

**Title:**

Sexual minority youth and depressive symptoms or depressive disorder: A systematic review and meta-analysis of population-based studies

**Running title:**

Sexual minority youth and depression

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## Abstract

**Objective:** Research has suggested that sexual minority young people are more likely to have depressive symptoms or depressive disorder, but to date most studies in the field have relied on convenience-based samples. This study overcomes this limitation by systematically reviewing the literature from population-based studies and conducting a meta-analysis to identify whether depressive disorder and depressive symptoms are elevated in sexual minority youth.

**Method:** A systematic review and meta-analysis were conducted and informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to determine if rates of depressive symptoms or depressive disorder differ for sexual minority youth, relative to heterosexual adolescents. MEDLINE, PsycINFO, EMBASE and ERIC databases were searched. Studies reporting depressive symptom data or the prevalence of depressive disorder in population-based samples of adolescents, that included sexual minority youth and heterosexual young people, were included in the review. A meta-analysis was conducted to examine differences between groups.

**Results:** Twenty-three articles met the inclusion criteria. The proportion of sexual minority youth in the studies ranged from 2.3% to 12%. Sexual minority youth reported higher rates of depressive symptoms and depressive disorder (odds ratio =

2.94,  $p < 0.001$  and standardized mean difference,  $d = 0.39$ ,  $p < 0.001$ ) in comparison to heterosexual young people. Female sexual minority youth were more likely to report depressive symptoms when compared to male sexual minority youth (standardized mean difference,  $d = 0.34$ ,  $p < 0.001$ ). Limitations included variations in how sexuality was operationalized and how depressive symptoms or depressive disorder was measured.

**Conclusions:** There is robust evidence that rates of depressive disorder and depressive symptoms are elevated in sexual minority youth in comparison to heterosexual young people. Despite the elevated risk of depressive symptoms or depressive disorder for sexual minority youth, the treatment for this group of young people has received little attention.

**Keywords:** depression; lesbian; gay; bisexual; systematic review; meta-analysis.

## Introduction

Depressive symptoms are common amongst young people and depressive disorder is a major risk factor for youth suicide (Malhi et al., 2015; Thapar, Collishaw,

Pine, & Thapar, 2012). Depressive disorder is also costly at a societal (Murray & Lopez, 2013) and at an individual level (Brière, Janosz, Fallu, & Morizot, 2015; Fergusson & Woodward, 2002). As a group of young people, sexual minority youth (i.e. lesbian, gay, and bisexual individuals, those that are not exclusively heterosexual, and people not sure of their sexual attractions) are thought to be at an increased risk of depressive symptoms (Marshall et al., 2011). It has been hypothesized that sexual minority youth are more likely to have depressive symptoms or depressive disorder because of the stress of being in a group that is in the minority and because of the stigma, discrimination, and victimization they experience as a result of homophobic cultures (Bariola, Lyons, & Leonard, 2016; Denny et al., 2016; Meyer, 2003). If this is so, then targeted treatment programmes that address mistreatment such as bullying, which has a sizeable impact on adolescent mental wellbeing (Ford, King, Priest, & Kavanagh, 2017), as well as focusing on depressive symptoms or depressive disorder in this group is warranted.

It is important to consider how sexuality is defined because this requires an appreciation of certain developmental factors. For instance, adolescents in high-income countries mostly report not having had sexual intercourse (Clark et al., 2013), so that using sexual behaviour as the primary means of determining adolescent sexuality is limited. Sexual identity labels, such as lesbian, gay, bisexual and

straight/heterosexual are frequently used by adolescents (Russell, Clarke, & Clary, 2009), yet many young people who are not exclusively heterosexual do not identify as lesbian, gay or bisexual (Mikulsky, 2005; Russell et al., 2009). Various reasons could account for this. For example, many of those who will eventually describe themselves as lesbian, gay or bisexual may not yet have ‘come out’ to themselves or others (Savin-Williams, 2001) and some may instead prefer terms like ‘queer’ or ‘questioning’ (Russell et al., 2009). Complexities linked to the challenges associated with defining sexuality may be one of the reasons why terminology like ‘sexual minority people’ or ‘sexual minority youth’ appears to have become fairly commonplace in the peer-reviewed literature.

Most research in the area of sexual minority youth and mental ill-health has relied on non-random samples of adolescents (Lucassen et al., 2011; Safren & Heimberg, 1999). As a result, the true proportion of sexual minority youth in the overall adolescent population and the risk of depressive disorder and depressive symptoms in sexual minority youth has been unclear. Non-random samples drawn from lesbian, gay and bisexual (LGB) community events, online sources, and help-seeking organizations (e.g. counselling services) are useful, in that the surveys used can be designed specifically with sexual minority individuals in mind (e.g. they can more easily include detailed questions focused on homophobia and biphobia).

Moreover, recruiting in this way is also an effective way of increasing a study's sexual minority sample size (Morris, McLaren, McLachlan, & Jenkins, 2015; Swannell, Martin, & Page, 2016). But utilizing convenience-based samples (which typically lack a heterosexual comparison) presents major difficulties in establishing whether sexual minority individuals experience elevated rates of depressive symptoms and depressive disorder in comparison to their heterosexual peers (Cochran & Mays, 2006). For instance, participants recruited from LGB community events and networks have been found to be disproportionately drawn from specific demographic groups (e.g. white and male) (Cochran & Mays, 2006; Goldbach, Tanner-Smith, Bagwell, & Dunlap, 2014), and are thought to have different psychological profiles than sexual minority individuals not involved in the LGB community (Meyer & Wilson, 2009).

