that disproportionately affect people of color (Gee and Ford 2011); people of color report worse health and are simultaneously more likely to identify as sexual minorities (Bridges and Moore 2018). Region is important to adjust for because SGM identification varies by region of residence, and people who live in the South tend to report worse health (Levi et al. 2015; Rosenfeld 2007; Stone 2018). Studies pooling data across multiple years commonly adjust for survey year (Lagos 2018; Reczek et al. 2017). We control for several socioeconomic characteristics because of variation in education, employment, and income by sexuality and gender (Mishel 2016; Mize 2016) and because of well-established empirical and theoretical work outlining

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[5] NHWI data are available only for 2018 and 2019.

how socioeconomic status shapes health and well-being (Link and Phelan 1995).
Finally, we adjust for marital status and the presence of children because marriage
and parenting influence health (Liu and Umberson 2008; Waite 1995), and SGM peo-
ple are less likely to marry and have children (Hsieh and Liu 2019).

Analytic Plan

We first show unweighted sample sizes and weighted percentages/means and stan-
dard deviations across all outcomes and our independent variable and covariates.
We then present bivariate results from Wald tests for our outcomes and covariates
stratified by sexual and gender minority statuses, comparing (1) gender minority
heterosexuals, (2) cisgender sexual minorities, and (3) people who are both gen-
der and sexual minorities with cisgender heterosexuals. We then estimate multivar-
iable logistic regression models to compare how (1) gender minority heterosexuals,
(2) cisgender sexual minorities, and (3) people who are both gender and sexual minor-
ities fare relative to cisgender heterosexuals. We also conduct pairwise comparisons
to analyze whether SGM groups experience health disparities relative to one another.
All analyses are conducted in Stata, version 15. To achieve population representation,
we assign survey weights to each respondent using the *svyset* command based on the
survey year.[6] The BRFSS weights also accommodate the complex sampling design,
adjust for item nonresponse, and reflect the state's population. For ease of interpreta-
tion, we present our regression estimates in odds ratios (ORs). However, ORs are rel-
ative and do not provide information in the natural metric of the dependent variable
(Mize 2019; Mood 2010). Consequently, we also use the suite of margins commands
in Stata (Long and Freese 2014) to estimate, as a function of sexual and gender minor-
ity statuses, the predicted probabilities of reporting (1) poor/fair self-rated health, (2)
functional limitations, and (3) diagnosed depression.

Results

Descriptive Results

Table 1 shows weighted descriptive statistics for the NHWI and BRFSS samples.
Estimates of the gender minority heterosexual population range from 0.11% to 0.22%,
cisgender sexual minorities represent 5.9% to 6.8% of the population, and estimates
for people who are both gender and sexual minorities are about 0.24% to 0.36% of the
population. From these data, SGM populations in both data sets appear to make up
approximately 6% to 7% of the population, which is in line with estimates from other
recognized population-level data sources (Gates 2017). The prevalence estimates of

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[6] Gallup created weights to reflect the U.S. population according to age, race, Hispanic ethnicity, gender,
education, region, and population density, drawing on data from Current Population Surveys for adults
and Nielsen Claritas statistics for metropolitan statistical areas. Population density targets are based on the
most recent U.S. Census data. Information on the BRFSS creation of weights can be found online at https://
www.cdc.gov/brfss/annual_data/annual_data.htm.

Table 1 Characteristics of the study population, National Health and Well-Being Index (NHWI) and Behavioral Risk Factor Surveillance System (BRFSS)

	NHWI		BRFSS	
	Unweighted Sample Size (*n*)	Weighted Mean (SD) / %	Unweighted Sample Size (*n*)	Weighted Mean (SD) / %
Poor or Fair Self-rated Health	12,826	15.06	93,128	16.62
Functional Limitations	21,994	22.19	98,854	15.70
Diagnosed Depression	19,524	21.90	108,187	19.29
Sexual and Gender Minority Status				
Cisgender heterosexual	88,183	92.73	514,244	93.63
Gender minority heterosexual	90	0.11	1,162	0.22
Cisgender sexual minority	4,752	6.80	27,326	5.91
Gender and sexual minority	169	0.36	985	0.24
Age		46.67 (17.31)		48.46 (17.45)
Race				
White	76,684	67.12	420,690	65.05
Black	5,338	10.30	42,059	12.33
Latinx	5,645	14.78	37,199	15.09
Other	5,477	7.80	43,769	7.53
Region				
Non-South	61,426	62.94	362,239	57.65
South	31,718	37.06	176,910	42.28
Guam	—	—	4,568	0.07
Year				
2018	87,283	93.71	182,141	31.71
2019	5,861	6.29	180,314	29.72
2020	—	—	181,262	38.56
Employment				
Not employed	35,479	30.37	253,669	40.53
Employed	57,665	69.63	290,048	59.47
Education				
Less than college	47,197	64.81	323,448	70.12
College education or more	45,947	35.19	220,269	29.87
Income				
<$60,000 (NHWI); <$50,000 (BRFSS)	42,352	51.00	252,931	46.67
≥$60,000 (NHWI); ≥$50,000 (BRFSS)	50,792	49.00	290,786	53.33
Has Health Insurance	88,612	90.60	502,582	88.47
Union Status				
Not married	40,375	44.45	253,328	47.28
Married	52,769	55.55	290,389	52.72
Residential Children				
No	70,214	63.87	394,061	63.31
Yes	22,930	36.13	149,656	36.69
N	93,144		543,717	

self-reported poor/fair health are 15.1% and 16.6%, whereas the percentages living with a functional limitation are 15.7% to 22.2%. Finally, 19.3% and 21.9% reported having been diagnosed with depression by a health professional.

Table 2 presents the NHWI and BRFSS weighted percentages and means for all outcome variables and covariates stratified by sexual and gender minority statuses. Evidence for unadjusted health disparities at this important intersection is clear at the bivariate level. Cisgender sexual minorities and people who are both gender and sexual minorities reported elevated rates of poor/fair self-rated health, any functional limitation, and depression diagnoses in both data sources. For example, prevalence estimates for people who are both gender and sexual minorities are 26.8% and 32.9% for poor/fair self-rated health, 33.0% and 45.0% for functional limitations, and 56.5% and 69.4% for depression. Relative to cisgender heterosexuals, gender minority heterosexuals experienced health disparities in functional limitations and depression in the BRFSS data. However, no significant differences were evident at the bivariate level in the NHWI data.

