

[Meta-analysis: Risk Prevalence, Self-Harm and Suicide, LGBTQ+ Youth]

1 **A systematic review and meta-analysis of victimisation and**  
2 **mental health prevalence among LGBTQ+ young people**  
3 **with experiences of self-harm and suicide.**

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## 19 **Abstract**

20 **Background:** LGBTQ+ youth have higher rates of self-harm and suicide than cisgender, heterosexual  
21 peers. Less is known about prevalence of risks within these populations.

22 **Objectives:** The first systematic review and meta-analysis to investigate the prevalence of risks  
23 among young people throughout the LGBTQ+ umbrella with experiences across the dimension of  
24 self-harm, suicidal ideation and suicide behaviour; and how they may differ between LGBTQ+  
25 umbrella groups.

26 **Data sources:** MEDLINE, Scopus, EMBASE, PsycINFO, and Web of Science searches were run to  
27 identify quantitative research papers (database inception to 31<sup>st</sup> January, 2020).

28 **Study Eligibility Criteria:** Articles included were empirical quantitative studies, which examined risks  
29 associated with self-harm, suicidal ideation or suicidal behaviour in LGBTQ+ young people (12-25  
30 years).

31 **Synthesis Methods:** 2457 articles were identified for screening which was completed by two  
32 independent reviewers. 104 studies met inclusion criteria of which 40 had data which could be  
33 meta-analysed in a meaningful way. This analysis represents victimisation and mental health  
34 difficulties as risks among LGBTQ+ youth with self-harm and suicide experiences. Random-effects  
35 modelling was used for the main analyses with planned subgroup analyses.

36 **Results:** Victimisation and mental health were key risk factors across the dimension self-harm and  
37 suicide identified through all analyses. A pooled prevalence of 0.36 was indicated for victimisation  
38 and 0.39 for mental health difficulties within LGBTQ+ young people with experiences of self-harm or  
39 suicide. Odds ratios were calculated which demonstrated particularly high levels of victimisation  
40 (3.74) and mental health difficulties (2.67) when compared to cisgender, heterosexual counterparts  
41 who also had these experiences.

42 **Conclusions:** Victimization and mental health difficulties are highly prevalent among LGBTQ+ youth  
43 with experiences of self-harm and suicide. Due to inconsistency of reporting, further risk synthesis is  
44 limited. Given the global inclusion of studies, these results can be considered across countries and  
45 inform policy and suicide prevention initiatives.

46 **PROSPERO registration number:** CRD42019130037.

47

48 **Key words:** Self-harm, suicide, sexual orientation, gender identity, meta-analysis

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## 50 Introduction

51 Worldwide, suicide is one of the leading causes of death for young people (1), with adolescent  
52 suicide rates between 11.2-12.7 per 100,000 across low-, middle-, and high-income countries (2).  
53 Suicidal thoughts and attempt are thought to be around 3 times higher among sexual orientation  
54 minorities (Lesbian, gay, bisexual, questioning or queer, LGBQ) youth when compared to  
55 heterosexual, cisgender counterparts (3). A recent meta-analysis found suicidal ideation prevalence  
56 was demonstrated to be around 28% among gender identity minority groups (transgender and  
57 gender non-conforming, TGNC) and suicidal attempt prevalence was 14.8% (3). Self-harm (defined as  
58 self-injury or self-poisoning of self, irrespective of suicidal intent (5)) is known as the most influential  
59 risk factor for completed suicide among young people (6, 7). There is also strong evidence that  
60 demonstrates the high prevalence of self-harm among young people who identify as LGBTQ+  
61 (Lesbian, Gay, Bisexual, Transgender, Queer or Questioning, and others) (8). Within LGBQ youth self-  
62 harm was reported by 65% of the sample whilst around 46% of TGNC samples have also reported  
63 this type of behaviour (9, 10).

64 Among young people generally, regardless of sexual orientation or gender identity, risks associated  
65 with experiences of self-harm and suicide are numerous, ranging from childhood neglect to poor  
66 academic performance (11, 12). Given this, risk factors are often put into broad categories;  
67 demographic, psychosocial, mental health, or psychopathology etc. (13-15). Within a category such  
68 as demographic risks, the individual risk factor can also range widely e.g. age (16), race (17, 18) or  
69 education level (19). Additionally, certain populations may also experience risks which are only  
70 influential to that specific group of individuals. LGBTQ+ young people are often exposed to  
71 additional stressors which are specifically related to their sexual orientation and gender identity  
72 when compared to cisgender heterosexual peers, such as institutionalised prejudice, social pressure  
73 and victimisation (20-22). Among the LGBTQ+ umbrella there is also variation of how prevalent a risk  
74 may be to a subgroup. For example, someone who is outwardly gender nonconforming may receive

75 more harassments than a cisgender member of the LGBTQ+ umbrella. Therefore, it is possible that  
76 there is another layer of risks which TGNC young people face. Gender nonconformity, gender  
77 dysphoria, and frustrations due to the long waiting lists for gender affirming medical interventions  
78 are common among TGNC populations and have previously been shown to influence suicidal  
79 behaviour (23). Although we know that negative experiences such as institutional prejudice, social  
80 pressures, victimisation are associated with self-harm or suicide among those who identify as  
81 LGBTQ+ young people (20-22), less is known about how prevalent these experiences may be within  
82 this population. This systematic review seeks to comprehensively investigate the prevalence of all  
83 risks within LGBTQ+ young people who have a history of self-harm, suicidal ideation or attempt.  
84 Previous reviews in this population specifically focus on a category of self-harm and suicide; either  
85 non-suicidal self-injury or suicide excluding self-harm (25, 26). However, we aim to investigate  
86 outcomes across the dimension of self-harm, irrespective of intent, suicidal ideation and attempt to  
87 consider differences and similarities within risk prevalence by outcome among LGBTQ+ young  
88 people. This will allow us to explore risks across the dimensional structure of self-destructive  
89 thoughts and behaviours (27) and consider the comparison of risk across the continuum of suicidal  
90 intent. Furthermore, previous reviews have not looked at the prevalence of risk factors for self-harm  
91 and suicide across the full LGBTQ+ umbrella, therefore, losing comparability of risks within this  
92 broad population (28). In this study, we consider LGBTQ+ young people as a whole group, and then  
93 by sexual orientation minority and gender identity minority groups.

## 94 **Objectives:**

- 95 1. To investigate, for the first time, the prevalence of risks associated with the full dimension of  
96 self-harm, suicidal ideation or attempts in LGBTQ+ young people who have these experiences.
- 97 2. To investigate whether there is a difference in the prevalence of risks between young people  
98 who identify as a sexual orientation minority (LGBQ) alongside those who identify as a gender  
99 identity minority (TGNC).

100

## 101 **Methods**

### 102 **Protocol and registration**

103 This review was conducted and reported in accordance with PRISMA guidelines (SM1) (29). An a-  
104 priori protocol was registered on PROSPERO (CRD42019130037), and the full protocol was published  
105 in 2019 (30). As this is a systematic review and meta-analysis of published literature, ethical approval  
106 was not sought.

### 107 **Search strategy**

108 During March 2019, a literature search strategy was developed with an academic skills specialist at  
109 the University of Birmingham. An electronic search was conducted on the 31<sup>st</sup> of March 2019 using  
110 MEDLINE, Scopus, EMBASE, PsycINFO, and Web of Science. This was updated on the 31<sup>st</sup> of January  
111 2020. There was no date limit for identified articles, however only those in English language were  
112 considered. Search terms (and their derivatives) focused on the variables of interest; “self-harm”,  
113 “suic\*”, “adolescent\*”, “young person\*”, “sexual orientation”, “gender identity” and “risk\*”, see  
114 figure 1. The reference list of included articles and key papers within the field were examined for  
115 further relevant publications.

