Suicide Risk in Sexual and Gender Minority Adults: Understanding the Role of Protective Factors and Minority Stress

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Table of Contents

List of Tables

List of Figures

Acknowledgments

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Chapter 1

Protective Factors and Suicide Risk in Sexual Minority Adults: A Systematic Review

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(Author Guidelines)

Abstract

Background: Sexual minority (SM) adults are disproportionately more at risk of suicide than the general population. Research examining factors that may reduce the risk of suicide in SM adults has increased; however, there remains a need to systematically review the evidence and synthesise findings within a framework of relevant theoretical models.

Methods: Key academic databases (PsycINFO, Embase, Web of Science, Medline, PubMed, ASSIA, CINAHL, PsycArticles, Psychology and Behavioural Sciences Collection) were searched on 2nd December 2024 for this pre-registered review (PROSPERO ID: CRD42024582369). Quantitative studies examining associations between protective factors and measures of suicidal thoughts or behaviours in SM adults published in English were eligible for inclusion. A narrative synthesis of the evidence was used to collate findings. Reporting quality and risk of bias was assessed using Joanna Briggs Institute Critical Appraisal Checklists.

Results: 15 articles were eligible for inclusion. Of these, 7 (46.6%) identified psychological factors (self-compassion, self-esteem, self-efficacy, gratitude, emotional stability, resilience and active coping), 6 (40%) identified interpersonal factors (social support and help-seeking willingness) and 1 (6.7%) identified community factors (community connectedness) which were associated with lower suicide risk in SM adults. Evidence regarding SM identity-related factors (outness and pride) was inconsistent. The overall quality of studies was mixed, with limitations including reporting quality, measurement issues and study design.

Conclusions: This review identified psychological, interpersonal and community factors which may help to reduce suicide risk in SM adults. Further research is needed to explore the potential role of societal protective factors for this particularly vulnerable group.

Keywords: suicide; IMV model; protective factors; sexual minority adults; systematic review

Introduction

Sexual minority (SM) individuals are defined as people whose "sexual identity, orientation or practices differ from the majority of surrounding society" (Math & Seshadri, 2013) including monosexual (lesbian and gay), plurisexual (bisexual, pansexual, queer, fluid), asexual and others (Galupo et al., 2015). Compared to the general population, SM adults are disproportionately more at risk of adverse mental health outcomes including suicide (de Lange et al., 2022b; Layland et al., 2020; Plöderl & Tremblay, 2015). Data from a national survey (n=191,954) showed SM adults (11.0–19.9%) were significantly more likely than heterosexual adults (4.0%) to report suicidal ideation (i.e. thoughts about killing oneself) in the past year, with the highest rates of suicidal ideation reported by bisexuals (Ramchand et al., 2022). Similarly, a meta-analysis of 30 cross-sectional studies found the prevalence of past suicide attempts (i.e. engaging in self-injurious acts with the intention of killing oneself) ranged from 11–20% in SM adults compared to 4% in heterosexuals (Hottes et al., 2016). This disparity highlights the importance of identifying factors that may mitigate the risk of suicide in SM adults. To date, previous research exploring protective factors in SM populations has generally focused on SM young people and research is lacking in SM adults (Di Giacomo et al., 2018; Gorse, 2022; Wang et al., 2023). Previous research into suicide risk in SM adults is limited by a focus on risk factors, as well as cross-sectional designs, and low ethnocultural diversity, which limits generalisability. Further, there remains a need to consider findings within the context of relevant theoretical frameworks.

Understanding suicide risk in SM adults

Minority stress theory

Meyer's (1995, 2003) minority stress theory (MST) proposes that unique stressors faced by minority groups (such as harassment, family rejection and discrimination) can result in the internalisation of these negative experiences and development of negative beliefs, leading to psychological distress. Several studies have observed associations between minority stress and suicidal ideation (Kittiteerasack et al., 2021; Rogers et al., 2021) as well as previous suicide attempts (de Lange et al., 2022b; Meyer et al., 2021) in SM adults. While effect sizes were small, these findings provide support for the application of MST to understanding suicide risk

in SM adults and highlight the need to identify factors that may reduce the impact of minority stress.

Integrated motivational-volitional (IMV) model of suicidal behaviour

In brief, the IMV model offers a tripartite framework that aids our understanding of factors which contribute to the development of suicidal thoughts and behaviours (O'Connor, 2011; O'Connor & Kirtley, 2018). As shown below, the model outlines the role of various factors and moderators in influencing an individual's risk of suicide and may provide a helpful framework for discussing suicide risk in SM adults. For example, in line with the IMV model, social support (Trujillo et al., 2020) and having an active coping style (de Lange et al., 2022a) have each been associated with lower suicidal ideation in SM adults, which may support their role as threat-to-self (TSM) and motivational moderators (MM) in this population.

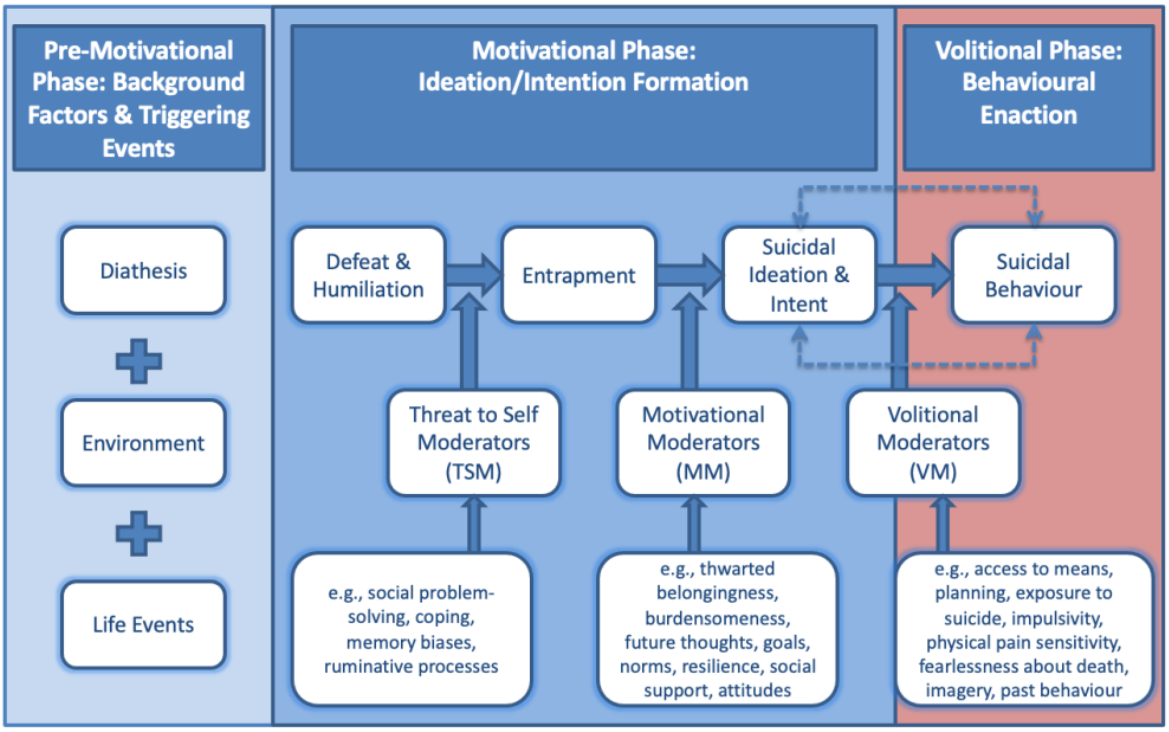

Figure 1

Integrated motivational-volitional model of suicidal behaviour (O'Connor, 2011; O'Connor & Kirtley, 2018)

Protective factors

Factors that may reduce suicide risk can also be considered within a framework of ecological systems theory, which proposes that human development is a dynamic process affected by a

complex interplay between individuals and different layers of the environment around them, outlining the role of individual, interpersonal, community and societal factors in influencing mental health outcomes (Bronfenbrenner, 2000). For instance, higher self-esteem, resilience and self-compassion have been associated with lower suicide risk in SM adults and could be considered individual protective factors (Rosenthal et al., 2023; Van Heeringen & Vincke, 2000; Woodford et al., 2018). Social support (Plöderl et al., 2014; Tang et al., 2024) and community connectedness (Rogers et al., 2021) have also been associated with lower suicide risk and could be considered interpersonal and community-level protective factors for SM adults, respectively. There is emerging evidence that societal factors such as access to gender-affirming medical care (Kattari et al., 2016) and supportive legislation (Rabasco & Andover, 2020) may be helpful in reducing suicide risk in gender minority (GM) adults. Furthermore, positive media representation (Poštuvan et al., 2019) and anti-bullying policies within schools (Wang et al., 2023) have been associated with lower suicide attempts in SM youth; however, there is a lack of studies investigating societal factors in SM adults.

Purpose of review

Research into protective factors for suicide risk in SM and GM populations has become more prevalent over the last decade. Although evidence relating to factors that may reduce suicide risk in GM adults (Inderbinen et al., 2021; Kia et al., 2021) and SM youth (Wang et al., 2023) has recently been reviewed, literature examining protective factors in relation to suicide risk in SM adults has yet to be systematically reviewed. Further, the aforementioned reviews were limited by factors such as predominantly western samples and inclusion of cross-sectional studies only. The present review will synthesise and critically appraise the current evidence relating to SM adults, with the aim of identifying potential factors which may offer this vulnerable group of individuals some protection from suicide.

Methods

A systematic review of published literature on protective factors and suicide risk in SM adults was undertaken in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021; see completed checklists in Appendix A, pp. 69-71). The review protocol was registered with PROSPERO: International Prospective Register of Systematic Reviews and accepted on 23rd August 2024 (ID: CRD42024582369).

Search strategy

An Internet-based search of nine academic databases (PsycINFO, Embase, Medline, PubMed, Web of Science, PsycArticles, ASSIA, CINAHL, Psychology and Behavioural Sciences Collection) was conducted for English-language articles published on or before 2nd December 2024 using the search terms detailed below. Reference lists of included papers were hand-searched for relevant articles during the screening process. Search terms were adapted from reviews investigating risk factors for depression and suicide in SM adults (Hall, 2018; Yıldız, 2018). The following search terms were used and adapted to the requirements of each database:

"sexual minorit*" OR "LGB" OR "LGB*" OR "lesbian" OR "gay" OR "homosex*" OR "bisex*" OR "pansex*" OR "asex*" OR "queer" OR "sexual identit*" AND "risk" OR "protec*" OR "reduc*" OR "resilien*" OR "coping" OR "cope" OR "suppor*" OR "lower*" OR "preven*" OR "improv*" OR "outcom*" OR "mediat*" OR "moderat*" AND "suicid*" OR "mental" OR "psycholog*" OR "wellbeing" OR "well-being" AND "adult" OR "adult*" OR "people" OR "individua*" OR "populatio*" OR "communit*" OR "college" OR "university" OR "older"

Inclusion criteria

Articles were included if they met the following criteria: 1) reported on a relationship between a protective factor and suicidal thoughts/behaviours; 2) included a sample of SM adults with a mean participant age of 18 years or older; 3) employed quantitative research methods; 4) published in English. Studies with non-SM participants were eligible for inclusion provided the authors reported on statistical relationships specifically in relation to SM adults. Qualitative studies, systematic reviews and meta-analyses, narrative and review articles, grey literature and theses were not eligible for inclusion. No restrictions on date of publication were applied.

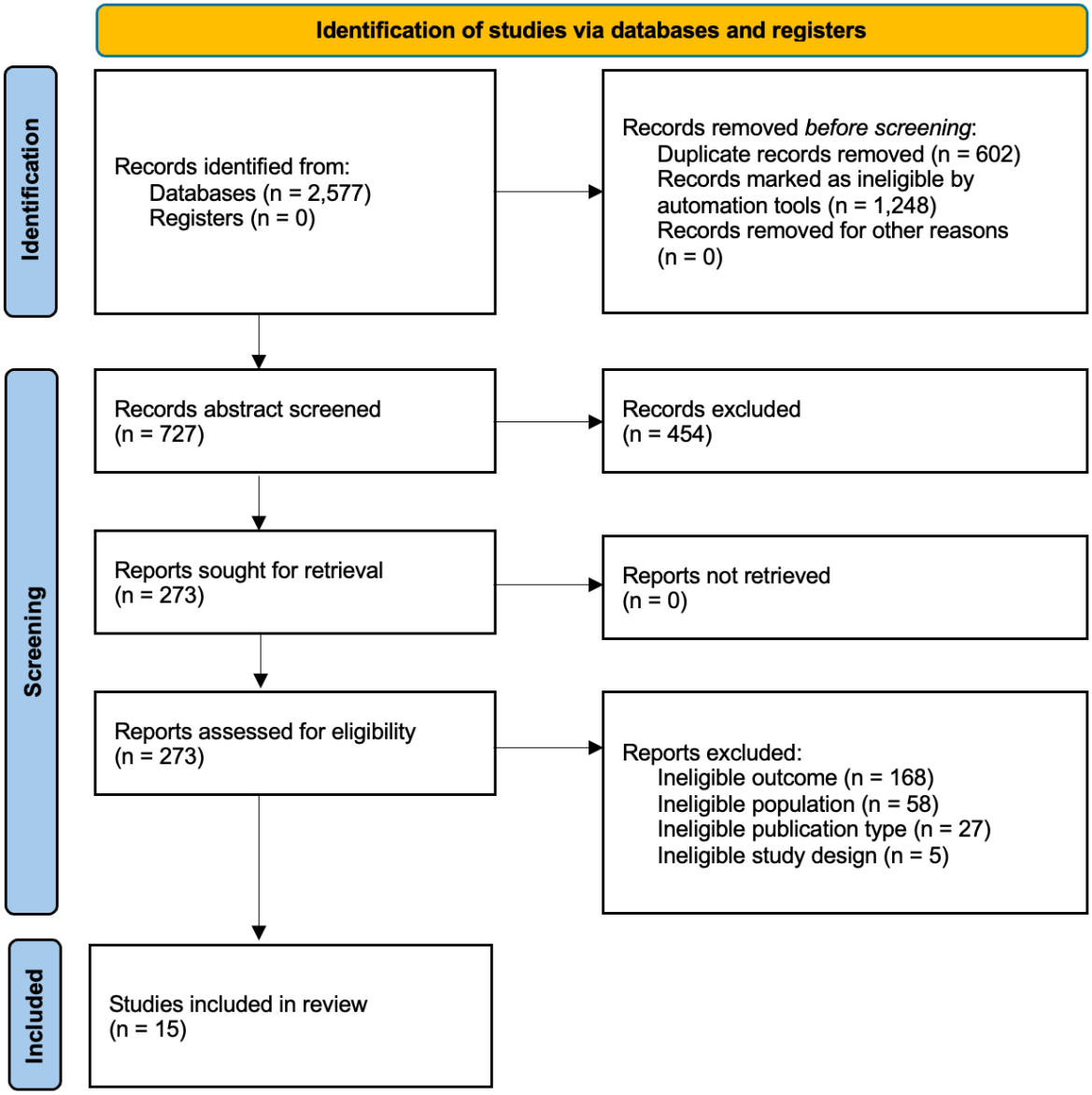

Figure 2

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram (Page et al., 2021)

Screening process

Final searches yielded a total of 2,577 results: Web of Science (779); PsycINFO (412); Embase (350); Medline (329); CINAHL (266); PubMed (225); ASSIA (98); Psychology and Behavioural Sciences Collection (68); PsycArticles (50). The references were imported into the systematic review management tool 'Rayyan'. 1,248 duplicate articles were removed using Rayyan's automated de-duplication feature (using a 95% similarity threshold) and a further 602 duplicates were removed manually. The remaining 727 articles were screened by the lead author in two stages: 1) by title and abstract, 2) by full text. A sample (10%) of articles were

co-screened by an independent reviewer (VK) at each stage. A small number of discrepancies (n=3) were identified at the title and abstract screening stage, which were resolved through discussion. 454 articles were identified as ineligible on the basis of title or abstract. 273 full-text articles were then assessed for eligibility and a further 258 were excluded (see Figure 2 for exclusion reasons). The remaining 15 articles were identified as eligible for inclusion.

Data extraction and synthesis

For each article, the following data were extracted: 1) study characteristics, e.g. author(s) and year, country of publication; 2) participant characteristics, e.g. mean age, sample size, sexual orientation; 3) primary outcomes, i.e. protective factor(s), measure(s) of suicide, instruments used to measure variables; 4) statistical test(s) used to assess relationships between variables; 5) statistical significance of relationships. Specific sexual orientations, gender identities and ethnicities were aggregated to increase homogeneity of data to aid comparison of studies. An independent reviewer (VK) co-extracted data from a proportion (10%) of included studies. A narrative synthesis of the included articles was conducted in accordance with 'Guidance on the Conduct of Narrative Synthesis in Systematic Reviews' (Popay et al., 2006). Following a framework of ecological systems theory, findings will be presented starting with individual factors followed by interpersonal, community and societal factors (Bronfenbrenner, 2000). A similar approach was used in a systematic review on depression in SM youth by Hall (2018).

Quality assessment

Reporting quality and risk of bias of studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklists for Analytical Cross Sectional Studies (JBI, 2017a) and Cohort Studies (JBI, 2017b) for cross-sectional and longitudinal studies, respectively (see Appendix B, pp. 72-78). These tools were developed to support the critical appraisal of studies regarding methodological quality and the possibility of bias within their design. Both checklists appraise articles across several methodological domains, including recruitment methods, validity of measurement tools, management of confounding factors and statistical analysis. Each article was attributed an overall quality rating in accordance with criteria adapted from the Quality Assessment Tool for Quantitative Studies (Effective Public Health Practice Project, 1998; see Appendix C, p. 79). An independent reviewer (VK) co-rated a sample (10%) of studies and no discrepancies were identified.