We now turn to demographic characteristics. Despite their higher rates of poor/fair self-rated health, functional limitations, and depression, cisgender sexual minorities and people who are both gender and sexual minorities are considerably younger than cisgender heterosexuals, who are the oldest in the sample, on average; this is in line with evidence suggesting that younger people are more likely to identify as sexual minorities, gender minorities, or both (Liu and Reczek 2021). Descriptive results also show that relative to cisgender heterosexuals, cisgender sexual minorities and people who are both gender and sexual minorities are less likely to be White (see Bridges and Moore 2018). Results for region are inconsistent across data sources. NHWI data suggest that a lower proportion of people who are both gender and sexual minorities reside in the South relative to cisgender heterosexuals, whereas BRFSS data suggest that residence in the South is higher for gender minority heterosexuals and lower for cisgender sexual minorities relative to cisgender heterosexuals.

Table 2 further shows important differences in socioeconomic status and family characteristics by sexual and gender minority statuses. BRFSS data show that people who are both gender and sexual minorities experience lower rates of employment because of unemployment or choice. Similarly, BRFSS data show that gender minority heterosexuals, cisgender sexual minorities, and people who are both gender and sexual minorities are less likely to have a four-year college degree than cisgender heterosexuals. The evidence regarding household income is clear: in the NHWI and BRFSS, gender minority heterosexuals, cisgender sexual minorities, and people who are both gender and sexual minorities are likelier to have household incomes below $60,000 or $50,000, respectively. Similarly, in both data sources, cisgender sexual minorities have lower rates of health insurance coverage than cisgender heterosexuals. However, BRFSS data also show significantly lower rates of health insurance coverage for gender minority heterosexuals and people who are both gender and sexual minorities. Our estimates for marital status are in line with other national estimates (Hsieh and Liu 2019): cisgender sexual minorities and people who are both gender and sexual minorities are less likely to be married than cisgender heterosexuals. Finally, in both data sets, cisgender heterosexuals are more likely than cisgender sexual minorities to have residential children. BRFSS data also suggest that gender minority heterosexuals and people who are both gender and sexual minorities are

Table 2 Percentages and means (and standard deviations) by sexual and gender minority status

	NHWI (N=93,144)				BRFSS (N=543,717)			
	Cisgender Heterosexual	Gender Minority Heterosexual	Cisgender Sexual Minority	Gender Minority and Sexual Minority	Cisgender Heterosexual	Gender Minority Heterosexual	Cisgender Sexual Minority	Gender Minority and Sexual Minority
Poor or Fair Self-rated Health	14.55	20.68	20.88***	32.85**	16.37	15.18	20.10***	26.77***
Functional Limitation	21.60	24.72	28.98***	45.00***	15.38	25.58**	19.59****	33.04****
Diagnosed Depression	20.31	21.45	41.10***	69.36***	18.01	27.75**	37.70****	56.46****
Age	47.32	45.79	38.47***	34.31***	49.07	47.60	39.50****	32.41***
	(17.39)	(16.05)	(14.17)	(9.84)	(17.39)	(18.01)	(15.82)	(12.63)
Race								
White	67.97	49.53*	56.79***	49.42**	65.51	52.26***	58.60****	56.21**
Black	10.15	17.06	12.52	4.96*	12.28	18.76*	12.90	9.97
Hispanic/Latinx	14.22	15.48	21.50***	32.63**	14.77	20.68	19.60****	22.65*
Other	7.66	17.94	9.19*	13.00	7.43	8.30	8.90****	11.16*
Region								
Non-South	62.85	49.67	63.83	73.29*	57.45	49.37*	60.98****	61.63
South	37.15	50.33	36.17	26.71*	42.48	50.37*	38.94****	38.27
Guam	—	—	—	—	0.07	0.26*	0.08	0.10
Year								
2018	93.62	94.75	95.06**	91.17	31.83	37.88	29.92***	25.38*
2019	6.38	5.25	4.94**	8.83	29.68	29.96	30.25	32.47
2020	—	—	—	—	38.49	32.15	39.83*	42.15
Employment								
Not employed	30.49	21.34	28.83	30.77	40.54	46.85	39.94	47.28*
Employed	69.51	78.65	71.17	69.23	59.46	53.15	60.06	52.72*

Table 2 (continued)

	NHWI (N=93,144)				BRFSS (N=543,717)			
	Cisgender Heterosexual	Gender Minority Heterosexual	Cisgender Sexual Minority	Gender Minority and Sexual Minority	Cisgender Heterosexual	Gender Minority Heterosexual	Cisgender Sexual Minority	Gender Minority and Sexual Minority
Education								
Less than college	64.69	69.57	66.08	71.15	69.96	79.91***	72.15***	80.73***
College education or more	35.31	30.43	33.92	28.85	30.04	20.09***	27.85***	19.27***
Income								
<$60,000 (NHWI); <$50,000 (BRFSS)	49.83	64.92*	65.38***	76.39***	45.87	62.88***	57.87***	66.11***
≥$60,000 (NHWI); ≥$50,000 (BRFSS)	50.17	35.08*	34.62***	23.61***	54.13	37.12***	42.13***	33.89***
Has Health Insurance								
No	9.14	7.48	12.45***	18.80	11.26	16.61*	15.41***	16.78*
Yes	90.86	92.52	87.55***	81.20	88.74	83.39*	84.59***	83.21*
Union Status								
Not married	42.46	40.59	72.47***	81.41***	45.70	52.44*	70.71***	81.73***
Married	57.74	59.41	27.53***	18.59***	54.30	47.56*	29.29***	18.27***
Residential Children								
No	63.25	69.67	72.16***	66.07	63.02	70.84***	67.01***	76.40***
Yes	36.75	30.33	27.84***	33.93	36.97	29.16***	32.99***	23.60***
Unweighted n	88,133	90	4,752	169	514,244	1,162	27,326	985

Notes: Wald tests were conducted to compare outcomes and covariates stratified by sexual and gender minority statuses, with cisgender heterosexuals as the reference group. Standard deviations are shown in parentheses.

Sources: National Health and Well-Being Index (NHWI) and Behavioral Risk Factor Surveillance System (BRFSS).

*p<.05; **p<.01; ***p<.001

less likely than cisgender heterosexuals to have coresident children. Of course, many of these differences are not surprising given the younger average ages for cisgender sexual minorities and people who are both gender and sexual minorities. That is, age differences by sexual and gender minority statuses likely contribute substantially to many other observed demographic differences.

