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Sexual minority health disparities: an examination of age-related trends across adulthood in a national cross-sectional sample

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ABSTRACT

Purpose: Sexual minorities experience significant health disparities across a variety of mental, behavioral, and physical health indicators. Yet, an understanding of the etiology and progression of sexual minority health disparities across the lifespan is limited.
Methods: We used the U.S. National Epidemiologic Survey of Alcohol and Related Conditions III to evaluate the association between sexual minority status and seven past-year health outcomes (alcohol use disorder, tobacco use disorder, drug use disorder, major depressive episode, generalized anxiety disorder, sexually transmitted infection, and cardiovascular conditions). To do this, we used unadjusted and adjusted logistic regression among our study sample (n = 30,999; aged 18–65 years) and time-varying effect models to evaluate how sexual orientation differences in these outcomes vary across adulthood.
Results: Relative to heterosexuals, sexual minorities had elevated odds of past-year alcohol use disorder and drug use disorder across all ages (18–65 years) although the magnitude of the disparity varies by age. Sexual minorities were also more likely to experience major depressive episode, generalized anxiety disorder, tobacco use disorder, sexually transmitted infection, and cardiovascular disease, but only at specific ages.
Conclusions: Sexual minority health disparities vary appreciably across the adult lifespan, thus elucidating critical periods for focused prevention efforts.

Introduction

Sexual minorities (SMs) are disproportionately vulnerable to a variety of poor health outcomes. In 2016, the National Institute on Minority Health and Health Disparities at the U.S. National Institutes of Health formally recognized sexual and gender minorities as a population for health disparities research [1]. Sexual orientation–related disparities span the spectrum of health outcomes, including physical health, mental health, and substance use [2–4]. Compared with heterosexual adults, for example, SMs are two to five times as likely to have substance use disorders [5], two times as likely to indicate mood or anxiety disorders [6], and 2.5 times as likely to report lifetime suicide attempts [7]. A recent review documented greater cardiovascular disease risk among SM men and women [8], largely attributed to health conditions such as poor mental health and substance use. SM men are also at increased risk for both sexually transmitted infections (STI) and HIV [2], and SM women are more likely to test positive for Hepatitis C [2].

A growing body of evidence suggests that sexual orientation–related health disparities are largely driven by internal (e.g., internalized homophobia and expectations of rejection) and external (e.g., discrimination and victimization) stressors that uniquely impact SMs across the life span—often referred to as minority stress [9–11]. Studies that use quasi-natural experimental designs, for example, highlight the deleterious effects of enacting anti-lesbian, gay, or bisexual policy for the health and well-being of

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SMs [12]. There are, however, unique developmental considerations that must be taken into account when considering risk factors that contribute to the timing of sexual orientation–related disparities. Schools, for example, are finite contexts that confer risk for victimization and bullying of SM youth [13], which can have lasting but diminishing effects for mental health as adolescence age into adulthood [14]. SMs also have to navigate "coming out"—or disclosing their sexual identity to family and friends that is oftentimes stressful [15]—which may lead to rejection and consequent mental and behavioral health risk [16]. Despite evidence on the existence of sexual orientation–related health disparities and the developmental nature of the associated risk factors, the progression of these health inequities across the lifespan is not completely understood.

Even with increased attention to SM health, significant research gaps remain [17]. Little is known, for example, about how health disparities [2,3,7] vary across the lifespan for SMs, despite evidence that mental, behavioral, and physical health conditions vary in their onset and course over the life course [18–21]. Alcohol use disorder, for example, increases during late adolescence into young adulthood, peaks during the mid-20s, and steadily declines across subsequent ages [21]. Considering that theoretical mechanisms of sexual orientation–related health disparities also vary by age [22], might the degree to which heterosexuals and SMs differ in these health-related outcomes change across the life course? Importantly, because there are developmental differences in the onset and prevalence of specific health conditions, researchers who aggregate data across broad age ranges (e.g., 18–65 years) may be over- or under-estimating the degree to which SMs may be at risk for poor mental, behavioral, and physical health. Understanding how health conditions fluctuate across the lifespan would allow research efforts to more accurately examine developmentally sensitive mechanisms that contribute to SMs' increased vulnerability and inform the development of tailored prevention and intervention strategies.

