Mental health in people with minority sexual orientations: A meta-analysis of population-based studies

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Abstract
Aims: To conduct a meta-analysis of population-based studies to quantify the association between sexual minority status (lesbian women, gay men, and bisexual people) and the risk of common mental disorders (depressive disorders, alcohol use disorders (AUD), anxiety disorders, and suicidality).

Method: PubMed, PsycInfo, Web of Science, the Cochrane Library Database, the Applied Social Sciences Index and Abstracts, and ProQuest were searched for relevant studies published between 2000 and May 2020. The PRISMA guidelines were followed for selection processes. Twenty-six studies met the inclusion criteria which included a total of 519,414 heterosexuals, 10,178 lesbian/gay people and 14,410 bisexual people.

Results: Lesbian/gay people (ORs between 1.97, 95% [CI = 1.76, 2.19] and 2.89, 95% [CI = 2.41, 3.38]) and bisexual people (ORs between 2.70; 95% [CI = 2.21, 3.18], and 4.81; 95% [CI = 3.63, 5.99]) had a higher risk for mental disorders than heterosexuals for all investigated diagnostic categories. The risk for depression (OR = 2.70; 95% [CI = 2.21, 3.18]) and suicidality (OR = 4.81; 95% [CI = 3.63, 5.99]) was higher in bisexual compared with lesbian/gay people. Exploratory meta-regressions revealed no evidence for a decrease in mental health differences between people with minority sexual orientations and heterosexuals in more recent years of data assessment, except for AUD.

Conclusions: These findings clearly suggest disparities in mental health between people with minority sexual orientations and heterosexual people. There is a lack of data regarding a wider spectrum of sexual orientations and mental disorders and studies in non-Western countries.

Keywords
alcohol use disorders, anxiety disorders, depression, LGB, suicidality. 
1 | INTRODUCTION

The question of mental health disparities among people with minority sexual orientations has been a major public health interest for many years. People who belong to any kind of minority group suffer from unique stress related to their marginalization, including discrimination, expectation of discrimination, and internalized stigma. Applied to sexual minority people, this includes stressors of everyday discrimination (e.g., microaggressions), expectation of rejection, self-devaluation because of internalized homophobia, the concealment of their identity (i.e., outness), and other forms of stigmatization. The various stressors potentially influencing the mental health of people with minority sexual identities are summarized in the minority stress model. Thereby, two dimensions of stigma are distinguished. Distal stress involves external experiences of discrimination; proximal stress summarizes stress experienced internally, regardless of having experienced discrimination directly. Proximal stress, such as internalized sexual stigma, occurs as a consequence of societal events in which hostility is demonstrated and society’s negative attitudes toward them are internalized. Sexual stigma is a cultural belief system through which non-heterosexuality is denigrated, discredited, and socially constructed as invalid relative to heterosexuality. Stigma-related experiences and negative feelings about one’s own sexuality are likely to have negative impacts on mental health.

Prior reviews found a 1.5–5 times higher risk for mental disorders, suicidality, and deliberate self-harm in lesbian, gay, and bisexual (LGB) compared with heterosexual people. This mounting evidence over the last decades suggests staggering mental health disparities between both sexual minority youth and adults compared with their heterosexual counterparts. In recent years, there have been political, legislative, and societal improvements for LGB people, predominantly in Western countries. Several countries now include sexual orientation in their anti-discrimination laws alongside other social characteristics. Currently, in 2021, marriage equality is legally recognized in 29 countries worldwide and in some more countries, civil unions and registered partnerships can be entered, which highlights at least some progress for people with minority sexual orientations in the Western world. In light of these developments, there is a need for an updated integration of the literature regarding the current association between minority sexual identities and mental disorders.

So far, previous meta-analyses either treated sexual minority people as one group in comparison with heterosexual people or they focused on the mental health of specific subgroups, such as sexual minority youth or bisexual people. One notable exception is a systematic review (without meta-analysis) of mental health disparities among differentiated sexual orientation groups in comparison with heterosexuals across a wide range of studies, including convenience sample studies and qualitative studies. To the best of our knowledge, there is no timely meta-analytic review of population-based studies, which simultaneously compares the risk of mental disorders in lesbian/gay and bisexual people with heterosexual people across different diagnostic categories.