Results

Study characteristics

15 articles were included in the review, with publication dates ranging from 2000 to 2024. No articles published prior to 2000 met inclusion criteria. A summary of methodological and participant characteristics is presented in Table 1, followed by a narrative synthesis of findings regarding relationships between protective factors and suicide outcomes in SM adults. Most (n=10) of the studies were conducted in the USA, while the rest were undertaken in Europe (n=4) and East Asia (n=1). The majority of studies (n=13) utilised a cross-sectional design, whereas two studies used longitudinal designs (Tang et al., 2024; Yen et al., 2024). Two of the included articles reported undertaking secondary analysis of data from larger datasets (e.g. national surveys) while the remaining 13 articles described direct data collection via online (n=10), in-person (n=2) or postal surveys (n=1). A wide range of statistical analysis methods were reported including logistic regression, Chi square tests, independent t-tests, Spearman's rank correlation, mediation and moderation analyses.

Participant characteristics

Sample size ranged from 199 to 1,432 for studies that recruited participants directly, and from 1,518 to 64,079 for those that analysed secondary data. Most studies reported predominantly young adult samples with mean ages ranging from 20.4 to 36.5. Two articles did not report a mean age for their samples, but a minimum age of 18 were inclusion criteria for both studies. As shown in Table 1, nine studies had exclusively SM samples and the rest ranged from 25% to 97.1% SM participants but reported specific analyses for SM participants. A range of gender identities were represented including cisgender women (20.3% to 68.1%), cisgender men (13.2% to 58.4%), transgender women (1.01% to 18.1%), transgender men (0.9% to 25.9%) and non-binary individuals (0.2% to 24.3%). Overall, the proportion of GM adults represented in samples ranged from 0% to 59.6%. Two articles did not report the gender identity of their participants (Plöderl & Fartacek, 2005; Plöderl et al., 2014). Ethnocultural diversity of samples was mixed, with the proportion of ethnic minority participants ranging from 20.4% (Kaniuka et al., 2021) to 71.1% (Trujillo et al., 2020). Five articles did not report the ethnicities of their

participants (de Lange et al., 2022a; Plöderl & Fartacek, 2005; Plöderl et al., 2014; van Heeringen & Vincke, 2000; Yen et al., 2024).

Measurement of suicidal thoughts and behaviours

As detailed in Table 2, measurement of suicide outcomes varied across studies. Seven articles solely measured suicidal ideation, while six studies assessed suicidal ideation alongside other outcomes such as previous suicide attempts, suicidal intent and having made a suicide plan. Tang et al. (2024) utilised each of the aforementioned outcomes; however, relationships with protective factors were only reported in relation to whether participants made a suicide plan during the follow-up period. Two studies used previous suicide attempts as the main outcome (Chang et al., 2022; Woodford et al., 2018). Nine studies measured suicidal thoughts and/or behaviours using specific questions (e.g. "*During the past 12 months, did you ever seriously think about committing suicide?*") which required participants to provide a binary "*yes/no*" response. The remaining six studies used standardised measures of suicidal thoughts and behaviours, including: Suicide Behaviours Questionnaire (Cotton et al., 1995); Beck's Scale for Suicidal Ideation (Beck et al., 1988); Suicidal Ideation Attributes Scale (van Spijker et al., 2014); Suicidal Ideation and Behaviour Scale (Teismann et al., 2017).

Factors associated with lower risk of suicidal thoughts and behaviours

SM identity factors

Four studies examined factors related to SM identity (Chang et al., 2022; Foster et al., 2023; Plöderl et al., 2014; Woodford et al., 2018). Chang et al. (2022) found that "outness" (i.e. the degree of openness with others about one's sexual identity) was not significantly associated ($p=0.64$) with previous suicide attempts. Furthermore, while low outness (i.e. 1SD below the mean) was reported to moderate the linear relationship between internalised homophobia, loneliness and suicidal ideation (B = -.09, SE =.05, p =.047, 95% CI = -.18 – -.00), moderation was not observed in those with medium or high outness (Foster et al., 2023). This suggests low outness may be a risk factor for feelings of internalised homophobia leading to suicidal ideation rather than high outness being protective. Plöderl et al. (2014) found that "coming out" to friends ($p<.05$), family ($p<.05$) and others ($p<.05$) were each significantly associated with lower suicidal ideation. Coming out to family ($p<.01$) and others ($p<.05$) were also found to be associated with fewer previous suicide attempts; however, coming out to friends was

not significant. Finally, Woodford et al. (2018) found that measures of outness and pride in SM identity were not significantly associated with previous suicide attempts in SM adults.

Psychological factors

The main psychological factors examined were gratitude, self-compassion, self-esteem, self-efficacy, emotional stability and internal locus of control (de Lange et al., 2022a; Kaniuka et al., 2021; Munn & James, 2022; Plöderl & Fartacek, 2005; Rosenthal et al., 2023; Van Heeringen & Vincke, 2000; Woodford et al., 2018). Higher gratitude was significantly associated ($p<.001$) with lower suicidal ideation (Kaniuka et al., 2021) and higher self-compassion was significantly associated with lower suicidal ideation ($p<.001$) in two studies (Kaniuka et al., 2021; Rosenthal et al., 2023). In serial mediation analyses, self-esteem (B = 0.16, SE = 0.04, 95% CI = 0.096 – 0.238), self-efficacy (B = 0.09, SE = 0.02, 95% CI = 0.045 – 0.127) and emotional stability (B = 0.11, SE = 0.03, 95% CI = 0.056 – 0.169) mediated the indirect effect of internalised homophobia (IH) on suicidal ideation via depression (e.g. higher IH was associated with lower self-esteem, which was then associated with higher depression and then higher suicidal ideation); however, internal locus of control did not (Munn & James, 2022). Plöderl and Fartacek (2005) found that higher self-esteem predicted lower suicidal ideation ($p<.001$) while Van Heeringen and Vincke (2000) found that SM adults with a history of suicidal ideation and/or attempts had lower self-esteem than those with no history of either. Woodford et al. (2018) reported that higher levels of resilience were associated with fewer past suicide attempts ($p<.001$). Finally, having an active coping style was significantly associated with lower suicidal ideation in the past year ($p<0.05$) and lifetime suicide attempts ($p<0.05$) in SM adults (de Lange et al., 2022a).

Interpersonal factors

Eight studies examined interpersonal factors in relation to suicide (Chang et al., 2022; Chang et al., 2024; Plöderl et al., 2014; Plöderl & Fartacek, 2005; Tang et al., 2024; Trujillo et al., 2020; Van Heeringen & Vincke; 2000; Yen et al., 2024). Social support was the most commonly investigated interpersonal factor; however, assessment of social support varied: three articles measured global social support; four reported specific types of support (e.g. family support). Plöderl et al. (2014) observed that global social support was associated with lower suicidal ideation ($p<.05$) and previous suicide attempts ($p<.01$). Global social support was associated

with lower odds of having made a suicide plan (p<0.001) and mediated the pathway between adverse childhood experiences (ACEs) and having made a suicide plan (OR = 1.107, p=0.03) during the past year (Tang et al., 2024). In contrast, Van Heeringen & Vincke (2000) did not observe a significant difference in social support between SM adults with or without a history of suicidal ideation or attempts. Support from friends (B = -0.71, SE = 0.23, 95% CI = -1.15 – -0.26) and romantic partners (B = -1.02, SE = 0.22, 95% CI = -1.46 – -0.58) were each found to moderate the relationship between heterosexism (i.e. prejudice or discrimination against SM people based on the belief that heterosexuality is "normal") and suicidal ideation; however, family support (B = -0.24, SE = 0.32, 95% CI = -0.85 – 0.36) was not (Trujillo et al., 2020). Support from mothers (p<.01), fathers (p<.01) and siblings (p<.01) were associated with lower suicidal ideation (Plöderl & Fartacek, 2005). Conversely, two studies observed no significant association between family support and outcomes related to suicide in SM adults (Chang et al., 2022; Yen et al., 2024). Support from friends was associated (p=0.03) with fewer previous suicide attempts (Chang et al., 2022) but had no significant association with suicidal ideation (Plöderl & Fartacek, 2005). Chang et al. (2022) did not find romantic partner support to have a significant association with suicidal ideation (p=0.27). Lastly, higher help-seeking willingness was significantly associated (p<.001) with lower suicidal ideation (Chang et al., 2024).

Community factors

Only one study investigated community-level protective factors. Community connectedness was found to moderate (B = -0.16, SE = 0.05, 95% CI = -0.25, -0.06,) the path between minority stress, internalised homophobia and suicidal ideation (Rogers et al., 2021).

Societal factors

No included studies examined societal factors that may reduce the risk of suicide in SM adults.

Quality assessment

As detailed in Table S1 (Appendix D, p. 80), the overall quality of studies was mixed (ranging from weak to strong). One study was strong in relation to its methodological and reporting quality (Kaniuka et al., 2021). Eight studies were rated as moderate (Chang et al., 2022; Chang et al., 2024; de Lange et al., 2022a; Munn & James, 2022; Rosenthal et al., 2023; Tang et al., 2024; Woodford et al., 2018; Yen et al., 2024) and the remaining six studies failed to meet

two or more JBI checklist criteria and were rated as weak (Foster et al., 2023; Plöderl et al., 2014; Plöderl & Fartacek, 2005; Rogers et al., 2021; Trujillo et al., 2020; Van Heeringen & Vincke, 2000). Most studies reported inclusion criteria where relevant; however, four articles did not specify clear criteria (Foster et al., 2023; Plöderl et al., 2014; Plöderl & Fartacek, 2005; Van Heeringen & Vincke, 2000). Several studies reported insufficient detail regarding factors such as demographic characteristics of participants, sampling methods and ethical approval.

All studies included in this review reported a clear definition of suicidal outcome (e.g. suicidal ideation or previous attempts); however, seven studies used binary questions to assess these outcomes (see Table 2), and one further study described using a non-standardised Likert scale to measure previous suicide attempts in participants (Woodford et al., 2018). Similarly, one study used binary questions to assess help-seeking willingness (Chang et al., 2024) while two studies used Likert scales to measure social support and outness, respectively (Plöderl & Fartacek, 2005; Woodford et al., 2018). Van Heeringen and Vincke (2000) used a psychometric scale with unclear reliability and validity to assess social support. The remaining 11 articles used validated psychometric tools to measure protective factors (see Table 2). The variation in measurement tools and study design utilised may have contributed to the variation in relationships between outcomes observed across studies.

Notably, the majority of papers described clear statistical methods used to analyse their data. However, reporting of analyses undertaken was mixed, with several studies failing to discuss power analyses in relation to their samples, explain test results detailed in tables or provide effect sizes where relevant. Furthermore, Tang et al. (2024) measured a number of variables (i.e. suicidal ideation, suicide intent and previous attempts) but only reported the association between social support and having made a suicide plan. Both longitudinal studies provided data from participants who were followed up for several years. Moreover, Yen et al. (2024) attempted to minimise drop-out rates by sending participants multiple text reminders spaced one month apart inviting them to participate in the follow-up survey. Finally, a significant proportion of included studies did not report or sufficiently account for possible confounding variables in their analyses. In total, eight studies described controlling for specific variables such as age, gender, ethnicity, income and employment status within their analytic strategy.

Table 1

Summary of study and participant characteristics

Study	Country	Design	Recruitment	Sample (N)	Mean Age (SD)	Sexual orientation, N (%)	Gender identity, N (%)	Ethnicity, N (%)
Foster et al. (2023)	USA	Cross-sectional	Online (social media, mailing lists etc.)	SM adults (199)	24.55 (± 9.39)	Sexual minority 199 (100)	Cisgender woman 131 (65.9) Cisgender man 55 (27.6) Gender minority 13 (6.5)	White 123 (61.8) Ethnic minority 76 (38.2)
Chang et al. (2022)	USA	Cross-sectional	In-person / online (public posters, online adverts)	SM adults (231)	28.04 (± 9.85)	Sexual minority 231 (100)	Cisgender woman 139 (58.9) Cisgender man 70 (29.7) Gender minority 22 (9.3)	White 140 (60.6) Ethnic minority 91 (39.4)
Kaniuka et al. (2021)	USA	Cross-sectional	Online (social media)	SM adults (651)	26.25 (± 7.73)	Sexual minority 651 (100)	Cisgender woman 301 (46.2) Cisgender man 86 (13.2) Gender minority 264 (40.6)	White 518 (79.6) Ethnic minority 133 (20.4)
Munn & James (2022)	USA	Cross-sectional	Online (online adverts)	SM adults (404)	27.42 (± 7.84)	Sexual minority 404 (100)	Cisgender woman 208 (51.5) Cisgender man 123 (30.4) Gender minority 73 (18.1)	White 266 (65.8) Ethnic minority 138 (34.2)
Yen et al. (2024)	Taiwan	Longitudinal	Online adverts (social media)	SM adults (673)	24.8 (± 2.9)	Sexual minority 673 (100)	Cisgender woman 336 (49.9) Cisgender man 337 (50.1) Gender minority 19 (2.8)	NR
Chang et al. (2024)	USA	Cross-sectional	Secondary data (college survey)	Adults[1] (64,079)	NR[2]	Heterosexual 48,043 (75.0) Sexual minority 16,036 (25)	Cisgender woman 43,648 (68.1) Cisgender man 17,968 (28.0) Gender minority 2,463 (3.9)	White 33,525 (55.4) Ethnic minority 30,554 (44.6)
Tang et al. (2024)	USA	Longitudinal	Secondary data (Generations study[3])	SM adults (1,518)	36.48 (± 14.7)	Sexual minority 1,518 (100)	Cisgender woman 750 (49) Cisgender man 674 (44) Gender minority 94 (6.2)	White 931 (61.3) Ethnic minority 587 (38.7)
Plöderl et al. (2014)	Germany	Cross-sectional	Online adverts (social media)	Adults[1] (438)	27.66 (± 3.98)	Heterosexual 183 (41.8) Sexual minority 255 (58.2)	NR	NR
Plöderl & Fartacek (2005)	Austria	Cross-sectional	Postal adverts (LGB mailing lists, universities etc.)	Adults[1] (625)	36.2 (± 11.8)	Heterosexual 267 (42.7) Sexual minority 358 (57.3)	NR	NR

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Study	Country	Design	Recruitment	Sample (N)	Mean Age (SD)	Sexual orientation, N (%)	Gender identity, N (%)	Ethnicity, N (%)
Van Heeringen & Vincke (2000)	Belgium	Cross-sectional	In-person surveys (holiday camps, high schools)	Adults[1] (404)	20.4 (± 2.3)	Heterosexual 189 (45.8) Sexual minority 215 (54.2)	Cisgender woman 196 (48.5) Cisgender man 208 (51.5)	NR
Rosenthal et al. (2023)	USA	Cross-sectional	Online adverts (social media)	SGM adults[1] (1,306)	NR[2]	Heterosexual 38 (2.9) Sexual minority 1,268 (97.1)	Cisgender woman 265 (20.3) Cisgender man 262 (20.1) Gender minority 779 (59.6)	White 959 (73.4) Ethnic minority 347 (26.6)
Rogers et al. (2021)	USA	Cross-sectional	Online adverts (social media, mailing lists)	SM adults (329)	30.94 (± 7.18)	Sexual minority 329 (100)	Cisgender woman 121 (36.8) Cisgender man 198 (58.4) Gender minority 10 (4.8)	White 138 (41.9) Ethnic minority 191 (58.1)
Trujillo et al. (2020)	USA	Cross-sectional	Online survey (source NR)	SM adults (239)	31.48 (± 11.35)	Sexual minority 239 (100)	Cisgender woman 150 (62.8) Cisgender man 89 (37.2)	White 69 (28.9) Ethnic minority (71.1)
Woodford et al. (2018)	USA	Cross-sectional	Online / in-person (LGBT conference, mailing lists etc.)	SGM adults (776)	22.68 (± 5.46)	Sexual minority 728 (93.8) Missing 48 (6.2)	Cisgender woman 344 (44.3) Cisgender man 276 (35.6) Gender minority 133 (17.1) Missing 23 (3.0)	White 510 (65.7) Ethnic minority 179 (23.1) Missing 47 (6.1)
de Lange et al. (2022a)	Netherlands & Belgium	Cross-sectional	Online adverts (social media, mailing lists)	SGM adults (1,432)	22.12 (± 3.20)	Sexual minority 1,432 (100)	Cisgender woman 694 (48.5) Cisgender man 433 (30.2) Gender minority 305 (21.3)	NR

Notes: NR = not reported. SM = sexual minority. SGM = sexual and gender minority. SD = standard deviation.

1. Sample included non-SM participants – data relating to SM participants were extracted in Table 2. **2.** Minimum participant age of 18 confirmed by lead author during full-text screening. **3.** Meyer et al., (2021).