Regression Results

Self-rated Health

Table 3 shows ORs from logistic regression models predicting poor/fair self-rated health as a function of sexual and gender minority statuses. Models 1 and 3 adjust for age, race and ethnicity, region, and survey year for NHWI and BRFSS data, respectively. Model 1 shows higher rates of poor/fair self-rated health for cisgender sexual minorities (OR=1.79; $p < .001$) and people who are both gender and sexual minorities (OR=3.69; $p < .001$) relative to cisgender heterosexuals. Pairwise comparisons further show that people who are both gender and sexual minorities are also more likely than cisgender sexual minorities to report poor/fair self-rated health. Model 3 generally confirms the same pattern of results: poor/fair self-rated health is higher among cisgender sexual minorities (OR=1.62; $p < .001$) and people who are both gender and sexual minorities (OR=2.94; $p < .001$) than among cisgender heterosexuals. Pairwise comparisons based on BRFSS data but with a much larger sample size demonstrate that cisgender sexual minorities are disadvantaged relative to gender minority heterosexuals. Further, these comparisons show that people who are both gender and sexual minorities are also disadvantaged in the odds of self-reported health relative to gender minority heterosexuals and cisgender sexual minorities.

Models 2 and 4 of Table 3 show fully adjusted odds ratios after controlling for age, race and ethnicity, region, year, employment, education, income, health insurance coverage, marital status, and residential parent status from the NHWI and BRFSS, respectively. Results show that cisgender sexual minorities and people who are both gender and sexual minorities still experience greater odds of poor/fair self-rated health relative to cisgender heterosexuals, although the odds ratios have been attenuated. Model 4 demonstrates that gender minority heterosexuals experience *lower odds* of poor/fair self-rated health relative to cisgender heterosexuals (OR =0.68; $p < .01$). Pairwise comparisons in Model 4 illuminate within-group variation: cisgender sexual minorities are disadvantaged relative to gender minority heterosexuals, whereas people who are both gender and sexual minorities are disadvantaged relative to gender minority heterosexuals and cisgender sexual minorities. The NHWI and BRFSS data suggest that even after we adjust for sociodemographic, socioeconomic, and family characteristics—some of which likely absorb some of the association between sexual and gender minority status and self-rated health (e.g., income, marital status)—people who are marginalized in both gender and sexuality are more than twice as likely as cisgender heterosexuals to have poor/fair self-rated health.

Figure 2 shows predicted probabilities of poor/fair self-rated health by sexual and gender minority statuses based on results from fully adjusted models. Probabilities of poor/fair self-rated health are 14.6% and 16.3% for cisgender heterosexuals, 12.1%

Table 3 Logistic regression results predicting self-rated health: Odds ratios, with 95% confidence intervals shown in parentheses

	NHWI		BRFSS	
	Model 1	Model 2	Model 3	Model 4
Sexual and Gender Minority Status (ref. = cisgender heterosexual)				
Gender minority heterosexual	1.47	1.53	0.85	0.68**
	(0.66, 3.29)	(0.65, 3.61)	(0.64, 1.13)	(0.61, 0.91)
Cisgender sexual minority	1.79***	1.46***	1.62***[a]	1.38***[a]
	(1.58, 2.03)	(1.28, 1.67)	(1.52, 1.74)	(1.29, 2.48)
Gender and sexual minority	3.69***[b]	2.60**[b]	2.94***[a,b]	2.02***[a,b]
	(2.15, 6.32)	(1.50, 4.51)	(2.25, 3.83)	(1.50, 2.72)
Age	1.02***	1.01***	1.03***	1.02***
	(1.02, 1.02)	(1.01, 1.01)	(1.03, 1.03)	(1.02, 1.02)
Race (ref. = White)				
Black	1.51***	1.10	1.57***	1.19***
	(1.236, 1.68)	(0.99, 1.23)	(1.49, 1.64)	(1.13, 1.25)
Latinx	1.33***	1.04	2.10***	1.47***
	(1.20, 1.49)	(0.03, 1.17)	(1.97, 2.24)	(1.38, 1.57)
Other	1.25***	1.24***	1.19***	1.17***
	(1.11, 1.40)	(1.09, 1.40)	(1.11, 1.28)	(1.09, 1.25)
Region (ref. = non-South)				
South	1.14***	1.06	1.25***	1.18***
	(1.07, 1.21)	(0.99, 1.13)	(1.21, 1.29)	(1.14, 1.22)
Guam			1.52***	1.19*
			(1.37, 1.74)	(1.03, 1.37)
Year (ref. = 2018)				
2019	0.98	0.99	0.87***	0.87***
	(0.87, 1.10)	(0.87, 1.12)	(0.85, 0.88)	(0.85, 0.88)
Employment (ref. = not employed)				
Employed		0.44***		0.48***
		(0.41, 0.47)		(0.46, 0.50)
Education (ref. = less than college)				
College education or more		0.49***		0.53***
		(0.46, 0.53)		(0.51, 0.55)
Income (ref. <$60,000 (NHWI); <$50,000 (BRFSS))				
≥$60,000 (NHWI); ≥$50,000 (BRFSS)		0.45***		0.41***
		(0.41, 0.48)		(0.39, 0.43)
Has Health Insurance		0.80***		0.86***
		(0.71, 0.90)		(0.81, 0.92)
Union Status (ref. = not married)				
Married		0.81***		0.86***
		(0.75, 0.86)		(0.82, 0.89)
Residential Children (ref. = no)				
Yes		0.98		1.01
		(0.89, 1.07)		(0.96, 1.06)
F	62.42	233.38	378.36	708.87
N	93,144	93,144	543,717	543,717

Sources: National Health and Well-Being Index (NHWI) and Behavioral Risk Factor Surveillance System (BRFSS).

[a] *p* < .05 compared with gender minority heterosexuals.

[b] *p* < .05 compared with cisgender sexual minorities.