Furthermore, in systematic reviews that combine convenience- and population-based samples, the proportion of sexual minority youth in the overall population cannot be determined, and when these estimates are presented they are understandably wide-ranging (i.e. 6% to 100% of a study's cohort) (e.g. Goldbach et al., 2014; King et al., 2008; Marshal et al., 2011; Plöderl & Tremblay, 2015). A previous systematic review reporting a greater risk of depressive symptoms or depressive disorder and suicide in sexual minority young people included both population-based studies and convenience-based samples of sexual minority and heterosexual youth (with a sample

mean age of  $\leq 18$  years) (Marshall et al., 2011). In our systematic review and meta-analysis, we have focused only on population-based studies of adolescents (defined below).

## **Methods**

We have conducted a systematic review informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009). We used the Joanna Briggs Institute Prevalence Critical Appraisal Tool (Munn, Moola, Riitano, & Lisy, 2014) to determine the quality of the studies and we have carried out a meta-analysis of results.

*Inclusion criteria:* Publications were included if they:

- Were population-based studies on depression (including depressive symptoms, depressive disorder or dysthymia) in which the size of the population could be determined and was deemed representative of a wider population in which there was no inherent selection bias towards including or excluding sexual minority young people, or sub-groups of these young people (e.g. school cohorts, birth cohorts, and area cohorts);
- Included prevalence statistics, symptom scores, or data comparing sexual minority individuals and heterosexuals on depressive symptoms or depressive disorder;

- Were studies conducted with sexual minority and heterosexual adolescents (and in which sexuality was a variable); and,
- Were published in the English-language.

*Exclusion criteria:* Publications were excluded if they:

- Utilized convenience or clinic/clinical-based sampling methods;
- Were studies where adolescent data were not presented separately from adult data (or only adult data were provided);
- Were opinion pieces or commentaries;
- Were treatment studies (including case studies); or,
- Were theoretical pieces (i.e. the publication did not contain original data).

When there were multiple publications from the same dataset each study was subjected to the inclusion and exclusion criteria, after which five studies remained (from a total of 26 studies). Of the five studies, three were from the National Longitudinal Study of Adolescent Health project (Add Health), and two from the Youth'2000 project. In order to not over-represent these datasets (Liberati et al., 2009), the relevant data from the study was extracted across the available papers and presented as one study in this review (i.e. Williams & Chapman, 2011).

*Search strategy:* We searched the following databases: PsycINFO (1806 to

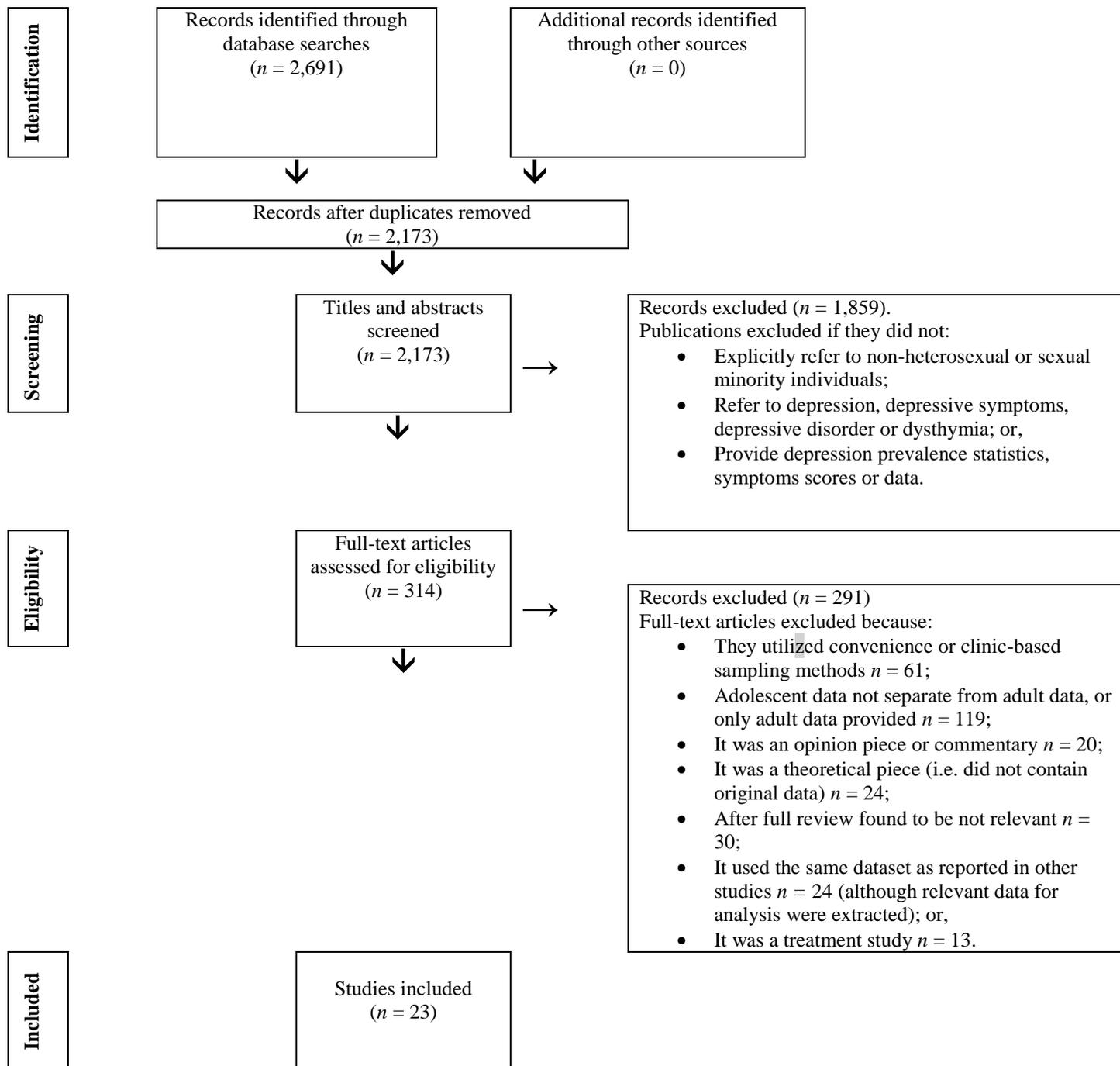
October 2015), Medline (1946 to October 2015), ERIC (1965 to October 2015), and EMBASE (1980 to October 2015). Relevant subject headings and key search terms with the appropriate truncation (i.e. \$) were used, specifically: “homosexual\$” or “Homosexuality” or “Sexual Orientation” or “Sexual Behavior” or “Lesbianism” or “Homosexuality, Female” or “Bisexuality” or “Male Homosexuality” or “Homosexuality, Male” or “Homosexuality (Attitudes Toward)” or “Gay” or “same sex attract\$” or “queer” AND “depress\$” or “Major Depression” or “Depressive Disorder” or “Depressive Disorder, Major” or “Depression” or “Depression (Emotion)” or “major depressive disorder\$” or “Dysthymia” or “Dysthymic Disorder”.

