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Review article

Suicidality and Depression Disparities Between Sexual Minority and Heterosexual Youth: A Meta-Analytic Review

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A B S T R A C T

Purpose: To examine disparities between sexual minority youth (SMY) and heterosexual youth in rates of suicidality and depression symptoms.

Methods: Separate meta-analyses were conducted to examine suicidality and depression disparities. Studies were included if the average age of the participants was <18 years, and if suicidality or depression symptoms were compared across SMY and heterosexual youth.

Results: SMY reported significantly higher rates of suicidality (odds ratio [OR] = 2.92) and depression symptoms (standardized mean difference, $d = .33$) as compared with the heterosexual youth. Disparities increased with the increase in the severity of suicidality (ideation [OR = 1.96], intent/plans [OR = 2.20], suicide attempts [OR = 3.18], suicide attempts requiring medical attention [OR = 4.17]). Effects did not vary across gender, recruitment source, and sexual orientation definition.

Conclusions: Disparities in suicidality and depression may be influenced by negative experiences including discrimination and victimization. Clinicians should assess sexual orientation, analyze psychosocial histories to identify associated risk factors, and promote prevention and intervention opportunities for SMY and their families.

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Suicide is the third leading cause of death among adolescents and young adults in the United States, with lifetime prevalence rates of suicide attempts ranging from 1% to 10% in adolescents [1–3]. After a decade of steady decline, the pediatric suicide rate in the United States increased 18% between the years 2003 and 2004 [4], signifying the largest single-year increase since 1990.

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Preliminary findings from national fatal injury data available for 2004–2005 show a continuation of this alarming trend [5], and suggest the possibility of youth suicide as an escalating public health crisis. Therefore, it is increasingly important for healthcare professionals to identify and intervene with the youth at high risk for suicide.

Existing research has highlighted characteristics of youths who are at high risk for suicide. The overwhelming majority of youth who make suicide attempts demonstrate mood psychopathology, with depression being the most prevalent disorder. Adolescent depression, marked by hopelessness, severe and perva-

sive suicidal ideation, is a significant contributor to suicidal behavior [6]. The risk for suicide among adolescents with bipolar disorder is even higher [7,8]. In addition, adolescent males have higher rates of suicide than adolescent females, who typically report higher rates of suicidal ideation and have higher rates of suicidal behavior [3]. Consistent with adult studies [9,10], a growing body of research suggests that sexual minority youth (SMY; youth who endorse same-sex attraction, same-sex behavior, or a gay/lesbian identity) are also at increased risk for mood disorders and suicidality [11–14]. The primary aim of this article was to summarize, describe, and compare rates of suicidality and depression between SMY and heterosexual youth.

Minority stress theory suggests that disparities between sexual minority and heterosexual youth can be attributed in part to stigma, discrimination, and victimization experiences that are a result of a homophobic and violent culture [10]. Among the factors that researchers have found to be associated with psychosocial risks in SMY are the negative responses of other people to gender atypical behavior, high-risk sexual behavior, conflicts related to disclosure of sexual orientation to family and its consequences, and mistreatment in community settings, especially schools [15]. One or more of these stressors can promote feelings of helplessness and hopelessness that may develop into depression and suicidality.

Despite the robust empirical and theoretical evidence for higher rates of depression and suicidality among SMY, the size of these disparities varies across studies, warranting a systematic investigation into the potential sources of heterogeneity. For example, evidence suggests that the disparities may vary across gender [13,16,17], bisexuality status [18,19], and different measures of sexual orientation (e.g., same-sex sexual behavior [20] vs. identity labels such as “gay” and “lesbian” [21]). Previous research has shown that these and other sample and study characteristics moderate the association between sexual orientation and outcomes such as substance use and abuse [22]. Thus, another goal of this article is to examine whether these variables moderate suicidality and depression outcomes to corroborate and expand on the existing published data.

Suicidality and depression effect sizes may vary as a function of how the constructs are measured. Effect sizes may vary on the basis of whether researchers measure depression using well-developed depression scales or single-item depression measures. Furthermore, SMY disparities may vary depending on the severity of the suicidality or how suicidality is operationalized. For example, some studies have examined disparities in suicidal ideation [19], whereas others have examined a wider range of suicidal behaviors including suicide attempts requiring medical attention [20,21]. Finally, questions remain regarding whether disparities persist after controlling for potential confounding variables. For example, as teenagers become older, they are more likely to endorse a same-sex orientation and more likely to endorse depression symptoms, suggesting that age may act as a confounder that accounts for part or all of the disparity.

In summary, the primary goal of this study was to summarize and describe suicidality and depression disparities between SMY and heterosexual youth. The second goal was to determine whether methodological characteristics of the original studies and sample characteristics explained variability in the disparities observed across studies including gender, bisexuality status, and how sexual orientation, depression, and suicidality were operationalized. The third goal was to review the methodological qualities of this literature to determine how many original studies

examined longitudinal patterns of suicidality and depression, as well as mediators, moderators, and potential confounders of the association between sexual orientation and the outcomes.

Methods

Meta-analysis reporting guidelines [23] developed and recommended by the Centers for Disease Control and Prevention were followed closely for this study.