p < .05; **p* < .01; ***p* < .001

Poor/fair self-rated health, NHWI data

Poor/fair self-rated health, BRFSS data
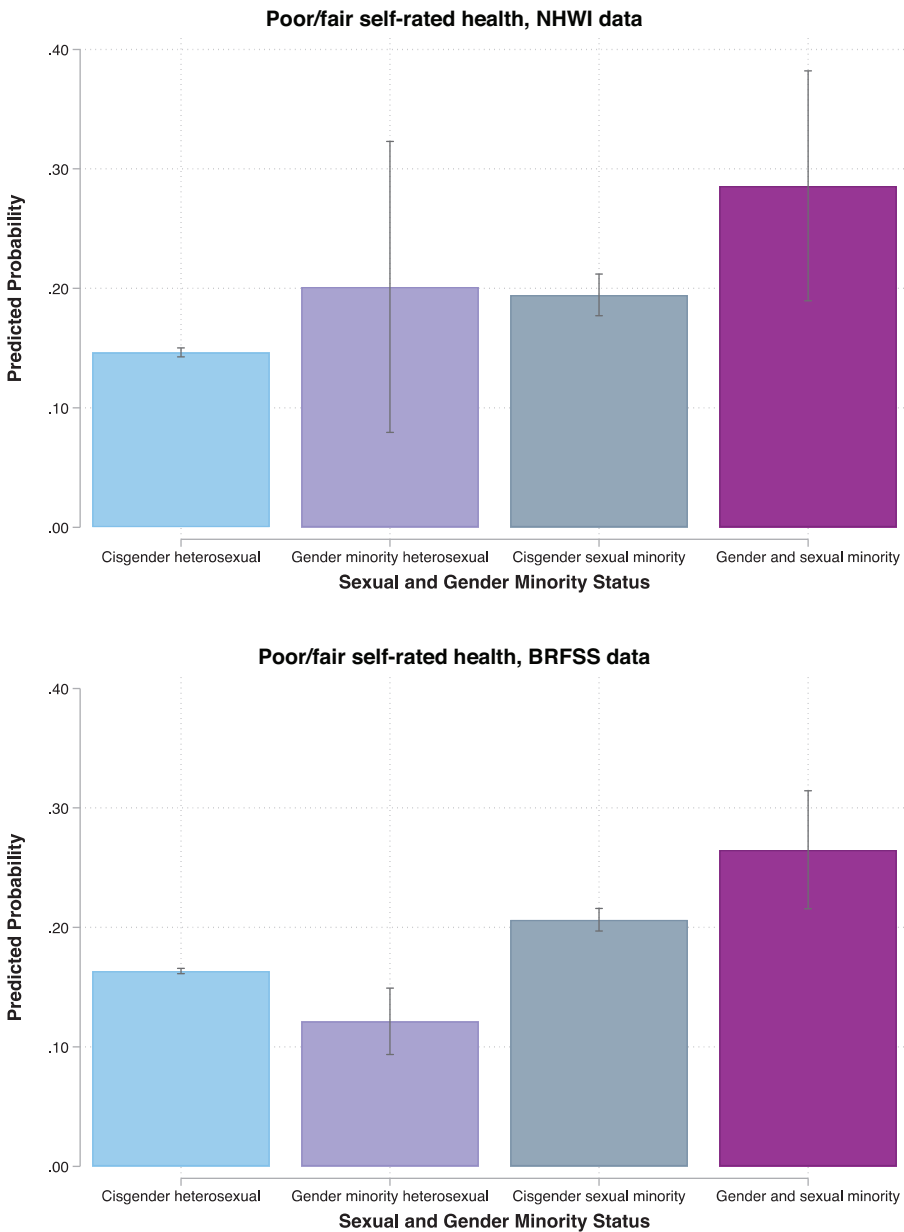
Fig. 2 Predicted probabilities of poor/fair self-rated health by sexual and gender minority statuses. Models adjust for age, race and ethnicity, region, year, employment status, education, household income, health insurance coverage, marital status, and residential children.

and 20.1% for gender minority heterosexuals, 19.5% and 20.6% for cisgender heterosexuals, and 26.5% and 28.6% for people who are both gender and sexual minorities. Among the latter group, close to one third—a substantial proportion—experience poor/fair self-rated health relative to good, very good, or excellent health.

Functional Limitations

Table 4 shows ORs based on logistic regression models predicting functional limitations as a function of sexual and gender minority statuses. Models 1 and 3 adjust for age, race and ethnicity, region, and year using NHWI and BRFSS data, respectively. Model 1 shows that, relative to cisgender heterosexuals, cisgender sexual minorities (OR = 1.90; $p < .001$) and people who are both gender and sexual minorities (OR = 4.50; $p < .001$) report higher rates of functional limitations. Model 3 generally confirms the same pattern: both cisgender sexual minorities (OR = 2.01; $p < .001$) and people who are both gender and sexual minorities (OR = 6.03; $p < .001$) report heightened rates of functional limitations. However, Model 3 also shows that gender minority heterosexuals are also disadvantaged (OR = 1.94; $p < .01$). Pairwise comparisons based on NHWI and BRFSS data demonstrate that people who are both gender and sexual minorities are also disadvantaged in the odds of reporting functional limitations relative to gender minority heterosexuals and cisgender sexual minorities.

Models 2 and 4 of Table 4 present fully adjusted ORs and show a similar trend of disadvantage as previous models. Model 2 (using NHWI data) and Model 4 (using BRFSS data) demonstrate that cisgender sexual minorities and people who are both gender and sexual minorities still face higher rates of functional limitations than cisgender heterosexuals. Pairwise comparisons remain significant for people who are both gender and sexual minorities relative to gender minority heterosexuals and cisgender sexual minorities even after the models adjust for all covariates. People who are both gender and sexual minorities are more than three times as likely to experience a limitation that hampers daily life than cisgender heterosexuals, the high odds of which are observed *after* we adjust for socioeconomic and family characteristics that likely partially explain why health disparities exist at this important intersection.

Figure 3 presents predicted probabilities of reporting any functional limitation across sexual and gender minority statuses based on results from fully adjusted models. The probability of reporting a functional limitation is 15.3% and 21.6% for cisgender heterosexuals, 21.4% and 25.2% for gender minority heterosexuals, 21.5% and 29.6% for cisgender sexual minorities, and 34.5% and 44.8% for people who are both gender and sexual minorities.

Diagnosed Depression

Table 5 shows logistic regression results from models predicting diagnosed depression by sexual and gender minority statuses. Models 1 and 3 adjust for age, race and ethnicity, region, and year. Model 1, based on NHWI data, shows that cisgender sexual minorities (OR = 2.70; $p < .001$) and people who are both gender and sexual minorities (OR = 8.90; $p < .001$) experience elevated rates of diagnosed depression

Table 4 Logistic regression results predicting functional limitations: Odds ratios, with 95% confidence intervals shown in parentheses