We hypothesize that health disparities between heterosexual and SM adults will vary by age such that there are age ranges of greater vulnerability for specific health outcomes among SMs. To evaluate these hypotheses, we used nationally representative cross-sectional data and an innovative analytic method, the time-varying effect model (TVEM) [23], to examine whether SM and heterosexual differences in seven well-established sexual orientation–related disparities differ across ages 18–65 years [2–8]: Outcomes include past-year alcohol, tobacco, and drug use disorders, major depressive episode, generalized anxiety disorder, cardiovascular problems, and STIs.

Methods

Participants and procedure

Data are from the National Epidemiologic Survey of Alcohol and Related Conditions–III, a nationally representative, cross-sectional study of the noninstitutionalized adult population in the United States collected in 2012–2013 [24]. To ensure an adequate sample size at all ages, we restricted our analytic sample to participants aged 18–65 years resulting in a final unweighted sample size of 30,999 participants.

Measures

Our primary predictor was SM status. SM status is complex, comprised of identity, behavior, and attraction. Despite significant research [25], there is not strong scientific consensus on how to best classify SMs. Because we hypothesize that the disparities examined are related to minority stress and because it is likely having same-sex attraction, behavior, or SM identity could result in experiences of internal and external stigma, we used broad criteria to identify SMs. We identified SMs using an inclusive classification strategy where any endorsement of same-sex attraction, same-sex behavior, or SM identity (i.e., lesbian/gay or bisexual) resulted in classification as SM.

Given the paucity of research documenting developmental differences in sexual orientation–related health disparities, we assessed age-specific differences in the prevalence of seven health outcomes that have been shown to systematically vary across sexual orientation [2–8]. These included three measures of past-year substance use disorders (i.e., alcohol use disorder [AUD], tobacco use disorder [TUD], and drug use disorder [DUD]) and two measures of mental health disorders (i.e., major depressive episode [MDE] and generalized anxiety disorder [GAD]). Substance use and mental health disorders were classified using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 [26], which aligns with the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (American Psychiatric Association, 2013) diagnostic criteria [24]. For each substance, participants were asked if they had experienced 11 symptoms and were coded as having specific substance use disorders if they experienced at least two symptoms within the past year. For AUD, questions referred to whether symptoms were caused by drinking alcohol. For TUD, the questions referred to "tobacco and nicotine, including cigarettes, cigars, pipes, snuff, chewing tobacco, or e-cigarettes." DUD indicated disorder associated with the use of sedatives, cannabis, opioids, cocaine, stimulants, hallucinogen, inhalant/solvent, club drugs, heroin, or other drugs. We also examined two measures of past-year physical health: self-reported diagnoses of STI and cardiovascular health via self-reported heart attack or any other form of heart disease.

Analysis

First, we used weighted logistic regression to calculate the unadjusted and adjusted associations between SM status and each health outcome. Adjusted models controlled for biological sex (male or female), race/ethnicity (white, black, Hispanic, and Other race), education (high school diploma or less, some college or more), household income (<$20,000; $20,000–$34,999; $35,000–$69,999; and $70,000+), and region of country (Northeast, Midwest, South, and West). Finally, we used weighted logistic TVEM [27] to estimate age-specific associations between SM status and each health outcomes from ages 18–65 years. The weighted TVEM macro applies normalized weights [27,28]. TVEM is a flexible, semiparametric model that estimates rates and associations as a flexible function of age. This method allows associations between predictors and outcomes to be modeled flexibly across continuous age, providing precise age ranges during which associations are the strongest [23,27]. We ran seven independent models with SM status predicting each outcome across age. For each model, the best-fitting number of knots (which define the complexity of each age function) for the intercept and SM status parameters were selected using the Akaike information criterion and Bayesian information criterion criteria. Models included biological sex, race or ethnicity, education, income, and U.S. region as time-invariant effects to account for potential confounding. Results are presented as figures to best display age-specific estimates and time-varying shape of associations. Thus, for each outcome, we present a figure showing adjusted odds ratios (aORs) and 95% confidence intervals (CI) corresponding to the age-specific associations between SM status and health outcomes.