Table 2

Summary of protective factors associated with suicidal thoughts and behaviours in sexual minority participants

Study	Suicide Outcome(s)	Protective Factor(s)	Primary Analysis Method(s)	Reported Relationship(s) Between Variables
Foster et al. (2023)	Suicidal ideation[a]	Outness[1]	Moderation analysis	**Low outness: B = −.09, SE = .05, 95% CI [−.18, −.00], p = .047** Med outness: B = −.07, SE = .04, 95% CI [−.15, .00], p = .051 High outness: B = −.059, SE = .03, 95% CI, [−.12, .00], p = .059
Chang et al. (2022)	Suicide attempts[a]	Outness[2] Social support[3]	Logistic regression analysis	Outness: OR = 1.05, 95% CI [.85, 1.30], p = 0.64 **Friend support: OR = .64, 95% CI [.43, .96], p = 0.03** Family support: OR = .96, 95% CI [.63, 1.47], p = 0.87 Significant other support: OR = .71, 95% CI [.49, 1.01], p = 0.27
Kaniuka et al. (2021)	Suicidal ideation[b]	Gratitude[4] Self-Compassion[5]	Multivariate mediation analysis	**Gratitude: c = −0.36, SE = 0.06, p < .001** **Self-compassion: b = −4.02, SE = 0.58, p < .001**
Munn & James (2022)	Suicidal ideation[c]	Self-esteem[6] Self-efficacy[7] Locus of control[8] Emotional stability[9]	Serial mediation analysis	**Self-esteem: index = 0.16, SE = 0.04, 95% CI [0.096, 0.238]** **Self-efficacy: index = 0.09, SE = 0.02, 95% CI [0.045, 0.127]** Locus of control: index = 0.02, SE = 0.01, 95% CI [-0.006, 0.049] **Emotional stability: index = 0.11, SE = 0.03, 95% CI [0.056, 0.169]**
Yen et al. (2024)	Suicidal ideation[a] Suicide attempts[a]	Family support[10]	Bivariate logistic regression	Family support (new risk): OR = 0.946, 95% CI [0.874–1.023], p = .162 Family support (persistent risk): OR = 0.944, 95% CI [0.882–1.009], p = .091
Chang et al. (2024)	Suicidal ideation[d] Suicide attempts[d]	Help-seeking willingness[11] Help-seeking history[12]	Multilevel logistic regression	**Help-seeking willingness: AOR = 0.79, 99% CI [0.73, 0.85], p < 0.001** Help-seeking history: sig. associated with increased suicide risk, p < 0.001
Tang et al. (2024)	Suicidal ideation[a] Suicidal intent[a] Suicide plan[a] Suicide attempts[a]	Social support[3]	Exploratory mediation analysis	<u>Direct effect</u> **Social support → suicide plan: OR = 0.823, p < 0.001** <u>Indirect effect</u> **ACEs → social support → suicide plan: OR = 1.017, p = 0.030**
Plöderl et al. (2014)	Suicidal ideation[e] Suicide attempts[a]	Social support[13] Coming out[14]	Spearman rank correlation	<u>Suicidal ideation</u> **Social support: r = -.44, p <.05** **Coming out: r = -.17, p <.05** <u>Suicide attempts</u> **Social support: t = 3.34, p <.01** **Coming out: t = -2.51, p <.01**
Plöderl & Fartacek (2005)	Suicidal ideation[a]	Social support[15] Self-esteem[6]	Spearman rank correlation	**Social support (mother): r = -.16, p < .01** **Social support (father): r = -.16, p <. 01** **Social support (siblings): r = -.18, p < .01** Social support (friends): r = -.05, p > .05 **Self-esteem: r = -.37, p < .001**

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Study	Suicide Outcome(s)	Protective Factor(s)	Primary Analysis Method(s)	Reported Relationship(s) Between Variables
Van Heeringen & Vincke (2000)	Suicidal ideation[a] Suicide attempts[a]	Social support[16] Self-esteem[6]	Independent t-tests Chi square tests	Suicidal ideation (absent vs present) Social support: p > 0.05 – *[Mean VBQ (absent) = 79.7; Mean VBQ (present) = 77.3]* **Self-esteem: p < 0.01 – *[Mean RSE (absent) = 52.4; Mean RSE (present) = 47.0]*** Suicide attempts (absent vs present) Social support: p > 0.05 – *[Mean VBQ (absent) = 79.7; Mean VBQ (present) = 80.4]* **Self-esteem: p < 0.01 – *[Mean RSE (absent) = 51.1; Mean RSE (present) = 48.1]***
Rosenthal et al. (2023)	Suicidal ideation[a]	Self-compassion[5]	Independent t-tests	**Self-compassion: p <.001** ***[Mean SCS-SF (ideation) = 2.30; Mean SCS-SF (no ideation) = 2.86]***
Rogers et al. (2021)	Suicidal ideation[e]	Community connectedness[17]	Mediation analysis	**Community connectedness: B = -.16, SE = .05, 95% CI [-.25, -.06]**
Trujillo et al. (2020)	Suicidal ideation[d]	Social support[3]	Moderation analysis	**Social support (family): B = -0.71, SE = 0.23, 95% CI [-1.15, -0.26]** Social support (friends): B = –0.24, SE = 0.32, 95% CI [–0.85, 0.36] **Social support (significant other): B = –1.02, SE = 0.22, 95% CI [–1.46, –0.58]**
Woodford et al. (2018)	Suicide attempts[a]	Resilience[18] LGBTQ pride[19] LGBTQ outness[20]	Multivariable regression	**Resilience: AOR = 0.30, 95% CI [0.16, 0.56], p < .001** LGBTQ pride: AOR = 0.68, 95% CI [0.30, 1.52], p > .05 LGBTQ outness: AOR = 0.85, 95% CI [0.53, 1.37], p > .05
de Lange et al. (2022a)	Suicidal ideation[a] Suicide attempts[a]	Active coping[21]	Logistic regression analysis	Suicidal ideation **Active coping: AOR = 0.44, 95% CI [0.36, 0.55], p < 0.05** Suicide attempts **Active coping: AOR = 0.57, 95% CI [0.44, 0.74], p < 0.05**

Note: Bold values indicate statistical significance.

a. Binary question(s) e.g. *"During the past 12 months, did you ever seriously think about committing suicide?"*. **b.** Suicidal Ideation Attributes Scale (SIDAS; Van Spijker et al., 2014). **c.** Suicide Ideation and Behavior Scale (SSEV-SI; Teismann et al., 2017). **d.** Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001). **e.** Beck's Scale for Suicide Ideation (Beck et al., 1988).

1. Outness Inventory (OI; Mohr & Fassinger, 2000). **2.** Likert scale – 5 items (Meyer et al., 2002). **3.** Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988). **4.** Gratitude Questionnaire–Six Item (GQ-6; McCullough et al., 2002). **5.** Self-Compassion Scale-Short-Form (SCS-SF; Raes et al., 2011). **6.** Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965). **7.** Generalised Self-Efficacy Scale (GSS; Schwarzer et al., , 1995). **8.** Levenson Multidimensional Locus of Control Scale (Levenson, 1973). **9.** 8-item *Neuroticism* subscale of Big Five Inventory (John & Srivastava, 1999). **10.** 5-item Chinese version of Family Adaptability, Partnership, Growth, Affection and Resolve (APGAR) Index (Chen et al., 1980). **11.** One binary question (Chang et al., 2024). **12.** Two binary questions (Chang et al., 2024). **13.** 14-item short version (K-14) of the Fragebogen zur sozialen unterstützung (F-SozU; Fydrich et al., 2009). **14.** Likert Scale – 3 items (Plöderl et al., 2014). **15.** Likert scale – 4 items (Plöderl & Fartacek, 2005). **16.** Questionnaire developed by Vincke & Bolton (1996) [referred to as "VBQ" above]. **17.** Community Connectedness Measure (CCM; Frost & Meyer, 2012). **18.** Brief Resilience Scale (Smith et al., 2008). **19.** Likert scale – 2 items (Woodford et al., 2018). **20.** Likert scale – 2 items (Woodford et al., 2018). **21.** Utrecht Coping List (UCL; Schreurs et al., 1993).

Discussion

This review aimed to synthesise evidence relating to protective factors for suicide risk among SM adults. The findings will now be discussed in the context of broader evidence and relevant theories including minority stress theory (MST), ecological systems theory and the IMV model. Strengths, limitations and implications for practice and future research will be considered.

SM identity factors

Evidence for the protective role of openness with others regarding sexual identity was mixed, with the majority of articles reviewed reporting non-significant associations with suicide risk. However, low outness moderated the pathway between internalised homophobia, loneliness and suicidal ideation and could be considered a risk factor for suicide in SM adults (Foster et al., 2023). This is consistent with MST in understanding suicide risk in SM populations in terms of internalised homophobia and identity concealment. Findings from recent studies suggest higher outness may be more protective against depression and suicidal ideation in SM youth (Real & Russell, 2025; Rentería et al., 2023). However, one study observed that higher outness was associated with increased suicide risk in both SM adolescents and young adults (Feinstein et al., 2023) while a recent longitudinal study found that being more out was associated with increased depression over time in SM adults (Feinstein et al., 2019). It could be argued that being more out may in fact increase someone's exposure to minority stressors, which might explain why outness was generally not associated with lower suicide risk. Likewise, Woodford et al. (2018) found that neither self-acceptance nor pride in SM identity were associated with previous suicide attempts. Ultimately, our understanding of the complex interplay between disclosure/self-acceptance of SM identity and suicide risk remains limited, and more research is needed to examine under what conditions minority stress and SM identity-related factors may influence the development of suicidal thoughts and behaviour in SM adults.

Psychological factors

The articles herein highlight a range of psychological factors which may be helpful in reducing the risk of suicide in SM adults including gratitude, self-compassion, self-esteem, resilience, active coping and emotional stability. All seven articles that examined psychological factors

reported significant associations with lower suicide risk, with the exception of internal locus of control (Munn & James, 2022). These findings are generally consistent with the literature on SM youth, with self-compassion (Hatchel et al., 2019), self-esteem (Oginni et al., 2019) and resilience (Giraud et al., 2024) having been associated with lower risk of suicide in SM youth. Coping and resilience are respectively considered TSMs and MMs in the IMV model (O'Connor & Kirtley, 2018). However, further studies applying the model are needed to investigate the mechanisms through which other psychological protective factors (e.g. self-compassion) may reduce the likelihood of suicidal thoughts or behaviours in SM adults. In summary, evidence supporting the protective role of psychological factors in reducing the risk of suicidality in SM adults is relatively strong. This has implications for clinical practice, given that factors such as self-compassion can be fostered through psychological interventions (Ferrari et al., 2019).

Interpersonal and community factors

Social support from family, friends and/or romantic partners was generally associated with lower risk of suicide in SM adults, with more evidence in favour of friend and family support. Community connectedness and help-seeking willingness were also identified as protective against suicide in one study each (Chang et al., 2024; Rogers et al., 2021). These findings are in keeping with literature on SM adolescents, for whom community connectedness and social support have been identified as protective factors (Gorse, 2022; Taliaferro & Muehlenkamp, 2017). These findings are also in line with the IMV model, which considers factors such as social support and community connectedness MMs that may reduce the likelihood of feelings of entrapment developing into suicidal ideation and intent (O'Connor & Kirtley, 2018).

Societal factors

The studies in this review omitted societal factors. This may be a result of our search strategy or an important gap, as societal factors including LGBTQ+ inclusive curriculums, peer support structures (e.g. LGBTQ+ student organisations) and identity-affirming policies have been shown to reduce suicide risk in SM adolescents (Gorse, 2022; Whitaker et al., 2016). Literature investigating factors associated with lower suicide risk in GM adults also highlights the role of societal factors including access to gender-affirming medical treatment (Grant et al., 2024) and supportive policy and legislation (Rabasco & Andover, 2020). With MST in mind, it would

be reasonable to expect societal protective factors may mitigate the potential impact of distal minority stressors on suicide risk in SM adults as well (Meyer et al., 2021).

Strengths and limitations

This review has several strengths: for instance, a rigorous search of nine academic databases was conducted using search terms informed by previous systematic reviews on similar topics (Hall, 2018; Yıldız, 2018). In addition, an independent reviewer contributed to screening, data extraction and quality appraisal stages of the review, thereby reducing risk of bias. This review also attempts to contextualise findings within relevant theoretical models (i.e. IMV, MST and ecological systems theory) in line with guidance on narrative synthesis for systematic reviews (Popay et al., 2006). However, this review also has potential limitations including the decision to exclude grey literature and non-English articles, which could have led to relevant findings being missed. Furthermore, due to the uncertainty around what factors may be protective in SM adults, only general terms for protective factors were used in the search strategy and it is possible that more specific terms (e.g. optimism) may have yielded additional results. Finally, data relating to ethnicity and gender of participants were aggregated during extraction due to small subgroup sizes. While this increased homogeneity of data and aided comparison of samples, there could be important differences in the profiles of SM individuals in relation to suicide risk and future studies may wish to investigate differences between these subgroups. Finally, the articles reviewed in the present study were limited by several factors including inconsistent reporting, measurement issues and predominantly cross-sectional designs. This is in keeping with the findings of previous reviews for GM adults (Inderbinen et al., 2021; Kia et al., 2021) and SM youth (Wang et al., 2023) and suggests an important gap in the literature.

Recommendations

This review highlights the need for further research, particularly for studies with longitudinal designs which could more effectively examine causal relationships between protective factors and suicide risk. Furthermore, there remains a need to consider societal factors that may help to reduce suicide risk in SM adults, given that these appear to be protective in SM adolescents and GM adults (Gorse, 2022; Rabasco & Andover, 2020). A limitation of the current literature on protective factors in relation to suicide risk in SM adults is that factors are often examined in isolation. Future research would benefit from applying theoretical models of suicide (e.g.

the IMV model) in order to better understand the mechanisms through which these factors influence the development of suicidal thoughts or behaviours, e.g. by testing whether factors moderate specific pathways in the IMV model. Finally, it is hoped that our findings will: inform the development of interventions and suicide prevention strategies which bolster empirically supported protective factors; influence the practice of healthcare providers and other sectors involved in supporting SM adults; and ultimately, improve and protect the lives of SM adults by promoting strategies that mitigate the risk of suicide in this particularly vulnerable group.

Conclusion

Findings from this review indicate that psychological (gratitude, self-esteem, active coping, self-efficacy, self-compassion, emotional stability and resilience), interpersonal (help-seeking willingness and social support) and community-level (community connectedness) factors may help to reduce suicide risk in SM adults. There is limited evidence to support the protective role of SM identity-related factors such as outness and pride in relation to suicide risk in SM adults. Further research is needed to examine the possible role of societal protective factors and develop evidence-based suicide prevention strategies for this population. Future studies would benefit from applying theoretical models of suicidal behaviour such as the IMV model.

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Chapter 2

Understanding Suicide Risk in Sexual and Gender Minority Adults:

Applying the Integrated Motivational-Volitional Model of Suicidal Behaviour

Prepared in accordance with the author requirements for:

Psychology of Sexual Orientation and Gender Diversity

(Author Guidelines)

Plain Language Summary

Title

Understanding Suicide Risk in Sexual and Gender Minority Adults: Applying the Integrated Motivational-Volitional Model of Suicidal Behaviour

Background

Studies have shown that sexual and gender minority (SGM) adults are more at risk of suicide than the general population. There is some evidence that minority stress (i.e. distress arising from different forms of discrimination often faced by minority groups) may help to explain this increased risk; however, there has been limited research on factors that may help to reduce the risk of suicide in SGM adults. Further research applying psychological theories such as the Integrated Motivational-Volitional (IMV) Model of Suicidal Behaviour (O'Connor & Kirtley, 2018) is needed to improve our understanding of suicide risk in SGM adults.

Aims and Questions

This study aims to explore how the IMV model can help us better understand why some SGM adults may be more vulnerable to suicide, by examining the role of various factors (including minority stress) in relation to suicidal thoughts and behaviours in SGM adults.

Methods

Participants: Adults aged 18 or older who lived in the UK were eligible to take part in the study, including non-SGM adults and those with no history of suicidal thoughts or suicide attempts. In total, 371 adults (247 SGM and 124 non-SGM) took part in the study.

Recruitment: Participants were recruited online using advertisements distributed on social media websites and through relevant mailing lists (e.g. LGBTQ+ student organisations).

Design of study: Adults from the community completed a once-off online survey.

Data collection: Participants were asked to complete questionnaires measuring different aspects of their mental health including suicidal thoughts and behaviours. All questions were optional, and participants were advised that they could exit the survey at any point.

Main Findings and Conclusions

Differences between groups: SGM adults reported higher rates of previous suicidal thoughts (77.7%) and suicide attempts (29.9%) compared to 50% and 19.8% in non-SGM adults. SGM adults scored significantly higher on measures of recent suicidal thoughts and risk factors, and significantly lower on measures of protective factors, compared to non-SGM adults.

Risk factors: In SGM adults, higher defeat, depression, minority stress and exposure to self-harm in others were associated with higher risk of suicidal thoughts. Minority stress appears to play an important role in the development of suicidal thoughts. Loneliness and exposure to suicidal behaviour in others were linked to higher likelihood of previous suicide attempts.

Protective factors: Higher optimism, self-compassion, social support and self-acceptance of SGM identity were associated with lower risk of suicidal thoughts in SGM adults. Higher self-compassion and social support were linked to lower likelihood of previous suicide attempts.

Recommendations: Interventions which aim to reduce loneliness, increase social support and self-compassion may help to reduce the risk of suicide attempts in SGM adults. Further research applying the IMV model is needed to better understand suicide risk in SGM adults.

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Abstract

Introduction: Sexual and gender minority (SGM) adults are disproportionately affected by suicide compared to the general population. Understanding factors associated with higher risk, and those which may act as protective factors is crucial. To this end, we investigated the extent to which psychological factors from the Integrated Motivational-Volitional (IMV) Model of Suicidal Behaviour were associated with suicide risk in SGM adults.

Methods: 371 adults (247 SGM, 124 non-SGM) completed an online cross-sectional survey with validated measures assessing risk and protective factors including key components of the IMV model.

Results: SGM adults scored higher on measures of suicidal ideation and risk factors, and lower on protective factors than non-SGM adults. Multivariate analyses identified that in SGM adults: higher defeat, depression, minority stress, exposure to others' non-suicidal self-injury, and previous suicide attempts were associated with higher suicidal ideation; higher loneliness and exposure to others' suicidal behaviour were associated with higher odds of previous attempts; higher optimism, self-compassion, social support and self-acceptance were associated with lower suicidal ideation; higher social support and self-compassion were associated with lower odds of previous attempts. Moderation analysis showed that minority stress moderates the entrapment–suicidal ideation pathway in SGM adults.