Selection of studies

There were two criteria for the inclusion of studies in the meta-analyses: (1) reported rates of depression and/or suicidality among sexual minority and heterosexual youth; and (2) a sample mean age of ≤ 18 years, and an upper bound of the age range not exceeding 21 years. These age criteria were used to ensure that most participants in the original studies were adolescents. Studies were identified for the analysis in four steps. First, a systematic search of PsychInfo and MedLine was conducted to identify all eligible studies (published in 2009 or earlier) using various combinations of key terms including “suicide,” “depression,” “gay,” “lesbian,” “LGB,” “adolescent,” and others. A total of 378 abstracts were identified and reviewed to determine their eligibility (the majority of ineligible studies were excluded because they either focused on youth aged 18–25 years, did not include a heterosexual comparison group, or they were review articles). Second, articles were retrieved and reviewed to confirm their eligibility ($n = 30$). Third, all eligible studies were reviewed to identify additional studies. Finally, letters were mailed to the corresponding authors of eligible studies asking for their help in identifying unpublished studies that met our inclusion criteria. One additional study was identified by this method [24]. A total of 20 suicide [11–14,16–21,24–33] and 12 depression [14,16,19,21,25,26,30,34–37] studies were identified, resulting in 24 total studies with seven of them examining both outcomes.

Coding of studies

Pertinent qualitative and quantitative data were extracted from the included studies which fell into four categories: (1) definition of sexual orientation; (2) depression and suicide measures; (3) moderating variables (e.g., bisexuality status, gender); and (4) the effect size data. Two co-authors coded all data. Coders achieved 100% agreement on all qualitative data. There were 727 individual pieces of data associated with effect size estimates (e.g., sub-sample sizes, p values, t -test values). The intra-class correlation between raters of the effect size data was high (.96), and inter-rater agreement was 85%. Discrepancies between raters were resolved by consensus among the two raters and the first author.

Operationalization of sexual orientation Four coding categories were used, including measures of: (1) self-identification as gay, lesbian, or bisexual, (2) same-sex romantic or sexual attraction, (3) same-sex romantic or sexual behavior, and (4) two or more of categories 1–3.

Bisexuality status Participants' bisexuality status was indicated in three ways: (1) self-reported labeling as bisexual, (2) self-reported romantic or sexual attraction to both sexes, or (3) reporting a history of sexual behavior with both sexes.

Suicidality Suicidality included the participants' reports of: (1) suicidal ideation (thoughts about suicide), (2) suicidal plans or intent, (3) suicide attempts, and (4) suicide attempts that caused injury and/or required medical attention. Furthermore, we distinguished between studies that operationalized the variables as *recent* suicidality (occurred within the previous year) versus *lifetime* suicidality.

Depression outcome variables We distinguished between the studies that used single-item indicators of depression (e.g., "During the past week, how often did you feel depressed?" [19]) and those that used multiple item measures, such as the Center for Epidemiologic Studies Depression scale [CES-D] [38] or the Beck Depression Inventory [39]. One study reported rates of Major Depressive Disorder, which were assessed using a comprehensive diagnostic interview [30].

Data analysis plan

The data analysis proceeded in several steps. First, overall effects for suicide and depression outcomes were estimated by combining weighted effects across all studies assuming a random effects model (based on rationale provided by Borenstein et al [40]). Second, methodological characteristics were tested as moderators of the overall effect by estimating a "Q" statistic that tests for heterogeneity across moderator subgroups. Mixed-effects models were used for the subgroup analyses such that a random-effects model was assumed when computing summary effects within subgroups, and the overall summary effect (across subgroups) was recalculated by combining the subgroup effects assuming that the subgroup categories were fixed [40]. Third, outcome variables were categorized on the basis of how suicide was operationalized (e.g., ideation vs. attempt) and the time frame of use (recent vs. lifetime), and the association between sexual orientation and these different variables was estimated. Fourth, subanalyses were conducted to examine how the inclusion of covariates affected the overall estimates. Fifth, diagnostics were performed to identify potential outliers, publication biases, and other threats to the statistical conclusion validity of the results. We also compared the average effect size estimates for groups of studies that did and did not use a public use dataset in their analyses to examine the effects of large sample sizes on the overall results.

Data management and analyses were conducted using software developed by the National Institutes of Health (Comprehensive Meta Analysis, version 2 [Biostat, Inc., Englewood, NJ]) [41]. In most of the studies, the suicide outcome variables were categorical, thus the suicide meta-analysis results are reported using an odds ratio (OR) effect size metric. In most of the original studies, the depression outcome variables were continuous; thus the depression meta-analysis results are reported using a standardized mean difference effect size metric (Cohen's *d* [42]).

Results

Suicidality

The literature search yielded 20 suicidality studies with 122 corresponding effect size estimates. Studies reported multiple effect size estimates because of having multiple outcome variables, multiple demographic subgroups, or both. One effect size was over five standard deviations larger than the overall

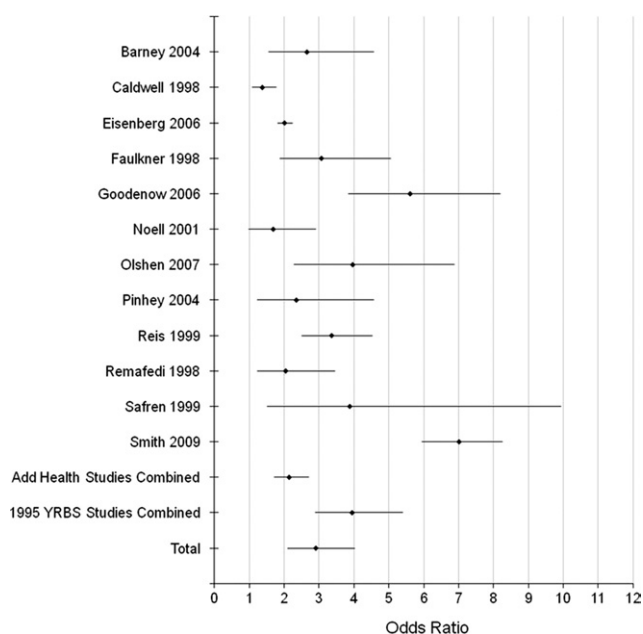


Figure 1. Odds ratios and 95% confidence intervals for studies testing the association between sexual orientation and adolescent suicidality.

weighted effect size [29], and thus was excluded from the analyses. Furthermore, 16 of the original 122 effects were redundant with other effects within the individual studies (e.g., some studies reported effects for boys and girls separately and combined. We retained the effects that facilitated our ability to examine subgroup differences). Removing the outlier and redundant effect sizes resulted in 19 studies and 105 effect size estimates used in the analyses.