	NHWI		BRFSS	
	Model 1	Model 2	Model 3	Model 4
Sexual and Gender Minority Status (ref. = cisgender heterosexual)				
Gender minority heterosexual	1.22	1.25	1.94**	1.65
	(0.57, 2.60)	(0.59, 2.66)	(1.32, 2.88)	(0.99, 2.74)
Cisgender sexual minority	1.90***	1.61***	2.01***	1.66***
	(1.71, 2.12)	(1.44, 1.80)	(1.88, 2.15)	(1.55, 1.78)
Gender and sexual minority	4.50***[a,b]	3.43***[a,b]	6.03***[a,b]	3.84***[a,b]
	(2.79, 7.28)	(2.16, 5.44)	(4.54, 8.01)	(2.88, 5.11)
Age	1.03***	1.01***	1.04***	1.03***
	(1.02, 1.03)	(1.01, 1.01)	(1.04, 1.04)	(1.03, 1.03)
Race (ref. = White)				
Black	1.09	0.87**	1.45***	1.07*
	(1.00, 1.20)	(0.79, 0.95)	(1.38, 1.53)	(1.01, 1.13)
Latinx	0.92	0.78***	1.27***	0.90**
	(0.83, 1.01)	(0.70, 0.86)	(1.18, 1.36)	(0.84, 0.97)
Other	1.06	1.03	1.07	1.03
	(0.96, 1.16)	(0.93, 1.14)	(0.99, 1.15)	(0.95, 1.10)
Region (ref. = non-South)				
South	1.15***	1.10***	1.29***	1.24***
	(1.09, 1.21)	(1.04, 1.16)	(1.25, 1.33)	(1.20, 1.29)
Guam			1.28**	1.01
			(1.10, 1.49)	(0.86, 1.20)
Year (ref. = 2018)				
2019	1.03	1.04	0.93***	0.94***
	(0.93, 1.13)	(0.94, 1.15)	(0.92, 0.95)	(0.92, 0.96)
Employment (ref. = not employed)				
Employed		0.38***		0.31***
		(0.36, 0.40)		(0.30, 0.32)
Education (ref. = less than college)				
College education or more		0.67***		0.55***
		(0.64, 0.71)		(0.53, 0.58)
Income (ref. <$60,000 (NHWI); <$50,000 (BRFSS))				
≥$60,000 (NHWI); ≥$50,000 (BRFSS)		0.57***		0.41***
		(0.54, 0.60)		(0.39, 0.43)
Has Health Insurance		1.11		1.16***
		(0.99, 1.25)		(1.09, 1.25)
Union Status (ref. = not married)				
Married		0.93*		0.75***
		(0.88, 0.99)		(0.72, 0.78)
Residential Children (ref. = no)				
Yes		0.88***		0.99
		(0.82, 0.94)		(0.94, 1.04)
F	133.51	310.3	660.06	1,031.6
N	93,144	93,144	543,717	543,717

Source: National Health and Well-Being Index (NHWI) and Behavioral Risk Factor Surveillance System (BRFSS).

[a] $p < .05$ compared with gender minority heterosexuals.

[b] $p < .05$ compared with cisgender sexual minorities.

*$p < .05$; **$p < .01$; ***$p < .001$

Functional limitation, NHWI data

Functional limitation, BRFSS data
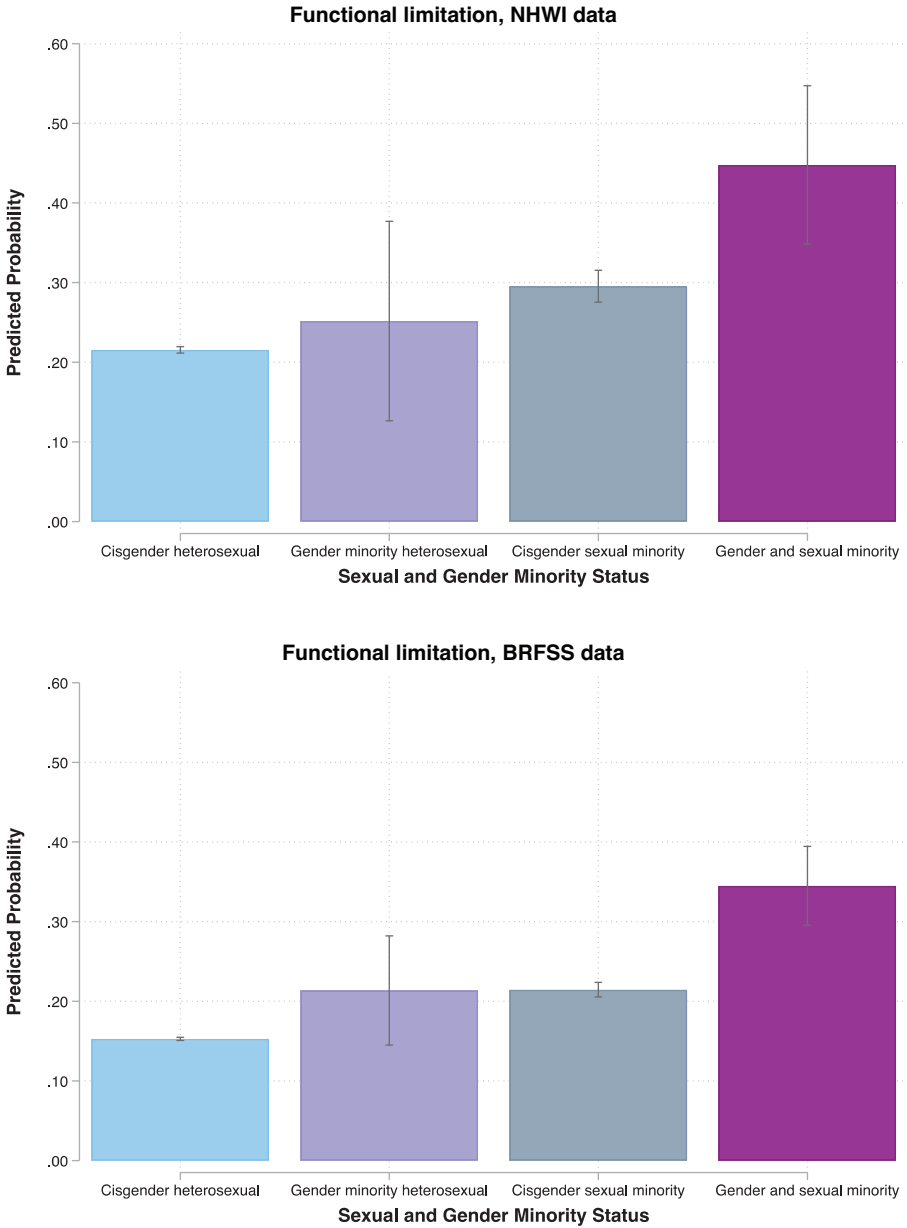
Fig. 3 Predicted probabilities of functional limitation by sexual and gender minority statuses. Models adjust for age, race and ethnicity, region, year, employment status, education, household income, health insurance coverage, marital status, and residential children.