This study used a limited access dataset obtained from the National Institute on Alcohol Abuse and Alcoholism and was approved

by the Pennsylvania State University Institutional Review Board (IRB #4463).

Results

Sample characteristics

Ten percent of the sample indicated same-sex attraction, same-sex behavior, and/or a gay/lesbian or bisexual identity, and thus 3349 individuals were classified as SM. Among the SM participants, 31% endorsed same-sex attraction, same-sex behavior, and an SM identity. Two percent of the SM sample endorsed same-sex behavior and SM identity (but not same-sex attraction), 20% endorsed same-sex attraction and same-sex behavior (but not SM identity), 5% endorsed same-sex attraction and an SM identity (but not same-sex behavior). Finally, 30% of the SM sample endorsed only same-sex attraction, 12% endorsed only same-sex behavior, and 1% exclusively endorsed an SM identity.

With respect to demographic variables, SMs were similar to heterosexuals. All health outcomes were more prevalent among the SMs. A quarter (24%) of SMs met the criteria for a past-year AUD compared with 15% of heterosexuals. Past-year anxiety disorders, major depressive episodes, and STIs were both approximately twice as prevalent among SMs with respective prevalence of 10% and 22% compared with 5% and 12% among heterosexuals. STDs affected 2% of SM in the past year, compared with less than 1% of heterosexuals. Five percent of SMs reported negative cardiovascular outcomes in the past year, compared with 4% of heterosexuals (Table 1).

Table 1
Weighted sample characteristics (unweighted n = 36,309)

Characteristic	Sexual minority	Heterosexual
	n = 3349	n = 27,650
Age (y)		
18–24	20.7%	15.0%
25–34	24.4%	20.1%
35–44	18.0%	20.7%
45–54	18.8%	22.5%
55–65	18.1%	21.8%
Biological sex		
Male	40.1%	50.1%
Female	59.9%	49.9%
Race/ethnicity		
White	63.7%	63.5%
Black	13.4%	12.4%
Hispanic	14.9%	16.3%
Other	8.0%	7.7%
Education		
High school diploma or less	35.1%	37.2%
Some college or more	64.9%	62.8%
Household income (annual)		
<$20,000	26.6%	18.8%
$20,000–34,999	19.1%	17.5%
$35,000–69,999	26.5%	28.1%
≥$70,000	27.8%	35.6%
Region of country		
Northeast	19.1%	18.0%
Midwest	19.9%	21.5%
South	33.3%	37.4%
West	27.7%	23.0%
Alcohol use disorder		
Yes	24.2%	15.2%
No	75.9%	84.8%
Tobacco use disorder		
Yes	28.9%	21.6%
No	71.1%	78.4%
Drug use disorder		
Yes	8.8%	4.0%
No	91.2%	96.0%
Major depressive episode		
Yes	21.7%	11.7%
No	78.3%	88.3%
Generalized anxiety disorder		
Yes	9.9%	5.2%
No	90.1%	94.8%
Cardiovascular outcome		
Yes	4.5%	3.6%
No	95.4%	96.1%
Sexually transmitted infection		
Yes	2.3%	0.7%
No	97.4%	98.9%

Substance use disorders

The unadjusted weighted OR for the association between SM status and AUD was 1.78 (95% CI, 1.61–1.96). The aOR indicated that the odds of past-year AUD among SMs were 1.83 (95% CI, 1.65–2.03) times compared to the odds of past-year AUD among heterosexuals. TVEM analyses revealed that the adjusted association did not vary appreciably by age (Fig. 1A). SM adults generally had two times greater adjusted odds of meeting the criteria for a past-year AUD compared with heterosexuals, and this association was significant until age 63 years.