### 116 **Inclusion criteria**

**Search strategy terms:**

(self-harm OR self harm\* OR self-injur\* OR "self injur\*" OR self-cut\* OR self-destruct\* OR "self destruct\*" OR "nonsuicidal self-injur\*" OR "non-suicidal self injur\*" OR "deliberate self harm" OR "deliberate self-harm" OR DSH OR "self-mutil\*" OR overdos\* OR self-inflicted injur\* OR "self inflicted injur\*" OR suicid\* OR "parasuicid\*" OR para-suicid\* OR parasuicid\* OR suicidal behav\* OR suicide\* OR "life-threatening behavio\*" OR "suicide ideat\*" OR "suicide attempt\*" OR "attempted suicide\*" OR NSSI)

AND

(moderat\* OR mediat\* OR "risk facto\*" OR mechan\* OR predict\* OR pathway OR interact\* OR "protective facto\*" OR facto\* OR influence OR correlate\* OR precurs\* OR "causal facto\*")

AND

(transgender\* OR transsexual\* OR "gender nonconforming" OR "gender identity disorder" OR "gender dysphoria" OR "gender minority" OR lesbian\* OR gay\* OR bisexual\* OR "sexual minority" OR "same-sex" OR homosexual\* OR "homosexuality, male" OR "homosexuality, female" OR "gender identity" OR non-heterosexual\* OR "non heterosexual\*" OR homosexuality OR queer\* OR questioning OR "non-binary" OR "non binary" OR "LGBT\*" OR "sexual dissident\*" OR "sexual and gender minorities" OR "gender variant" OR gender-variant OR genderqueer OR intersex OR "minority groups" OR "TGNC" OR "transgender and gender nonconforming")

AND

(Child\* OR adolesc\* OR "young people" OR kid\* OR pupils OR youth OR juvenile OR "young adult\*" OR "young person" OR minor\*)

**Fig 1: Search Strategy Terms**

117 Articles included in this systematic review were empirical quantitative studies, which examined risks  
118 across the dimension of self-harm and suicide in LGBTQ+ young people (12-25 years). This age range  
119 covers the period of adolescence and early adulthood (31). An associated risk is operationalised as  
120 "an exposure that is statistically related in some way to an outcome" (32; p1), such as significant  
121 effect sizes, correlations, mediators, moderators, beta statistics, or any prevalence available relating  
122 to an outcome of self-harm or suicide. Mixed-method study designs were included if the quantitative  
123 aspects were relevant and extractable. Papers were included if they provided a self-reported or  
124 verified group who identified as a sexual orientation or gender identity minority, and any outcome of  
125 across the dimension of self-harm and suicide. Studies, whose population were not focused on any  
126 sexual orientation or gender identity minorities, were included if they presented information for  
127 LGBTQ+ participants separately or if authors were able to offer this information when contacted. Full  
128 inclusion criteria are described in Table 1.

129 **Table 1: Inclusion criteria used during screening process**

Inclusion Criteria	Exclusion criteria
- Peer reviewed studies.	- Non-peer reviewed literature.
- Any geographical location.	- Not English language.
- English language.	- Grey literature such as theses, dissertations
- Empirical quantitative studies, following cross-sectional, prospective, longitudinal, cohort and case-control designs.	or conference proceedings.
- Participants that have had a measured outcome from the dimension of self-harm and suicide; self-harm (self-harm or injury to self-irrespective of suicidal intent), suicidal ideation (thoughts, plan, death wish), or suicide attempt (individual took an attempt on their life, suicide death).	- Articles such as commentaries, reviews, editorial or opinion pieces.
- Studies must consider risks associated with or predictive of self-harm, suicidal ideation, suicidal attempt or death.	- Empirical qualitative studies.
- Participants must be young people (12-25 years).	- Participants who have no experience of self-harm, suicidal ideation or suicidal attempt.
- Participants that are identified or self-identified as any sexual or gender minority or member of LGBTQ+.	- Sample not aged between 12 and 25 years, e.g. adults 26 years and above or children 12 years and under.
	- Participants who are identified as heterosexual or not part of sexual or gender minority.

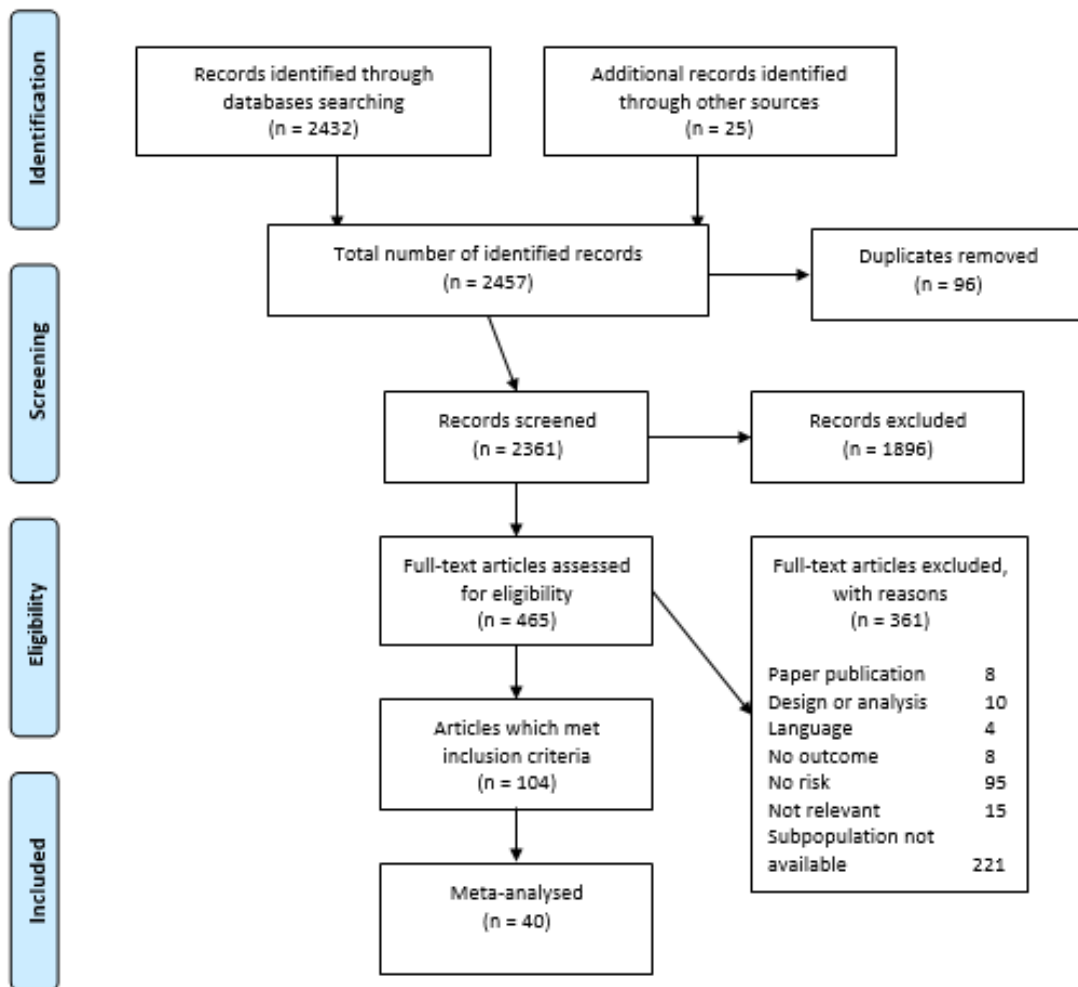
130 **Study selection**

131 The results of the systematic search are presented in Figure 2. Overall, the searches yielded 2457

132 results; 96 duplicates were removed. Studies were screened for eligibility at title, abstract and full-



133 text by two independent researchers (AJW and AL) following the PRISMA guidelines (29). Following  
 134 the removal of duplications, 2361 were title and abstract screened. If agreement regarding the  
 135 eligibility of an article could not be met through discussion, a third researcher (MM) was invited to  
 136 review. This process was repeated at full-text screening for 465 articles, which produced a very high  
 137 inter-rater reliability (Prevalence- And Bias-Adjusted Kappa, PABAK = 0.948) (33). This was used due  
 138 to PABAK being a more stable indicator of inter-rater reliability than Cohen’s Kappa (34).