Weighted effect size estimates and methodological characteristics for each suicide study included in the analysis are summarized in Figure 1, Table 1. Four of these studies used the same two datasets for their analyses [11,12,19,33]: The 1995 Massachusetts and Vermont Youth Risk Behavior Surveys (YRBS). Three other studies used the National Longitudinal Study of Adolescent Health (Add Health) data [14,19,26]. These data were combined and analyzed using methods to account for their interdependency; thus, their combined effect sizes (one for YRBS and one for Add Health) are presented in Figure 1.

Results showed that the estimate for the overall weighted effect size for the relationship between sexual orientation and suicidality was $OR = 2.92$ (confidence interval $CI = 2.11-4.03$) and significantly different from zero ($z = 6.48, p < .0001$). Study-level effect sizes ranged from 1.39 [16] to 8.62 [11]. Individual effect sizes ranged from .90 [18] to 15.19 [11]. Over 40% of the individual ORs (43/105) were <2.0 , and over 25% (28/105) were >4.0 . Only one of the 105 individual ORs was <1.00 . When the overall effect was re-calculated with each study removed, the re-estimated effect sizes ranged from 2.67 to 3.11. Regardless of which study was removed, all the overall tests remained significant (p values $< .0001$). Begg and Mazumdar's rank correlation test ($p = .70$) and Egger's linear regression test ($p = .63$) suggested that there was no significant relationship between the standard errors and the effect sizes. Rosenthal's Fail-safe N test suggested that 2,325 missing studies with null effects would be needed to increase the overall p value to $>.05$.

Table 1
Descriptive statistics and study characteristics for studies that examined rates of suicidality among heterosexual and sexual minority youth

Study	Average OR	OR confidence interval	Number of ES estimates	Total sample size	Average % endorsing suicidality SMY group	Average % endorsing suicidality hetero group	Gender	Suicide variable definition	Recency of suicide event	S/O definition	Comments
1 Barney (2004) [25]	2.66	1.55–4.57	2	5,602	36%	18%	M	Both	Lifetime	4	1, 11
2 Bontempo and D'Augelli (2002) [11]	8.62	7.00–10.60	2	9,188	16%	1%	M, F	Attempt	Recent	4	3, 5, 9, 10
3 Caldwell et al (1998) [16]	1.39	1.09–1.77	3	2,756	—	—	C, M, F	Attempt	Lifetime	2	5, 11
4 Consolacion et al (2004) [26]	2.39	1.92–2.98	3	13,205 ^a	—	—	C, M, F	Ideation	Recent	2	3, 5, 9, 10
5 Eisenberg and Resnick (2006) [27]	2.02	1.83–2.24	12	21,927	49%	31%	M, F	Both	Lifetime	3	2, 3, 10, 11
6 Faulkner and Cranston (1998) [20]	3.08	1.87–5.06	5	1668	27%	15%	C	Both	Recent	3	3, 11
7 Garofalo et al (1998) [12]	5.03	3.32–7.62	1	4,159 ^a	36%	10%	C	Attempt	Recent	1	3, 11
8 Garofalo et al (1999) [17]	2.48	1.50–4.12	2	4,167 ^a	—	—	M, F	Attempt	Recent	1	2, 3, 5, 10
9 Goodenow et al (2006) [28]	5.61	3.84–8.19	3	3,637	22%	5%	C	Attempt	Recent	1	3, 11
10 Noell and Ochs (2001) [30]	1.70	.99–2.90	8	532	39%	31%	M, F	Both	Both	4	4, 5, 11
11 Olshen et al (2007) [18]	3.97	2.29–6.88	8	8,080	—	—	M, F	Attempt	Recent	0	2, 3, 10
12 Pinhey and Millman (2004) [31]	2.36	1.22–4.57	8	1381	—	—	M, F	Both	Recent	1	2, 6, 8, 10
13 Reis and Saewyc (1999) [32]	3.37	2.50–4.54	4	7,477	24%	10%	C	Both	Recent	4	3, 11
14 Remafedi et al (1998) [13]	2.05	1.22–3.46	6	730	24%	11%	M, F	Both	Both	4	3, 10
15a Robin et al (2002) [33] 1995 Vermont YRBS Data	2.22	1.46–3.38	8	7,458	23%	8%	C	Attempt	Recent	3	2, 3, 10, 11
15b Robin et al (2002) [33] 1995 Massachusetts YRBS Data	2.94	1.38–6.23	8	4,176	28%	9%	C	Attempt	Recent	4	2, 3, 10, 11
16 Russell and Joyner (2001) [14]	2.03	1.60–2.57	12	11,940 ^a	15%	8%	M, F	Both	Recent	4	2, 3, 8, 10, 11
17 Safren and Heimberg (1999) [21]	3.89	1.52–9.93	4	104	29%	10%	C	Both	Both	1	5, 11
18 Smith et al (2009) [24]	7.01	5.96–8.25	2	29,440	22%	4%	M, F	Attempt	Recent	1	6, 11
19 Udry and Chantala (2002) [19]	2.09	1.50–2.91	4	18,799	29%	16%	M, F	Ideation	Recent	3	3, 11
Average	2.92 ^b	2.11–4.03 ^b	5.25 Total n ^a	7,821 122,955	28%	12%					

S/O Definition: 0 = unknown, 1 = identity, 2 = attraction, 3 = behavior, 4 = 2 or more.