*Study selection:* The initial search revealed a total of 2,691 articles. Of these, 518 studies were discarded as duplicates. The titles and abstracts of the remaining 2,173 studies were examined by ML, and 1859 were excluded because they did not meet the criteria (see Figure 1). A researcher and RS randomly selected and reviewed 109 papers identified by the search strategies (i.e. 5% of the papers) and independently concluded that 94% (n=103) of the abstracts were suitable, but queried the exclusion of six abstracts. These were reviewed by another researcher who agreed with ML’s decisions for five out of the six abstracts. The sixth was excluded. The full text of the remaining 314 citations were examined in more detail and it was determined that 291

did not meet the inclusion/exclusion criteria. No new articles were found by searching the reference lists of the articles included in the review. Data extraction was carried out by ML and checked by RS.

*Meta-analysis methods:* The overall effects for depressive symptoms and depressive disorder results were estimated in the studies that provided the relevant data (of note, studies 2, 7, 15 and 19 were excluded as the required data was not reported). This was done by combining weighted effects across all studies. Due to methodological diversity in the studies (i.e. variations in how sexuality and depressive symptoms or depressive disorder were assessed), statistical heterogeneity was anticipated, and therefore a random effects model was employed. The extent of heterogeneity in the results across studies was summarized as the  $I^2$  statistic. Different scales were used across the studies to report depressive symptoms; therefore these are summarized in the meta-analysis using standardized mean differences (Cohen's  $d$ ). Sub-group analyses were conducted to compare: male sexual minority with female sexual minority youth; and, lesbian, gay and bisexual (LGB) youth with young people questioning their sexuality, as there were more than three studies available which allowed for these comparisons to be made. The meta-analysis was undertaken using RevMan5.

**Figure 1. PRISMA flow diagram depicting the flow of information through the stages of the systematic review.**



## Results

Twenty-three studies met the inclusion criteria (see Table 1).

*Date and location of studies:* All 23 studies have been published since 1999 and almost half of the papers were published after 2010. The studies were from eight countries, with 14 studies from the United States, and two studies each from both the United Kingdom and New Zealand. The remaining studies were from Europe, Asia and North America.

*Study design and sizes:* The reviewed studies were predominantly cross-sectional and carried out in school settings; however, six studies were longitudinal, with three of these being studies of cohorts recruited from birth. Most of the studies were large with over 1,000 participants (Tables 1 & 2), with the largest study having 31,852 participants. The smallest studies consisted of two papers with matched samples of sexual minority youth and heterosexual young people (n=106 and n=194). In total, the studies in the review included 165,380 individuals, of which an estimated 14,352 were sexual minority youth.

**Table 1: Summary of included studies (ordered by year of publication)**

Study	Sample	Year & sample size	Sexuality measure	Sexuality groupings	Depression assessment	Comparison of SMY & heterosexuals depressive symptoms or depressive disorder		Significantly different?
1. Lucassen et al. (2015) [Youth'2000]	Cross-sectional study (x 3 survey waves) of secondary school students nationwide in New Zealand	2001 n=9011 2007 n=8002 2012 n=8167	Sexual attraction	Same/both-sex & 'not sure' (6%) vs. Opposite Sex Attracted (heterosexual)	Standardized assessment	2012 SMY females 38.6% & SMY males 24.2%	2012 heterosexual females 14.8% & heterosexual males 7.3%	n.r.  Yes**
2. Mustanski et al. (2014)	Cross-sectional study (x 2 survey waves) of secondary school students 11 USA jurisdictions	2005 & 2007 N=16,977 males	Sexual behavior	Sex with female (MSW), male (MSM, 4%), or male & female (MSMW, 3.2%)	Single item question†	MSMW 44.2% & MSM 34.7%	MSW 20.7%	n.r.  Yes**
3. Pesola et al. (2014)	Longitudinal birth cohort study (1991 & 92→onwards) Avon UK	Longitudinal (15 to 18 year old participants) N=3,710	Sexual identity	Heterosexual vs. SMY (12%)	Standardized assessment	SMY mean depression score 7.9 (age 16 years)	Heterosexual mean depression score 5.3 (age 16 years)	Yes**
4. Seil et al. (2014)	Cross-sectional study of secondary school students New York, USA	2009 N=8,910	Sexual identity	Heterosexual vs. LGBQ (10.8%)	Single item question†	LGBQ sad/depressed 48.5%	Heterosexuals sad/depressed 26%	Yes**
5. Marshal et al. (2012)	Longitudinal study of 5-8 to 13-16 year old females in Pittsburgh, USA	Longitudinal (17 year old participants) N=527 females	Sexual attraction or sexual identity	Heterosexual vs. SMY (6%)	Standardized assessment	Female SMY mean depression score 11.4	Heterosexual females mean depression score 7.5	Yes**