Table 5 Logistic regression results predicting diagnosed depression: Odds ratios, with 95% confidence intervals shown in parentheses

	NHWI		BRFSS	
	Model 1	Model 2	Model 3	Model 4
Sexual and Gender Minority Status (ref. = cisgender heterosexual)				
Gender minority heterosexual	1.11	1.11	1.84***	1.68***
	(0.54, 2.28)	(0.50, 2.45)	(1.31, 2.57)	(1.16, 2.44)
Cisgender sexual minority	2.70***[a]	2.34***	2.68***[a]	2.39***
	(2.44, 2.98)	(2.11, 2.60)	(2.54, 2.82)	(2.26, 2.52)
Gender and sexual minority	8.90***[a,b]	7.27***[a,b]	5.58***[a,b]	4.50***[a,b]
	(5.66, 13.97)	(4.63, 11.39)	(4.41, 7.06)	(3.50, 5.79)
Age	0.99***	0.99***	0.99***	0.99***
	(0.99, 1.00)	(0.99, 0.99)	(0.99, 0.99)	(0.99, 0.99)
Race (ref. = White)				
Black	0.84**	0.65***	0.67***	0.54***
	(0.76, 0.93)	(0.59, 0.72)	(0.64, 0.71)	(0.51, 0.57)
Latinx	0.76***	0.64***	0.59***	0.49***
	(0.69, 0.83)	(0.58, 0.71)	(0.55, 0.62)	(0.46, 0.52)
Other	0.72***	0.68***	0.60***	0.56***
	(0.65, 0.80)	(0.61, 0.76)	(0.57, 0.64)	(0.52, 0.60)
Region (ref. = non-South)				
South	1.02	1.98	1.11***	1.10***
	(0.96, 1.08)	(0.93, 1.04)	(1.08, 1.14)	(1.06, 1.13)
Guam			0.58***	0.52***
			(0.49, 0.68)	(0.44, 0.62)
Year (ref. = 2018)				
2019	1.02	1.03	1.01	1.01
	(0.93, 1.13)	(0.93, 1.14)	(0.99, 1.03)	(0.99, 1.03)
Employment (ref. = not employed)				
Employed		0.53***		0.58***
		(0.50, 0.57)		(0.56, 0.60)
Education (ref. = less than college)				
College education or more		0.86***		0.95**
		(0.82, 0.90)		(0.92, 0.98)
Income (ref. <$60,000 (NHWI); <$50,000 (BRFSS))				
≥$60,000 (NHWI); ≥$50,000 (BRFSS)		0.60***		0.61***
		(0.57, 0.64)		(0.59, 0.63)
Has Health Insurance		1.06		1.28***
		(0.94, 1.18)		(1.21, 1.35)
Union Status (ref. = not married)				
Married		0.76***		0.72***
		(0.69, 0.77)		(0.69, 0.74)
Residential Children (ref. = no)				
Yes		1.07*		1.10***
		(1.00, 1.15)		(1.06, 1.14)
F	66.2	127.58	254.18	391.51
N	93,144	93,144	543,717	543,717

Source: National Health and Well-Being Index (NHWI) and Behavioral Risk Factor Surveillance System (BRFSS).

[a] $p < .05$ compared with gender minority heterosexuals.

[b] $p < .05$ compared with cisgender sexual minorities.

*$p < .05$; **$p < .01$; ***$p < .001$

relative to cisgender heterosexuals. Model 3, based on BRFSS data, shows a similar trend of disadvantage for cisgender sexual minorities (OR = 2.68; $p < .001$) and people who are both gender and sexual minorities (OR = 5.58; $p < .001$). However, Model 3 also suggests that gender minority heterosexuals (OR = 1.84; $p < .001$) experience higher odds of diagnosed depression relative to cisgender heterosexuals. Pairwise comparisons based on both data sources illuminate within-group variation in the sexual and gender minority community: cisgender sexual minorities experience higher rates of diagnosed depression relative to gender minority heterosexuals, and people who are both gender and sexual minorities experience higher rates relative to gender minority heterosexuals *and* cisgender sexual minorities.

After we adjust for socioeconomic, marital, and residential parent status, the results still reveal stark disparities in diagnosed depression. Models 2 and 4 show that cisgender sexual minorities and people who are both gender and sexual minorities are more likely to experience diagnosed depression relative to cisgender heterosexuals. Model 4, based on larger sample sizes in the BRFSS data, reveals that gender minority heterosexuals still experience greater odds of depression than cisgender heterosexuals. The pairwise comparisons reveal that people who are both gender and sexual minorities experience detriments relative to gender minority heterosexuals and cisgender sexual minorities. However, after we adjust for all covariates, cisgender sexual minorities no longer experience greater odds of diagnosed depression relative to gender minority heterosexuals. After we adjust for several sociodemographic, socioeconomic, and family characteristics, people who are marginalized in their gender and sexuality are approximately 4.5 and 7.3 times as likely to be diagnosed with depression relative to cisgender heterosexuals.

Figure 4 presents the predicted probabilities of reporting depression by sexual and gender minority statuses based on results from fully adjusted models. The probabilities of reporting a depression diagnosis are 18.2% and 20.6% for cisgender heterosexuals, 22.2% and 26.7% for gender minority heterosexuals, 33.7% and 36.7% for cisgender sexual minorities, and a stark 48.0% and 62.7% for people who are both gender and sexual minorities. These results suggest that approximately one half to nearly two thirds of people who are both gender and sexual minorities report having been *diagnosed* with depression—an astronomically high portion of the community.