Comments: 1 = excluded Bisexuals; 2 = controlled for covariates; 3 = public dataset; 4 = nonschool-based sample; 5 = excluded some effect size estimates in meta-analysis due to within-study redundancy; 6 = international sample; 7 = examined longitudinal patterns of suicide outcomes; 8 = examined mediators of the association between sexual orientation and the outcomes; 9 = examined moderators of the association between sexual orientation and the outcomes; 10 = effect sizes were calculated and published in original study; 11 = effect sizes were calculated using summary statistics for each subgroup provided by the original study (e.g., average scores for each group or prevalence rates for each group).

ES = effect size; S/O = sexual orientation; Gender of participants in included effect sizes: M = male, F = female, C = combined in original study.

^a Study sample sizes indicated were deleted from the calculation of the total N due to overlap.

^b Overall weighted average from random effects model.

Estimation of effects with and without covariates

There was variability across studies regarding whether they ran multivariate analyses and reported estimates for the relationship between sexual orientation and suicidality adjusted statistically for various demographic and risk and protective factors (e.g., age, gender, race, depression, substance use). In all, 13 studies [11–13,16,19–21,24–26,28,30,32] reported unadjusted effect sizes only, one [17] reported adjusted effects size only, and five [14,18,27,31,33] reported both adjusted and unadjusted effect sizes. To determine whether adjusting for covariates had a significant effect on the overall weighted effect size estimate, we conducted a series of subanalyses. The overall weighted effect using only the unadjusted results from these five studies combined with the remaining 13 studies with unadjusted effects was $OR = 3.15$ ($CI = 2.25–4.43$). The overall weighted effect using only the adjusted effects from the studies that provide them (six in all) combined with the remaining 13 studies was $OR = 2.82$ ($CI = 2.02–3.93$). Because many of the covariates that were used in the original studies could be conceptualized as mediators (e.g., substance use, depression symptoms) rather than confounding variables, the overall estimated effect may be biased low when using only the adjusted coefficients. Therefore, results in this article are reported from models that retained both unadjusted and adjusted effects ($OR = 2.92$, $CI = 2.11–4.03$).

Moderation of the association between sexual orientation and suicidality

Results suggested that bisexuality status was a significant moderator ($Q = 9.7$, $df = 1$, $p < .01$). Three studies reported effect size estimates for bisexual SMY, four reported effect size estimates for nonbisexual SMY, and 15 reported results combining bisexual and nonbisexual SMY. Two studies in the “combined” group used the 1995 Massachusetts YRBS [11,18] and two used the Add Health data [14,26]. Furthermore, one study using Add Health data [19] and one using the 1995 Vermont and Massachusetts YRBS data [33] examined the bisexual and nonbisexual SMY groups separately. To avoid dependency in the data across moderator subgroups, the Add Health and 1995 YRBS studies that combined bisexual and nonbisexual SMY in their original analyses were excluded [11,14,18,26]. Results showed that the association between sexual orientation and suicidality was strongest among bisexual SMY ($OR = 4.92$; $p < .0001$; $CI = 2.82–8.59$) and weakest among nonbisexual SMY ($OR = 1.87$; $p < .0001$; $CI = 1.35–2.58$). The 95% CI for the combined group overlapped with the CIs from the other two ($OR = 3.08$; $p < .0001$; $CI = 2.08–4.57$). The overall effect combining the groups and adjusting for the group differences using a mixed effects analysis was $OR = 2.64$ ($p < .0001$; $CI = 2.12–3.27$). None of the following variables moderated the association between sexual orientation and suicidality: definition of sexual orientation, gender, and use of a public dataset.

Results stratified by how suicide was operationalized

The definition of suicide (e.g., ideation vs. attempt) was not tested as a moderator because of the nonindependence of the data; however, the average effect for each definition of suicide was estimated so as to examine their potential influence on effect size variability. Results suggested that disparities in rates of suicidality increased with an increase in the severity of the

suicidal behavior (ideation [$OR = 1.96$, $n = 9$]; intent/plans [$OR = 2.20$, $n = 4$]; attempts [$OR = 3.18$, $n = 14$]; and attempts resulting in injury or medical attention [$OR = 4.17$, $n = 5$]). Finally, a trend suggested that the association was stronger when recent suicidality was measured ($OR = 3.34$) as compared with lifetime measures ($OR = 1.92$).

Summary of the absolute rates of suicidality

A total of 13 of the 19 studies (68%) reported data that allowed for an estimation of the absolute rates of suicidality in each group; thus, these estimates are not representative of the population of studies and participants. However, to provide a context for interpreting the meta-analysis results, we present the average absolute rates across suicide constructs (e.g., ideation, plans) and across subgroups for each study in Table 1. The average of these rates showed that 28% of SMY and 12% of heterosexual youth reported a history of suicidality. When we averaged the absolute rates across the six studies that reported rates for each gender, it was found that: (a) 28% of sexual minority boys and 17% of heterosexual boys reported a history of suicidality; and (b) 37% of sexual minority girls and 23% of heterosexual girls reported a history of suicidality.

Depression: overall effect size estimates

The literature search identified 12 depression studies with 51 corresponding effect size estimates. In all, 14 of these effects were redundant with other effects within the individual studies. The effect size for one study [29] was considered as an outlier and was removed from the analyses because it was over 10 standard deviations larger than the overall weighted average effect size. Thus, a total of 11 studies and 36 effect size estimates were used for the analyses. Weighted effect size estimates and methodological characteristics for each depression outcome study included in the analysis are summarized in Figure 2 and Table 2. Four of the depression studies used the Add Health dataset for their analyses [14,19,26,35]. These data were combined and analyzed using methods to account for their inter-dependency; thus, their combined effect size is presented in Figure 2.