Unadjusted and adjusted weighted logistic regression models indicated that SMs had greater odds of past-year TUD relative to heterosexuals (OR: 1.47, 95% CI: 1.32–1.64; aOR: 1.48, 95% CI: 1.34–1.64). TVEM analyses indicated that SM status was most strongly associated with having a past-year TUD at earlier ages, and this disparity declined over age, remaining significant until age 54 years (Fig. 1B). For example, SMs had three times greater odds of meeting the criteria for a past-year TUD at age 18 and 1.5 times greater adjusted odds at age 27 years.

Generally, SMs had about 2–2.5 times the odds of meeting criteria for past-year DUD (OR: 2.32, 95% CI: 1.94–2.79; aOR: 2.22, 95% CI: 1.84–2.68). TVEM models indicated that SM status was significantly associated with DUD across all adult ages, with some fluctuation in effect size (Fig. 1C). SM young adults had approximately three times greater adjusted odds of past-year DUD but declined sharply until age 25 years.

Mental health disorders

The crude association between SM status and MDE was 2.09 (95% CI, 1.89–2.31); an association that was slightly attenuated after adjustment (aOR, 2.00; 95% CI, 1.81–2.19). TVEM analyses revealed that the association between SM status and MDE was strongest at younger ages and declined with age (Fig. 2A). At age 18 years, SM status was associated with approximately three times higher adjusted odds of having an MDE in the past year compared with 1.5 times higher odds at age 25–40 years and was no longer statistically significant by age 52 years.

Logistic regression models revealed significant sexual orientation differences in past-year GAD (OR: 2.02, 95% CI: 1.73–2.36; aOR: 1.81, 95% CI: 1.56–2.10), but the disparity varied by age. The relationship was strongest in the late 20s with an aOR of approximately 2.5 before declining and plateauing around age 40 years. The association was nonsignificant statistically by age 53 years (Fig. 2B).

Physical health

SMs had more than three times the odds of reporting an STI in the past year in both unadjusted (OR, 3.57; 95% CI, 2.72–4.67) and adjusted (aOR, 3.19; 95% CI, 2.42–4.22) models. TVEM analyses indicated that SM status was significantly associated with STI between ages 20 and 49 years (Fig. 3A), but most strongly in the late

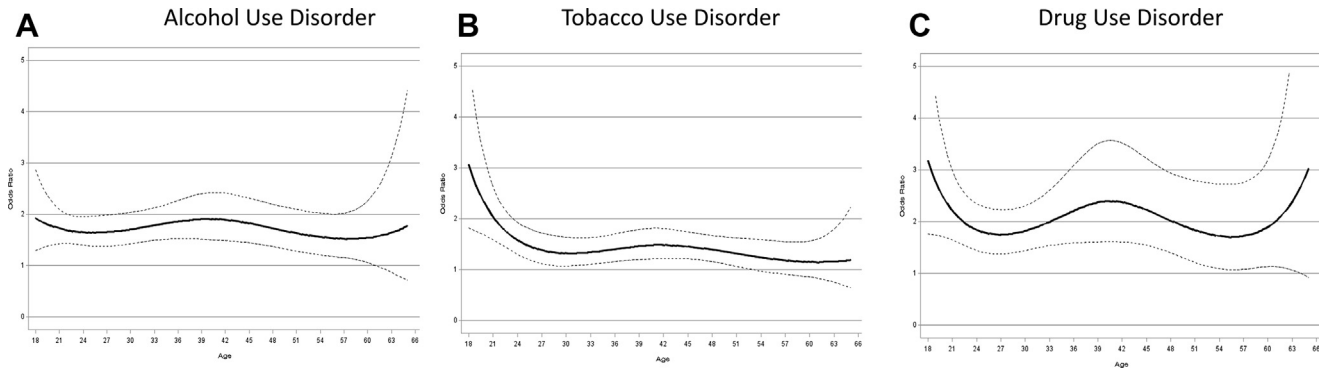

Fig. 1. Age-varying associations between sexual minority status and past-year alcohol use disorder, tobacco use disorder, and drug use disorder, controlling for biological sex, race or ethnicity, education, household income, and region of country. Dashed lines indicate 95% confidence intervals.