Conclusions: Loneliness and exposure to others' suicidal behaviour may be risk factors for suicidal behaviour in SGM adults. Interventions which bolster self-compassion and social support may help to reduce the risk of suicide attempts. The IMV model provides a useful framework for understanding suicide risk in SGM adults; however, more research is needed.

Keywords: suicidal ideation; suicide attempts; sexual and gender minority adults; minority stress; risk factors; protective factors; IMV model

Introduction

Suicide is considered a serious public health issue and is one of the leading causes of death worldwide (World Health Organisation, 2021). Certain groups within the population are more at risk of suicide, and research has consistently shown that sexual and gender minority (SGM) adults are significantly more likely to experience suicidal ideation or attempt suicide than the general population (Layland et al., 2020; McNeil et al., 2017; Yıldız, 2018). The estimated prevalence of lifetime suicide attempts in sexual minority (SM) adults ranges from 11% to 20% – compared to 4% in heterosexual adults (Hottes et al., 2016). In particular, bisexuals (Salway et al., 2019), SGM adults from ethnic minority groups (Wang et al., 2022) and gender minority (GM) adults (McNeil et al., 2017) may be more at risk than other SGM subgroups. Research has identified a range of factors which can increase an individual's risk of suicidality including depression, loneliness and a lack of social support (Franklin et al., 2017). However, much of the research exploring factors associated with suicide risk in SGM populations has focused on SGM adolescents (Gorse, 2022). Further, existing literature on suicide risk in SGM adults often examines factors in isolation and there remains a need to contextualise results within relevant theoretical models in order to better understand the circumstances under which some SGM adults may be more likely to develop suicidal thoughts and behaviours (Franklin et al., 2017).

Understanding suicide risk in SGM adults

Integrated motivational-volitional model (IMV) of suicidal behaviour

The IMV model of suicidal behaviour is a tripartite framework that proposes a pathway of biopsychosocial factors which can contribute to the development of suicidal ideation and behaviours (O'Connor, 2011; O'Connor & Kirtley, 2018). As shown in Fig. 1, the model details the role of pre-motivational factors (e.g. environment, life events) in the emergence of suicide risk and outlines a pathway from defeat (i.e. feelings of humiliation or being brought down by life) to entrapment (i.e. feeling trapped by one's life circumstances with no hope of escape) to suicidal ideation (i.e. thoughts about killing oneself) to suicidal behaviours (i.e. engaging in self-injurious acts with the intention of killing oneself). The model outlines how threat-to-self moderators [TSM] (e.g. rumination, problem solving) influence the transition from defeat to entrapment, motivational factors [MM] (e.g. social support, burdensomeness) facilitate the

transition from entrapment to suicidal ideation and volitional moderators [VM] (e.g. exposure to suicidal behaviour in others) govern the transition to suicidal behaviour. Rasmussen et al. (2021) recently examined associations between IMV factors and suicidal ideation in a sample of young adults, finding that higher defeat and entrapment were associated with SM identity and suicidal ideation. However, further examination of pathways between key components within the IMV model is needed to improve our understanding of suicide risk in SGM adults.

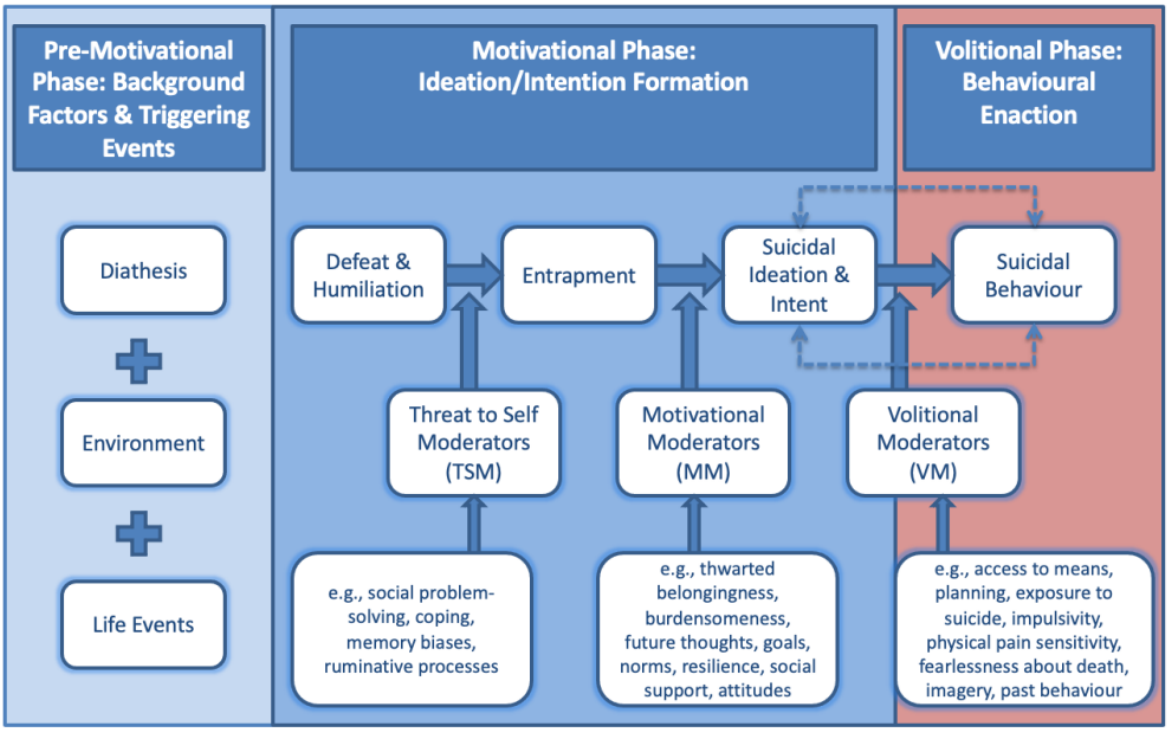

Figure 1

Integrated motivational-volitional model of suicidal behaviour (O'Connor, 2011; O'Connor & Kirtley, 2018)

Minority stress theory

Another theoretical framework which can be applied to understanding suicide risk in SGM populations is Meyer's (1995, 2003) minority stress model. The model proposes that distal stressors experienced by minority groups (e.g. harassment, family rejection, discrimination) result in the internalisation of these experiences and development of negative self-attitudes, leading to psychological distress. It has been suggested that the increased suicide risk in SGM populations could be explained by minority stress factors resulting in feelings of depression, hopelessness and perceived burdensomeness (Plöderl et al., 2014). Significant associations

between minority stress and suicidal ideation and attempts have been reported in SGM adults across several cross-sectional studies (Kittiteerasack et al., 2021; Meyer et al., 2021; Rogers et al., 2021). Furthermore, a recent meta-analysis of 44 studies found that minority stress was associated with suicidal ideation and previous attempts in SM adults (de Lange et al., 2022b). Although effect sizes were small, this highlights the need to identify factors that may reduce the potential impact of minority stress on SGM adults. Finally, although homophobic violence (a distal stressor) was found to be directly associated with suicidal ideation in SM adults, its indirect effect on ideation through entrapment was nonsignificant (Parra et al., 2021). Thus, the mechanism through which minority stress influences suicide risk in SGM adults in the IMV model remains unclear. Given the overlap between perceived burdensomeness [a MM] and minority stress in SM populations (Plöderl et al., 2014) it is possible that minority stress may function as a MM; however, further research is needed to examine this, therefore the present study aimed to explore the role of minority stress in the entrapment–ideation pathway.

Protective factors

Despite the increased risk of suicide in SGM adults, research examining protective factors in this population is relatively sparse. Starting with psychological factors, de Lange et al. (2022a) observed that having an active coping style was associated with lower likelihood of lifetime suicidal ideation and suicide attempts in both SM and GM young adults, while avoidant and passive coping were found to strengthen the association between minority stress and suicidal ideation in GM participants only. Furthermore, self-compassion and optimism have each been associated with lower likelihood of suicidal ideation and behaviour in SGM adults (Kaniuka et al., 2021; Moe et al., 2023; Rosenthal et al., 2023; Snooks & McLaren, 2021). Self-acceptance of SGM identity has been associated with lower psychological distress in SM adults (Huang et al., 2020); however, evidence of its protective role in relation to suicide risk in this population is lacking (Woodford et al., 2018). There is emerging evidence that interpersonal factors such as social support (de Lange et al., 2023; Tang et al., 2024) and community connectedness (Rogers et al., 2021) are associated with lower suicidal ideation in SGM adults, providing some support their role as MMs in this population. The role of societal factors is also important; for instance, supportive legislation and positive community attitudes have been associated with lower suicidality in SGM adults (Huang et al., 2020; Rabasco & Andover, 2020). While research into protective factors in SGM adults has increased, there remains a need to consider factors

within an IMV framework by examining specific interactions and mechanisms through which protective factors may help to reduce the risk of suicide in people from high-risk populations.

Present study

This study aims to examine whether key risk and protective factors from the IMV model (and in particular, those from the motivational phase) can aid our understanding of why some SGM adults may be more vulnerable to developing suicidal ideation and behaviours, and to explore whether minority stress may act as a motivational moderator (MM). It was hypothesised that:

H1: SGM adults would report higher levels of suicidal ideation, previous suicide attempts and risk factors from the IMV model compared to non-SGM adults.

H2: Higher defeat, entrapment, loneliness and minority stress would be associated with higher suicidal ideation and previous suicide attempts in SGM adults.

H3: Higher optimism, self-compassion, social support and self-acceptance would be associated with lower suicidal ideation and previous suicide attempts in SGM adults.

H4: Minority stress would have a moderating effect on the pathway from entrapment to suicidal ideation in SGM adults, i.e. functioning as a MM within the IMV model.

Methods

Ethics statement

This study was approved by the University of Glasgow School of Medical and Veterinary and Life Sciences Ethics Committee on 11th July 2024 (Ref: 200230341; see Appendix F, p. 89).

Procedure

Participants were recruited to an online cross-sectional study between 11th October and 4th December 2024 via poster advertisements (see Appendix G, p.90) which were distributed via social media websites (e.g. Reddit, Instagram). Relevant organisations (e.g. LGBTQ+ staff and student groups) were approached and asked to share advertisements within their networks, via newsletters or webpages. Further, advertisements were shared via mailing lists including the University of Glasgow Psychology Participant Pool. Participants were eligible for inclusion if they were aged 18 or older and lived in the UK. Potential participants who viewed the advert could follow a link to an anonymous survey, hosted on the online platform '*Qualtrics*'. After viewing the participant information (see Appendix G, pp. 90), only those who selected boxes to confirm they met the inclusion criteria and consented to take part were granted entry to the survey page. Participants were informed that taking part was voluntary and they could withdraw at any time. At the end of the survey, participants could opt in to a separate prize draw for one of two £50 shopping vouchers. Information with details of support organisations was available for participants to download throughout the survey (see Appendix G, p. 90).

Participants

A total of 484 participants began the survey; however, 113 did not progress beyond the initial consent or demographic sections and thus were excluded from the analyses. The final sample (n=371) was aged between 18 and 70 (M = 29.91, SD = 9.26); n=247 identified as SGM (M age = 30.13, SD = 9.76) and n=124 identified as non-SGM (M age = 29.47, SD = 8.19). The most common SGM identity within the SGM group was bisexual (n=93, 37.7%) followed by gay man (n=65, 26.3%), lesbian (n=34, 13.8%), nonbinary/gender non-confirming (n=33, 13.4%), queer (n=24, 9.7%), pansexual (n=13, 5.3%), asexual (n=11, 4.5%), transgender man (n=5, 2.0%) and transgender woman (n=4, 1.6%). The majority of the non-SGM group identified as cisgender

heterosexual females (n=118, 78.2%) and the remainder were cisgender heterosexual males (n=81, 21.8%). See Table S2 (Appendix D, p. 81) for demographic characteristics of the sample.

Measures

Demographic information including age, gender identity, sexual orientation, ethnicity, living situation, relationship status, educational attainment and employment status were collected.

Defeat and entrapment

Defeat and entrapment were measured via the top four factor loading items from the Defeat Scale (DS; Gilbert & Allan, 1998) and the four-item Entrapment Scale Short-Form (E-SF; De Beurs et al., 2020). The DS measures how often a person has felt a certain way in the past seven days (e.g. *"I feel defeated by life"*) and the E-SF assesses how closely a person relates to feeling trapped (e.g. *"I feel trapped inside myself"*). These brief measures have been shown to provide comparable information to the full scales and have been found valid in both clinical and population samples (De Beurs et al., 2020; Griffiths et al., 2015). In this study, the DS and ES-F demonstrated excellent (Cronbach alpha (α) = 0.926) and good (α= 0.855) reliability, respectively.

Recent suicidal ideation

The 8-item Suicide Ideation subscale of the Suicide Probability Scale (SPS; Cull & Gill, 1988) was used to assess recent suicidal ideation (e.g. *"I feel it would be less painful to die than to keep living the way things are"*). The SPS has demonstrated internal consistency in previous research (Atlı et al., 2009) and showed excellent reliability (α=0.912) in this sample. The SPS has been used in previous research on suicide risk in the SGM population (Reyes et al., 2017).

Exposure to suicidal behaviour

Two additional items were used to assess participants' exposure to friends or family engaging in suicidal behaviour or non-suicidal self-injury (NSSI): 1) "*Has someone in your family or close friends attempted or died by suicide?*" and 2) "*Has someone in your family or close friends deliberately harmed themselves without the intention of killing themselves?*". These questions have been used in previous research in the Suicidal Behaviour Research Laboratory (SBRL) to assess exposure to suicidal behaviour (O'Connor et al., 2012).

History of suicidal ideation and behaviour

Two items adapted from the Adult Psychiatric Morbidity Survey (APMS) were used to assess lifetime history of suicidal ideation and suicide attempts (McManus et al., 2009). Participants were asked to select one response ("*the past week*", "*the past year*", "*longer ago*", "*never*", or "*would rather not say*") for the following statements: 1) "*Have you ever seriously thought of taking your life, but not actually attempted to do so?*"; 2) "*Have you ever made an attempt to take your life, by taking an overdose of tablets or in some other way?*". These items were selected as they have been used in previous research within the SBRL to assess lifetime history of suicidal thoughts and behaviour (O'Connor et al., 2018; Sivertsen et al., 2024).

Minority stress

The LGBT Minority Stress Measure (LGBT-MSM) was used to measure minority stress (e.g. *"I have been verbally harassed or called names because I am LGBT"*) and was presented only to SGM participants. The LGBT-MSM is a 25-item instrument developed by Outland (2016) which has demonstrated good convergent, criterion and discriminant validity and has been used in recent studies exploring suicide risk in SGM adults (Kaufman et al., 2022; Salerno & Boekeloo, 2022). The LGBT-MSM showed good reliability (α=0.892) in this study.

Depression

The Patient Health Questionnaire – 9 (PHQ-9) was used to assess how often participants had experienced different depressive symptoms (e.g. *"little interest or pleasure in doing things"*) in the past two weeks. The PHQ-9 is a 9-item self-report measure which was developed as a screening tool for depression and has demonstrated internal reliability and construct validity (Kroenke et al., 2001). The PHQ-9 is widely used in suicide research including studies that have focused on SGM individuals (Baams et al., 2015; Janković et al., 2020). Reliability was good (α=0.893) for the PHQ-9 in the current sample.

Loneliness

The 3-item UCLA Loneliness Scale (Hughes et al., 2004) was used to measure how often participants had experienced feelings of loneliness (e.g. *"how often do you feel isolated from others?"*). The 3-item version was selected as it has demonstrated comparable psychometric

properties to the longer 20-item version in a Taiwanese sample of sexual minority men (Lin et al., 2022). This scale has been used in a recent study on suicide risk in SGM college students (Busby et al., 2020) and it showed good reliability (α=0.851) in the present study.

Optimism

The 7-item State Optimism Measure (SOM) was used to assess optimism (e.g. *"the future is looking bright to me"*) which has shown strong internal reliability, convergent and construct validity (Millstein et al., 2019) and demonstrated excellent reliability (α=0.936) in this sample. The SOM was selected as it has been shown to be more sensitive to detecting small changes in optimism compared to alternative measures of trait optimism (Hoeppner et al., 2024).

Self-compassion

The 26-item Self-Compassion Scale (SCS; Neff, 2003) was used to measure participants' self-compassion (e.g. *"I'm kind to myself when I'm experiencing suffering"*) and was selected due to its superior reliability compared to the 12-item version of the scale (Uršič et al., 2019). The SCS was used in a recent study exploring factors associated with reduced suicide risk in college students (Zeifman et al., 2021) and showed excellent reliability (α=0.940) in the present study.

Self-acceptance of LGBTQ+ identity

The Factors of Self-Acceptance – Sexual and Gender Identities (FSA-SGI; Toscano, 2022) was used to measure overall self-acceptance of LGBTQ+ identity (e.g. *"I accept my sexual/gender identity is part of who I am"*). The 23-item scale was presented only to SGM participants. The FSA-SGI demonstrated incremental validity in the author's normative sample (Toscano, 2024). This scale was developed recently and has yet to be validated by further samples; however, the FSA-SGI demonstrated good reliability (α=0.889) in the current study.

Social support

The ENRICHD Social Support Inventory (ESSI) was used to assess the current level of support participants have access to within their social network (e.g. *"Is there someone available to give you good advice about a problem?"*). This 7-item instrument was developed by Mitchell et al. (2003) as a brief measure of social support and has shown good reliability and divergent

validity. The ESSI has been utilised in a previous study examining the mental health of sexual minority men (Mo et al., 2018) and demonstrated good reliability (α=0.892) in this sample.