Results showed that the estimate for the overall weighted effect size for the relationship between sexual orientation and depression was $d = .33$ (95% $CI = .22–.43$, $z = 6.02$, $p < .0001$). Mean effect sizes for each study ranged from .17 [36] to .67 [25], and the mean effect size for the Add Health studies combined was .25. Individual effect sizes ranged from $-.28$ [35] to 1.0 [35]. Approximately 17% (6/36) of the individual effect sizes were smaller than .20 and 17% (6/36) were larger than .50.

When the overall effect was re-calculated with each study removed, the re-estimated effect sizes ranged from .28 to .36. Regardless of which study was removed, the overall tests of significance remained significant (p values $< .0001$). Begg and Mazumdar's rank correlation test ($p = .22$) and Egger's linear regression test ($p = .18$) suggested that there was no significant relationship between the standard errors and the effect sizes. Rosenthal's Fail-safe N test suggested that 228 missing studies with null effects would be needed to increase the overall p value to $> .05$.

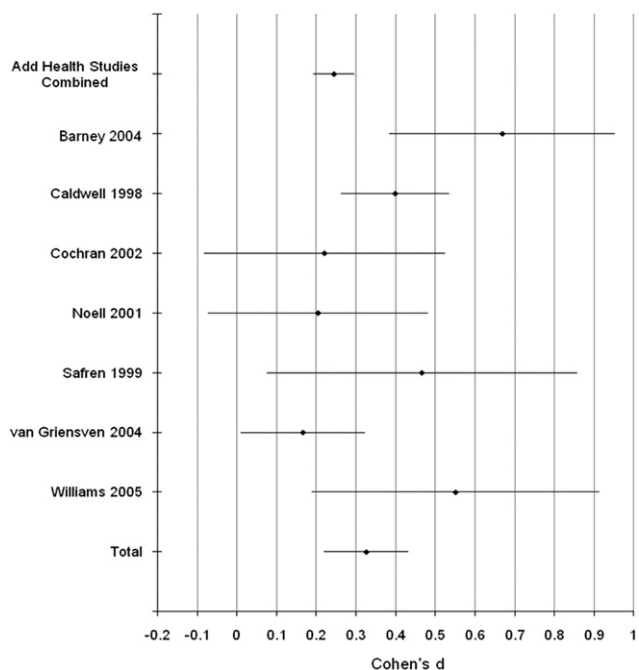


Figure 2. Cohen's d and 95% confidence intervals for studies testing the association between sexual orientation and adolescent depression symptoms.

Estimation of effects with and without covariates

Two studies examined the association between sexual orientation and depression outcomes controlling for covariates [26,35]. One study reported a significant three-way interaction between sexual orientation and two covariates [35]; thus, its conditional main effects of sexual orientation were not considered. The other study only reported adjusted effect size estimates [35]. The association between sexual orientation and depression did not change when this study was removed from the analysis.

Moderation of the association between sexual orientation and depression

The nature of the depression measure was a significant moderator ($Q = 3.97, df = 1, p < .05$) of the association between sexual orientation and depression. One Add Health study used a single-item measure of depression [19] and three Add Health studies used the CES-D depression scale [14,26,35]. The Add Health study that used a single-item depression measure was removed in order to avoid dependency in the data across moderator subgroups. Results showed that on average the strongest associations between sexual orientation and depression were found in studies that used single-item measure of depression ($d = .50, p < .0001, CI = .25-.76$). The average effect for studies that used a depression scale, such as the CES-D or the Beck Depression Inventory, was $d = .24 (p < .0001, CI = .19-.29)$. The overall effect combining the groups and adjusting for group differences using a mixed effects analysis was $d = .25 (p < .0001, CI = .20-.30)$. None of the following variables moderated the association between sexual orientation and depression: definition of sexual orientation, bisexuality status, gender of the participant, and use of public dataset.

Table 2 Descriptive statistics and study characteristics for studies that examined depression among heterosexual and sexual minority youth

Study	Average Cohen's d	Cohen's d confidence interval	Number of ES estimates	Total sample size	Gender	Depression variable type	Recency of depression measure	S/O definition	Comments
1 Barney (2004) [25]	.67	.38-.95	1	5,602	M	Single item	Lifetime	4	1, 11
2 Caldwell et al (1998) [16]	.40	.26-.53	3	2,756	C, M, F	Single item	Lifetime	2	5, 11
3 Cochran et al (2002) [34]	.22	-.08-.52	1	168	C	Scale	Recent	4	4, 11
4 Consolacion et al (2004) [26]	.26	.18-.35	5	13,205 ^a	C, M, F	Scale	Recent	2	2, 3, 5, 9, 11
5 Galliher et al (2004) [35]	.34	.06-.62	12	7,613 ^a	M, F	Scale	Recent	2	2, 3, 9, 11
6 Noell and Ochs (2001) [30]	.20	-.07-.48	4	532	M, F	Diagnosis	Both	1	5, 11
7 Russell and Joyner (2001) [14]	.21	.14-.28	2	11,940 ^a	M, F	Scale	Recent	4	3, 11
8 Safren and Heimberg (1999) [21]	.47	.08-.86	1	104	C	Scale	Recent	1	11
9 Udry and Chantala (2002) [19]	.39	.19-.59	4	18,799	M, F	Single item	Recent	3	3, 11
10 van Griensven et al (2004) [36]	.17	.01-.32	2	1,725	M, F	Scale	Recent	4	6, 11
11 Williams et al (2005) [37]	.55	.19-.59	1	194	C	Scale	Recent	1	6, 8, 11
Average	.33 ^b	.22-.43 ^b	3.3	5,694					
Total			n ^a	29,880					

S/O definition: 1 = identity, 2 = attraction, 3 = behavior, 4 = 2 or more.