6. Martin-Storey & Crosnoe (2012)	Longitudinal birth cohort study (1991 → onwards) 10 locations, USA	Longitudinal (15 year old participants) N=957	Sexual attraction	Romantic partners – females, males & females, or males (SMY 4.2%)	Standardized assessment	SMY mean depression score 3.3	Heterosexual mean depression score 1.9	Yes**
7. Shields et al. (2012)	Cross-sectional study of secondary school students in San Francisco, USA	2009 N=2,154	Sexual identity	Heterosexual vs. LGB (n.r.%)	Single item question†	LGB sad/depressed 49%	Heterosexuals sad/depressed 22%	n.r.
						[LGB vs. heterosexuals unadjusted OR=3.3 (ORs adjusted for gender, race & substance use)]		Yes**
8. Hatzenbuehler (2011)	Cross-sectional study (x 3 survey waves) of secondary school students in Oregon, USA	N=31,852 2006-2008	Sexual identity	Heterosexual vs. LGB (4.4%)	Single item question†	Lesbian or gay 35.9% & bisexual 40.4%	Heterosexual 17.1%	Yes**
9. Johnson et al. (2011)	Cross-sectional study of secondary school students in Boston, USA	2008 N=832 females	Sexual identity	Heterosexual vs. SMY (11.9%)	Standardized assessment	SMY females mean depression score 15.8	Heterosexual females mean depression score 14.2	Yes**
10. Williams & Chapman (2011) [Add Health]	Longitudinal study (Wave 1 sample – all participants Grades 7-12) Nation-wide USA	1995 N=18,924	Sexual attraction & sexual behavior	Heterosexuals vs. same sex relationship &/or sexual partner (7.5%)	Standardized assessment	SMY 19.8%	Heterosexuals 11.9%	Yes**
11. Jiang et al. (2010)	Cross-sectional study of secondary school students in Rhode Island, USA	2007 N=2,210	Sexual identity	Heterosexual vs. LGBQ (9.9%)	Single item question†	LGBQ sad/hopeless 50.3%	Heterosexuals sad/hopeless 20.8%	Yes**
12. Almeida et al. (2009)	Cross-sectional study of secondary school students in Boston, USA	2006 N=1,032	Sexual identity (& gender identity)	Heterosexual (non-LGBT) vs. LGB or Transgender/ LGBT (10%)	Standardized assessment	LGBT females mean depression score 15.4 & LGBT males mean depression score 13.6	Heterosexual females mean depression score 14.2 & heterosexual males mean depression score 11.9	Yes*

13. Birkett et al. (2009)	Cross-sectional study of secondary school students Midwestern USA	2005 N=6,667	'Confused about whether you are LGB?'	Heterosexual vs. sexually questioning (4.6%) & LGB (10.5%)	Single item question (& suicidality question) ‡	LGB mean depression/suicidality score 0.52 & 'questioning' mean depression score 1.06	Heterosexual mean depression/suicidality score 0.49	Questioning only**
14. Poteat et al. (2009)	Cross-sectional study of secondary school students Midwestern USA	n.r. N=14,439	'Confused about whether you are LGB?'	Heterosexual vs. sexually questioning (6.4%) & LGB (7.3%)	Single item question (& suicidality question) ‡	LGB white female mean depressed/suicidal score 0.96 (results by sex, sexuality & race)	Heterosexual white female mean depressed/suicidal score 0.72 (results by sex, sexuality & race)	White females only**
15. Bos et al. (2008)	Cross-sectional study of secondary school students in the Netherlands	2004 N=866	Sexual attraction	Without SSA vs. those with SSA (8.5%)	Standardized assessment	Overall mean score 1.40 (small but significant correlation between depression and sexuality)		Yes**
16. Espelage et al. (2008)	Cross-sectional study of secondary school students Midwestern USA	2005 N=13,921	'Confused about whether you are LGB?'	Heterosexual vs. questioning (6.7%) & LGB (7.7%)	Single item question (& suicidality question) ‡	LGB mean depression/suicidality score 0.77 & 'questioning' mean depression score 1.07	Heterosexual mean depression/suicidality score 0.63	Yes**
17. Hatzenbuehler et al. (2008)	Longitudinal study of secondary school students (Nov 05→ May 06) in Connecticut, USA	Longitudinal (11 to 14 year old participants) N=1,071	Sexual attraction	Heterosexual vs. SSA (2.3%)	Standardized assessment	SSA mean depression score 13.14 (at baseline)	Heterosexual mean depression score 9.57 (at baseline)	Yes**
18. Rivers & Noret (2008)	Cross-sectional study of secondary school students from the 'North of England' UK	2003 N=106	Sexual attraction (overall sample 2.7% SSA)	Matched sample 53 heterosexual vs. 53 SSA (from 2,002 students)	Standardized assessment	SSA mean depression score 1.29	Heterosexual mean depression score 0.60	Not significant
19. Bezinovic & Tkalcic (2005)	Cross-sectional study of secondary school students from 4 counties, Croatia	2003 N=6,392	Sexual attraction	Heterosexual vs. SSA 13.3% females & SSA 10% males	Standardized assessment	Overall mean score 26.7 (significant differences for depression when comparing SSA and heterosexual students)		Yes**
20. Williams et al. (2005)	Cross-sectional study of secondary school students from a South Central City, Canada	n.r. N=194	Sexual identity (overall sample 6% LGBQ)	Matched sample 97 heterosexual vs. 97 LGBQ (from 1,598 students)	Standardized assessment	LGB mean depression score 30.0 & 'questioning' mean depression score 27.7	Heterosexual mean depression score 24.8	Yes**