Power analysis

A priori power analysis was conducted using G*Power to determine the minimum sample size required for linear multiple regression analysis with up to 10 predictors. To achieve a power (1-β) of 0.90 for detecting a medium effect of ρ = 0.15, at a significance level of α = .05, a sample size of n=147 was required, indicating that the SGM sample (n=247) was sufficient.

Statistical analysis

Analysis of data was performed using SPSS version 29 (IBM Corp., Armonk, NY).

Missing data analysis

Missing data were examined at a measure level. Participants who completed >80% of items on a measure were retained for analysis of that scale, in line with a recent study in the Suicidal Behaviour Research Laboratory (Cleare et al., 2018). A small proportion of participants were excluded for specific measures as they completed <80% of items: UCLA (n=1); SOM (n=1); SCS (n=4); FSA-SGI (n=1); ESSI (n=6), APMS (n=15). After exclusion, missing data analysis showed a small proportion of missing data for: E-SF (n=1, 0.06%); SPS (n=3; 0.10%); LGBT-MSM (n=4, 0.06%); PHQ-9 (n=2, 0.06%); SOM (n=2, 0.08%); SCS (n=17, 0.18%); FSA-SGI (n=9, 0.20%); ESSI (n=3, 0.18%). Little's MCAR test showed data to be missing completely at random (MCAR) for each scale with the exception of the SPS (χ^2= 57.987, df=21, p=0.000). Median imputation was used to replace missing items (including the SPS) due to the small proportion of missing items, as this method is considered less sensitive to outliers than mean imputation.

Analysis of differences between SGM and non-SGM adults

First, tests of normality were performed to assess the distribution of scores for each measure. Across all measures, scores were not normally distributed across the sample; therefore, non-parametric tests (Mann-Whitney U and Chi-square for continuous and categorical variables, respectively) were used to compare SGM and non-SGM participants. To explore the relative contribution of SGM identity toward suicidal ideation and behaviour across the total sample relative to other factors, multivariate linear and logistic regression analyses were undertaken.

Analysis of factors associated with suicidal ideation and behaviour in SGM adults

Univariate linear regression was used to examine associations between variables and recent suicidal ideation in SGM participants. Depression was entered as a covariate in further linear regression analyses for factors with significant univariate associations with SPS scores. Finally, hierarchical multiple linear regression analyses were conducted to explore how each variable independently contributes to variation in recent suicidal ideation in SGM adults. To examine factors associated with lifetime suicidal ideation and attempts in SGM participants, univariate multinomial logistic regression analyses were used. For these analyses, APMS responses were recoded to binary and SGM participants were allocated to one of three groups based on their responses: *Control* (n=112; no history of ideation/attempt), *Ideation* (n=150; lifetime history of ideation only) or *Attempt* (n=94; lifetime history of attempt). Depression was included as a covariate in further analyses for variables identified as significant during univariate analyses. Finally, multivariate multinomial logistic regression analyses were conducted to examine the relative ability of variables to independently distinguish between the suicide history groups.

Exploratory moderation analysis

A simple moderation model was conducted using Model 1 from Hayes' (2017) PROCESS macro to explore whether minority stress moderates the pathway between entrapment and suicidal ideation outlined within the IMV model. Depression was entered as a covariate in the model. Bootstrapping was set to 1000, and HC4 was selected for a robust standard error (HSE).

Results

Differences between SGM and non-SGM adults

As shown in Table S3 (Appendix D, p. 82), there were no significant differences in demographic variables between groups. SGM adults were significantly more likely than non-SGM adults to report recent (U = 19241, z = 4.067, p<.001) and past suicidal ideation (χ^2 (1, n=364) = 27.500, p<.001). A higher proportion (n=72, 29.9%) of SGM adults reported previous suicide attempts compared to non-SGM adults (n=24, 19.8%); however, this difference was not significant (χ^2 (1, n=362) = 3.668, p=.055). SGM participants scored higher than non-SGM participants across most risk factors including defeat (U = 18911, z = 3.709, p<.001), entrapment (U = 18558, z = 3.340, p<.001) and depression (U = 18636, z = 3.565, p<.001). Furthermore, SGM participants scored lower than non-SGM participants across all hypothesised protective factors including optimism (U = 12063, z = -3.289, p<.001) and self-compassion (U = 11369, z = -3.791, p<.001).

Table 1

Multivariate model of factors associated with Suicide Probability Scale scores in total sample (n=367)

	B	*t*	*Sig.*
SGM identity	-0.019	-0.050	p=.960
Defeat (DS)	0.296	3.929	**p<.001**
Entrapment (E-SF)	0.199	2.850	**p=.005**
Depression (PHQ-9)	0.299	6.831	**p<.001**
Loneliness (UCLA)	0.283	2.558	**p=.011**

To examine the contribution of SGM identity to recent suicidal ideation when controlling for known risk factors, hierarchical multiple linear regression was conducted in the total sample. SGM identity was entered as the sole variable in Step 1, explaining 2.8% of variance in SPS scores, F (1, 366) = 10.364, p=.001. As shown above in Table 1, four additional variables were entered in Step 2 and the total variance explained by the model increased to 61.7%, F (1, 362) = 119.467, p<.001. SGM identity was not significant in the final model (B = -0.019, p=.960) while defeat (B = 0.296, p<.001), entrapment (B = 0.199, p=.005), depression (B = 0.299, p<.001) and loneliness (B = 0.283, p=.011) significantly contributed to variance in SPS scores.

Note: Bold values indicate statistical significance. B = unstandardised beta.

As shown below in Table 2, multivariate multinomial logistic regression analyses showed that SGM identity significantly differentiated between *Control* vs *Ideation* (B = 1.043, OR = 2.837, 95% CI = 1.587 – 5.069) and *Control* vs *Attempt* (B = 0.854, OR = 2.349, 95% CI = 1.178 – 4.683) group membership across the overall sample, after accounting for other risk factors. Defeat (B = 0.160, OR = 1.173, 95% CI = 1.021 – 1.348) and loneliness (B = 0.290, OR = 1.233, 95% CI = 1.006 – 1.511) also significantly differentiated between *Control* and *Attempt* groups. No factors differentiated between *Ideation* and *Attempt* groups in the total sample.

Table 2

Multivariate model of factors associated with suicidal history in total sample (n=353)

	B	*OR*	*95% CI*
Control vs Ideation[a]			
SGM identity	1.043	**2.837*****	1.587 – 5.069
Defeat (DS)	0.111	1.118	0.987 – 1.266
Entrapment (E-SF)	0.120	1.127	0.998 – 1.272
Depression (PHQ-9)	0.014	1.014	0.943 – 1.089
Loneliness (UCLA)	0.065	1.067	0.893 – 1.275
Control vs Attempt[a]			
SGM identity	0.854	**2.349***	1.178 – 4.683
Defeat (DS)	0.160	**1.173***	1.021 – 1.348
Entrapment (E-SF)	0.103	1.109	0.971 – 1.265
Depression (PHQ-9)	0.033	1.034	0.954 – 1.121
Loneliness (UCLA)	0.209	**1.233***	1.006 – 1.511
Ideation vs Attempt[b]			
SGM identity	-0.189	0.828	0.444 – 1.546
Defeat (DS)	0.048	1.050	0.941 – 1.171
Entrapment (E-SF)	-0.016	0.984	0.891 – 1.086
Depression (PHQ-9)	0.020	1.020	0.956 – 1.088
Loneliness (UCLA)	0.144	1.155	0.976 – 1.367

Factors associated with suicidal ideation in SGM adults

Demographic characteristics

Univariately, several demographic factors were associated with recent suicidal ideation (SPS scores) in SGM adults including age (R^2 = .042, F (1, 243) = 10.636, B = -0.113, p=.001), gender minority status (R^2 = .034, F (1, 245) = 8.638, B = 2.499, p=.004), relationship status (R^2 = .028, F (1, 245) = 7.148, B = 1.846, p=.008) and employment status (R^2 = .031, F (1, 245) = 7.847, B

Note: Bold values indicate statistical significance. B = unstandardised beta. OR = odds ratio. *p<0.05, **p<0.01, ***p<0.001. **a.** Control [no suicidal history] as reference. **b.** Ideation [lifetime history of suicidal ideation] as reference.

= 2.077, p=.005). However, no demographic factors were significant after entering depression as a covariate (Table S4; Appendix D, p. 83) or in the multivariate model (see Table 3). With regard to previous suicidal ideation, age (B = -0.045, OR = 0.956, 95% CI = 0.924 – 0.990), educational attainment (B = 1.052, OR = 2.863, 95% CI = 1.112 – 7.371) and employment status (B = 1.166, OR = 3.208, 95% CI = 1.380 – 7.461) univariately differentiated between *Ideation* and *Control* group membership (Table S5; Appendix D, p. 84). Of these, only employment status (B = 1.029, OR = 2.798, 95% CI = 1.169 – 6.696) was significant when controlling for depression as a covariate (Table S6; p. 85) and in the multivariate model (Table S7; p. 86) whereby being unemployed or a student was associated with three times higher likelihood of previous ideation compared to those who were employed (B = 1.128, OR = 3.090, 95% CI = 1.052 – 9.082).

Table 3

Multivariate model of risk factors associated with Suicide Probability Scale scores in sexual and gender minority adults (n=235)

	B	*t*	*Sig.*
Age	-0.014	-0.604	p=.546
Relationship status	0.020	0.043	p=.965
Gender minority status	-0.151	-0.279	p=.780
Employment status	0.310	0.602	p=.548
Defeat (DS)	0.195	2.258	**p=.025**
Entrapment (E-SF)	0.112	1.371	p=.172
Depression (PHQ-9)	0.343	6.946	**p<.001**
Loneliness (UCLA)	0.164	1.220	p=.224
Minority stress (MSM)	0.054	3.620	**p<.001**
Previous suicidal ideation	1.067	1.960	p=.051
Previous suicide attempt	0.939	3.910	**p<.001**

Risk factors

In SGM participants, multiple linear regression analyses showed that higher SPS scores were associated with higher levels of defeat (B = 0.417, t = 5.700, p<.001), entrapment (B = 0.369, t = 5.389, p<.001), depression (B = 0.605, t = 16.947, p<.001), loneliness (B = 0.547, t = 3.947, p<.001), minority stress (B = 8.024, t = 5.713, p<.001) in addition to previous suicidal ideation (B = 5.032, t = 4.546, p<.001) and attempts (B = 1.985, t = 5.758, p<.001) when controlling for

Note: Bold values indicate statistical significance. B = unstandardised beta. t = standardised t-score.

depression (refer to Table S4; Appendix D, p. 83). According to Cohen's (1992) guidelines for interpreting effect sizes, univariate effect sizes were medium for depression (η^2 = 0.541); small for defeat (η^2 = 0.487), entrapment (η^2 = 0.474), loneliness (η^2 = 0.247) and minority stress (η^2 = 0.208); and very small for previous ideation (η^2 = 0.153) and attempts (η^2 = 0.115).

With regard to previous ideation, defeat, entrapment, depression, loneliness, minority stress and exposure to others' NSSI univariately differentiated between *Ideation* and *Control* groups (Table S5, p. 84). When depression was included in the model, defeat (B = 0.179, OR = 1.196, 95% CI = 1.060 – 1.350), entrapment (B = 0.147, OR = 1.158, 95% CI = 1.026 – 1.306), depression (B = 0.128, OR = 1.136, 95% CI = 1.068 – 1.209) and exposure to NSSI (B = 0.868, OR = 2.382, 95% CI = 1.169 – 4.851) remained significant (Table S6, p. 85). Multivariate logistic regression was conducted to examine the relative ability of each variable to independently differentiate between those with ideation history and those with no history. After entering all variables simultaneously, Model 1 was significant, $\chi 2$ (20, N = 232) = 78.784, p<.001, and explained between 28.8% (Cox and Snell R^2) and 32.9% (Nagelkerke R^2) of the variance in lifetime ideation. As detailed in Table S7, exposure to NSSI in others was associated with four times higher odds of lifetime ideation (B = 1.370, OR = 3.935, 95% CI = 1.565 – 9.895) and depression was associated with slightly higher odds of lifetime ideation (B = 0.174, OR = 1.189, 95% CI = 1.010 – 1.402).

Protective factors

Univariately, after controlling for depression (Table S4, p. 83) higher optimism (B = -0.781, t = -2.677, p=.008), self-compassion (B = -0.821, t = -2.134, p=.034), social support (B = -0.171, t = -4.718, p<.001) and self-acceptance (B = -0.082, t = -4.754, p<.001) were associated with lower SPS scores. However, effect sizes were small for optimism (η^2 = 0.264), self-compassion (η^2 = 0.215) and very small for social support (η^2 = 0.151) and self-acceptance (η^2 = 0.166). As shown in Table 4, hierarchical multivariate linear regression was used to assess the strength of association between each protective factor and recent ideation when controlling for other factors. In Step 1, all demographic factors that were univariately significant were entered as covariates, explaining 8.5% of variance in SPS scores. In Step 2, protective factors were added and the variance explained by the model increased to 45.7%, F (1, 232) = 24.375, p<.001. In the final model, all protective factors were significant: optimism (B = -1.656, p<.001); self-

compassion (B = -1.328, p=.004); social support (B = -0.168, p=.002); self-acceptance (B = -0.094, p<.001); as were age (B = -0.094, p=.003) and GM status (B = 1.431, p=.035).

Table 4

Multivariate model of protective factors associated with Suicide Probability Scale scores in sexual and gender minority adults (n=240)

	B	*t*	*Sig.*
Optimism (SOM)	-1.656	-4.717	**p<.001**
Self-compassion (SCS)	-1.328	-2.880	**p=.004**
Social support (ESSI)	-0.168	-3.206	**p=.002**
Self-acceptance (FSA-SGI)	-0.094	-4.636	**p<.001**
Age	-0.094	-3.039	**p=.003**
Relationship status	0.545	0.850	p=.396
Gender minority status	1.431	2.119	**p=.035**
Employment status	0.142	0.210	p=.834

Factors associated with previous suicide attempts in SGM adults

Demographic characteristics

Univariately (Table S5, p. 84), with depression as a covariate (Table S6, p. 84) and in the final multivariate model (Table S7, p. 86), no demographic variables differentiated between SGM adults who reported a previous suicide attempt from those in the *Ideation* or *Control* groups.

Risk factors

After controlling for depression, the following variables differentiated between *Attempt* and *Control* groups: defeat (B = 0.226, OR = 1.254, 95% CI = 1.097 – 1.434); entrapment (B = 0.213, OR = 1.237, 95% CI = 1.085 – 1.410); depression (B = 0.145, OR = 1.156, 95% CI = 1.082 – 1.236); loneliness (B = 0.354, OR = 1.424, 95% CI = 1.122 – 1.807); minority stress (B = 0.039, OR = 1.040, 95% CI = 1.011 – 1.071). Loneliness, minority stress and exposure to others' suicidal behaviour and NSSI each univariately differentiated between *Attempt* and *Ideation* groups (see Table S5, p. 84). Only loneliness (B = 0.255, OR = 1.290, 95% CI = 1.065 – 1.562) and exposure to suicide (B = 0.685, OR = 1.948, 95% CI = 1.078 – 3.653) remained significant with depression included in the model (see Table S6, p. 85). In the multivariate multinomial logistic regression model (Table S7; p. 86), exposure to suicidal behaviour in others (B = 1.107,

Note: Bold values indicate statistical significance. B = unstandardised beta. t = standardised t-score.

OR = 3.026, 95% CI = 1.469 – 6.234) was associated with three times higher odds of lifetime suicide attempts compared to lifetime ideation only, while loneliness (B = 0.263, OR = 1.301, 95% CI = 1.044 – 1.622) also differentiated between *Ideation* and *Attempt* groups with each UCLA point representing 30.1% higher odds of previous attempts.

Protective factors

Univariately (see Table S5, p. 84), all hypothesised protective factors differentiated between *Attempt* and *Control* groups, and all but self-compassion differentiated between *Attempt* and *Ideation* groups. With depression included in the model (Table S6, p. 85), self-compassion (B = -0.854, OR = 0.426, 95% CI = 0.224 – 0.811) and social support (B = -0.101, OR = 0.904, 95% CI = 0.846 – 0.966) differentiated between *Attempt* and *Control* groups and in the multivariate logistic regression model (Table S7; p. 86), social support (B = -0.080, OR = 0.923, 95% CI = 0.857 – 0.994) and self-compassion (B = -0.820, OR = 0.440, 95% CI = 0.215 – 0.901) differentiated *Attempt* from *Control* groups. No factors significantly differentiated between *Attempt* and *Ideation* groups.

Exploratory moderation analysis

A simple moderation model was conducted to examine whether minority stress (measured by the MSM) moderates the pathway between entrapment (E-SF) and recent suicidal ideation (SPS) in SGM adults. PHQ-9 scores were included in the model to control for depression.

Table 5

Moderation model of factors associated with Suicide Probability Scale scores in sexual and gender minority adults (n=245)

	B	*SE*	*t*	*Sig.*	*LLCI*	*ULCI*
E-SF	-0.0884	0.1467	-0.6026	p=.5473	-0.3774	0.2006
MSM	0.0091	0.0228	0.3981	p=.6909	-0.0359	0.0540
E-SF x MSM	0.0076	0.0028	2.6614	**p=.0083**	0.0020	0.0131
PHQ-9	0.3876	0.0668	5.8030	**p=.0000**	0.2560	0.5191

Note: Bold values indicate statistical significance. B = unstandardised beta, SE = standard error. t = standardised t-score. LLCI = lower limit confidence interval. ULCI = upper limit confidence interval.