139

140 Fig 2: PRISMA Flow Diagram

141 **Data extraction**

142 A modified version of the data extraction tool used in a previous systematic review was utilised by  
143 two independent authors (AJW, AL) to extract data on study design, participants, outcome details,  
144 and associated risk (35). After extraction was completed and checked, any disagreements were  
145 discussed and resolved by the research team. Risks were extracted based on a significant  
146 relationship to self-harm or suicide outcome. This has the potential to produce multiple reporting of  
147 the same study, as the risk may be reporting different outcomes for the same population or the  
148 same risk reported for multiple subgroups. For example, within one study, victimisation may be  
149 significantly associated with self-harm and suicidal ideation, both of which have an effect size. This  
150 would then be extracted twice to yield both sets of information. Initially, outcomes were combined  
151 into a single quantitative outcome (36). Thereby, the overall prevalence of this risk for self-harm and  
152 suicide could be observed. Further analysis considered the risk to each outcome individually. The  
153 inclusion of multiple reporting from a single study may have resulted in a reduction in confidence  
154 intervals for the random effects model as the sample sizes will be included numerous times.

## 155 **Risk of Bias Assessment**

156 To assess quality within the literature, variations of the Newcastle-Ottawa Scale (NOS) were  
157 employed (35-38). This allowed a number of study designs to be considered and assessed. The forms  
158 assess risk of bias based on three core aspects of study design: participant selection, comparability  
159 of participants, and exposure ascertainment. These were adapted for this systematic review (see  
160 SM3), and rated as either low, moderate or high quality using the same category distinctions as  
161 previous research (39). The two reviewers assessed the quality of studies independently, with  
162 intermediate agreement (PABAK = 0.43). Agreement was achieved through discussion.

## 163 **Data Synthesis**

164 The search strategy yielded 104 primary articles, across 102 studies. Given the large number of  
165 individual risk factors, similar variables were categorised resembling the format used by previous

166 literature (40); demographic, psychosocial, mental health difficulties. Rather than use “psychiatric or  
167 mental health” however, mental health difficulties was selected due to self-report measures  
168 commonly being used, the inclusion of symptomology, and limited information regarding diagnosis  
169 of mental health conditions. Additionally, two categories of risk were created, victimisation and  
170 LGBTQ+ specific risks. Victimisation includes individual measures which considered the process of  
171 the LGBTQ+ young person being treated poorly, harassed, abuse or discriminated against or  
172 subjected to bullying. LGBTQ+ specific risks included risks which were strongly related to the LGBTQ+  
173 identity held by the young person, e.g. coming out stress (41), parent being unaware of sexual  
174 orientation (42), or negative attitudes towards homosexuality (43). Risks were classed as  
175 victimisation if they suggested direct negative action against the individual, e.g. discrimination,  
176 bullying, harassment or threat. Victimisation was selected as representative title as it most often  
177 occurred within the studies. Risks which were both victimisation and LGBTQ+ specific, such as trans,  
178 bi, and homophobic bullying, were categorised as victimisation.

179 There was a large amount of inconsistency among individual risks for three categories: demographic,  
180 psychosocial and LGBTQ+ specific risks. This did not allow for meaningful clustering of variables into  
181 meta-analysis which would provide a prevalence of risk among LGBTQ+ young people who had  
182 experiences of self-harm or suicide. Furthermore, numerical evidence was not available for many  
183 individual risks; in these instances, either there was no statistically significant statistics available for  
184 associated risks, effect sizes, correlations, mediators, moderators, beta statistics, or any reporting of  
185 prevalence. Numerical data was predominantly available within victimisation and mental health  
186 difficulties; therefore these risks were analysed. The 65 studies not included in meta-analysis due to  
187 are briefly described by risk category, and separated by population (e.g. sexual orientation minority,  
188 gender identity minority, LGBTQ+ umbrella).

## 189 **Numerical Analysis**

190 A meta-analysis was conducted for two risks associated with self-harm and suicide among LGBTQ+  
191 young people; victimisation and mental health difficulties, where sufficient data for aggregation  
192 were available. For these two risks, outcome data from forty primary studies were synthesised. The  
193 purpose of the meta-analysis was to 1) to investigate the prevalence of victimisation and mental  
194 health difficulties associated with self-harm, suicidal ideation or suicidal attempt among LGBTQ+  
195 young people with these experiences; 2) to investigate whether there is a difference in the  
196 prevalence of victimisation and mental health difficulties among those young people who identify as  
197 a sexual orientation minority (LGBQ) and those who identify as a gender identity minority (TGNC); 3)  
198 to identify whether the prevalence of victimisation and mental health difficulties is different in  
199 LGBTQ+ young people who have experiences of self-harm, suicidal ideation or attempt compared  
200 with cisgender heterosexual young people with these experiences.

201 Event rates of primary studies were log transformed before numerical syntheses such that they were  
202 all the same unit of measure (but back-transformed for clear presentation in tables). Studies with an  
203 event rate of zero or one were excluded from analysis as studies with a small sample size do not  
204 permit accurate estimations of event rate. Where data was available for the target population  
205 subgroup and a control subgroup of cisgender and heterosexual individuals, odds ratios were  
206 calculated.

207 The random effects model was used as this assumes that not all studies have the same power to  
208 detect effects, therefore, a common effect size cannot be assumed. As the study effects were  
209 normally distributed, the DerSimonian and Laird method was selected to determine the variation  
210 between the studies to fit the random effects model (44). The random effects model was extended  
211 to include explicit consideration of the methodological quality of the primary studies. This “quality  
212 effects model” (QEM) used the NOS total score to characterise the overall quality of the study. This  
213 QEM model can be interpreted as the meta-analytic synthesis that would have been obtained if all  
214 the studies had been of the same methodological quality as the highest rated study within the

215 review, thereby providing a measure of attenuation to the methodological variation of included  
216 studies.

217 Higgins  $I^2$  was used to determine the level of heterogeneity within the primary studies with a value  
218 of above 75% considered problematic. Sensitivity analysis was conducted to identify studies  
219 disproportionately influencing results. Such studies were excluded from subsequent analyses due to  
220 the high risk of bias. Subgroup analysis was also used to aid the identification of sources of  
221 problematic heterogeneity.

222 Publication bias and small study effects were also estimated by inspection of funnel plots. In absence  
223 of publication bias, high precision studies will be evidenced near the average, with lower precision  
224 studies spread evenly and symmetrically on both sides of the average, creating a funnel-shaped  
225 distribution. Publication bias is indicated by the absence of studies in the area of the final plot  
226 associated with small (i.e. non-significant) effect sizes in small studies.

227 If publication bias was evidenced then a trim and fill procedure was undertaken. This produced an  
228 adjusted effect size (controlling for publication bias), and the impact of publication bias was assessed  
229 by comparison with the uncorrected random effects model. The fail-safe N was also calculated using  
230 the Orwin algorithm (45). This is the estimation of missing studies that was required to render the  
231 effect non-significant. If the fail-safe N is large (in relation to the number of studies included in the  
232 synthesis), then the synthesis could be considered robust to the effects of publication bias.