Comments: 1 = excluded bisexuals; 2 = controlled for covariates; 3 = public dataset; 4 = nonschool-based sample; 5 = excluded some effect size estimates in meta-analysis due to within-study redundancy; 6 = international sample; 7 = examined longitudinal patterns of depression outcomes; 8 = examined mediators of the association between sexual orientation and the outcomes; 9 = examined moderators of the association between sexual orientation and the outcomes; 10 = effect sizes were calculated and published in original study; 11 = effect sizes were calculated using summary statistics for each subgroup provided by the original study (e.g., average scores for each group or prevalence rates for each group).

ES = effect size; S/O = sexual orientation; Gender of participants in included effect sizes: M = male, F = female, C = combined in original study.

^a Study sample sizes indicated were deleted from the calculation of the total N due to overlap.

^b Overall weighted average from random effects model.

Discussion

This study provides strong evidence that SMY experience significantly higher levels of suicidality and depression symptoms than heterosexual youth. The robust pattern of results, particularly regarding suicidality, highlights the severity and pervasiveness of disparities between SMY and heterosexual youth. For example, on average 28% of SMY reported a history of suicidality as compared with 12% of heterosexual youth. Second, 104 of the 105 individual ORs for the association between sexual orientation and suicidality were greater than 1.00, and over 25% of them were larger than 4.00. Third, the disparities increased in size as the severity of the suicidality increased. Finally, studies showed that even after controlling for important explanatory variables, SMY were still almost three times as likely to report a history of suicidality as heterosexual youth.

These results are consistent with the growing number of studies showing that SMY are at risk for developing psychosocial health problems. For example, meta-analysis results have shown that sexual minority adults [9] and youth [22] report higher rates of substance use and abuse than heterosexuals. Recent results show that as compared with heterosexual youth, SMY report higher rates of sex under the influence of alcohol or drugs [43]. Furthermore, evidence suggests that SMY, and sexual minority boys in particular, were more likely to have a history of eating disorders than were heterosexual youth [44], a diagnosis associated with significant mood comorbidity and mortality. Finally, recent meta-analysis results showed that as compared with heterosexual youth, SMY report higher rates of violence and victimization [45].

Bisexuality was a significant moderator in this study. SMY who were bisexual reported being almost five times more likely to report suicidality as compared with heterosexual youth. SMY who were not bisexual reported being almost two times more likely to endorse suicidality as compared with heterosexual youth. These results are consistent with previous reviews showing that bisexual youth are at greater risk for substance use [22], and suggest that bisexuality status among SMY may be a particularly stressful phase of sexual identity development. The remainder of the moderation results showed that gender, recruitment source, and operationalization of sexual orientation did not significantly affect the association between sexual orientation and adolescent depression or suicidality. Given that several of these constructs were associated with substance use disparities [22] or victimization disparities among SMY [45], and that there are notable trends in the previously published data regarding the rates of suicidality across gender, these null results were unexpected. One potential explanation, especially for the depression analysis, is reduced power [40] because of a relatively small number of studies.

Another striking trend in our results was that as the severity of the suicidal behavior increased, the disparity between SMY and heterosexual youth increased. Reasons for this trend remain unclear; however, high rates of violence and victimization among SMY [45] might give rise to higher levels of hopelessness, increasing the likelihood of an attempt to suicide. High rates of substance use [22] may also increase the likelihood of suicide attempts. This trend suggests that clinicians and caregivers should pay close attention to the early signs of suicidality among SMY and intervene early to prevent more serious suicidal behaviors from developing.

There are several important limitations of the literature. First, none of the studies examined individual trajectories of depression or suicidality into young adulthood. Two recent longitudinal studies found that sexual orientation in adolescence predicted suicidality in young adulthood [46,47]. Future studies are needed that can examine individual trajectories of mental health problems over time, to confirm that for high-risk adolescents, problems may persist and even grow more severe as they transition into young adulthood. For example, individual trajectory modeling has been used to describe change in substance use among SMY as they transition into young adulthood [48–51].

Second, five studies reported components of the “causal steps” approach to testing mediation [52], by estimating the association between sexual orientation and suicidality before and after controlling for potential confounders or mediators [14,18,27,31,33]. However, only one study [37] tested a complete mediation model using a product of coefficients test [53], providing the strongest evidence to date that victimization significantly mediated the association between sexual orientation and depression. Future studies that can provide similar evidence for mediators will help inform theory and identify targets for prevention and intervention programs.

Third, only three studies examined moderators of these disparities between SMY and heterosexual youth [11,26,35]. Bon-tempo and D’Augelli [11] reported that rates of suicidal ideation were higher among SMY who reported a history of victimization. These results suggest that victimization experiences play a key role in the mental health problems of SMY. Future studies that identify demographic and substantive moderators of this disparity will help researchers tailor their prevention and intervention programs to these high-risk subgroups.

Clinical implications for adolescent mental health services

The biggest challenge facing mental health service professionals is identifying adolescents most at-risk for suicidal events. Results from this meta-analysis provide strong evidence that SMY are at a substantially heightened risk for suicide and depression. Mental health service professionals who assess and treat adolescents may wish to pay particular attention to patients who identify as lesbian or gay or who endorse same-sex attraction, as these youths may face unique or severe negative circumstances that exacerbate depression. SMY presenting with depression should be screened carefully for past and current suicidal thoughts and attempts, and risk factors for suicidal behavior such as substance use and abuse. A detailed plan for maintaining safety should be established even in the absence of current suicidality, in the effort to decrease impulsive self-harm. Finally, clinicians should be prepared to promote healthier outcomes among SMY by advocating and promoting no tolerance policies in schools to help prevent bullying and peer victimization, protective factors such as positive relationships with family and connection with friends [54,55], and resources in schools for youth including gay-straight alliance organizations and on-site mental health providers.