21. Lam et al. (2004)	Cross-sectional study of secondary school students in Hong Kong	2001 N=2,427	'Ever experienced homosexual tendencies?' (Yes=SSA)	No SSA vs. SSA (4.4% males & 11.8% females) & 'don't know' SSA	Standardized assessment	SSA mean depression score 2.61 & 'don't know' mean depression score 2.42	No SSA (heterosexual) mean depression score 2.30	Yes**
22. van Griensven et al. (2004)	Cross-sectional study of private vocational school students in Northern Thailand	1999 N=1,725	Sexual attraction & sexual behaviour	Heterosexual vs. homo- or bisexual/HB males 9.1% & HB females 11.2%	Single item question~	HB females mean depression score 3.2 & HB males mean 3.0	Heterosexual females mean depression score 3.1 & heterosexual males mean depression score 2.9	Males only*
23. Fergusson et al. (1999)	Longitudinal birth cohort study (1977 → onwards) Christchurch, New Zealand	Longitudinal (14 to 21 year old participants) N=1,007	Sexual identity & sexual behavior	Heterosexual vs. LGB 2.8%	DSM diagnosis of major depression	LGB major depression 71.4%	Heterosexuals major depression 38.2%	Yes**  Yes*

HB: Homosexual or bisexual. LGB: lesbian, gay, bisexual. LGBQ: LGB & questioning or 'not sure'. n.r.: information not reported. OR: odds ratio. RR: relative risk. SMY: sexual minority youth. SSA: Same sex attracted. † "...feel so sad or hopeless almost every day for 2 weeks or more in a row that you stopped doing some usual activities (past 12 months)" ‡ "...felt like killing yourself?" & "...been depressed or sad?" ~"How often do you feel...[energetic: down: bored: optimistic: lonely]"

\* p<0.05: \*\* p<0.01

*Measuring sexuality:* There were reliability issues in determining participants' sexuality, specifically there was no consistent method for determining sexuality for participants in the studies, and many measured more than one dimension of sexuality. Nine studies based their definitions on participants' sexual attractions (with three of these including another dimension of sexual orientation) and 10 primarily used sexual identity labels like heterosexual, lesbian, and gay (with two of these studies including another dimension of sexual orientation). Four used sexual behaviour to determine sexuality and four used a single-item question. Specifically, in three studies "Do you ever feel confused about whether you are lesbian, gay, or bisexual (LGB)?" and in one study "Have you ever experienced homosexual tendencies?" The proportion of sexual minority youth in the studies ranged from 2.3% to 12% (with this being 13.3% for same-sex attracted females in one study) and between 2.8% to 10.5% identifying as lesbian, gay or bisexual.

*Assessing depressive symptoms or depressive disorder* There were issues in terms of reliability, as there was no consistent method for establishing depressive symptomatology (Table 2) and only one study included a diagnostic interview (i.e. Fergusson et al., 1999). This study used a diagnosis of major depression based on the Diagnostic and Statistical Manual of Mental Disorders (DSM) with participants between the ages of 14 to 21 years old. Nine studies used a single item question while

13 studies used a standardized assessment or a shortened version of an assessment (for the adapted questionnaires, cut-offs for the clinical severity of depressive symptoms were not reported). The assessments included:

- The Child Depression Inventory/CDI (e.g. Hatzenbuehler et al., 2008), where possible scores range from 0-54, and with a mean cut-off of 14.5 for discriminative validity for detecting major depressive disorder (based on a systematic review and meta-analysis of diagnostic utility of various assessments) (Stockings et al., 2015). A shortened form of the CDI was also used in one study (e.g. Martin-Storey & Crosnoe, 2012).
- The Reynolds Adolescent Depression Scale – Short Form/RADS-SF (e.g. Lucassen, Clark, et al., 2015) where scores  $\geq 28$  were used as a cut-off for clinically significant depressive symptoms, because an analysis of earlier results from the Youth'2000 project showed that this cut-off best matched that of the full Reynolds Adolescent Depression Scale (Milfont et al., 2008).
- The Short Mood and Feelings Questionnaire (e.g. Pesola et al., 2014) where possible scores range from 0-26, and where scores  $\geq 12$  are indicative of clinically significant depressive symptoms (Angold et al., 1995).
- The Beck Depression Inventory/BDI (e.g. Williams et al., 2005) where possible scores range from 0-63, and where scores  $\geq 29$  are indicative of

severe depressive symptoms (Beck, Steer, & Brown, 1996).

- Adapted versions of: the Modified Depression Scale (e.g. Almeida et al., 2009; Johnson et al., 2011); the Center for Epidemiological Studies-Depression Scale/CES-D (e.g. Lam et al., 2004; Williams & Chapman, 2011); the Child Symptom Inventories (e.g. Marshal et al., 2012); the General Health Questionnaire (e.g. Bos et al., 2008); Brief Symptom Inventory (Rivers & Noret, 2008); and Depressiveness and Existential Crisis assessment (e.g. Bezinovic & Tkalcic, 2005).