233 Before searches were conducted, two a-priori hypotheses were established to consider  
234 heterogeneity which may occur within the data (30). The first suggested that heterogeneity may be  
235 explained by consideration of sexual orientation (LGBQ) and gender identity minorities (TGNC) as  
236 separate populations. This allows us to determine whether there are similar levels of risk within both  
237 groups. The second a-priori aim was to consider risk by age group; however, this was not possible  
238 given the final dataset. Additionally, a subgroup analysis was run based on the type of outcomes  
239 reported: self-harm, suicidal ideation, and suicidal attempt. Summary effects and associated

240 heterogeneity measures were calculated for each subgroup, the significance of difference between  
241 these being evaluated by the comparison of their 95% confidence intervals.

242

## 243 **Results**

244 One-hundred and four papers from 102 studies were included, which met all the inclusion criteria  
245 and contained extractable significant risks associated with self-harm, suicidal ideation, or suicidal  
246 attempt. Twenty-six studies examined a form of self-harm (e.g. self-harm with suicidal intent, self-  
247 harm intent unspecified, non-suicidal-self-injury) whereas 77 considered ideation and 76 considered  
248 behaviour, studies often considered more than one outcome. None of the studies included  
249 information on participants who died by suicide. Two of the included papers (46, 47) utilised the  
250 same dataset as a previously included study (48, 49). These were included as separate papers, given  
251 that they highlight risk factors which the primary study did not. The majority of studies were cross-  
252 sectional (n = 91); with 10 longitudinal studies, and 3 cohort studies. A total of 1,146,395 participants  
253 were included, with 129,469 (11.3%) being LGBQ and 13,041 (1.1%) being TGNC. Ages ranged from  
254 12-25 (M = 17.7, SD = 1.9). Studies were mainly based within the U.S.A (n = 77), followed by the U.K.  
255 (n = 7), and China (n = 4). For full individual study characteristics, see supplementary materials 4  
256 tables A and B (SM3). From this document, further figures regarding heterogeneity and influential  
257 studies are also available.

258 From the 104 included papers, 64 were unable to be numerically synthesised ( 17, 18, 41, 43, 49-  
259 109). The individual characteristics of these studies can be seen in Supplementary Table A (SM3). The  
260 population of these papers represented a total of 929,802 individuals, of whom 90,767 were LGBTQ+  
261 identifying (9.76%). Therefore, these studies are considered 81.1% of the overall population. These  
262 studies did evidence multiple risks associated with experiences of self-harm and suicide among  
263 LGBTQ+ young people. The individual risk factors were varied and numerous to the extent that they

264 could not be individually considered in relation to prevalence. However, by categorising these  
 265 broadly, some information can be gained.

266 Most of the papers which were not numerically synthesised, focused on samples which only  
 267 considered sexual orientation minorities, see table 2. With fewer studies examining TGNC  
 268 populations or across the LGBTQ+ umbrella. Across all populations, psychosocial risks were most  
 269 commonly cited in associated with self-harm and suicide. Victimization and mental health difficulties  
 270 were evident, although without reinforcing numerical evidence.

271 **Table 2: Risks associated with experiences of self-harm or suicide among LGBTQ+ young people:**  
 272 **Data unable to be numerically synthesised**

Categories of risk	LGBQ k=48 N (%)	TGNC k=8 N (%)	LGBTQ+ k=8 N (%)
<b>Demographic variables</b> <i>(e.g. natal gender, age, race)</i>	15 (30.6)	4 (50)	3 (37.5)
<b>Psychosocial variables</b> <i>(e.g. low self-esteem, dating violence, suicide of friend or family, abuse)</i>	31 (63.3)	4 (50)	5 (62.5)
<b>Victimisation variables</b> <i>(e.g. LGBTQ hate crime, homophobic bullying, school bullying, cyber bullying)</i>	27 (55.1)	2 (25)	4 (50)
<b>Mental health difficulties variables</b> <i>(e.g. depression, substance use, bipolar, anxiety)</i>	10 (20.4)	4 (50)	2 (25)
<b>LGBTQ+ specific variables</b> <i>(e.g. gender-role nonconformity, internalised homophobia, parental rejection, loss of friends due to sexual orientation)</i>	13 (26.5)	2 (25)	3 (37.5)

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274

## 2. Meta-analysis: Victimization

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A random effects model was calculated, using the generic inverse variance method, to examine the

276

prevalence of victimisation as a risk associated with experiences of self-harm, suicidal ideation or

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suicidal attempt among LGBTQ+ young people. Sixty-three estimates from 31 individual samples

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were reported, representing 331,321 participants in total. The random effects models reported a

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pooled prevalence estimate of 0.33 and a 95% confidence interval of between 0.29-0.38 among

280

LGBTQ+ young people with self-harm or suicide experiences.

281

A high level of between study variation (heterogeneity) could not be attributed to differences in

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individual reaction to victimisation within the included studies (Higgin's  $I^2 = 99\%$ ). Therefore, the

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prevalence estimates of the primary studies may be influenced by the presence of uncontrolled or

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confounding factors. Given this substantial level of heterogeneity, the impact of disproportionately

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influential individual studies was assessed using a leave-one-out analysis. Following this, Taliaferro

286

and Muehlenkamp (2017) was removed from the meta-analysis (137). This was due to a variable

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being extracted multiple times as numerical data was given per sexual orientation, this resulted in a

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large volume of included variables. Therefore, this study was overtly overrepresented within the

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sample.

290

The random effects model was recalculated with 55 measures of prevalence from 30 unique

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samples. The corrected random effects model reported a pooled prevalence estimate of 0.36

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(95%CI: 0.31-0.40) (Figure 3). The corrected random effects model did not impact heterogeneity

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(Higgin's  $I^2 = 99\%$ ). Accordingly, the observed heterogeneity could not be considered to be the result