Depression in SMY should be treated aggressively with empirically supported interventions to decrease the likelihood of suicidal behaviors. Current treatment guidelines include the combination of selective serotonin reuptake inhibitors and empirically supported psychotherapies, such as cognitive behavior therapy or interpersonal psychotherapy for depressed adolescents; however, extant treatment studies for youth depression

have not provided information regarding the efficacy of psychotherapies or selective serotonin reuptake inhibitors in SMY. Future treatment studies for youth depression should also collect information on sexual orientation so as to provide more specific outcome data in SMY, to tailor empirically supported interventions to the unique needs of SMY and their families.

In summary, our results showed that SMY are at increased risk for suicidality and depression, and that these disparities are strong and pervasive, remaining significant in multiple subpopulations after taking into account other risk and protective factors. The identification of significant moderator variables in our results can help the design of future studies that can identify explanatory mechanisms of moderators such as bisexuality status. Future studies should also focus on articulating and testing longitudinal and mediated pathways of risk among SMY so as to identify key mechanisms that can be targeted by prevention and intervention programs. Finally, clinicians are encouraged to promote a safe and confidential environment for SMY to discuss their orientation with their healthcare providers, and assess depression and suicidality adequately to provide appropriate care for youth in need [56].

References

- Bridge JA, Goldstein TR, Brent DA. Adolescent suicide and suicidal behavior. *J Child Psychol Psychiatry* 2006;47:372–94.
- Eaton D, Kahn L, Kinchen SA, et al. Youth risk behavior surveillance—United States, 2005. *MMWR Surveill Summ* 2006;55:1–108.
- Lewinsohn PM, Rhode P, Seeley JR. Adolescent suicidal ideation and attempts: Prevalence, risk factors, and clinical implications. *Clin Psychol Sci Practice* 1996;3:25–46.
- Mortality Query, CDC Wonder, Data, and Statistics, 2006 [Online]. Available at: <http://wonder.cdc.gov/mortSQL.html>. Accessed July 12 2010.
- Bridge JA, Greenhouse JB, Weldon AH, Campo JV, Kelleher KJ. Suicide trends among youths aged 10 to 19 years in the United States, 1996–2005. *JAMA* 2008;300:1025–6.
- Brent DA, Birmaher B. Adolescent depression. *N Engl J Med* 2002;347:667–71.
- Brent DA. Depression and suicide in children and adolescents. *Pediatr Rev* 1993;14:380–8.
- Goldstein TR, Brent DA. Youth suicide. In: Dulcan MK, ed. *Dulcan's Textbook of Child and Adolescent Psychiatry*. Washington, DC: American Psychiatric Publishing, 2009:531–42.
- King M, Semlyen J, Tai SS, et al. A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry* 2008;8:70.
- Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychol Bull* 2003;129:674–97.
- Bontempo DE, D'Augelli AR. Effects of at-school victimization and sexual orientation on lesbian, gay, or bisexual youths' health risk behavior. *J Adolesc Health* 2002;30:364–474.
- Garofalo R, Wolf RC, Kessel S, Palfrey SJ, DuRant RH. The association between health risk behaviors and sexual orientation among a school-based sample of adolescents. *Pediatrics* 1998;101:895–902.
- Remafedi G, French S, Story M, Resnick MD, Blum R. The relationship between suicide risk and sexual orientation: Results of a population-based study. *Am J Public Health* 1998;88:57–60.
- Russell ST, Joyner K. Adolescent sexual orientation and suicide risk: Evidence from a national study. *Am J Public Health* 2001;91:1276–81.
- Rivers I, D'Augelli AR. The victimization of lesbian, gay, and bisexual youths: Implications for intervention. In: D'Augelli AR, Patterson CJ, eds. *Lesbian, Gay, and Bisexual Identities and Youths: Psychological Perspectives*. New York, NY: Oxford University Press, 2001:199–223.
- Caldwell LL, Kivel BD, Smith EA, Hayes D. The leisure context of adolescents who are lesbian, gay male, bisexual and questioning their sexual identities: An exploratory study. *J Les Res* 1998;30:341–55.
- Garofalo R, Wolf C, Wissow LS, Woods ER, Goodman E. Sexual orientation and risk of suicide attempts among a representative sample of youth. *Arch Pediatr Adolesc Med* 1999;153:487–93.
- Olshen E, McVeigh KH, Winsch-Hitzig RA, et al. Dating violence, sexual assault, and suicide attempts among urban teenagers. *Arch Pediatr Adolesc Med* 2007;161:539–45.
- Udry J, Chantala K. Risk assessment of adolescents with same-sex relationships. *J Adolesc Health* 2002;31:84–92.
- Faulkner AH, Cranston K. Correlates of same-sex sexual behavior in a random sample of Massachusetts high school students. *Am J Public Health* 1998;88:262–6.
- Safren SA, Heimberg RG. Depression, hopelessness, suicidality, and related factors in sexual minority and heterosexual adolescents. *J Consult Clin Psych* 1999;67:859–66.
- Marshal MP, Friedman MS, Stall R, et al. Sexual orientation and adolescent substance use: A meta-analysis and methodological review. *Addiction* 2008;103:546–56.
- Stroup DF, Berlin JA, Morton SC, et al; Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. Meta-analysis of observational studies in epidemiology: A proposal for reporting. *JAMA* 2000;283:2008–12.
- Smith A, Steward D, Peled M, et al. A picture of health: Highlights from the 2008 BC Adolescent Health Survey. Vancouver, BC: McCreary Centre Society, 2009.
- Barney DD. Health risk-factors for gay American Indian and Alaska Native adolescent males. *J Homosex* 2004;46:137–57.
- Consolacion TB, Russell ST, Sue S. Sex, race/ethnicity, and romantic attractions: Multiple minority status adolescents and mental health. *Cultur Divers Ethnic Minor Psychol* 2004;10:200–14.
- Eisenberg ME, Resnick MD. Suicidality among gay, lesbian and bisexual youth: The role of protective factors. *J Adolesc Health* 2006;39:662–8.
- Goodenow C, Szalacha L, Westheimer K. School support groups, other school factors, and the safety of sexual minority adolescents. *Psychol Sch* 2006;43:573–89.
- Lampinen TM, McGhee D, Martin I. Increased risk of "club" drug use among gay and bisexual high school students in British Columbia. *J Adolesc Health* 2006;38:458–61.
- Noell JW, Ochs LM. Relationship of sexual orientation to substance use, suicidal ideation, suicide attempts, and other factors in a population of homes adolescents. *J Adolesc Health* 2001;29:31–6.
- Pinhey TK, Millman SR. Asian/Pacific Islander adolescent sexual orientation and suicide risk in Guam. *Am J Public Health* 2004;94:1204–6.
- Reis E, Saewyc E. 83,000 youth: Select findings of eight population-based studies as they pertain to anti-gay harassment and the safety and well-being of sexual minority students. Seattle, WA: Safe Schools Coalition of Washington, 1999.
- Robin L, Brener ND, Donahue SF, et al. Associations between health risk behaviors and opposite-, same-, and both-sex sexual partners in representative samples of Vermont and Massachusetts high school students. *Arch Pediatr Adolesc Med* 2002;156:349–55.
- Cochran BN, Steward AJ, Ginzler JA, Cauce AM. Challenges faced by homeless sexual minorities: Comparison of gay, lesbian, bisexual, and transgender homeless adolescents with their heterosexual counterparts. *Am J Public Health* 2002;92:773–7.
- Gallagher RV, Rostosky SS, Hughes HK. School belonging, self-esteem, and depressive symptoms in adolescents: An examination of sex, sexual attraction status, and urbanicity. *J Youth Adolesc* 2004;33:235–45.
- van Griensven F, Kilmarx PH, Jeeyapat S, et al. The prevalence of bisexual and homosexual orientation and related health risks among adolescents in northern Thailand. *Arch Sex Behav* 2004;33:137–47.
- Williams T, Connolly J, Pepler D, Craig W. Peer victimization, social support, and psychosocial adjustment of sexual minority adolescents. *J Youth Adolesc* 2005;34:471–82.
- Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385–401.
- Beck AT, Ward CH, Mendelson M, et al. An inventory for measuring depression. *Arch Gen Psychiatry* 1961;4:561–71.
- Borenstein M, Hedges L, Higgins J, Rothstein H. *Introduction to meta-analysis*. Chichester, UK: Wiley, 2009.
- Borenstein M, Hedges L, Higgins J, Rothstein H. *Comprehensive meta-analysis, version 2*. Englewood, NJ: Biostat, 2005.
- Cohen J. *Statistical Power for the Behavioral Sciences*, 2nd edition. Hillsdale, NJ: Erlbaum, 1988.
- Herrick A, Marshal MP, Smith H, Stall R. Sex while Intoxicated: A Meta-analysis Comparing Heterosexual and SMY. *J Adolesc Health* 2011;48:306–9.
- Austin SB, Ziyadeh NJ, Corliss HL, et al. Sexual orientation disparities in purging and binge eating from early to late adolescence. *J Adolesc Health* 2009;45:238–45.
- Friedman MS, Marshal MP, Guadamuz TE, et al. A meta-analysis to examine disparities in childhood sexual abuse, parental physical abuse, and peer victimization among sexual minority and sexual nonminority individuals. *Am J Public Health* (in press).
- Russell ST, Toomey RB. Men's sexual orientation and suicide: Evidence for adolescent specific risk. *Soc Sci Med* (in press).