*Quality of the evidence base:* Most studies were representative of the target population, had appropriate recruitment strategies, adequate sample sizes and measured depressive symptoms in at least 70% of the sample. Slightly over half of the papers provided detailed descriptions of their study, and used standardized, reliable and objective measures of depressive symptoms or depressive disorder. Twenty-one studies were probability samples, but only seven explicitly stated that their analyses were weighted. Fewer than half the studies examined within group differences in their sample (Table 2).

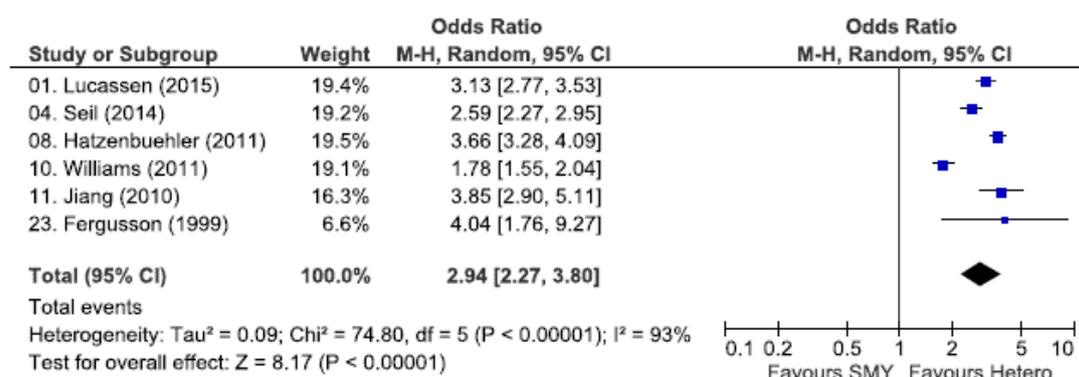
**Table 2: Assessment of the evidence using the Joanna Briggs Institute Prevalence Critical Appraisal Tool (Munn et al., 2014), systematic review of depression prevalence among sexual minority youth**

Item	Criteria	Yes [Study No.] <sup>^</sup>	No [Study No.] <sup>^</sup>	Unclear [Study No.] <sup>^</sup>	Comments
i.	Was the sample representative of the target population?	<b>21</b>		<b>2</b> [18&20]	We excluded all convenience-based samples, and in no studies were participants recruited on the basis of their sexuality. However two studies matched samples of SMY with heterosexual students (using participants from their overall sample).
ii.	Were study participants recruited in an appropriate way?	<b>23</b>			Probability samples of adolescents and SMY are challenging to obtain, 17 studies used school settings for sampling and six studies were longitudinal (three being birth cohort longitudinal studies).
iii.	Was the sample size adequate?	<b>21</b>	<b>2</b> [18&20]		Power calculations for SMY sample sizes were not described in the studies. We estimated studies needed 238 participants overall to establish a depression prevalence of 10% where 5% of the sample were SMY (providing 80% power).
iv.	Were the study subjects and the setting described in detail?	<b>13</b>	<b>10</b> [2,3,6,7,11,14,15, 19, 21 & 23]		To satisfy this criterion studies were required to report on the following: 1) age (or Grade Level), sex, and ethnicity (or race); and 2) setting (site/s where the study took place, e.g. high school/s).
v.	Was the data analysis conducted with sufficient coverage of the identified sample?	<b>18</b>	<b>1</b> [3]	<b>4</b> [2,15,16 & 19]	To satisfy this criterion more than 70% of those in the overall sample were required to complete the study's assessment of depressive symptoms.
vi.	Were objective, standard criteria used for the measurement of the condition?	<b>14</b>	<b>9</b> [2,4,7,8,11,13,14,16 & 22]		To satisfy this criterion a diagnostic assessment of a depressive disorder or standardized assessment of depressive symptoms was required.
vii.	Was the condition measured reliably?	<b>14</b>	<b>9</b> [2,4,7,8,11,13,14,16 & 22]		13 studies used a standardized assessment and one study [study 23] utilized diagnostic assessments.
viii.	Was there appropriate statistical analysis?	<b>7</b> [1,2,4,7,10,11,12]	<b>16</b>		All studies were probability samples so we required papers to explicitly state that they utilised weighted analyses (except 18 & 20 which were matched samples).
ix.	Are all important confounding factors/subgroups/differences identified and accounted for?	<b>11</b> [1,8,10, 12-14,16,& 19-22]	<b>12</b>		To meet this criterion studies were required to report depression by at least one SMY sub-group, such as: sexuality sub-group (e.g. bisexual participants compared to lesbian & gay participants); sex (e.g. SSA females compared to OSA females); or, ethnicity or race.
x.	Were subpopulations identified using objective criteria?	<b>23</b>			Sub-group membership (e.g. being a SMY) was identified based on self-report for all 23 studies, and these suffer from social desirability bias.

<sup>^</sup>: Study number as used in Table 1: OSA: Opposite sex attracted: SMY: Sexual minority youth. SSA: Same sex attracted.

*Depressive symptoms or depressive disorder:* In 22 out of the 23 studies sexual minority youth were significantly more likely to experience depressive symptoms or depressive disorder. In one study (Birkett et al., 2009) only those questioning their sexuality reported higher levels of depressive symptoms, but this study relied only on a single-item question to determine depressive symptoms. Poteat et al. (2009) found that only white LGB females reported higher levels of depressive symptoms and van Griensven et al. (2004) found that only sexual minority males were more likely to have depressive symptoms, however both studies assessed depressive symptoms using a single-item. One other study (Rivers & Noret, 2008) found no significant differences between sexual minority youth and heterosexual young people, however this was based on a small sample of 106 participants.