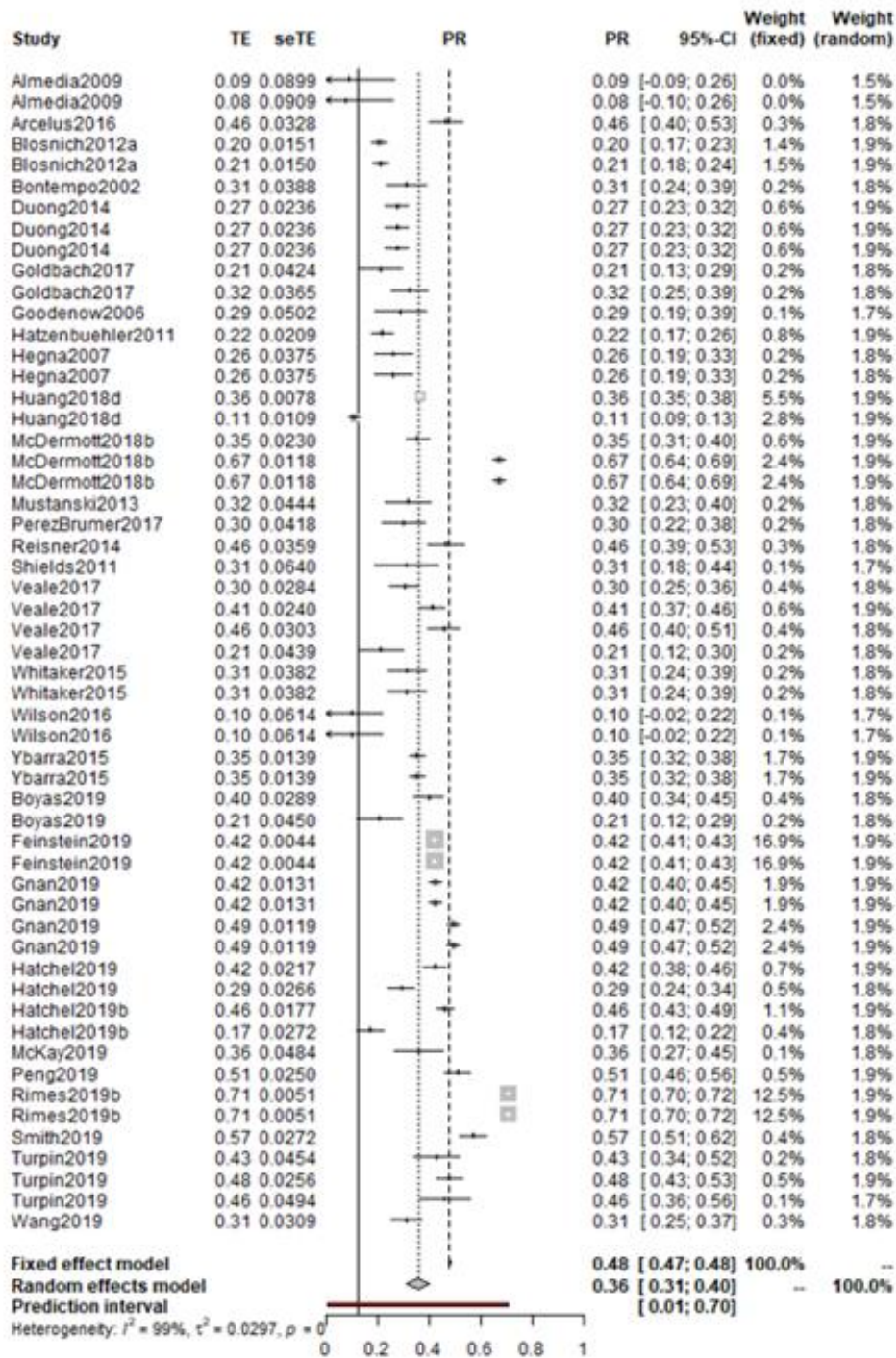
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of overly influential individual studies, and therefore other sources of heterogeneity require

295

exploration.





296

297 **Fig 3: Forest plot of victimisation prevalence among LGBTQ+ with experiences of self-harm or**

298 **suicide**

299

300 The Quality Effects Model was calculated using the total score from the risk of bias ratings,  
301 (individual study ratings can be found in SM3). The QEM can be interpreted as the meta-analytic  
302 synthesis that would have been obtained had all the studies been of the same methodological  
303 quality as the best study within the review. This reported an estimate of 0.36 (95% CI: 0.31-0.41).  
304 Given the similarity between the random effects model and the synthesis derived from the quality  
305 effects model, it is possible to conclude that the ratings of methodological quality did not have a  
306 significant and substantial impact upon the estimates of prevalence.

307 Visual inspection of the funnel plot of victimisation prevalence there is little evidence of publication  
308 bias. A fail-safe number of 107 suggested that an additional 101.9% of the existent literature would  
309 be required for unpublished null effects for the meta-analytic effect to become non-significant. Thus,  
310 the observed effect is considered robust to publication bias.

311 To further assess the impact of methodological variation upon heterogeneity, a series of subgroup  
312 analyses were conducted (Table 3). The first considered risk of bias ratings; low, moderate, and high  
313 quality ( $Q = 19.5$ ,  $p < 0.01$ ). Both high-rated and low-rated studies evidenced higher prevalence than  
314 those rated as moderate quality.

315 Subgroup analysis was utilised to explore the impact of uncontrolled covariates upon victimisation.  
316 Initially, this evaluated differences in prevalence of victimisation between groups of sexual  
317 orientation (LGBQ) or gender identity groups (TGNC) with these experiences of self-harm and  
318 suicide. This analysis was to explore whether a particular identity group experiences greater  
319 victimisation than others. Studies which combined the populations or looked at just one  
320 representation of LGBQ were excluded from this analysis. The subgroup analysis showed that  
321 prevalence rates of victimisation were relatively consistent across all gender identity and sexual  
322 orientation studies/groups ( $Q = 0.11$ ,  $p = 0.74$ ). However, heterogeneity was notably lower within  
323 the TGNC studies. This may be related to a small number of studies being included, as analysis of  
324 LGBQ triples the study sample. Following this, subgroup analysis was conducted regarding outcome.

325 Again, studies were excluded if they collapsed two distinct categories; suicidal ideation and suicidal  
 326 attempt. Studies with self-harm as outcome demonstrated an overall victimisation prevalence rate  
 327 of 39%. This suggests that higher rates of victimisation are associated with self-harm when  
 328 compared to suicidal thoughts or attempts among LGBTQ+ participants.

329

330 **Table 3: Subgroup analyses of victimisation prevalence among LGBTQ+ young people with self-**  
 331 **harm or suicidal experiences**

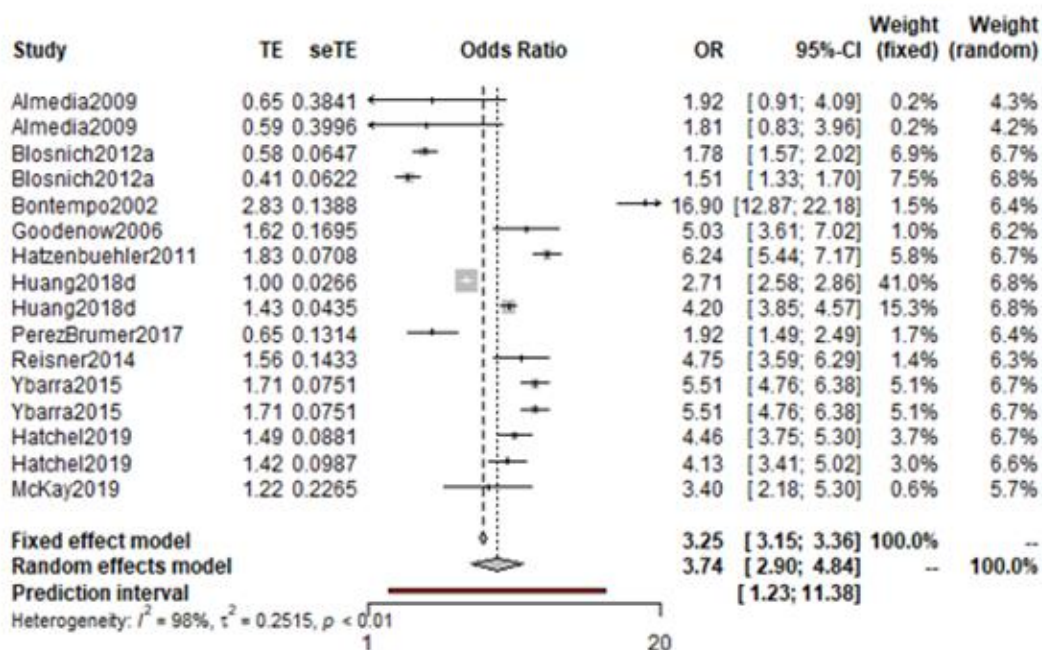
	Number of estimates (N)	Prevalence Rate	95% CI	Q	I <sup>2</sup> (%)	χ <sup>2</sup>	Q, df, p
							Q = 19.50, df = 2, p = 0.01
<b>QUALITY RATING</b>							
Low	7	0.46	0.34-0.58	347.88	98.3	0.02	
Moderate	31	0.28	0.24-0.32	686.32	95.6	0.01	
High	17	0.45	0.37-0.52	4107.33	99.6	0.02	
							Q = 0.11, df = 1, p = 0.74
<b>POPULATION</b>							
LGBQ	27	0.34	0.27-0.42	6282.68	99.6	0.03	
TGNC	9	0.33	0.24-0.41	108.99	92.7	0.01	
							Q = 12.18, df = 2, p = 0.01
<b>OUTCOME</b>							
Self-harm	10	0.39	0.31-0.48	353.09	97.5	0.02	
Suicidal ideation	21	0.35	0.33-0.38	212.38	93.4	0.00	
Suicidal attempt	15	0.26	0.20-0.31	212.38	93.4	0.01	