2 | METHOD

2.1 | Study selection

2.1.1 | Inclusion and exclusion criteria

Only population-based studies, that used pre-specified defined populations, and studies published in English language before May 2020 were included. Included studies had to report a comparison between at least one group with minority sexual identities and a heterosexual control group regarding one or more of the following common mental disorders: depression, anxiety disorders (generalized anxiety disorder, panic disorder, phobia-related disorders, post-traumatic stress disorder, and alcohol use disorders.

In addition, suicidality (i.e., suicidal ideation and/or suicidal attempts) as a syndrome of high clinical importance was included. Since PTSD was categorized as an anxiety disorder until DSM-5, it was also included in the “anxiety” category for the present analyses. Furthermore, mental disorders of the participants had to be assessed with a validated instrument to allow reliable comparisons across all selected studies. People with minority sexual identities other than lesbian, gay, and
bisexual were not included, since a first exploratory literature search revealed too few population-based studies for a meta-analytic integration.

2.1.2 | Systematic literature search

Keywords for the search of eligible studies included “mental disorder, mental health, mental illness, psychological distress, lesbian, gay, bisexual, homosexual, sexual minority, and sexuality” as well as acronyms such as “LGB, LGBT, and LGBTQ”. Databases that were searched included PubMed, PsycInfo, Web of Science, the Cochrane Library Database, the Applied Social Sciences Index and Abstracts, and ProQuest. The meta-analysis has been pre-registered (CRD42020221947).

2.1.3 | Selection process

Figure 1 depicts the study selection process in a PRISMA flow chart. Study selection was conducted by two independent researchers (C.W. and S. Th.), discrepancies were resolved after discussion with a third reviewer (S.T.). A total of 28,305 studies were identified in the initial search, 26 studies were further identified through manual research in reference lists and previous reviews. After duplicates were removed, 18,014 articles remained. 17,640 articles were excluded after screening the titles and abstracts, and another 348 articles were excluded after full-text review. This led to a final study sample of \( N = 26 \) studies being eligible for the meta-analysis.

2.1.4 | Data extraction

The following information was extracted from each article: number of participants and their age range, date of publication, specific population, assessed disorder(s), diagnostic assessment tool, country of assessment, definition of sexual orientation (identity, behavior, and attraction), and reported effect sizes. Odds Ratios were calculated from proportions and sample sizes if they were not reported. For each of the four mental disorder categories, comparisons were made between lesbian/gay and heterosexual people, bisexual and heterosexual people, and bisexual and lesbian/gay people.

2.1.5 | Quality assessment

The quality of the studies was rated in accordance to the Study Quality Assessment Tool for Case-Control Studies by the National Heart, Lung, and Blood Institute. Items were rated in terms of sufficient quality between one and two (1 = no, 2 = yes). One item assessing the used instruments to determine diagnostic status was rated between one and three, with three being the most desirable method (1 = checklists, 2 = screening instruments, 3 = structured interview). Studies could reach a maximum score of 19 and a minimum score of 9. Of the included studies the minimum score reached was 15 and the maximum 19. Only 12 out of 26 studies used structured interviews to determine diagnostic status.

2.2 | Statistical analysis

All statistical analyses were performed using Stata 15.1 (Stata Corp., 2015). Random effect estimates were calculated for each of the three previously described comparisons of sexual orientations for each diagnostic category using the STATA metan package. The percentage of effect size variation which can be attributed to differences between studies (heterogeneity) was calculated with the Q test and presented using \( I^2 \). Publication bias was tested by visually assessing the Funnel Plot for asymmetry and by calculating the Egger’s test (using the STATA metabias package). In cases where there were indications for publication bias, the trim-and-fill method was used to calculate corrected effect sizes. In these cases, data from the trim-and-fill method are presented in the text while the presented figures contain the original uncorrected data. In addition to the pooled Odds Ratio (OR) and 95% confidence intervals (CI), the number of included effect sizes (k) is reported for each meta-analytic comparison. To examine the influence of the publication year on the association between sexual orientation and mental health, meta-regressions were calculated using the STATA metareg package. Estimates were based on the restricted maximum likelihood method. Standard errors and confidence intervals are calculated as suggested by Knapp and Hartung (2003) because this procedure has much more appropriate false-positive rates than the standard approach. \( p \)-values were calculated using a permutation test approach based on Monte Carlo simulation (2000 permutations), which results in more accurate \( p \)-values compared with standard methods, particularly if the number of studies in a model is small. Meta-regression were also used to evaluate whether the study quality (i.e., the combined quality rating) impacted the results. The results of all meta-regressions are presented in further detail in the Appendix S1. Because of the limited number of included studies per analysis, the moderation analysis should be considered exploratory.
RESULTS