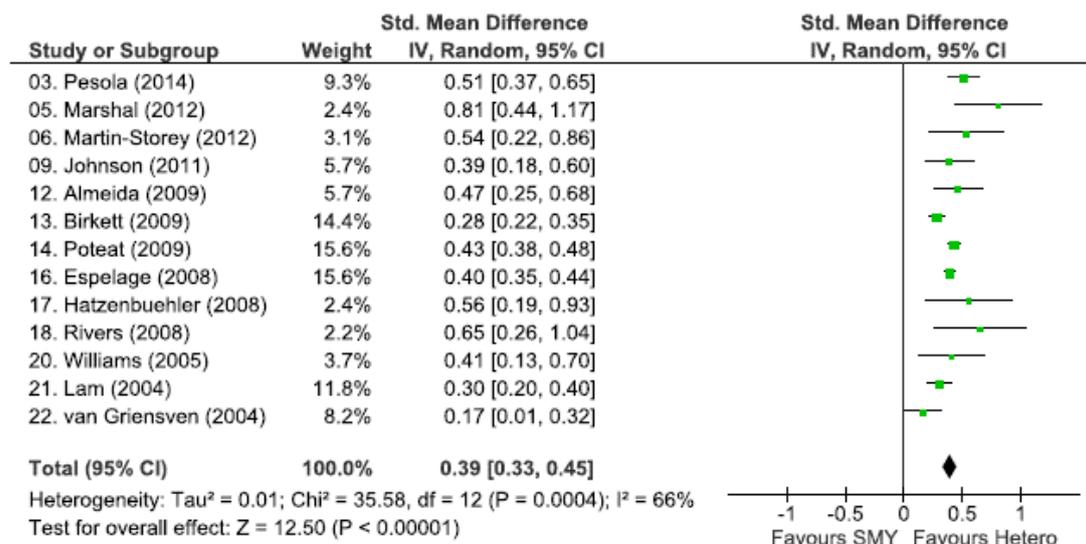
*Meta-analysis:* Where studies reported categorical data on depressive symptoms or depressive disorder for results comparing sexual minority youth with heterosexual young people, the estimate for the relationship was OR 2.94 (95% CI 2.27-3.80,  $p < 0.001$ ). The estimated study level ORs ranged from 1.78 to 4.04 (see Figure 2).



Hetero = Heterosexual: SMY = sexual minority youth

**Figure 2. Odds Ratios and 95% confidence intervals for studies testing the association between sexuality and depressive symptoms or depressive disorder.**

Where studies reported continuous data on depressive symptoms comparing sexual minority youth with heterosexual young people, the overall standardized mean difference was  $d = 0.39$  (95% CI 0.33-0.45,  $p < 0.001$ ), with a range of 0.17 to 0.81 across studies (see Figure 3).

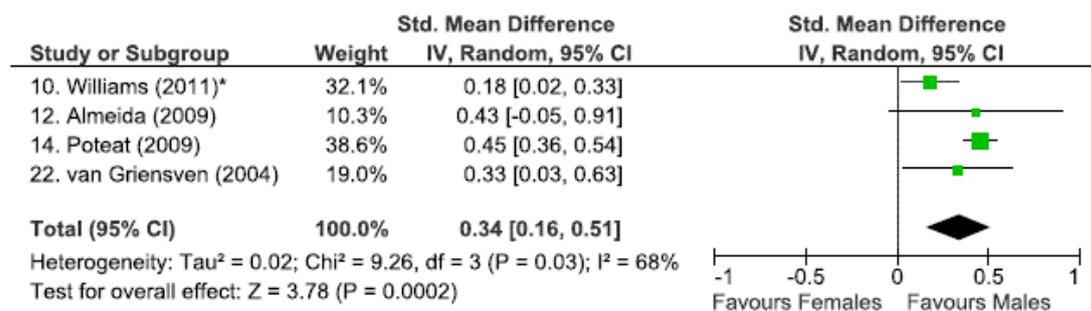


Hetero = Heterosexual; SMY = sexual minority youth

**Figure 3. Standardized mean difference and 95% confidence intervals for studies testing the association between sexuality and depressive symptoms**

Five studies provided data comparing LGB (i.e. lesbian, gay and bisexual young people or youth who were same-sex attracted) and questioning young people (i.e. youth questioning or unsure of their sexuality) and depressive symptoms. But the results for these comparisons did not reach statistical significance (standardized mean difference  $d = 0.21$ , 95% CI -0.04-0.46,  $p = 0.1$ , I<sup>2</sup> 94%).

Only four studies reported data that allowed for comparisons to be made between male sexual minority and female sexual minority youth. The results indicated that sexual minority males are less likely to report depressive symptoms, relative to female sexuality minority youth (standardized mean difference  $d = 0.34$ , 95% CI 0.16-0.51,  $p < 0.001$ , see Figure 4).



\* Add Health

**Figure 4. Standardized mean difference and 95% confidence intervals comparing male sexual minority and female sexual minority youth and depressive symptoms**

## Discussion

In this review and meta-analysis, we have shown that sexual minority young people have approximately three times the odds of depressive symptoms or a depressive disorder compared with their heterosexual peers, and increased depressive symptoms of moderate effect size. Female sexual minority youth appear to be at particular risk, based on the results from four studies.