332

333

334 The prevalence of victimisation within LGBTQ+ young people with experiences of self-harm or  
 335 suicide was compared to matched cisgender, heterosexual control counterparts. These young  
 336 people also had experiences of self-harm or suicide. The odds ratios (19 estimates from 12 studies)  
 337 were synthesised using the generic inverse variance. An odds ratio of 4.82 (CI: 3.67-6.32) was  
 338 reported. Between studies heterogeneity was high ( $I^2 = 98\%$ ) suggesting uncontrolled  
 339 methodological or conceptual factors contributing variations in reported risks. Therefore, a leave-  
 340 one-out analysis was conducted to identify studies that might be exerting a disproportionate  
 341 influence on the overall meta-analysis. One study was identified as both heterogeneous and  
 342 influential, demonstrated by a change of effect of over 13%. Thus, Turpin and colleagues' study was  
 343 removed to give a more conservative overall odds ratio (139).

344 The following meta-analysis was based on the remaining 16 odds ratios from 12 studies. This  
 345 produced a synthesised odds ratio of 3.74 (95% CI: 2.90-4.84)(Figure 4). The corrected random  
 346 effects model produced very little change to the heterogeneity level, (Higgin's  $I^2 = 98\%$ ). Given the  
 347 small number of studies, further analyses including an assessment for publication bias were not  
 348 feasible.



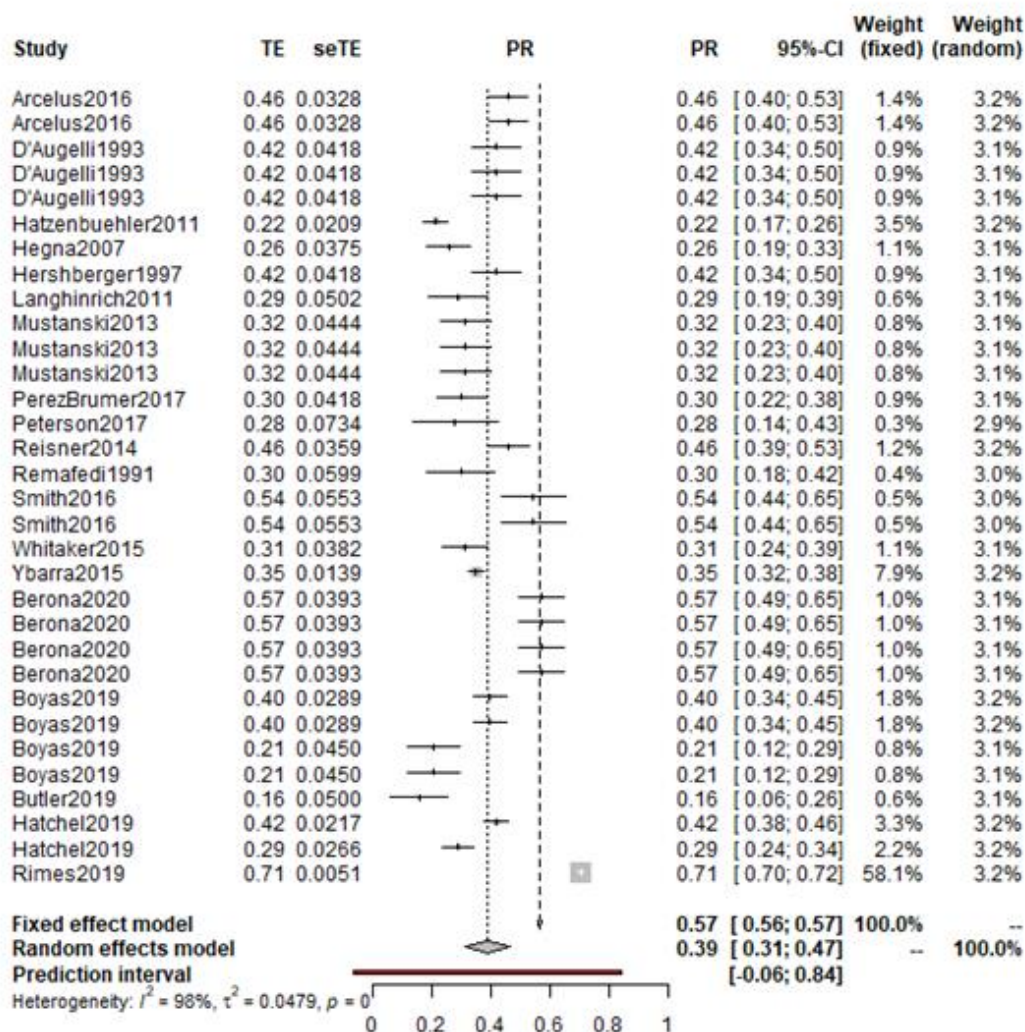
349

350 **Fig 4: Odds ratio among LGBTQ+ young people with experiences of self-harm or suicide compared**  
351 **to cisgender, heterosexual young people with experiences of self-harm or suicide**

352

### 353 **3. Meta-analysis: Mental Health Difficulties**

354 A second random effects model was calculated to consider the prevalence of previous mental health  
355 difficulties within LGBTQ+ young people who have an experience of self-harm, suicidal ideation or  
356 suicidal attempt. A total of 166,810 participants were assessed over 22 studies which produced 51  
357 estimates. The model calculated a prevalence of mental health difficulties of 0.36 (95% CI: 0.29-  
358 0.43). Again, a high level of heterogeneity was found (Higgin's  $I^2 = 99\%$ ). A leave-one-out analysis  
359 was therefore run, with the influential studies being evaluated for inclusion. Studies were omitted if  
360 they disproportionately influenced the overall result (136-138). The random effects models were then  
361 recalculated with the 19 studies and 32 variables. This resulted in the prevalence of mental health  
362 difficulties increasing to 0.39 (95% CI: 0.31-0.47) (Figure 5). While high heterogeneity remained  
363 (Higgin's  $I^2 = 98\%$ ).



364

365 **Fig 5: Overall prevalence of mental health difficulties within LGBTQ+ young people with**  
 366 **experiences of self-harm or suicide**

367 Visual observation of a funnel plot and trim-and-fill procedure suggests the absence of publication  
 368 bias. Following Orwin's algorithm, it was shown that 31 unpublished null studies would be needed to  
 369 reduce the meta-analytic effect found within this sample. Again, subgroup analyses considering the  
 370 risk of bias were conducted. The QEM model reported an estimate of 0.39 (95% CI: 0.31-0.47),  
 371 suggesting that there were not enough differences regarding the risk of bias ratings to substantially  
 372 influence the overall effects. Subgroup analysis of this sample demonstrated that 4 studies were



373 considered high quality, 14 were of moderate quality and 3 of low quality. However, little could be  
 374 concluded from between groups differences ( $Q = 1.54, P = 0.46$ ).