Discussion

Past work has illuminated adverse physical and mental health for gender minorities and sexual minorities (Gonzales et al. 2016; Lagos 2018; Liu and Reczek 2021; Meyer 2003; Stacey et al. 2022). Drawing on population-level data from Gallup's NHWI and the CDC's BRFSS data (which represent 41 states and one U.S. territory), our novel study documents physical and mental health disparities at the intersection of sexual and gender minority statuses with nationally representative samples. Studies have examined disparities for sexual minorities *or* gender minorities relative to their heterosexual and cisgender counterparts, respectively, but population-level research has been hampered by a lack of measures on surveys and sufficient sample sizes to estimate health disparities for individuals who are both gender *and* sexual
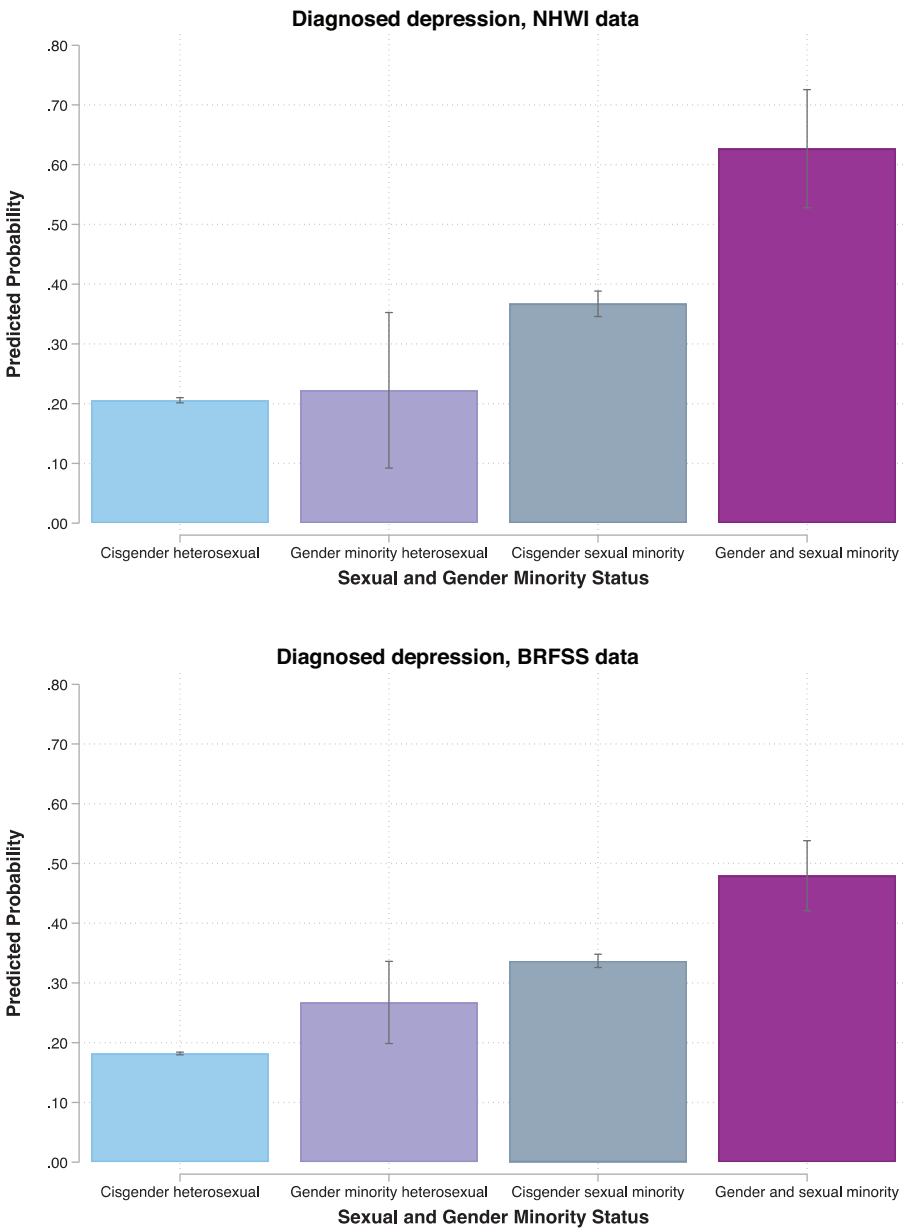
Fig. 4 Predicted probabilities of diagnosed depression by sexual and gender minority statuses. Models adjust for age, race and ethnicity, region, year, employment status, education, household income, health insurance coverage, marital status, and residential children.

minorities (Mayer et al. 2008). Our study leverages recent advancements in measurement and data collection targeting SGM populations (Lagos and Compton 2021) to construct a sexual and gender minority status variable. Our population-level data from the NHWI and BRFSS yield valid and reliable results and permit us to generalize to the United States, lending confidence about the level of health disparities we document (Gates 2017; Mayer et al. 2008).

Our results build on earlier work and illuminate the cumulative toll of navigating life for people who are both gender minorities and sexual minorities and uncover the ways this burden translates to population health disparities (Källström et al. 2022). Relative to cisgender heterosexuals, people who are both gender and sexual minorities (e.g., gay transgender men, queer nonbinary people) tend to experience the largest physical and mental health disadvantages, with gender minority heterosexuals and cisgender sexual minorities experiencing smaller disadvantages. More than a quarter of people who are gender and sexual minorities experienced poor/fair self-rated health relative to only roughly 15% of cisgender heterosexuals, which is a robust predictor of morbidity and mortality (Idler and Benyamini 1997; Jylhä 2009). The portion of the same community receiving a depression diagnosis relative to cisgender heterosexuals is even higher and is also cause for concern.

Importantly, our study also advances past work by examining critical within-group differences and comparing various sexual and gender minority groups with one another and with cisgender heterosexuals (Stacey et al. 2022). People who are both gender and sexual minorities fared worse on many health outcomes relative to gender minority heterosexuals and cisgender sexual minorities—for example, faring worse in functional limitations and diagnosed depression in both data sets in models adjusting for sociodemographic, socioeconomic, and family characteristics (Källström et al. 2022). Such evidence offers strong support for "double disadvantage" at this important intersection and illuminates acute disadvantages for those who are both gender *and* sexual minorities. Interestingly, the magnitude of health disparities documented remains substantively large after we adjust for socioeconomic and family characteristics, implying that such disparities are driven by other factors, such as the presence of minority stressors (e.g., discrimination, violence, stigma; Meyer 2003). The burden of bearing marginalization by heterosexism, homophobia, and transphobia translates to large disparities that are not driven fully by sociodemographic, socioeconomic, or family characteristics.

We advance double disadvantage theory by explaining potential mechanisms that might explain the magnitude of health disparities observed for people who are both gender and sexual minorities. Such individuals likely experience greater incidence and severity of discrimination because they experience marginalization in terms of their gender minority status and sexual minority status from interpersonal and structural forces (Mishel 2016; Reczek and Bosley-Smith 2022; Tilcsik 2011), which have been linked to adverse health outcomes (Denise 2014; Meyer 2003). Another mechanism could potentially be greater rates of misclassification, which are associated with worse overall assessments of health (Hart et al. 2019; Lagos 2019), for people who are both gender and sexual minorities relative to others. Finally, extant classification schemes of sexuality and gender both rely on and reinscribe gender and sexual binaries, which might lead to heightened dysphoria and stress and undermine health (de Graff et al. 2021; Puckett et al. 2021). Although testing these mechanisms is outside the scope of this study and is not possible

with NHWI or BRFSS data, future research should attempt to better understand the reasons for the magnitude of disparities observed in our study.