3.1 Characteristics of included studies

A total of $N = 26$ studies were included in the meta-analysis. Table 1 gives an overview of the characteristics of the included studies. The first study to meet all inclusion criteria was published in year 2000. In total, eight studies were published before 2010 and 18 of the 26 included studies were published between 2010 and 2019. The majority of studies ($n = 15$) collected their data from the United States, two studies from each New Zealand, Canada and the UK, and one study each from Switzerland and Iceland. All included studies were conducted in Western industrialized countries. The studies contained a total of 519,414 heterosexual people, 10,178 lesbian/gay people and 14,410 bisexual people. A few studies examined high school students while the majority of studies used adult samples only. Twenty-one studies reported comparisons for depression, ten studies assessed alcohol use disorders, nine studies assessed anxiety disorders, and eight studies assessed suicidality. Thirteen studies assessed only one disorder while thirteen assessed at least two or more disorders.

3.2 Lesbian/gay people compared with heterosexual people

Because of heterogeneity in the results ($I^2 = 79.0\%, p < 0.001$) and the methodological variation employed when collecting the data for the studies (definitions of sexual orientation, different assessment tools, and sampling strategies), random effects are reported in the meta-analytic results (Figure 2). There was an indication of publication bias across all diagnostic categories as well as for depression, anxiety, and alcohol use disorder, specifically when comparing lesbian/gay people versus heterosexual people. For these cases, the trim-and-fill corrected effects are reported in the text.

The meta-analyses revealed that across all investigated categories, lesbian/gay people had a higher risk for mental disorders than heterosexuals ($OR = 2.16; 95\%CI [1.89, 2.45]$).
| Author                        | Sample Size | Age Range | Population          | Diagnostic category                | Disorders                                                                 | Country | Instrument                  | Reported comparison | Sexual orientation measure |
|-------------------------------|-------------|-----------|---------------------|------------------------------------|---------------------------------------------------------------------------|---------|-----------------------------|---------------------|---------------------------|
| (Bolton & Sareen, 2011)       | N = 34.659  | 20+       | General population  | Anxiety, suicide attempt           | Any mood disorder, any anxiety disorder, any substance use disorder, suicide attempt | USA     | AUDADIS-IV Structured Interview | bi versus hetero; bi versus LG | Identity |
| (Borgogna et al., 2019)       | N = 43.632  | NA        | College students    | Depression, anxiety                | Major depressive disorder, generalized anxiety disorder (GAD)             | USA     | PHQ–9, GAD–7 Structured interview | bi versus hetero; bi versus LG | Identity |
| (Cochrane, 2000)             | N = 3.648   | 17–39     | Male young adults   | Depression, suicidality            | Suicide ideation, suicide attempt, major depression                      | USA     | Structured interview         |                     | History of sexual partners |
| (Cochran & Mays, 2000)        | N = 9.908   | 18+       | General population  | Depression                         | Major depression, GAD, panic attack, agoraphobia, alcohol dependency    | USA     | Structured interview         |                     | History of sexual partners |
| (Cochran & Mays, 2009)        | N = 2.272   | 18–72     | Adult Californians  | Depression, AUD, anxiety           | Major depression, GAD, panic attack, agoraphobia, alcohol dependence     | USA     | WHO-CIDI-SF Structured interview | bi versus hetero; bi versus LG | Identity+ behavior |
| (Demant et al., 2016)         | N = 58.963  | 16–35     | Young adults        | AUD                                | Alcohol Use                                                               | Global  | AUDIT                       | bi versus hetero; bi versus LG | Identity |
| (Denny et al., 2016)          | N = 7.713   | 13–17     | High school students| Depression, suicidality            | Depressive symptoms, suicide attempts, plans, and thoughts              | New Zealand | RADS-SF                     | bi versus hetero; bi versus LG | Attraction |
| (Drabble et al., 2005)        | N = 7.612   | 18+       | General population  | AUD                                | Prevalence of alcohol use                                                | USA     | Structured interview         | bi versus hetero; bi versus LG | Identification +behavior |
| (Fergusson et al., 2005)      | N = 967     | 21–25     | Young Adults        | Depression, AUD, suicidality, anxiety| Major depression; anxiety disorders including generalized anxiety disorder, panic disorder, agoraphobia, social phobia and specific phobia; alcohol dependence | New Zealand | Structured interview |                     | Identity |
| (Gattis et al., 2012)         | N = 32.846  | NA        | General population  | Depression, anxiety, AUD           | AUD; major depressive disorder-lifetime; GAD-generalized anxiety disorder-lifetime; PTSD-LT post-traumatic stress disorder-lifetime | USA     | Structured interview         |                     | Identity+behavior |