The overall model was significant, F (4, 240) = 117.6550, p=.0000, R^2 = 0.6378. As shown in Table 5, a significant interaction was observed between entrapment and minority stress in association with recent suicidal ideation (B = 0.0076, SE = 0.0028, t = 2.6614, p=.0083, 95% CI = 0.0020 – 0.0131) indicating that minority stress moderates the relationship between entrapment and suicidal ideation in SGM adults. However, depression also accounted for a large proportion of variance in SPS scores as a covariate within the model (B = 0.3876, SE = 0.0668, t = 5.8030, p=.0000, 95% CI = 0.2560 – 0.5191).

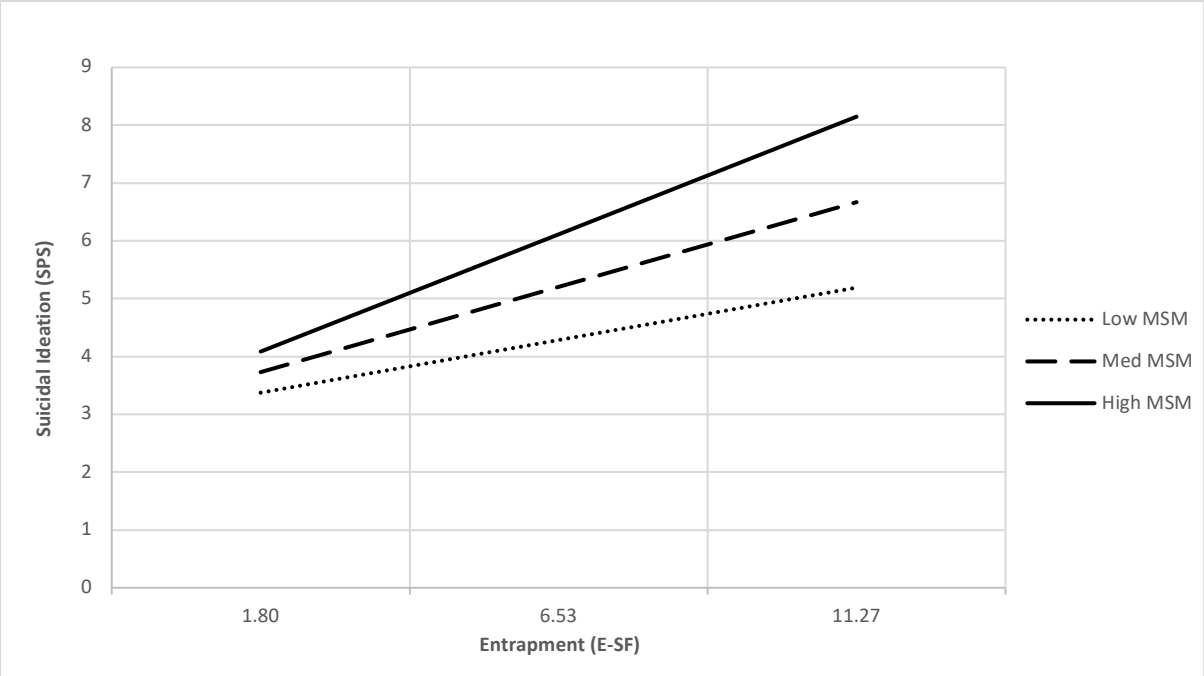

Figure 2

Minority stress as a moderator between entrapment and suicidal ideation in sexual and gender minority adults

As illustrated above in Figure 2, simple slope analyses revealed that the association between entrapment and suicidal ideation was stronger at high [i.e. +1 SD] levels of minority stress (B = 0.4291, SE = 0.1058, t = 4.0573, p=.0184, CI = 0.2207 – 0.6374) compared to medium [mean] (B = 0.3105, SE = 0.0829, t = 3.7448, p=.0002, CI = 0.1472 – 0.4738) and low [i.e. -1 SD] levels of minority stress (B = 0.1919, SE = 0.0814, t = 2.3738, p=.0001, CI = 0.0327 – 0.3512).

Discussion

The present study examined risk and protective factors associated with suicidal ideation and behaviour in SGM adults. In line with previous research and our hypothesis (H1), SGM adults were significantly more likely than non-SGM adults to report suicidal ideation (McNeil et al., 2017; Yıldız, 2018). A higher proportion of SGM adults reported a previous attempt compared to non-SGM adults; however, this difference was nonsignificant. This contradicts findings of a systematic review which reported significantly higher attempt rates in SGM adults compared to non-SGM adults (Hottes et al., 2016). The rate of previous attempts in our non-SGM sample was substantially higher than typically observed in the general population (Hottes et al., 2016; O'Connor et al., 2018). It is possible that our non-SGM attempt rate could have been inflated due to the nature of our study advertisements, i.e. non-SGM adults with a history of suicidality may have been more likely to respond. Consistent with previous research and hypothesis H1, SGM participants scored significantly higher than non-SGM participants for several risk factors including defeat, entrapment and depression (Rasmussen et al., 2021; Ross et al., 2018).

Risk factors

Suicidal ideation

As hypothesised (H2), higher defeat, entrapment, depression, loneliness and minority stress were univariately associated with lower recent and previous suicidal ideation in SGM adults. Only defeat, minority stress and depression remained significant in any multivariate models. These results are in keeping with previous research in relation to defeat (Cramer et al., 2024), depressive symptoms (Kuper et al., 2018) and minority stress (de Lange et al., 2022a; Rogers et al., 2021) and highlight that defeat has a key role in the motivational phase within the IMV model. Further research will be needed to examine whether there are key aspects of minority stress (e.g. internalised stigma) and how these relate to defeating experiences in influencing the development of suicidal thoughts. Consistent with a recent study in GM youth (Mesznik et al., 2025), previous suicide attempts were associated with higher recent suicidal ideation in SGM adults. Furthermore, we observed that exposure to others' NSSI was associated with four times higher odds of previous suicidal ideation in SGM adults. This could be a product of the "social contagion" effect often associated with NSSI (Jarvi et al., 2013) combined with the

importance of community connectedness (i.e. “chosen families”) in SGM populations (Milton, 2020). Unemployment was associated with significantly higher odds of recent and previous suicidal ideation in SGM adults compared to those who were employed. While consistent with previous research in the general population (Amiri, 2022), these results should be interpreted cautiously as subgroups were aggregated and reasons for unemployment were not known.

Suicide attempts

As expected (H2), higher defeat, entrapment, depression, loneliness and minority stress were univariately associated with higher likelihood of previous suicide attempts in SGM adults. Of these, loneliness differentiated between SGM adults who reported previous suicide attempts from those who reported previous suicidal ideation only. This is in line with findings from of a cross-sectional study in the general population (Beutel et al., 2017). The current study also found that exposure to others’ suicidal behaviour was associated with approximately three times higher likelihood of previous suicide attempts in SGM adults compared to those with a history of suicidal ideation only. This is consistent with findings from the general population (Hill et al., 2020). Our results provide further support for the role of exposure to suicide as a volitional moderator (VM) and suggest that loneliness may also act as a VM for SGM adults.

Protective factors

Suicidal ideation

In line with H3, higher levels of optimism, self-compassion, social support and self-acceptance of LGBTQ+ identity were each associated with lower levels of recent suicidal ideation in SGM adults when controlling for other variables, whereas self-compassion was also associated with lower odds of past suicidal ideation in our multivariate model. These findings are consistent with previous research on self-compassion (Kaniuka et al., 2021; Rosenthal et al., 2023) and social support (de Lange et al., 2023; Plöderl et al., 2014), while previous findings relating to the link between self-acceptance and suicidal ideation in SGM adults are mixed (Plöderl et al., 2014; Woodford et al., 2018). To our knowledge, this is the first study to examine optimism in relation to suicidal ideation in SGM adults; however, optimism has been associated with lower suicidal ideation in the general population (Huffman et al., 2016). Our results provide support for social support as a MM in the IMV model (O’Connor & Kirtley, 2018) and suggest that optimism, self-compassion and self-acceptance may have roles within the motivational

phase; however, further research is needed to examine their roles within specific pathways in the model to ascertain whether they may function as TSMs or MMs.

Suicide attempts

As expected (H3), all protective factors were univariately associated with lower likelihood of previous suicide attempts in SGM adults; however, only self-compassion and social support were significantly associated with lower likelihood of previous attempts when controlling for other variables. Findings are consistent with previous studies which found that hope (Moe et al., 2023), self-compassion (Boase & McLaren, 2023) and social support (de Lange et al., 2023; Plöderl et al., 2014) were associated with lower odds of previous attempts in SGM adults. In keeping with the IMV model and known VMs in the general population (O'Connor & Kirtley, 2018), none of the protective factors examined in the present study differentiated SGM adults with a lifetime history of suicide attempts from those with a lifetime history of ideation only.

Moderating role of minority stress

As hypothesised (H4), the present study found that minority stress moderated the pathway between entrapment and suicidal ideation outlined in the IMV model. Although these results will require replication, they suggest that minority stress may act as a motivational moderator (MM) in the development of suicidal ideation in SGM adults. These findings provide us with a deeper understanding of the association between minority stress and suicidal ideation in SGM groups (de Lange et al., 2022a) and expand on the previous examination of minority stress in relation to the development of suicidal ideation within an IMV framework (Parra et al., 2021).

Implications

In this sample, SGM adults were more vulnerable to suicidal ideation and behaviours and were disproportionately affected by factors from the IMV model associated with increased risk compared to non-SGM adults. Minority stress appears to function as a MM in SGM adults, highlighting the importance of addressing minority stressors at a societal level and identifying factors which may buffer their potential impact on individuals from minority groups. Further, findings provide support for the role of loneliness and exposure to suicidal behaviour as VMs and these should be considered key risk factors for suicide attempts in this population. Finally,

optimism and self-acceptance may reduce the risk of suicidal ideation, while self-compassion and social support may reduce the risk of suicidal ideation and behaviour in SGM adults.

Limitations

The results of the present study should be considered within the context of its limitations. For instance, while the sample was sufficiently powered for the planned analyses, the SGM group was too small to explore factors that may influence suicide risk within particularly at-risk SGM subgroups such as bisexuals (Salway et al., 2019) and GM adults (McNeil et al., 2017). Further, our decision to aggregate data for certain demographic groups due to small sample sizes may have obscured important variation in suicide risk between subgroups. While our recruitment strategy was effective, it was targeted for our population of interest. Use of sources such as LGBTQ+ student and university staff networks during recruitment likely contributed to our sample being relatively highly educated, which may reduce the generalisability of our findings. Similarly, as has been observed in previous research on suicide risk in SGM adults (Layland et al., 2020; Wu & Lee, 2021), our sample was limited by low ethnocultural diversity. Finally, the study utilised a cross-sectional design, meaning it is not possible to determine causality, and future research should consider longitudinal approaches to investigate temporal relationships between risk or protective factors and suicidal outcomes within an IMV framework.

Recommendations

This study has several implications for further research and clinical practice. Firstly, strategies and interventions which aim to reduce loneliness, increase self-compassion (e.g. compassion-focused therapy; Ferrari et al., 2019) and social support may be helpful in reducing the risk of suicide in SGM adults accessing mental health services. Although we have identified potential protective factors for this particularly at-risk group, further research is needed to examine the possible moderating roles of these factors on pathways in the motivational phase of the IMV model to better understand the mechanisms through which they may help to reduce suicide risk in SGM adults. Finally, given the moderating role of minority stress in the development of suicidal ideation, researchers should investigate the impact of minority stress in relation to suicide risk in other minority groups, which could provide further support for its role as a MM.

Conclusion

The findings of the present study indicate the importance of considering risk and protective factors (aside from SGM identity alone) in understanding why some SGM adults may be more at risk of suicide. Our results suggest that minority stress may act as a motivational moderator within the IMV model, while loneliness and exposure to suicidal behaviour were identified as volitional moderators and can be considered risk factors for suicide attempts in SGM adults. Self-compassion and social support were identified as key protective factors, which may help to reduce the risk of suicide attempts in SGM adults. Further research is needed, and future studies should contextualise findings within theoretical frameworks such as the IMV model to aid our understanding of factors that may contribute to suicide risk in SGM adults.

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Appendices

Appendix A: PRISMA Checklist and PRISMA for Abstract Checklist

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	6
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	7
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	8-10
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	10
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	11
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	11
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	11
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	12-13
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	13
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	13
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	13
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	13
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	13
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	N/A
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	13

Section and Topic	Item #	Checklist item	Location where item is reported
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	N/A
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	N/A
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	N/A
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	N/A
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	N/A
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	12
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	12-13
Study characteristics	17	Cite each included study and present its characteristics.	19-20
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	17-18, 80
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	21-22
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	14-18
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	N/A
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	N/A
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	23-25
	23b	Discuss any limitations of the evidence included in the review.	17-18, 23-25
	23c	Discuss any limitations of the review processes used.	25
	23d	Discuss implications of the results for practice, policy, and future research.	25-26
OTHER INFORMATION			
Registration	24a	Provide registration information for the review, including register name	11

Section and Topic	Item #	Checklist item	Location where item is reported
and protocol		and registration number, or state that the review was not registered.	
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	11
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	N/A
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	N/A
Competing interests	26	Declare any competing interests of review authors.	N/A
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	N/A

PRISMA 2020 for Abstracts Checklist

Section and Topic	Item #	Checklist item	Reported (Yes/No)
TITLE			
Title	1	Identify the report as a systematic review.	Yes
BACKGROUND			
Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	Yes
METHODS			
Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	Yes
Information sources	4	Specify the information sources (e.g. databases, registers) used to identify studies and the date when each was last searched.	Yes
Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	Yes
Synthesis of results	6	Specify the methods used to present and synthesise results.	Yes
RESULTS			
Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	Yes
Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies and participants for each. If meta-analysis was done, report the summary estimate and confidence/credible interval. If comparing groups, indicate the direction of the effect (i.e. which group is favoured).	Yes
DISCUSSION			
Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review (e.g. study risk of bias, inconsistency and imprecision).	Yes
Interpretation	10	Provide a general interpretation of the results and important implications.	Yes
OTHER			
Funding	11	Specify the primary source of funding for the review.	N/A
Registration	12	Provide the register name and registration number.	Yes

JBI Critical Appraisal Checklist for analytical cross sectional studies

	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?	☐	☐	☐	☐
Were the study subjects and the setting described in detail?	☐	☐	☐	☐
Was the exposure measured in a valid and reliable way?	☐	☐	☐	☐
Were objective, standard criteria used for measurement of the condition?	☐	☐	☐	☐
Were confounding factors identified?	☐	☐	☐	☐
Were strategies to deal with confounding factors stated?	☐	☐	☐	☐
Were the outcomes measured in a valid and reliable way?	☐	☐	☐	☐
Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Explanation of analytical cross sectional studies critical appraisal

How to cite: Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, Currie M, Qureshi R, Mattis P, Lisy K, Mu P-F. Chapter 7: Systematic reviews of etiology and risk . In: Aromataris E, Munn Z (Editors). *JBI Manual for Evidence Synthesis*. JBI, 2020. Available from https://synthesismanual.jbi.global

Analytical cross sectional studies Critical Appraisal Tool

Answers: Yes, No, Unclear or Not/Applicable

1. Were the criteria for inclusion in the sample clearly defined?

The authors should provide clear inclusion and exclusion criteria that they developed prior to recruitment of the study participants. The inclusion/exclusion criteria should be specified (e.g., risk, stage of disease progression) with sufficient detail and all the necessary information critical to the study.

2. Were the study subjects and the setting described in detail?

The study sample should be described in sufficient detail so that other researchers can determine if it is comparable to the population of interest to them. The authors should provide a clear description of the population from which the study participants were selected or recruited, including demographics, location, and time period.

3. Was the exposure measured in a valid and reliable way?

The study should clearly describe the method of measurement of exposure. Assessing validity requires that a 'gold standard' is available to which the measure can be compared. The validity of exposure measurement usually relates to whether a current measure is appropriate or whether a measure of past exposure is needed.

Reliability refers to the processes included in an epidemiological study to check repeatability of measurements of the exposures. These usually include intra-observer reliability and inter-observer reliability.

4. Were objective, standard criteria used for measurement of the condition?

It is useful to determine if patients were included in the study based on either a specified diagnosis or definition. This is more likely to decrease the risk of bias. Characteristics are another useful approach to matching groups, and studies that did not use specified diagnostic methods or definitions should provide evidence on matching by key characteristics

5. Were confounding factors identified?

Confounding has occurred where the estimated intervention exposure effect is biased by the presence of some difference between the comparison groups (apart from the exposure investigated/of interest). Typical confounders include baseline characteristics, prognostic factors, or concomitant exposures (e.g. smoking). A confounder is a difference between the comparison groups and it influences the direction of the study results. A high quality study at the level of cohort design will identify the potential confounders and measure them (where possible). This is difficult for studies where behavioral, attitudinal or lifestyle factors may impact on the results.

6. Were strategies to deal with confounding factors stated?

Strategies to deal with effects of confounding factors may be dealt within the study design or in data analysis. By matching or stratifying sampling of participants, effects of confounding factors can be adjusted for. When dealing with adjustment in data analysis, assess the statistics used in the study. Most will be some form of multivariate regression analysis to account for the confounding factors measured.

7. Were the outcomes measured in a valid and reliable way?

Read the methods section of the paper. If for e.g. lung cancer is assessed based on existing definitions or diagnostic criteria, then the answer to this question is likely to be yes. If lung cancer is assessed using observer reported, or self-reported scales, the risk of over- or under-reporting is increased, and objectivity is compromised. Importantly, determine if the measurement tools used were validated instruments as this has a significant impact on outcome assessment validity.

Having established the objectivity of the outcome measurement (e.g. lung cancer) instrument, it's important to establish how the measurement was conducted. Were those involved in collecting data trained or educated in the use of the instrument/s? (e.g. radiographers). If there was more than one data collector, were they similar in terms of level of education, clinical or research experience, or level of responsibility in the piece of research being appraised?