Examining physical and mental health at the intersection of sexual and gender minority statuses also provides important information about SGM health disparities. Our results complicate prior findings about gender minorities' disadvantages in self-rated health. Transgender and gender-nonconforming populations in the aggregate have been shown to experience worse self-rated health than the cisgender population (Lagos 2018; Meyer et al. 2017), although research shows that gender-nonconforming and gender-nonbinary/genderqueer people tend to experience the largest health differences relative to cisgender people and often experience worse health than transgender men and transgender women (Lagos 2018; Stacey et al. 2022). However, those aggregate findings for gender minorities relative to cisgender people obscure considerable heterogeneity. Our study revealed that only gender minorities who were also sexual minorities experienced worse self-rated health relative to cisgender heterosexuals and that gender minority heterosexuals had comparable self-rated health relative to cisgender heterosexuals. In fact, results based on BRFSS data in models adjusting for sociodemographic, socioeconomic, and family characteristics show that gender minority heterosexuals experienced lower odds of poor/fair self-rated health relative to cisgender heterosexuals. Thus, prior findings on detriments in self-rated health for gender minorities relative to cisgender people might be driven by those people who are *both* gender and sexual minorities, given that gender minorities disproportionately also identify as sexual minorities. The relative advantages of gender minority heterosexuals compared with other sexual and gender minority groups might be explained by the overrepresentation of transgender men and transgender women, who tend to experience better health than nonbinary gender minorities (Lagos 2018; Stacey et al. 2022), in the category of people who are gender minority heterosexuals. Gender-nonconforming people are, conversely, overrepresented in the category of people who are both gender and sexual minorities. That gender minority heterosexuals had better self-rated health but elevated rates of functional limitations and diagnosed depression compared with cisgender heterosexuals should be investigated further.

This study also confirms the results of past work showing notable disparities for sexual minorities relative to heterosexuals (Liu and Reczek 2021; Stacey et al. 2022). Our study revealed that cisgender sexual minorities had a higher likelihood of poor/fair self-rated health, functional limitations affecting daily life, and depression diagnoses relative to cisgender heterosexuals (Gorman et al. 2015; Meyer 2003). In many cases, this population had health comparable to that of gender minority heterosexuals. Although cisgender sexual minorities compose a large share of all sexual minorities, a nonnegligible number of people who are sexual minorities are also gender minorities. Future studies should examine health at the intersection of sexual and gender minority statuses, given the large discrepancies we observed.

Our study faces some limitations—the primary one being the detail sacrificed from dichotomizing sexual identity and gender identity to create our main independent variable of interest. Unfortunately, this limitation means that we obscure heterogeneity within each sexual and gender identity category (Lagos 2018; Liu and Reczek 2021). Health disparities for some specific subgroups at the intersection of sexuality and gender might be driving associations: gender-nonconforming and nonbinary/genderqueer populations (Lagos 2018; Stacey et al. 2022) and bisexual men and women (Gorman et al.

2015; Liu and Reczek 2021) tend to experience worse physical and mental health than other gender and sexual minority subgroups. Because of the disparate discrimination, stigma, and violence these groups face, no doubt partly because they do not fit neatly within existing gender and sexual binary classification schemes (i.e., man–woman and heterosexual–homosexual), these groups are marginalized within the sexual and gender minority population. Unfortunately, we cannot examine how various subpopulations are faring at the intersection of sexuality and gender.

Other limitations are also noteworthy. First, as stated earlier, both indicators in the NHWI and BRFSS identifying gender minorities include only those who first identified as transgender. Some gender-nonbinary and other gender minorities do not identify as transgender, expressing concerns that they are not "trans enough" because they have not suffered as much as they presume transgender people have (Darwin 2020). Consequently, health disparities might be larger for gender minorities who identify as transgender relative to those who do not. Second, the measures we draw on to examine disparities in a depression diagnosis require a visit with a medical provider. LGBTQ people are known to have lower health insurance coverage rates and avoid care that might be stigmatizing and harmful (Dahlhamer et al. 2016; Doan and Grace 2022). Therefore, our estimates are likely biased in the direction of the null and are thus conservative. Third, some of the socioeconomic status covariates that our fully adjusted models accounted for might be endogenous with physical and mental health: sexual minorities, gender minorities, or both might have lower employment rates or household incomes at least partly because they have poorer health, more functional limitations, and a greater likelihood of diagnosed depression. Longitudinal data are needed to better adjudicate between temporal concerns of influences on health and consequences of poor health for various outcomes. Finally, we acknowledge that measuring functional limitations can imperfectly approximate physical health. The NHWI measure's wording implies that a physical disability is inextricably tied to health and functioning, an assumption that rests on a strictly medical model of disability (Bunbury 2019; Hahn 1993). Despite these limitations, we advance past work on SGM health by documenting severe health disparities at the intersection of sexual and gender minority statuses.

Conclusion

In the United States, SGM populations face ubiquitous physical and mental health disparities relative to cisgender heterosexual populations. Our findings suggest that interventions and programs designed to curtail these health disparities may need to be targeted and tailored differently to populations at the intersection of sexual and gender minority statuses. Striking results across measures of health and well-being point to a glaring gap in our current health care system's attention to SGM people. For too long, public health campaigns and strategies have grouped SGM people under the same umbrella, failing to acknowledge the specific needs of those who are marginalized in terms of sexual *and* gender minority status. Our results also suggest that providing competent medical knowledge and addressing concerns unique to sexual minorities (i.e., same-sex safe sex, fertility, PrEP) or gender minorities (i.e., gender-affirming care, gender confirmation surgery, hormone blockers) are insufficient. Providers must also be able to provide adequate and supportive health care to people who are both gender and

sexual minorities, given the disproportionate percentage of gender minorities who are sexual minorities and the magnitude of this population's deleterious health outcomes.

Our results also highlight the necessity of mental health programs and better data collection efforts to understand SGM health disparities more thoroughly. The staggering rates of diagnosed depression for gender and sexual minorities necessitate the implementation of mental health programs and support structures tailored to this population's unique needs. It is worth mentioning the very real possibility that depression rates are higher than documented given the limitations of using a diagnosis measure. Such distinct struggles with depression require further research and the development of specialized solutions to reduce the disparities this group experiences. We echo the thoughts of other scholars and the U.S. Department of Health and Human Services in recommending the inclusion of routine survey measures to identify both sexual and gender minorities in large-scale surveys. We must also target and oversample SGM individuals in national- and state-level surveys to yield sufficient sample sizes and provide valid and reliable estimates of health and other disparities. Further, we must incorporate measures to elucidate and quantify the explanatory role of possible mechanisms, such as discrimination (Meyer 2003), that drive these disparities. Engaging with these efforts will enable scholars to pursue analyses like those we have done here and provide a firmer foundation on which public health can work to reduce SGM health disparities. ∎

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