375 Further subgroup analyses were conducted to investigate the impact of uncontrolled covariates  
 376 relating to mental health difficulties prevalence (Table 4). The first of these again considered the  
 377 prevalence differences which may occur between LGBQ and TGNC samples. This analysis evidenced  
 378 that LGBQ young people were shown to have a higher prevalence of mental health difficulties than  
 379 TGNC individuals (42% vs 34%). The difference in effect size is likely related to the large difference of  
 380 included studies. The Higgins  $I^2$  value for both groups were still high, suggesting that these studies do  
 381 contribute to heterogeneity, although to lesser extent within TGNC populations. A similar subgroup  
 382 analysis regarding outcome was conducted, this demonstrated that the rates of mental health  
 383 difficulties were slightly more prevalent among those with suicidal ideation.

384

385 **Table 4: Subgroup analyses of mental health difficulties prevalence among LGBTQ+ populations**  
 386 **who have experiences of self-harm or suicide**

	Number of estimates (N)	Prevalence Rate	95% CI	Q	$I^2$ (%)	$\chi^2$	Q, df, p
							Q = 1.54, df = 2, p = 0.46
<b>QUALITY RATING</b>							
Low	11	0.41	0.33-0.49	122.06	91.8	0.01	
Moderate	17	0.36	0.31-0.41	125.83	87.3	0.00	
High	4	0.47	0.25-0.69	417.38	99.3	0.05	
							Q = 2.43, df = 1, p = 0.30
<b>POPULATION</b>							
LGBQ	20	0.42	0.32-0.53	1227.71	98.5	0.05	
TGNC	5	0.34	0.22-0.45	37.56	89.4	0.01	

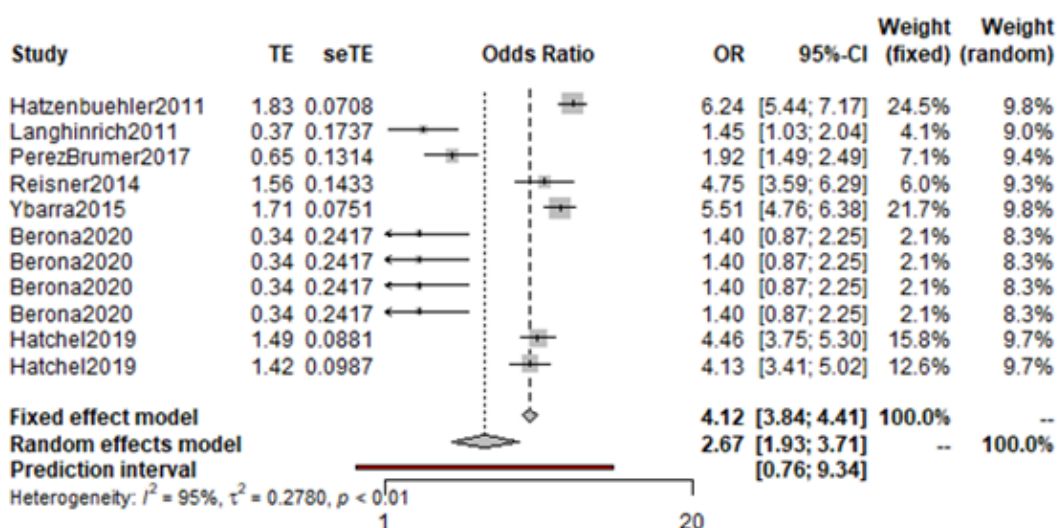
Q = 0.41, df =  
2, p = 0.82

**OUTCOME**

<b>Self-harm</b>	3	0.38	0.20-0.53	30.19	93.4	0.02
<b>Suicidal ideation</b>	8	0.40	0.35-0.44	32.70	78.6	0.00
<b>Suicidal attempt</b>	19	0.38	0.31-0.44	222.21	91.9	0.02

387

388 Following this, a meta-analysis of odds ratios was conducted; considering prevalence of mental  
 389 health difficulties among LGBTQ+ young people and cisgender, heterosexual young people both with  
 390 experiences of self-harm or suicide. Only 7 studies had available data. The random effects model  
 391 calculated an odds ratio of 2.67 (95% CI: 1.93-3.71), with a high level of heterogeneity ( $I^2 = 95\%$ )  
 392 (Figure 6). However, due to the limited number of studies, further analysis was not conducted.



393

394 **Fig 6: Odds ratio of LGBTQ+ young people with experiences of self-harm or suicide compared to**  
 395 **cisgender, heterosexual peers with experiences of self-harm or suicide**

396



## 397 **Discussion**

398 This is the first meta-analysis which evidences prevalence of victimisation and mental health  
399 difficulties within young people aged 12-25 who identify as LGBTQ+ with experiences of self-harm,  
400 suicidal ideation and attempt. The review consisted of 142,510 participants who were a sexual  
401 orientation or gender identity minority. Due to limited information reported within the studies, it  
402 was not possible to consistently consider TGNC participants by their sexual orientation as well.  
403 Evidence demonstrated high prevalence of victimisation (36%) and mental health difficulties (39%)  
404 within these populations. Our review shows that these experiences were respectively 3.74 times and  
405 2.67 times higher among young LGBTQ+ people than their cisgender, heterosexual counterparts.  
406 There were only 10 studies which were considered high-quality, with most studies (81%) being rated  
407 as moderate quality. Substantial heterogeneity was observed between study estimates within both  
408 meta-analyses.

409 The key findings of this meta-analysis strongly support previous research (9, 20, 22- 26). Within this  
410 study, a broad view of victimisation was arrogated, including a range of bullying behaviours such as  
411 cyber victimisation, homophobic bullying, peer bullying and so forth. Preceding meta-analyses have  
412 previously demonstrated established links between peer victimisation and suicide and LGBT  
413 victimisation and non-suicidal self-injury (NSSI) (25, 26). This review demonstrates that there is a  
414 high prevalence between LGBTQ+ young people experiencing various forms of victimisation and self-  
415 harm and suicide. Indeed, this link between victimisation and self-harm and/or suicide appears to be  
416 more common than that among cisgender, heterosexual peers.

417 Mental health difficulties were also shown to be highly prevalent with self-harm and suicide among  
418 LGBTQ+ young people. Liu and colleagues also evidenced mental health difficulties were linked to  
419 NSSI within this population (25). The current review extends findings from previous research by  
420 calculating risk prevalence and odds across the spectrum of self-harm to suicide and differentiating

421 by gender identity and sexuality (25, 26). Thus, demonstrating that higher rates of victimisation and  
422 mental health difficulties are found in LGBTQ+ young people who experience self-harm and suicide.  
423 However, evidence is not available from this review as the causal pathway causing self-harm or  
424 suicide or how predictive these risks associated with self-harm and suicide are.

425 By looking across the broad umbrella LGBTQ+ identities, this review has assessed the prevalence of  
426 risks associated with self-harm and suicide by gender identity compared to sexual orientation  
427 minorities groups. This allows for consideration of how influential these risks might be to particular  
428 groups among the LGBTQ+ label, and where differences of risk may lie. Both victimisation and  
429 mental health difficulties were evidenced to be more prevalent within LGBQ young people rather  
430 than TGNC. However, it is likely that our finding is due to the higher number of studies focusing  
431 solely on LGBQ populations, as noted by the wider confidence intervals seen within the TGNC  
432 subgroup analyses. Furthermore, those studies which considered both sexual orientation and gender  
433 identity, tend to have low numbers of TGNC participants. Therefore, the TGNC risks are potentially  
434 conflated or ignored, as there is a lack of statistical power to evidence risks which may apply to  
435 TGNC participants and not LGBQ.