(Continues)
| Author | Sample Size | Age range | Population | Diagnostic category | Disorders | Country | Instrument | Reported comparison | Sexual orientation measure |
|--------|-------------|-----------|------------|---------------------|----------|---------|------------|---------------------|---------------------------|
| (Gilman et al., 2001) | N = 8.098 | 15–54 | General population | Depression, anxiety, AUD, suicidality | Agoraphobia, GAD, panic, social phobia, simple phobia, PTSD, major depression, dysthymia, any mood disorder, alcohol abuse, alcohol dependence, suicide—thought, plans, attempts | USA | Structured interview | | Identity |
| (Gisladottir et al., 2018) | N = 10.764 | 16–20 | Junior college students | Depression | Depressed mood, anger, perceived stress | Iceland | SCL−90 | bi versus hetero; bi versus LG | Attraction |
| (Horwitz et al., 2020) | N = 41.412 | 18–31+ | College students | Depression, AUD, suicidality | Depression, heavy alcohol use, past-year suicidal ideation, and suicide attempt | USA | PHQ−2, AUDIT | bi versus hetero; bi versus LG | Identity |
| (Jabson et al., 2014) | N = 9.662 | NA | General population | Depression | Current depressive symptoms | USA | PHQ−9 | bi versus hetero | Identity |
| (McNair et al., 2011) | N = 8.850 | 25–30 | Female young adults | Depression, anxiety | Depression, anxiety | Australia | CES-D, reported diagnosis/treatment | bi versus hetero; bi versus LG | Identity |
| (Midanik et al., 2007) | N = 7.612 | 18+ | General population | AUD | Alcohol use, alcohol related problems | USA | Structured Interview | bi versus hetero; bi versus LG | Identity, behavior |
| (Needham & Austin, 2010) | N = 11.153 | 18–26 | Female Middle School and High school students | Depression | Depression, suicidal thoughts | United Kingdom | CES-D | bi versus hetero; bi versus LG | Identity |
| (Praeger et al., 2019) | N = 12.078 | 14+ | General population | AUD | High risk drinking | Australia | AUDIT-C | bi versus hetero; bi versus LG | Identity |
| (Rath et al., 2013) | N = 4.215 | 18–34 | General population | Depression, anxiety | Major depressive disorder, GAD | USA | PHQ−2, GAD−2 | bi versus hetero; bi versus LG | Identity |
| (Schauer et al., 2013) | N = 3.892 | NA | College students | Depression | Depressive symptoms, perceived stress | USA | PHQ−2 | bi versus hetero; bi versus LG | Identity |
| (Scott et al., 2016b) | N = 24.788 | 15+ | General population | Depression | Major depressive episode | Canada | PHQ−2 | bi versus hetero | Identity |
| Author                        | Sample Size | Age range | Population       | Diagnostic category | Disorders                                       | Country   | Instrument                                      | Reported comparison                  | Sexual orientation measure |
|-------------------------------|-------------|-----------|------------------|---------------------|-------------------------------------------------|-----------|------------------------------------------------|------------------------------------|--------------------------|
| (Scott et al., 2016a)         | N = 8.165   | NA        | Military personnel | Depression          | Major depressive episode                        | Canada    | WHO-CIDI Structured interview                   | bi versus hetero            | Identity                 |
| (Shahab et al., 2017)         | N = 44.030  | 16+       | Adult population  | AUD                 | Prevalence of alcohol use                       | United Kingdom | AUDIT Structured interview                     | bi versus hetero; bi versus LG | Identity                 |
| (Tabler et al., 2019)         | N = 10.727  | 11–32     | Adolescents and young adults | Depression          | Depressive symptoms                             | USA       | CES-D                                          | bi versus hetero; bi versus LG | Identity                 |
| (Valanis, 2000)               | N = 93.311  | 50–79     | Postmenopausal women | Depression          | Depression                                      | USA       | CES-D                                          | bi versus hetero; bi versus LG | Behavior                 |
| (Wang et al., 2014)           | N = 5.875   | NA        | Male general population | Depression, suicidality | Major depression, mild depression, moderate depression, severe depression, suicide attempt | Switzerland | MOS SF–12, ESPAD | bi versus hetero; bi versus LG | Attraction               |