20s. SMs were four times as likely to report STI in their late 20s, but only two times as likely at age 18 and 45 years.

SM status was significantly associated with poor cardiovascular health in unadjusted (OR, 1.26; 95% CI, 1.00–1.59), but not in adjusted (aOR, 1.23; 95% CI, 0.97–1.56) logistic regression models. Results from adjusted TVEM revealed that the disparity was significant at some ages: heterosexual and SMs aged 43–53 years (Fig. 3B) statistically differed, with the largest difference at age 45 years.

Discussion

Consistent with a large and growing body of evidence, we find that SMs experience striking health disparities across a variety of mental, behavioral, and physical health conditions. Our findings, however, demonstrate that the degree to which SMs are more likely to experience poor health varies by age. Findings identify critical periods of vulnerability for the development of these disparities and suggest potential ages to target for prevention and intervention.

Similar to prior research [5–7], we found that SMs have significantly higher odds of AUD and DUD throughout adulthood with slight variation across ages. Yet, our results from TVEM analyses also indicate that the odds of a major depressive episode, anxiety disorder, TUD, STI, and cardiovascular disease among SMs vary by age.

The associations between SM status and depression and anxiety are strongest around age 20 and 24 years, respectively. Elevated rates in the early 20s may be related to experience of "coming out" which, for many, occurs in the late teens and early 20s. Furthermore, these youth may still be dealing with the residual effects of school-based victimization, which is more common for SM youth [13] and the effect of which last (at least) into the early 20s [14]. The decreasing disparity in mental health across adulthood may reflect SMs exiting hostile school and family environments while simultaneously seeking out supportive networks and communities [14,29,30].

SMs have significantly higher odds of TUD in early adulthood (ages 18–28 years), and the disparity narrows with age. One possible explanation for this narrowing disparity may be that smoking rates among SMs may decline after early adulthood. A key driver of smoking among SMs may be SM stressors, including discrimination [31], which is reported at the highest rates in early adulthood [32]. It could also be that the narrowing disparity is not due to decreased tobacco use among SMs as they age, but instead due to elevated rates of tobacco use among older heterosexuals. A recent report from the Centers for Disease Control and Prevention indicates that 13% of adults aged 18–24 years, 18% of adults aged 25–44 years, and 18% of adults aged 45–64 years smoke cigarettes [33]. Notably, this mimics the shape of the trajectories we found for the examined mental health outcomes (GAD and MDE). We hypothesize that these similar trajectories reflect the well-documented relationship between smoking and mental health [34], where persons with mental illness are approximately two times as likely to smoke [23], perhaps as a form of self-medication [35], although smoking may increase the risk of certain mental disorders [36].