- [47] Wichstrom L, Hegna K. Sexual orientation and suicide attempt: A longitudinal study of the general Norwegian adolescent population. *J Abnorm Psychol* 2003;112:114–51.
- [48] Corliss HL, Rosario M, Wypij D, Fisher LB, Austin SB. Sexual orientation disparities in longitudinal alcohol use patterns among adolescents: Findings from the growing up today study. *Arch Pediatr Adolesc Med* 2008;162:1071–8.
- [49] Hatzenbuehler ML, Corbin WR, Fromme K. Trajectories and determinants of alcohol use among LGB young adults and their heterosexual peers: Results from a prospective study. *Dev Psychol* 2008;44:81–90.
- [50] Marshal MP, Friedman MS, Stall R, Thompson AL. Individual trajectories of substance use in lesbian, gay, and bisexual youth and heterosexual youth. *Addiction* 2009;104:974–81.
- [51] Talley AE, Sher JK, Littlefield AK. Sexual orientation and substance use trajectories in emerging adulthood. *Addiction* 2010;105:1235–45.
- [52] Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J Pers Soc Psychol* 1986;51:1173–82.
- [53] MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. Comparison of methods to test the significance of the mediated effect. *Psychol Methods* 2002;7:83–104.
- [54] Borowsky IW, Ireland M, Resnick MD. Adolescent suicide attempts: Risks and protectors. *Pediatrics* 2001;107:485–93.
- [55] Resnick MD, Bearman PS, Blum, et al. Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. *JAMA* 1997;278:823–32.
- [56] Coker TR, Austin SB, Schuster MA. The health and health care of lesbian, gay and bisexual adolescents. *Annu Rev Public Health* 2010;31:457–77.