8. Was appropriate statistical analysis used?

As with any consideration of statistical analysis, consideration should be given to whether there was a more appropriate alternate statistical method that could have been used. The methods section should be detailed enough for reviewers to identify which analytical techniques were used (in particular, regression or stratification) and how specific confounders were measured.

For studies utilizing regression analysis, it is useful to identify if the study identified which variables were included and how they related to the outcome. If stratification was the analytical approach used, were the strata of analysis defined by the specified variables? Additionally, it is also important to assess the appropriateness of the analytical strategy in terms of the assumptions associated with the approach as differing methods of analysis are based on differing assumptions about the data and how it will respond.

JBI Critical Appraisal Checklist for cohort studies

	Yes	No	Unclear	Not applicable
Were the two groups similar and recruited from the same population?	☐	☐	☐	☐
Were the exposures measured similarly to assign people to both exposed and unexposed groups?	☐	☐	☐	☐
Was the exposure measured in a valid and reliable way?	☐	☐	☐	☐
Were confounding factors identified?	☐	☐	☐	☐
Were strategies to deal with confounding factors stated?	☐	☐	☐	☐
Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	☐	☐	☐	☐
Were the outcomes measured in a valid and reliable way?	☐	☐	☐	☐
Was the follow up time reported and sufficient to be long enough for outcomes to occur?	☐	☐	☐	☐
Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	☐	☐	☐	☐
Were strategies to address incomplete follow up utilized?	☐	☐	☐	☐
Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Explanation of cohort studies critical appraisal

How to Cite: *Moola S, Munn Z, Tufanaru C, Aromataris E, Sears K, Sfetcu R, Currie M, Qureshi R, Mattis P, Lisy K, Mu P-F. Chapter 7: Systematic reviews of etiology and risk . In: Aromataris E, Munn Z (Editors). JBI Manual for Evidence Synthesis*. JBI, 2020. Available from https://synthesismanual.jbi.global

Cohort Studies Critical Appraisal Tool

Answers: Yes, No, Unclear or Not/Applicable

1. Were the two groups similar and recruited from the same population?

Check the paper carefully for descriptions of participants to determine if patients within and across groups have similar characteristics in relation to exposure (e.g. risk factor under investigation). The two groups selected for comparison should be as similar as possible in all characteristics except for their exposure status, relevant to the study in question. The authors should provide clear inclusion and exclusion criteria that they developed prior to recruitment of the study participants.

2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?

A high quality study at the level of cohort design should mention or describe how the exposures were measured. The exposure measures should be clearly defined and described in detail. This will enable reviewers to assess whether or not the participants received the exposure of interest.

3. Was the exposure measured in a valid and reliable way?

The study should clearly describe the method of measurement of exposure. Assessing validity requires that a 'gold standard' is available to which the measure can be compared. The validity of exposure measurement usually relates to whether a current measure is appropriate or whether a measure of past exposure is needed.

Reliability refers to the processes included in an epidemiological study to check repeatability of measurements of the exposures. These usually include intra-observer reliability and inter-observer reliability.

4. Were confounding factors identified?

Confounding has occurred where the estimated intervention exposure effect is biased by the presence of some difference between the comparison groups (apart from the exposure investigated/of interest). Typical confounders include baseline characteristics, prognostic factors, or concomitant exposures (e.g. smoking). A confounder is a difference between the comparison groups and it influences the direction of the study results. A high quality study at the level of cohort design will identify the potential confounders and measure them (where

possible). This is difficult for studies where behavioral, attitudinal or lifestyle factors may impact on the results.

5. Were strategies to deal with confounding factors stated?

Strategies to deal with effects of confounding factors may be dealt within the study design or in data analysis. By matching or stratifying sampling of participants, effects of confounding factors can be adjusted for. When dealing with adjustment in data analysis, assess the statistics used in the study. Most will be some form of multivariate regression analysis to account for the confounding factors measured. Look out for a description of statistical methods as regression methods such as logistic regression are usually employed to deal with confounding factors/variables of interest.

6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?

The participants should be free of the outcomes of interest at the start of the study. Refer to the 'methods' section in the paper for this information, which is usually found in descriptions of participant/sample recruitment, definitions of variables, and/or inclusion/exclusion criteria.

7. Were the outcomes measured in a valid and reliable way?

Read the methods section of the paper. If for e.g. lung cancer is assessed based on existing definitions or diagnostic criteria, then the answer to this question is likely to be yes. If lung cancer is assessed using observer reported, or self-reported scales, the risk of over- or under-reporting is increased, and objectivity is compromised. Importantly, determine if the measurement tools used were validated instruments as this has a significant impact on outcome assessment validity.

Having established the objectivity of the outcome measurement (e.g. lung cancer) instrument, it's important to establish how the measurement was conducted. Were those involved in collecting data trained or educated in the use of the instrument/s? (e.g. radiographers). If there was more than one data collector, were they similar in terms of level of education, clinical or research experience, or level of responsibility in the piece of research being appraised?

8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?

The appropriate length of time for follow up will vary with the nature and characteristics of the population of interest and/or the intervention, disease or exposure. To estimate an appropriate duration of follow up, read across multiple papers and take note of the range for duration of follow up. The opinions of experts in clinical practice or clinical research may also assist in determining an appropriate duration of follow up. For example, a longer timeframe may be needed to examine the association between occupational exposure to asbestos and the risk of lung cancer. It is important, particularly in cohort studies that follow up is long enough to enable the outcomes. However, it should be remembered that the research question and outcomes being examined would probably dictate the follow up time.

9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?

It is important in a cohort study that a greater percentage of people are followed up. As a general guideline, at least 80% of patients should be followed up. Generally a dropout rate of 5% or less is considered insignificant. A rate of 20% or greater is considered to significantly impact on the validity of the study. However, in observational studies conducted over a lengthy period of time a higher dropout rate is to be expected. A decision on whether to include or exclude a study because of a high dropout rate is a matter of judgement based on the reasons why people dropped out, and whether dropout rates were comparable in the exposed and unexposed groups.

Reporting of efforts to follow up participants that dropped out may be regarded as an indicator of a well conducted study. Look for clear and justifiable description of why people were left out, excluded, dropped out etc. If there is no clear description or a statement in this regards, this will be a 'No'.

10. Were strategies to address incomplete follow up utilized?

Some people may withdraw due to change in employment or some may die; however, it is important that their outcomes are assessed. Selection bias may occur as a result of incomplete follow up. Therefore, participants with unequal follow up periods must be taken into account in the analysis, which should be adjusted to allow for differences in length of follow up periods. This is usually done by calculating rates which use person-years at risk, i.e. considering time in the denominator.

11. Was appropriate statistical analysis used?

As with any consideration of statistical analysis, consideration should be given to whether there was a more appropriate alternate statistical method that could have been used. The methods section of cohort studies should be detailed enough for reviewers to identify which analytical techniques were used (in particular, regression or stratification) and how specific confounders were measured.

For studies utilizing regression analysis, it is useful to identify if the study identified which variables were included and how they related to the outcome. If stratification was the analytical approach used, were the strata of analysis defined by the specified variables? Additionally, it is also important to assess the appropriateness of the analytical strategy in terms of the assumptions associated with the approach as differing methods of analysis are based on differing assumptions about the data and how it will respond.

Appendix C: Global Quality Rating Criteria

QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES

GLOBAL RATING FOR THIS PAPER (circle one):

1	STRONG	(no WEAK ratings)
2	MODERATE	(one WEAK rating)
3	WEAK	(two or more WEAK ratings)

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No Yes

If yes, indicate the reason for the discrepancy

1	Oversight
2	Differences in interpretation of criteria
3	Differences in interpretation of study

Final decision of both reviewers (circle one):

1	**STRONG**
2	**MODERATE**
3	**WEAK**

Adaptations:

1	STRONG	(zero 'NO' ratings on JBI checklist)
2	MODERATE	(one 'NO' rating on JBI checklist)
3	WEAK	(two or more 'NO' ratings' on JBI checklist)

Reference:

Effective Public Health Practice Project. (1998). *Quality Assessment Tool for Quantitative Studies.* Retrieved December 20, 2024, from: https://merst.ca/ephpp/.

Appendix D: Supplementary Tables

Table S1

Critical appraisal of methodological quality and risk of bias for included studies

Cross-sectional studies	Checklist for Analytical Cross Sectional Studies (JBI, 2017a)								Overall appraisal
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	
Foster et al. (2023)	✗	✓	✓	✗	✗	✗	✓	✓	WEAK
Chang et al. (2022)	✓	✗	✓	✗	✓	✓	✓	✓	MODERATE
Kaniuka et al. (2021)	✓	✓	✓	✓	✓	✓	✓	✓	STRONG
Munn & James (2022)	✓	✗	✓	✓	✓	✓	✓	✓	MODERATE
Chang et al. (2024)	N/A	✓	✓	✓	✓	✓	✗	✓	MODERATE
Plöderl et al. (2014)	✗	✗	✓	✓	✗	✗	✓	✓	WEAK
Plöderl & Fartacek (2005)	✗	✗	✓	✗	✗	✗	✗	✓	WEAK
Van Heeringen & Vincke (2000)	✗	✗	✓	✗	✗	✗	✗	✗	WEAK
Rosenthal et al. (2023)	✓	✗	✓	✗	✓	✓	✓	✓	MODERATE
Rogers et al. (2021)	✓	✗	✓	✓	✗	✗	✓	✓	WEAK
Trujillo et al. (2020)	✓	✗	✓	✓	✗	✗	✓	✓	WEAK
Woodford et al. (2018)	N/A	✓	✓	✗	✓	✓	✗	✓	MODERATE
de Lange et al. (2022a)	N/A	✓	✓	✗	✓	✓	✓	✓	MODERATE

Longitudinal studies	Checklist for Cohort Studies (JBI, 2017b)											Overall appraisal
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	
Yen et al. (2024)	✓	✓	✓	✗	✗	N/A	✓	✓	✓	✓	✓	MODERATE
Tang et al. (2024)	✓	✓	✗	✓	✓	N/A	✓	✓	N/A	N/A	✗	MODERATE

Notes: ✓ = yes; ✗ = no; **N/A** = not applicable. **Overall appraisal:** global rating criteria adapted from Quality Assessment Tool for Quantitative Studies (Effective Public Health Practice Project, 1998).

Table S2

Demographic characteristics of sample

	Total sample (n=371)	SGM (n=247)	Non-SGM (n=124)
	N (%)	N (%)	N (%)
Gender identity			
Female	215 (58.0)	118 (47.8)	97 (78.2)
Male	108 (29.1)	81 (32.8)	27 (21.8)
Transgender man	5 (1.3)	5 (2.0)	–
Transgender woman	4 (1.1)	4 (1.6)	–
Non-binary / gender non-conforming	33 (8.9)	33 (13.4)	–
Other	6 (1.6)	6 (2.4)	–
Sexual orientation			
Asexual	11 (3.0)	11 (4.5)	–
Bisexual	93 (25.1)	93 (37.7)	–
Gay man	65 (17.5)	65 (26.3)	–
Lesbian	34 (9.2)	34 (13.8)	–
Heterosexual	124 (33.4)	0 (0.0)	124 (100)
Other	7 (1.9)	7 (2.8)	–
Pansexual	13 (3.5)	13 (5.3)	–
Queer	24 (6.5)	24 (9.7)	–
Relationship status			
Single / not in a relationship	134 (36.1)	92 (37.2)	42 (33.9)
Married / partnered	231 (62.3)	150 (60.7)	81 (65.3)
Separated / divorced / widowed	6 (1.6)	5 (2.0)	1 (0.8)
Currently living alone			
Yes	107 (28.8)	75 (30.4)	32 (25.8)
No	264 (71.2)	172 (69.6)	92 (74.2)
Educational attainment			
No qualifications	0 (0.0)	0 (0.0)	0 (0.0)
Secondary school qualifications	74 (19.9)	53 (21.5)	21 (17.1)
Further education	296 (79.8)	194 (78.5)	102 (82.9)
Ethnicity			
White	293 (79.0)	201 (81.4)	92 (74.2)
Asian	53 (14.3)	34 (13.8)	19 (15.3)
African	4 (1.1)	0 (0.0)	4 (3.2)
Caribbean or black	5 (1.3)	2 (0.8)	3 (2.4)
Mixed or multiple ethnic group	0 (0.0)	0 (0.0)	0 (0.0)
Other ethnic group	16 (4.3)	10 (4.0)	6 (4.8)
Employment status			
Employed	255 (68.7)	175 (70.9)	80 (64.5)
Not employed	26 (7.0)	13 (5.3)	13 (10.5)
Student	90 (24.3)	59 (23.9)	31 (25.0)

Note: Refer to Table S3 for comparison of demographic characteristics between SGM and non-SGM participants.

Table S3

Comparison of demographic, risk and protective factors between sexual and gender minority (SGM) and non-SGM participants

	Total sample (n=371)	**SGM (n=247)**	**Non-SGM (n=124)**	**Non-parametric analysis**		
				Test scores	*Effect size*	*Sig. value*
Demographic factors	*N (%)*	*N (%)*	*N (%)*			
Single / not in a relationship[a]	140 (37.7)	97 (39.3)	43 (34.7)	χ^2 (1, n=371) = 0.559[b]	phi = .045	p=.455
Currently living alone	107 (28.8)	75 (30.4)	32 (25.8)	χ^2 (1, n=371) = 0.628[b]	phi = .047	p=.428
No further education	74 (20.0)	53 (21.5)	21 (17.1)	χ^2 (1, n=370) = 0.731[b]	phi = .052	p=.392
Ethnic minority group[a]	78 (21.0)	46 (18.6)	32 (25.8)	χ^2 (1, n=371) = 2.151[b]	phi = -.083	p=.142
Student / unemployed[a]	116 (31.3)	72 (29.1)	44 (35.5)	χ^2 (1, n=371) = 1.261[b]	phi = -.064	p=.262
Lifetime risk factors	*N (%)*	*N (%)*	*N (%)*			
Previous suicidal ideation[c]	249 (67.1)	188 (77.7)	61 (50.0)	χ^2 (1, n=364) = 27.500[b]	phi = .281	**p<.001**
Previous suicide attempt[c]	96 (25.9)	72 (29.9)	24 (19.8)	χ^2 (1, n=362) = 3.668[b]	phi = .107	p=.055
Exposure – suicide	152 (41.0)	107 (43.3)	45 (36.3)	χ^2 (1, n=371) = 1.409[b]	phi = .067	p=.235
Exposure – NSSI	221 (59.6)	158 (64.0)	63 (50.8)	χ^2 (1, n=371) = 5.404[b]	phi = .127	**p=.020**
Current risk factors	*M (SD)*	*M (SD)*	*M (SD)*			
Suicidal ideation (SPS)	4.82 (5.33)	5.45 (5.36)	3.57 (5.05)	U = 19241, z = 4.067	r = 0.211[d]	**p<.001**
Defeat (DS)	5.49 (4.39)	6.09 (4.41)	4.31 (4.11)	U = 18911, z = 3.709	r = 0.193[d]	**p<.001**
Entrapment (E-SF)	5.94 (4.66)	6.54 (4.71)	4.73 (4.31)	U = 18558, z = 3.340	r = 0.173[d]	**p<.001**
Depression (PHQ-9)	9.83 (6.55)	10.63 (6.52)	8.24 (6.34)	U = 18636, z = 3.565	r = 0.185[d]	**p<.001**
Loneliness (UCLA)	5.97 (1.96)	6.31 (1.89)	5.28 (1.92)	U = 19825, z = 4.847	r = 0.252[d]	**p<.001**
Minority stress (MSM)	–	52.89 (15.66)	–	–	–	–
Protective factors	***M (SD)***	***M (SD)***	***M (SD)***			
Optimism (SOM)	3.37 (0.93)	3.25 (0.96)	3.59 (0.83)	U = 12063, z = -3.289	r = 0.171[d]	**p<.001**
Self-compassion (SCS)	2.72 (0.72)	2.62 (0.71)	2.92 (0.72)	U = 11369, z = -3.791	r = 0.198[d]	**p<.001**
Social support (ESSI)	25.02 (6.48)	24.28 (6.44)	26.48 (6.34)	U = 11600, z = -3.394	r = 0.178[d]	**p<.001**
Self-acceptance (FSA-SGI)	–	67.34 (13.55)	–	–	–	–

Note: Bold values indicate statistical significance.

a. Subgroups aggregated due to small 'N' for specific subgroups. **b.** Yates' Correction for Continuity used for 2x2 crosstabulation. **c.** Responses recoded to binary for analysis. **d.** Estimated r values calculated manually (*r = z / square root of N where N = total number of cases).*

Table S4

Linear regression analysis of factors associated with recent suicidal ideation in sexual and gender minority participants (n=247)