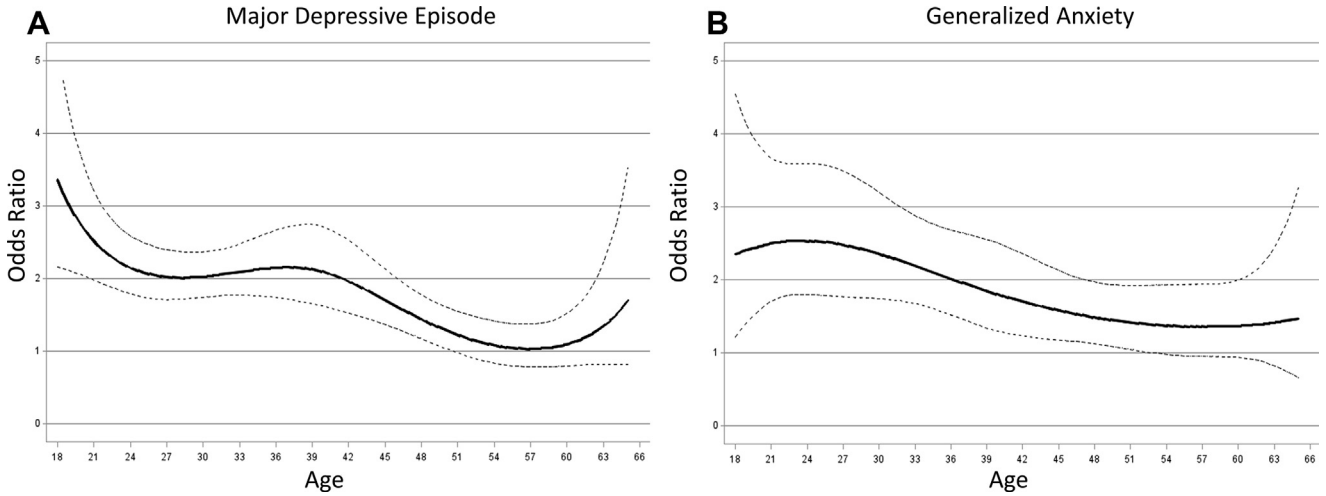

Fig. 2. Age-varying associations between sexual minority status and past-year major depressive episode and generalized anxiety disorder, controlling for biological sex, race or ethnicity, education, household income, and region of country. Dashed lines indicate 95% confidence intervals.

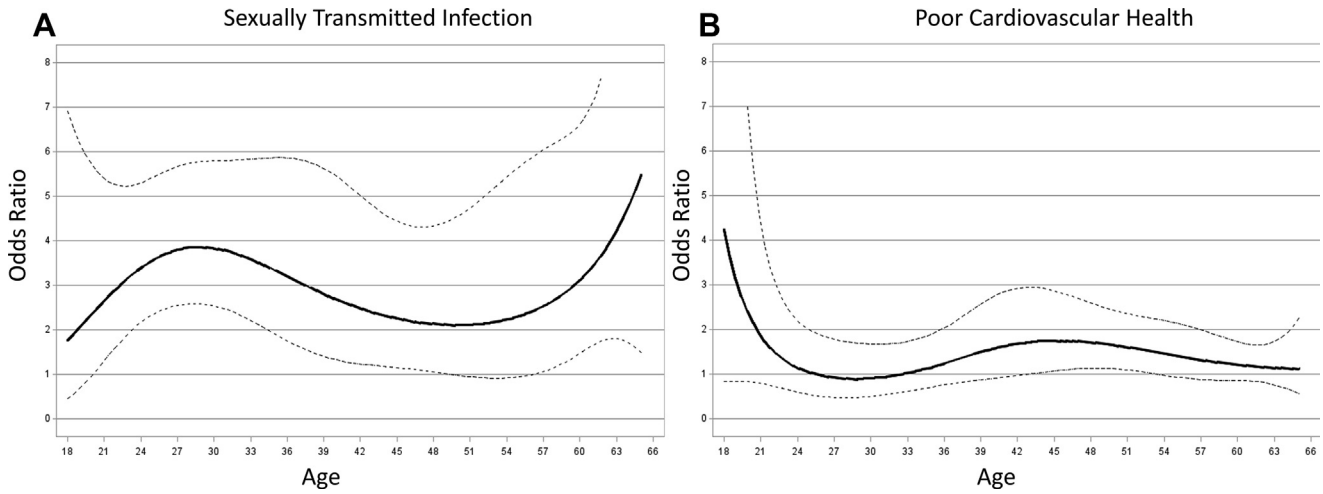

Fig. 3. Age-varying associations between sexual minority status and past-year sexually transmitted infections and poor cardiovascular health, controlling for biological sex, race or ethnicity, education, household income, and region of country. Dashed lines indicate 95% confidence intervals.

We also noted unique patterns for AUD and DUD whereby disparities were largest during 18–20 years and then again around the age of 40 years. Generally, rates of alcohol and drug use peak in early adulthood and decline as people age [21]. It is possible that the sexual orientation–related disparities in early adulthood are, in part, due to unique milestones for SM adolescents and young adults (e.g., "coming out"), coinciding with normative increases in substance use. Elevated risk for AUD and DUD during midlife, however, is counter to what we might expect and encourage future research attention into its predictors. This may, for example, be an instance where the explanation may be more related to cohort, rather than a developmental, differences [37].