Note: Bi versus hetero = comparison of bisexual people (bi) versus heterosexual people. Bi versus lesbian/gay (LG) = comparison of bisexual people versus lesbian/gay people.

Abbreviations: AUD, Alcohol Use Disorder; AUDADIS-IV, Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV; AUDIT-C, Alcohol Use Disorder Identification Test-Concise; CES-D, Center for Epidemiologic Studies Depression Scale; ESPAD, European School Survey Project on Alcohol and Other Drugs; GAD, Generalized Anxiety Disorder; MOS SF-12, Medical Outcomes Study 12 Item Short Form Health Survey; NA, Not available; PCL-C/5, PTSD Checklist Civilian Version for DSM-5; PHQ, Patient Health Questionnaire; RADS-SF, Reynolds Adolescent Depression Scale, 2nd Edition: Short Form; SCL-90, Symptom; WHO-CIDI(-SF), The World Health Organization Composite International Diagnostic Interview (Short Form).

*aAll studies reported comparisons between gay men and lesbian women versus heterosexual people.

*bStudies used either a single question or set of questions to assess sexual orientation.
**FIGURE 2** Forest plot of lesbian women and gay men versus heterosexuals. Note: Weights are from random effects analysis (Not trim-and-fill corrected)
sexual people decreased with more recent years of data assessment for alcohol use disorders only (b = −0.08; [CI = 1.94,2.41]). With regard to the different diagnostic categories, lesbian/gay people had a higher risk for depression (OR = 1.97, 95% [CI = 1.76,2.19], k = 26), anxiety disorder (OR = 2.24, 95% [CI = 1.76,2.86], k = 14), alcohol use disorder (OR = 1.97, 95% [CI = 1.50,2.59], k = 21), and suicidality (OR = 2.89, 95% [CI = 2.41,3.38], k = 16).

The meta-regression showed that the quality of the included studies comparing lesbian/gay with heterosexual people was positively associated to mental health differences across all diagnostic categories (b = 0.09; [CI = 0.00, 0.19] as well as for depression (b = 0.09; [CI = 0.00, 0.17])). Further, the mental health difference between lesbian/gay people compared with heterosexuals were larger in studies using diagnostic interviews compared with symptom scales for comparisons across all categories pooled together (b = 0.30; [CI = 0.11; 0.51]), as well as for depression (b = 0.33; [CI = 0.17; 0.50]) and alcohol use disorder (b = 0.59 [CI = 0.08; 1.12]), in particular. In other words, the better the study quality and the better the method to determine diagnostic status, the larger the detected mental health disparities for lesbian/gay people compared with heterosexuals. There was no moderation by the year of data assessment or sexuality measure (identity, history of sexual partners, and behavior) (ps > 0.49).