436 Further to this, we were unable to conduct meta-analysis by identity (e.g. transgender man,  
437 transgender woman, nonbinary etc.) within gender identity or sexuality (e.g. bisexual, homosexual,  
438 lesbian), thereby these are broadly categorised. This may overlook differences between identifying  
439 as a particular sexual orientation or gender identity; and, how being a member of these subgroups  
440 may differ from each other (145). Additionally, no papers considered sexualities outside of  
441 homosexual, bisexual, queer or questioning. This limits how far these risk conclusions might be  
442 drawn to other sexual orientation groups e.g. those who are asexual, pansexual, polysexual etc.  
443 Future research should support inclusion of diverse sexualities and gender identities within studies,  
444 offering individuals to self-report in their own words, and options for intersectional identities.

445 This review has important clinical and policy implications in relation to suicide prevention among  
446 LGBTQ young people. Primarily, discrimination against LGBTQ+ individuals has widely been  
447 recognised as a priority for governments and organisations globally (146, 147). These results  
448 definitively highlight the harmful outcomes associated with acts of discrimination and victimisation.  
449 Given the variety of countries which are included in this study, the findings of this study could be  
450 used to inform national policies, such that there is a priority focus on reducing minority victimisation  
451 and discrimination. Furthermore, by understanding these complex experiences which surround  
452 LGBTQ+ youth, compounded by high rates of mental health difficulties, suicide prevention strategies  
453 are better informed to support LGBTQ+ youth. Thereby suicide prevention interventions and policies  
454 may be better tailored to the specific needs of LGBTQ+ young people and develop initiatives which  
455 build resilience and challenge societal acceptance of such discrimination. However, the studies in  
456 this meta-analysis mainly come from High-Income Countries (HIC), therefore the results might not  
457 be generalisable to Low- and Middle- Income Countries (LMIC) where young people who identify as  
458 LGBTQ+ may face additional or different types of risks.

459 Secondly, health care professionals should be aware of the high prevalence of mental health  
460 difficulties and victimisation within the umbrella of LGBTQ+ young people. Acknowledging sexuality  
461 and gender identity in an accepting and supportive manner, would be beneficial to encouraging a  
462 constructive health care environment (148, 149), which could potentially aid disclosure of self-harm  
463 and suicide. Evidence also shows that health professionals encouraging LGBTQ+ youth to discuss  
464 their experiences of victimisation could further reduce negative health consequences (150). From  
465 these insights, professionals might be able to suggest treatments or care understanding the  
466 sociodemographic environment which these individuals are living in.

467 Much of this research takes places within school settings, with the average age of participants being  
468 below 18 years old. Given that bullying among school-aged children is common (151), this would  
469 suggest that school-based interventions would be an appropriate setting to target victimisation for

470 LGBTQ+ young people, potentially reducing self-harm and suicide. This is supported by a recent  
471 study suggesting that addressing the barriers and facilitators when reporting and responding to  
472 LGBTQ+ victimisation in schools would prevent adverse mental health (152). In particular, LGBTQ+  
473 youth felt that building trust with staff members, being given time to discuss problems and receiving  
474 responses from school were key (152). Therefore, creating an environment which recognises the  
475 unique aspects and potential risks of being LGBTQ+, such as dealing with difficult disclosure (118) or  
476 understanding gender nonconformity (25) would be beneficial. This could translate to older  
477 adolescents and young adults by having similar environments within colleges, universities or social  
478 community spaces. These spaces might be able to consider risks, which differentiate by age (e.g.  
479 identity development, transition treatments available, housing situations) which due to limited  
480 reporting we were unable to meta-analysis within this review.

481 There is a wealth of literature readily available relating to risks for self-harm and suicide within  
482 LGBTQ+ young people. However importantly, even though many of these studies had explicit focus  
483 on LGBTQ+ individuals, only 12% of the total population held these identities and reporting is highly  
484 inconsistent between individual risks. Future research in the field of self-harm and suicide  
485 prevention requires a specific LGBTQ+ focus as this would allow for a holistic understanding of these  
486 populations' experiences.

## 487 **Strengths & Limitations**

488 This is the first systematic review and meta-analysis which has comprehensively synthesised existing  
489 evidence from across the full spectrum of LGBTQ+ young people in order to identify the prevalence  
490 of key risks with self-harm and suicide. Firstly, this dimensional approach allowed for a holistic view  
491 and comparison of risk prevalence across self-harm and suicidal thoughts and behaviours. Secondly,  
492 broad search strategies were run, which ensured a large amount of studies was identified across  
493 disciplines and across the LGBTQ+ umbrella. This search was re-run prior to submission to ensure  
494 that the review was as up-to-date as possible. Thereby, TGNC populations were able to be identified

495 and specifically examined with reference to similar LGBQ samples. A final strength was the robust  
496 meta-analytic strategy which was emplaced within this study, therefore allowing authors to  
497 determine points of bias and control for these.

498 There were, however, some limitations which need to be considered. Firstly, there were few high-  
499 quality studies and substantial heterogeneity within the findings. Sources of heterogeneity were  
500 explored using our pre-specified subgroup analysis but also to determine points of heterogeneity;  
501 this offered little. Potentially, this was related to the use of four variations of the NOS assessment  
502 (see SM2). While inclusion of four versions allowed for a greater number of papers to be assessed,  
503 this also created another variable of ambiguity. However, heterogeneity may also be related to the  
504 variation in conceptualisation of phenomena, population, study design and fundamentally individual  
505 reporting of risk. In future, clear operationalisation within studies is necessary and use of  
506 standardised, validated measures to assess self-harm and suicide across the spectrum of thoughts  
507 and behaviours.

508 Secondly, self-harm with suicide intention and self-harm without suicide intention may have  
509 different associated risks which link to why someone might be more likely to consider suicide.  
510 However, given the measures used to assess self-harm within included studies this was not possible.  
511 Therefore, only risks associated with self-harm regardless of intention was able to be analysed. This  
512 does not allow us to offer explanation as to why someone might consider suicide with this  
513 behaviour. Finally, searches were limited to English language; thereby key studies within other  
514 languages may have been overlooked.

515

## 516 **Author contribution statement**

517 AJW, JA, ET, and MM conceptualised the study. AJW developed the search strategy, conducted the  
518 literature search, reviewed papers, extracted and analysed the data. AL reviewed and extracted

519 data. AJW and AL conducted quality assessments. CJ also analysed the data. AJW, JA, ET, MM and CJ  
520 edited a draft of the manuscript. The final manuscript was approved by all authors.

521

## 522 **Data availability**

523 Data is available on the Open Science Framework; DOI 10.17605/OSF.IO/2NPGZ.

524

## 525 **Supporting information**

526 **S1 Fig:** Search Strategy Terms

527 **S2 Fig:** PRISMA Flow Diagram

528 **S3 Fig:** Forest plot of victimisation prevalence among LGBTQ+ with experiences of self-harm or  
529 suicide

530 **S4 Fig:** Odds ratio among LGBTQ+ young people with experiences of self-harm or suicide compared  
531 to cisgender, heterosexual young people with experiences of self-harm or suicide

532 **S5 Fig:** Overall prevalence of mental health difficulties within LGBTQ+ young people with  
533 experiences of self-harm or suicide

534 **S6 Fig:** Odds ratio of LGBTQ+ young people with experiences of self-harm or suicide compared to  
535 cisgender, heterosexual peers with experiences of self-harm or suicide

536 **S1 Table:** Inclusion criteria used during screening process

537 **S2 Table:** Risks associated with experiences of self-harm or suicide among LGBTQ+ young people:  
538 Data unable to be numerically synthesised

539 **S3 Table:** Subgroup analyses of victimisation prevalence among LGBTQ+ young people with self-  
540 harm or suicidal experiences

541 **S4 Table:** Subgroup analyses of mental health difficulties prevalence among LGBTQ+ populations  
542 who have experiences of self-harm or suicide

543 **S1 File:** PRISMA Checklist

544 **S2 File:** NOS

545 **S3 File:** Supplementary Results

546

547

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