Finally, cardiovascular disparities were smaller in magnitude and age-specific. The odds of cardiovascular disease were significantly higher for SMs, relative to heterosexuals, from the mid-40s to early 50s. This likely reflects the natural trajectory of cardiovascular disease, where the risk of cardiovascular disease increases with age. Thus, the relationship between SM status and cardiovascular health maps on to an age period of heightened risk in the overall population. Given previous findings of significant associations between stress and cardiometabolic risk among SM groups [8], but not among heterosexuals [38], as well as lifelong experiences of sexual minority–specific discrimination [39], disparities in cardiovascular health may reflect the effect of chronic stress for SM populations or other health-related behaviors linked to stress (e.g., substance use). Future research should investigate the role of minority stress on the significant cardiovascular health disparity, such that future programs might intervene on that link.

This study had several limitations. First, it is widely recognized that there is heterogeneity in the SM population. Health disparities, for example, have been shown to differ by sexual identity (i.e., gay vs. bisexual) [5,44] and by biological sex [2,7]. Others have applied an intersectionality framework to examine how SM health disparities differ across racial/ethnic groups [40]. In this analysis, we did not examine the differences within SMs but instead call attention to developmental differences in sexual orientation health disparities more broadly. Thus, the degree to which disparities vary by age may also significantly differ across subpopulations within the larger SM community is an important focus for future research. Second, we used an inclusive definition of SM status by including those who report any same-sex attraction, behavior, or SM identity [41]. This is a conservative approach and thus may yield an underestimate of SM health disparities. Future research should explore whether these disparities may be stronger among particular subgroups of SMs. Third, the interpretation of these analyses is limited by our inability to separate age effects from cohort effects. Future longitudinal studies that explicitly collect measures of sexual orientation and related experiences (e.g., discrimination) are needed to better untangle these potentially related and confounding effects. Fourth, our substance abuse measures combine all drug use disorders into a single item. Although useful in providing the overall prevalence of drug use disorder among SM adults, drug disorders have varying etiologies, prevalence, and contributing factors. Thus, future research examining specific drug abuse prevalence by age is needed to make more direct claims for this population. Finally, the National Epidemiologic Survey of Alcohol and Related Conditions–III does not include measures of gender identity; we were therefore unable to examine disparities by gender identity. The absence of gender identity measures in national data has stymied scientific understanding of this population; the measurement of gender identity in future national studies would provide an unprecedented opportunity to address these knowledge gaps.

Future research should continue to explore the etiology of these disparities and, specifically, addressable social factors that contribute to them. The minority stress theory [11,42], for example, posits that health disparities affecting SMs may be explained by minority-specific stress unique to SMs (e.g., internalized stigma and discrimination) [11,43]. It is likely that exposure to SM-related stressors varies as people age, potentially leading to different health outcomes across the life course. Future work should also explore how age-specific disparities vary across other sociodemographic factors known to affect the health of SMs. Furthermore, many of these health factors are co-occurring and interrelated (e.g., smoking and mental health) [34]. Although this analysis focused on addressing each health condition as an independent outcome, future research focused on the developmental timing of risk may aim to understand the co-occurrence of outcomes.

Sexual orientation–related health disparities persist in most cases across adulthood, but vary in strength by age. These findings inform the timing and targeting of prevention and intervention efforts suggest focused research efforts on developmental periods where disparities are most salient for SMs and highlight the need for investigations into developmentally situated mechanisms that contribute to SM health.

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Contributors: CER conceptualized study, performed analyses, and led manuscript writing. SAV contributed to study design, provided guidance on analysis, and contributed to manuscript writing. JNF contributed to manuscript writing. STL oversaw analysis and revised manuscript. All authors have read and approved the final version of the manuscript.

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