### 3.3 Bisexual people compared to heterosexual people

There was significant heterogeneity across the studies (I² = 96.3%, p < 0.001). The Funnel Plot and the Egger’s test revealed evidence for the publication bias for studies regarding depression; so, the trim-and-fill corrected data are reported in the following. Figure 3 shows a forest plot of the comparison for all diagnostic categories. The meta-analysis showed that bisexual people had a higher risk for mental disorders compared with heterosexual people across all categories pooled together (OR = 2.78 [CI = 2.34,3.21]). With regard to specific categories, bisexual people had a higher risk for depression (OR = 2.70; 95% [CI = 2.32,3.14], k = 18), alcohol use disorder (OR = 1.50; 95% [CI = 1.17,1.82], k = 13), anxiety disorders (OR = 2.87; 95% [CI = 1.65,4.09], k = 5), and suicidality (OR = 4.81; 95% [CI = 3.63,5.99], k = 7).

The meta-regression revealed that study quality was related to increased risk for alcohol use disorder (b = 0.48; [CI = 0.02,0.95]) and to decreased risk for suicidality (b = −0.30; [CI = −0.44,−0.15]). Moreover, the mental health differences between bisexual and heterosexual people decreased with more recent years of data assessment for alcohol use disorders only (b = −0.08; [CI = −0.12,−0.04]). The meta-regressions regarding the sexuality measure (identity, history of sexual partners, and behavior) revealed that compared with studies using identity measures, mental health differences between bisexual and heterosexual people were larger in studies using attraction-based measures across all categories pooled together (b = 0.82; [CI = 0.34, 1.31]) as well as for depression (b = 0.40, [CI = 0.09,0.71]) and suicidality (b = 0.89, [CI = 0.37, 1.42]), in particular. Disparities in alcohol use disorders were also larger in behavior-based studies (b = 1.06, [CI = 0.41, 1.70]). Compared with studies assessing sexual identity, mental health differences for depression were smaller when using the history of sexual partners as proxy for sexual orientation (b = −0.61, [CI = −1.04,−0.19]). There was no moderation by assessment instrument (symptom scale vs. structured interview) (ps > 0.49).

### 3.4 Bisexual people compared to lesbian/gay people

When comparing bisexual people with lesbian/gay people, there was significant heterogeneity across all studies (I² = 73.1%, p < 0.001; Figure 4). The Funnel Plot and the Egger’s test revealed significant publication bias across all disorders as well as for studies on depression and anxiety disorder specifically. For these cases, the trim-and-fill corrected data are presented in the following. When comparing bisexual people with lesbian/gay people, bisexual people had a higher risk for mental disorders compared with lesbian/gay people across all diagnostic categories pooled together (OR = 1.30, 95% [CI = 1.12,1.47]). When looking at each disorder separately, we found a higher risk only for depression (OR = 1.50; 95% [CI = 1.31,1.72], k = 16 results). Although the point estimate for the same comparison was almost similar for anxiety disorders (OR = 1.33; 95% [CI = 0.82,2.16], k = 5 results), the lower number of studies resulted in broader confidence intervals and a statistically non-significant result.

Study quality was negatively related to differences between bisexual people and lesbian/gay people over all diagnostic categories pooled together (b = −0.14 [CI = −0.24,−0.03]) and for suicidality (b = −0.28; [CI = −0.57,0.00]). There was also evidence for increasing differences in depression risk with more recent year of data assessment (b = 0.02; [CI =0.00,0.04]). Mental health differences between lesbian women/gay men and bisexual people was lower across all categories pooled together (b = −0.43, [CI = −0.68,−0.18]) and for suicidality (b = −0.67, [CI = −1.34,0.00]), when studies used a structured interview instead of a symptom scale. Further, the meta-regressions regarding the sexuality measure...
(identity, history of sexual partners, and behavior) revealed that overall mental health differences were lower when sexual orientation was measured by attraction \( (b = 0.40, [CI = 0.00, 0.81]) \) compared with identity, and differences in depression were also lower when the history of sexual partners was used to assess sexual orientation \( (b = -0.55, [CI = -1.03, -0.06]) \).