*Strengths and limitations of the review:* We included only population studies and excluded research that included non-random and potentially biased samples. We were careful to include search strategies that were inclusive and relevant, particularly in terms of the definition of sexual minority young people. Our findings are limited by the quality of evidence in some of the studies. Nonetheless, we have appraised the quality of the studies, and have summarized these in Table 2. Heterogeneity was high for the meta-analysis of dichotomous results (i.e.  $I^2$  93%), yet the same direction of effect was evident across these studies, and the findings were further supported by the results from studies reporting continuous data. However, the results based on secondary school samples are likely to under-estimate depression for both the sexual minority youth and heterosexual young people, as evidence suggests that adolescents excluded from mainstream education are likely to come from disadvantaged backgrounds and have high mental health needs (Denny, Clark, Fleming, & Wall, 2004). Our focus has been on sexual minority youth and not on adolescents who are diverse in terms of their gender identity (e.g. transgender youth) or sex (i.e. intersex young people). This is because there are insufficient probability studies conducted with these adolescents at present.

*Comparisons to prior reviews:* Three prior reviews have also concluded that sexual minority individuals are more likely to report mental ill-health, two primarily

focused on adults (King et al., 2008; Plöderl & Tremblay, 2015), and the other on young people (Marshal et al., 2011). King and colleagues' (2008) review included four studies (out of 25) that were conducted with adolescents. The inconsistent methods of assessing depressive symptoms or depressive disorder were critiqued in this review, and only one of the youth studies met all four of their quality criteria (King et al., 2008). Plöderl & Tremblay (2015) focused on adults as well as adolescents for a range of issues including depressive symptoms or depressive disorder, suicidality, anxiety disorders, alcohol use, drug use, and other disorders. Based on their review of PubMed articles, they reported that in 97% of studies rates of depressive symptoms were elevated (Plöderl & Tremblay, 2015). Marshal et al. (2011) included 11 studies on depressive symptoms or depressive disorder in sexual minority youth in their analyses, but they included non-random samples, presumably because there were fewer population-based studies at the time. Our review not only reinforces previous findings but also strengthens the evidence on which they are based. Our analyses suggest that, similar to females compared to males in the overall population, female sexual minority youth are at greater risk of depressive symptoms when compared to male sexual minority youth. Our review has strengthened previous findings by comparing male and female sexual minority youth, including more recent studies, assessing the evidence more closely, and excluding convenience-based

studies. By excluding convenience-based studies, we have been able to report the proportion of sexual minority young people more confidently at between 2.3% and 12%. It should be noted that questions on sexuality, by virtue of being 'sensitive' are affected by social desirability bias. Moreover, recent work has also indicated that 'mischievous responders' could artificially inflate sexual minority numbers (e.g. there may be heterosexual adolescents who think it is humorous to report that they are LGB, transgender and/or physically disabled in questionnaires) (Robinson-Cimpian, 2014). Our estimate of the proportion of sexual minority youth is inclusive of adolescents who reported same-sex attractions, rather than the more limited constructs of sexual identity or same-sex sexual behaviour. Therefore, having up to 12% of adolescents reporting these attractions is not surprising, as a greater proportion of young people are likely to have these sexual attractions than those who identify as LGB, or report having had sex with a same-sex partner (Wichstrom & Hegna, 2003).

We believe that this review is timely as there has been a recent call to action recommending that there should be more research into the mental health of lesbian, gay, bisexual, transgender and intersex (LGBTI) people e.g. the recent position statement from the Royal Australian and New Zealand College of Psychiatrists highlighting the need to address the mental health needs of the LGBTI people (Royal Australian and New Zealand College of Psychiatrists, 2016). The findings from our

review support this position statement, but also highlight particular needs for young people in the overall LGBTI population, particularly female sexual minority youth.

Much is still unknown about the optimal treatment of depressive symptoms in adolescents (Malhi et al., 2015), hence it is time to consider in what ways young people overall can be treated, alongside gaining an understanding of how sexual minority young people can receive more targeted support and assistance, to ensure that their mental health is enhanced. Work in this area has begun, for instance where an existing intervention has been assessed with young people more generally, such as attachment-based family therapy (Devenish, Berk, & Lewis, 2016), which has been modified specifically with suicidal sexual minority youth in mind (Diamond et al., 2013). This approach has also been employed in the treatment of depressive symptoms using a form of computerised cognitive behavioural therapy, called SPARX (Merry et al., 2012), which has been adapted and evaluated amongst sexual minority youth with depressive symptoms (Lucassen, Hatcher, et al., 2015; Lucassen, Merry, Hatcher, & Frampton, 2015).

Future studies in this field would be improved by the inclusion of standardized symptom measures or diagnostic assessments that have established validity and reliability such as the CDI, BDI, CES-D and RADS (Stockings et al., 2015).

Moreover, we would recommend the use of sexual attractions to assess adolescent

sexuality. We consider this is an appropriate measure to use from a developmental perspective and is a view supported by others (Saewyc et al., 2004).

### **Conclusion**

Depressive symptoms and depressive disorder in adolescents are associated with considerable morbidity and tend to persist into adulthood (Thapar et al., 2012). Sexual minority youth make up a relatively small but important sub-group of the overall population making up 2.3%-12% of adolescents and there is now robust evidence to suggest that this group of young people are at elevated rate of depressive symptoms and depressive disorder (although there are ongoing reliability issues in terms of how sexuality is defined and depressive symptoms or depressive disorder are assessed in this area of research). Sexual minority youth face the double stigma of being in this marginalized group and having mental health problems. More needs to be done to enhance their mental health taking into account the challenges they are likely to face accessing appropriate help.

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