4 | DISCUSSION

Integrating the findings of population-based studies conducted over the last 20 years, this meta-analysis found an overall higher risk for mental disorders in sexual minority people compared with heterosexuals. Both lesbian/gay and bisexual people had a higher risk for all examined...
diagnostic categories than heterosexual people. When comparing bisexual people to lesbian/gay people, bisexual people had a higher risk for depression and suicidality. The results are in line with the findings from previous meta-analytic findings focusing on selected mental disorders such as anxiety and depression (bisexual people vs. lesbian/gay people OR = 1.44, 95% [CI = 1.22, 1.70] and bisexual people versus heterosexual people OR = 2.38, 95% [CI = 1.86, 3.05].

The current findings in this study connect well to the minority stress theory, which expects mental health disparities for people with minority sexual orientations compared with heterosexuals in light of excess stress related to a variety of stigma-related experiences.
Minority stress may include discrimination, micro aggressions, verbal and physical violence, and internalized sexual stigma, which can promote the development of mental disorders. Moreover, people with minority sexual orientations may be less likely to disclose their sexual orientation in healthcare settings, seek treatment for mental health problems in fear of discrimination and may discontinue treatment after de facto experiences of discrimination when seeking help.

Regarding the higher risk for depression and suicidality in bisexual people compared with both heterosexual and lesbian/gay people, there are several likely explanations. The stigmatization of bisexuality may occur both from heterosexuals and from people with monosexual orientations within the sexual minority group. Biphasic stigmatization may include denying bisexuality as a valid sexual orientation and stereotypes of excessive promiscuity, sexual/romantic greed, selfishness, immaturity, and dishonesty. Moreover, bisexual people reported to feel less connected to their community and found to have a higher likelihood to conceal their sexual orientation than lesbian/gay people. This combination of bi-specific minority stressors and the limitation of social-psychological resources put bisexual people at high risk for adverse mental health outcomes, particularly for depression and suicidality.

Beyond these societal and environmental variables, it should be noted that genetic factors might also play a role as a common factor underlying both sexual behavior and mental disorders such as depression. However, the so far identified loci only account for a relatively small percentage of variation in sexual behavior, and the potential complex interactions between these genetic and the described environmental factors are still largely unknown.

In exploratory moderation analyses, there was no evidence for a decline in the mental health difference between sexual minority and heterosexual people over the past 20 years; a development that runs counter the expectation that mental health disparities might decline in light of legislative and social changes in several countries during the last decades. First, there might be methodological explanations. Most importantly, the number of included studies was rather small, resulting in limited statistical power to detect small to moderate effects. However, inspection of coefficients and confidence intervals among analysis with null findings also gave no indication for effects of publication year. Further, the year of publication had to be analyzed because the actual date of assessments was not reported in all included studies. Thus, the time range between data collection and publication might have clouded some of the temporal changes. Moreover, there is a chance that sexual minority people had higher odds of being misclassified as heterosexual people in earlier studies because participants might have been more afraid to reveal their true sexual orientation. This might have led to an under-estimation of mental health disparities in earlier studies. Although the found associations between publication year and mental health disparities have to be interpreted with caution, it can be assumed that societal and political changes—while laudable—did indeed not suffice to counteract the damage done by decade-long societal and institutional discrimination faced by people with minority sexual identities. Such changes may take a long time before they are reflected in mental health data. Moreover, there is evidence that societal attitudes towards sexual identity did not so much improve as that they gave way to modernized forms of prejudice and discrimination. However, it should be noted that we found smaller differences in alcohol use disorder risk in bisexual compared with heterosexual people but not compared with lesbian/gay people in later more recent studies. Besides the external factor of society, there is an interplay of internalized stigma that create a negative impact on mental health of LGB individuals, which need to be taken into account, such as internalized homophobia, anticipation of rejection, and concealment. Internalized homophobia refers to the internalization of negative societal attitudes about one’s sexual orientation or gender identity and could therefore be a strong factor for the slow improvement over time. Another partly explanation for a relative stability in mental health disparities could lie in the abovementioned contribution of genetic factors underlying both sexual behavior and mental health.

Several limitations must be taken into account when interpreting the presented findings. [1] The results must be interpreted in relation to the number of available studies. While there were 21 studies that compared the risk for depression, there were only 10 studies reporting comparisons for alcohol use disorder, 9 studies for anxiety disorders, and only 8 studies for suicidality. [2] Although the overall quality assessment for all studies was good, less than half of the included studies used structured interviews to determine diagnostic status. Moreover, there is a chance of assessment bias especially in face-to-face study settings where clinicians and researchers might also be subjected to stigmatizing views on sexual orientations. In fact, some of the reported differences were related to study quality and assessment instruments, although no consistent pattern regarding the direction of this association was found. More systematic investigations of these aspects are needed. [3] The included studies stem from a small number of different countries where the political and societal development for LGB people is much different from other regions. Thus, the generalizability of the presented findings might be limited to parts of the global West. The fact that all studies were published in English.
language may have increased this bias. [4] While some studies reported findings separately for women and men, this number was too small to allow an analysis of the interplay of gender and sexual orientation. [5] Mental disorders such as personality disorders, mood disorders other than depression, substance use disorders, and psychotic disorders could not be included in the analyses. [6] Also, we could not analyze the influence of age, ethnicity, and other socio-demographic variables, which has to be kept in mind when interpreting the results. [7] The vast majority of included studies measured sexual orientation by self-assignment to identity labels (e.g., gay, lesbian or bisexual). Thus, there was little variance in other definitions (same-sex sexual experience and attraction) may constitute two altogether different exposures and the respective meta-regression have to be interpreted with caution. As a multi-dimensional construct, sexual orientation research often focuses on three primary components of identity, attraction, and behavior in order to elevate one’s sexual orientation. The representation of monosexual orientations (e.g., lesbian/gay people) is well captured, while plurisexuals (e.g., bisexual people) have greater difficulty in classifying themselves on the existing scales. [34] Therefore, it is important to develop more differentiated scales, which include further dimensions such as sexual fantasy or emotional and social preference as already suggested by Klein et al. (1985). [35]

Taking into account these limitations, the presented findings have important implications for future research. First, more studies are needed that investigate gender differences in the association between sexual orientation and mental health. Specifically, gender identities other than cis-gender women and men should be analyzed (e.g., trans-women, trans-men and genderqueer, non-binary and agender people). For instance, the minority stress model was developed with regard to LGB people but research shows that trans people suffer from gender minority stressors too such as hostile and confusing reactions and transphobia [36,37] which is not considered in the included studies. There is very little research on non-binary/gender people compared with research that is devoted to sexual minority orientations. This research gap underlines once again how predominant binary gender thinking still is, both in society as well as in science, and this gap needs to be addressed. There is also need for further research from different societal and cultural backgrounds other than from the Western industrialized world. Another important aspect is the interplay of multiple minority identities, including dimensions such as race, religion, and disability. It is to be expected that multiple marginalization affects mental health in additive and multiplicative ways. [39] More research is also needed on a wider range of sexual orientations (e.g., queer, asexual, and pansexual) beyond the most visible identities such as lesbian, gay, and bisexual. Further, more research should include the group of people who identify as “mostly heterosexual.” [40] The majority of studies either did not assess this aspect, conflated it with other identities (i.e., heterosexual) or excluded those participants altogether. Lastly, there is a need for more studies assessing mental health in sexual minority people for disorders other than depression, alcohol use disorders, anxiety disorders, and suicidality.

Beyond these research needs, there are also several practical implications. The presented findings should inform mental health and prevention policies and stimulate increased efforts to reduce the mental health disparities between people with different sexual orientations. Moreover, professional healthcare personnel should be aware about the elevated need for the recognition and treatment of common mental disorders in people with minority sexual orientations by providing sexuality-sensitive healthcare. In addition, the present meta-analysis suggests once more the need for primary care physicians to systematically collect data about sexuality, sexual orientation, and gender identity from patients for quality assurance, to increase understanding of the health disparities and in order to be able to preventively address possible vulnerability constellations. Continuous reduction of prejudice and stigmatization through education and inclusion across different areas of society including schools, the healthcare sector, workplace, and media is essential for progress in order to improve the mental health of people with minority sexual orientations.

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CONFLICT OF INTEREST

All other authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.
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