	Univariate analysis (no covariates)						Depression as covariate		
	R^2	*F*	*B*	*t*	*Effect size*	*Sig.*	*B*	*t*	*Sig.*
Demographic factors									
Age	0.042	F (1, 243) = 10.636	-0.113	-3.261	$\eta^2 = 0.042^a$	**p=.001**	-0.041	-1.678	p=.095
Gender minority group[b,c]	0.034	F (1, 245) = 8.638	2.499	2.939	$\eta^2 = 0.034^a$	**p=.004**	0.702	1.175	p=.241
Bisexual / pansexual[b,c]	0.003	F (1, 245) = 0.776	0.608	0.881	$\eta^2 = 0.003^a$	p=-.379	–	–	–
Single / not in a relationship[b,c]	0.028	F (1, 245) = 7.148	1.847	2.674	$\eta^2 = 0.028^a$	**p=.008**	0.782	1.631	p=.104
Currently living alone	0.010	F (1, 245) = 2.373	1.141	1.541	$\eta^2 = 0.010^a$	p=.125	–	–	–
No further education	0.013	F (1, 245) = 3.276	1.499	1.810	$\eta^2 = 0.013^a$	p=.072	–	–	–
Ethnic minority group	0.004	F (1, 245) = 0.980	0.869	0.990	$\eta^2 = 0.004^a$	p=.323	–	–	–
Student / unemployed[c]	0.031	F (1, 245) = 7.847	2.077	2.801	$\eta^2 = 0.031^a$	**p=.005**	0.846	1.642	p=.102
Lifetime risk factors									
Previous suicidal ideation[b]	0.153	F (1, 240) = 43.337	5.032	6.583	$\eta^2 = 0.153^a$	**p<.001**	2.571	4.546	**p<.001**
Previous suicide attempt[b]	0.115	F (1, 239) = 31.080	1.985	5.575	$\eta^2 = 0.115^a$	**p<.001**	1.405	5.758	**p<.001**
Exposure – suicide	0.000	F (1, 245) = 0.000	0.006	0.008	$\eta^2 = 0.000^a$	p=.993	–	–	–
Exposure – NSSI	0.004	F (1, 245) = 0.863	0.661	0.929	$\eta^2 = 0.004^a$	p=.354	–	–	–
Current risk factors									
Defeat (DS)	0.487	F (1, 245) = 232.638	0.850	15.252	$\eta^2 = 0.487^a$	**p<.001**	0.417	5.700	**p<.001**
Entrapment (E-SF)	0.474	F (1, 245) = 220.785	0.783	14.859	$\eta^2 = 0.474^a$	**p<.001**	0.369	5.389	**p<.001**
Depression (PHQ-9)	0.542	F (1, 244) = 287.207	0.605	16.947	$\eta^2 = 0.541^a$	**p<.001**	–	–	–
Loneliness (UCLA)	0.247	F (1, 245) = 80.536	1.410	8.974	$\eta^2 = 0.247^a$	**p<.001**	0.537	3.947	**p<.001**
Minority stress (MSM)	0.208	F (1, 245) = 64.391	0.156	8.024	$\eta^2 = 0.208^a$	**p<.001**	0.084	5.713	**p<.001**
Protective factors									
Optimism (SOM)	0.264	F (1, 244) = 87.301	-2.868	-9.344	$\eta^2 = 0.264^a$	**p<.001**	-0.781	-2.677	**p=.008**
Self-compassion (SCS)	0.215	F (1, 242) = 66.210	-3.505	-8.137	$\eta^2 = 0.215^a$	**p<.001**	-0.821	-2.134	**p=.034**
Social support (ESSI)	0.151	F (1, 241) = 42.700	-0.323	-6.534	$\eta^2 = 0.151^a$	**p<.001**	-0.171	-4.718	**p<.001**
Self-acceptance (FSA-SGI)	0.166	F (1, 244) = 48.575	-0.161	-6.970	$\eta^2 = 0.166^a$	**p<.001**	-0.082	-4.754	**p<.001**

Note: Bold values indicate statistical significance. B = unstandardised beta.

a. Estimated η2 values calculated manually (*η2 = sum of squares between groups / total sum of squares*). **b.** Responses recoded to binary for analysis. **c.** Data aggregated due to small 'N' for specific subgroups.

Table S5

Univariate logistic regression analysis of factors associated with suicidal history in sexual and gender minority participants (n=236) [no covariates]

	Control vs. Ideation[a]			Control vs. Attempt[a]			Ideation vs. Attempt[b]		
	B	OR	95% CI	B	OR	95% CI	B	OR	95% CI
Demographic factors									
Age	-0.045	**0.956***	0.924 – 0.990	-0.027	0.973	0.938 – 1.009	0.017	1.018	0.984 – 1.052
Gender minority group[c]	0.971	2.640	0.949 – 7.346	0.941	2.564	0.867 – 7.583	-0.030	0.971	0.471 – 2.001
Bisexual / pansexual[d]	0.564	1.758	0.877 – 3.524	0.697	2.007	0.945 – 4.261	0.132	1.142	0.628 – 2.075
Single / not in a relationship[e]	0.548	1.730	0.854 – 3.507	0.673	1.961	0.914 – 4.206	0.125	1.133	0.621 – 2.067
Currently living alone[f]	-0.130	0.878	0.429 – 1.789	0.285	1.330	0.620 – 2.851	0.415	1.514	0.803 – 2.854
No further education[g]	1.052	**2.863***	1.112 – 7.371	0.559	1.749	0.617 – 4.959	-0.493	0.611	0.294 – 1.267
Ethnic minority group[h]	0.867	2.379	0.916 – 6.177	0.357	1.429	0.492 – 4.154	-0.510	0.601	0.277 – 1.304
Student / unemployed[i]	1.166	**3.208****	1.380 – 7.461	0.717	2.049	0.817 – 5.138	-0.448	0.639	0.333 – 1.223
Lifetime risk factors									
Exposure – suicide[j]	-0.305	0.737	0.377 – 1.442	0.425	1.529	0.742 – 3.151	0.730	**2.074***	1.131 – 3.805
Exposure – NSSI[j]	1.018	**2.767****	1.402 – 5.464	0.542	1.720	0.832 – 3.556	-0.476	0.621	0.331 – 1.168
Current risk factors									
Defeat (DS)	0.227	**1.255*****	1.141 – 1.380	0.269	**1.308*****	1.180 – 1.450	0.042	1.043	0.973 – 1.118
Entrapment (E-SF)	0.200	**1.211*****	1.119 – 1.334	0.249	**1.283*****	1.166 – 1.411	0.049	1.050	0.985 – 1.121
Depression (PHQ-9)	0.128	**1.136*****	1.068 – 1.209	0.145	**1.156*****	1.082 – 1.236	0.017	1.018	0.972 – 1.066
Loneliness (UCLA)	0.271	**1.311****	1.089 – 1.579	0.499	**1.647*****	1.330 – 2.040	0.228	**1.256****	1.060 – 1.490
Minority stress (MSM)	0.032	**1.033***	1.007 – 1.059	0.052	**1.053*****	1.025 – 1.082	0.020	**1.020***	1.001 – 1.039
Protective factors									
Optimism (SOM)	-0.506	**0.603***	0.411 – 0.884	-0.825	**0.438*****	0.288 – 0.666	-0.319	**0.727***	0.531 – 0.994
Self-compassion (SCS)	-1.018	**0.361*****	0.221 – 0.590	-1.261	**0.283*****	0.161 – 0.498	-0.243	0.785	0.491 – 1.255
Social support (ESSI)	-0.079	**0.924****	0.872 – 0.979	-0.128	**0.880*****	0.825 – 0.937	-0.049	**0.952***	0.907 – 0.999
Self-acceptance (FSA-SGI)	-0.022	0.978	0.952 – 1.005	-0.044	**0.957****	0.929 – 0.985	-0.022	**0.978***	0.957 – 0.999

Note: Bold values indicate statistical significance. B = unstandardised beta, OR = odds ratio, CI = confidence intervals, *p<0.05, **p<0.01, ***p<0.001.

a. Control [no suicidal history] as reference. **b.** Ideation [lifetime history of suicidal ideation] as reference. **c.** [Cisgender] as reference. **d.** [Non-bisexual/pansexual] as reference. **e.** [In a relationship] as reference. **f.** [Not living alone] as reference. **g.** [Further education] as reference. **h.** [White ethnicity] as reference. **i.** [Employed] as reference. **j.** [No exposure] as reference.

Table S6

Multivariate logistic regression analysis of factors associated with suicidal history in sexual and gender minority participants (n=236)

[depression as covariate]

	Control vs. Ideation[a]			Control vs. Attempt[a]			Ideation vs. Attempt[b]		
	B	OR	95% CI	B	OR	95% CI	B	OR	95% CI
Demographic factors									
Age	-0.034	0.967	0.931 – 1.003	-0.013	0.987	0.949 – 1.026	0.021	1.021	0.987 – 1.055
Gender minority group[c]	0.683	1.980	0.687 – 5.705	0.610	1.840	0.595 – 5.689	-0.073	0.929	0.445 – 1.942
Bisexual / pansexual[d]	0.462	1.587	0.771 – 3.268	0.634	1.885	0.859 – 4.135	0.172	1.187	0.650 – 2.169
Single / not in a relationship[e]	0.344	1.411	0.674 – 2.953	0.434	1.543	0.692 – 3.440	0.090	1.084	0.594 – 2.014
Currently living alone[f]	-0.216	0.806	0.380 – 1.707	0.247	1.280	0.574 – 2.852	0.463	1.588	0.838 – 3.011
No further education[g]	0.872	2.391	0.902 – 6.341	0.244	1.290	0.433 – 3.844	-0.617	0.540	0.254 – 1.145
Ethnic minority group[h]	0.991	2.694	0.996 – 7.292	0.552	1.737	0.572 – 5.271	-0.439	0.645	0.295 – 1.408
Student / unemployed[j]	-1.029	**2.798***	1.169 – 6.696	0.592	1.808	0.694 – 4.708	-0.437	0.646	0.334 – 1.248
Lifetime risk factors									
Exposure – suicide[j]	-0.341	0.711	0.353 – 1.433	0.345	1.411	0.660 – 3.016	0.685	**1.948***	1.078 – 3.653
Exposure – NSSI[j]	0.868	**2.382***	1.169 – 4.851	0.310	1.363	0.634 – 2.933	-0.558	0.572	0.302 – 1.086
Current risk factors									
Defeat (DS)	0.179	**1.196****	1.060 – 1.350	0.226	**1.254*****	1.097 – 1.434	0.047	1.048	0.947 – 1.160
Entrapment (E-SF)	0.147	**1.158***	1.026 – 1.306	0.213	**1.237****	1.085 – 1.410	0.066	1.068	0.974 – 1.171
Depression (PHQ-9)	0.128	**1.136*****	1.068 – 1.209	0.145	**1.156*****	1.082 – 1.236	0.017	1.018	0.972 – 1.066
Loneliness (UCLA)	0.099	1.104	0.894 – 1.363	0.354	**1.424****	1.122 – 1.807	0.255	**1.290****	1.065 – 1.562
Minority stress (MSM)	0.021	1.021	0.994 – 1.049	0.039	**1.040****	1.011 – 1.071	0.019	1.019	0.999 – 1.039
Protective factors									
Optimism (SOM)	-0.047	0.954	0.601 – 1.515	-0.420	0.657	0.401 – 1.078	-0.373	0.689	0.474 – 1.002
Self-compassion (SCS)	-0.637	**0.529***	0.300 – 0.932	-0.854	**0.426****	0.224 – 0.811	-0.217	0.805	0.474 – 1.367
Social support (ESSI)	-0.054	0.948	0.892 – 1.007	-0.101	**0.904****	0.846 – 0.966	-0.048	0.954	0.908 – 1.002
Self-acceptance (FSA-SGI)	-0.005	0.996	0.967 – 1.025	-0.026	0.974	0.945 – 1.005	-0.021	0.979	0.957 – 1.001

Note: Bold values indicate statistical significance. B = unstandardised beta, OR = odds ratio, CI = confidence intervals, *p<0.05, **p<0.01, ***p<0.001.

a. Control [no suicidal history] as reference. **b.** Ideation [lifetime history of suicidal ideation] as reference. **c.** [Cisgender] as reference. **d.** [Non-bisexual/pansexual] as reference. **e.** [In a relationship] as reference. **f.** [Not living alone] as reference. **g.** [Further education] as reference. **h.** [White ethnicity] as reference. **i.** [Employed] as reference. **j.** [No exposure] as reference.

Table S7

Multivariate logistic regression analysis of factors associated with suicidal history in sexual and gender minority participants (n=236)

	Control vs. Ideation[a]			Control vs. Attempt[a]			Ideation vs. Attempt[b]		
	B	OR	95% CI	B	OR	95% CI	B	OR	95% CI
Model 1: Risk Factors									
Age	0.005	1.005	0.961 – 1.050	0.001	1.001	0.954 – 1.050	-0.004	0.996	0.957 – 1.037
No further education[c]	0.299	1.348	0.432 – 4.209	-0.163	0.849	0.231 – 3.130	-0.462	0.630	0.241 – 1.647
Unemployed / student[d]	1.128	**3.090***	1.052 – 9.082	0.471	1.601	0.495 – 5.179	-0.657	0.518	0.227 – 1.182
Exposure – suicide[e]	-0.913	**0.401***	0.163 – 0.986	0.194	1.214	0.462 – 3.188	1.107	**3.026****	1.469 – 6.234
Exposure – NSSI[e]	1.370	**3.935****	1.565 – 9.895	0.413	1.511	0.563 – 4.050	-0.957	**0.384***	0.178 – 0.829
Depression (PHQ-9)	0.174	**1.189***	1.010 – 1.402	0.148	1.159	0.974 – 1.380	-0.026	0.974	0.853 – 1.113
Defeat (DS)	-0.005	0.995	0.845 – 1.172	0.081	1.085	0.915 – 1.285	0.086	1.090	0.963 – 1.234
Entrapment (E-SF)	0.035	1.036	0.942 – 1.139	-0.007	0.993	0.895 – 1.101	-0.043	0.958	0.885 – 1.037
Loneliness (UCLA)	-0.017	0.983	0.767 – 1.261	0.247	1.280	0.969 – 1.691	0.263	**1.301***	1.044 – 1.622
Minority stress (MSM)	0.009	1.009	0.978 – 1.040	0.023	1.024	0.991 – 1.057	0.015	1.105	0.993 – 1.038
Model 2: Protective Factors									
Age	-0.029	0.971	0.928 – 1.016	-0.033	0.967	0.921 – 1.016	-0.004	0.996	0.956 – 1.038
No further education[c]	0.240	1.271	0.424 – 3.809	-0.477	0.621	0.171 – 2.250	-0.717	0.488	0.192 – 1.240
Unemployed / student[d]	0.745	2.107	0.700 – 6.346	0.256	1.291	0.386 – 4.315	-0.490	0.613	0.272 – 1.379
Optimism (SOM)	-0.022	0.978	0.595 – 1.609	-0.299	0.742	0.434 – 1.269	-0.277	0.758	0.504 – 1.141
Self-compassion (SCS)	-0.908	**0.404***	0.215 – 0.758	-0.820	**0.440***	0.215 – 0.901	0.087	1.091	0.606 – 1.966
Social support (ESSI)	-0.025	0.975	0.910 – 1.045	-0.080	**0.923***	0.857 – 0.994	-0.055	0.946	0.894 – 1.001
Self-acceptance (FSA-SGI)	-0.009	0.991	0.962 – 1.020	-0.028	0.972	0.942 – 1.004	-0.018	0.982	0.959 – 1.005

Note: Bold values indicate statistical significance. B = unstandardised beta, OR = odds ratio, CI = confidence intervals, *p<0.05, **p<0.01, ***p<0.001.

a. Control [no suicidal history] as reference. **b.** Ideation [lifetime history of suicidal ideation] as reference. **c.** [Further education] as reference. **d.** [Employed] as reference. **e.** [No exposure] as reference.

Appendix E: STROBE Statement

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	38
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	38
Introduction			
Background / rationale	2	Explain the scientific background and rationale for the investigation being reported	39-42
Objectives	3	State specific objectives, including any prespecified hypotheses	42
Methods			
Study design	4	Present key elements of study design early in the paper	43
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	43
Participants	6	(*a*) *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	43
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	44-47
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	44-47
Bias	9	Describe any efforts to address potential sources of bias	44-47
Study size	10	Explain how the study size was arrived at	47
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	47-48
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	47-48
		(*b*) Describe any methods used to examine subgroups and interactions	48
		(*c*) Explain how missing data were addressed	47-48
		(*d*) *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	48
		(*e*) Describe any sensitivity analyses	48
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	43-44
		(b) Give reasons for non-participation at each stage	43-44

		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	43-44, 81
		(b) Indicate number of participants with missing data for each variable of interest	47
		(c) *Cohort study*—Summarise follow-up time (e.g., average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	49-50, 82
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	49-55, 83-85
		(*b*) Report category boundaries when continuous variables were categorized	49-55, 83-85
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	48-55, 83-85
Discussion			
Key results	18	Summarise key results with reference to study objectives	56-58
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	59
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	56-59
Generalisability	21	Discuss the generalisability (external validity) of the study results	59
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Appendix F: Ethical Approval Letter

Dr Seonaid Cleare

MVLS College Ethics Committee

Suicide Risk in Sexual and Gender Minority Adults: Understanding the Role of Protective Factors and Minority Stress

The College Ethics Committee has reviewed your application and has agreed that there is no objection on ethical grounds to the proposed study.

We are happy therefore to approve the project, subject to the following conditions

- Project end date as stipulated in original application.
- The data should be held securely for a period of ten years after the completion of the research project, or for longer if specified by the research funder or sponsor, in accordance with the University's Code of Good Practice in Research: (http://www.gla.ac.uk/media/media_227599_en.pdf)
- The research should be carried out only on the sites, and/or groups or datasets as defined in the application.
- Any proposed changes in the protocol should be submitted for reassessment, except when it is necessary to change the protocol to eliminate hazard to the subjects or where the change involves only the administrative aspects of the project. The Ethics Committee should be informed of any such changes.
- For projects requiring the use of an online questionnaire, the University has an Online Surveys account for research. To request access, see the University's application procedure at https://www.gla.ac.uk/research/strategy/ourpolicies/useofonlinesurveystoolforresearch/.
- You should submit a short end of study report within 3 months of completion.

Yours sincerely

Dr Terry Quinn

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Appendix G: Links to External Documents

Final Approved MRP Proposal: https://osf.io/bxm6q

Study Advertisements: https://osf.io/xtevb

Participant Information Sheet: https://osf.io/mq5an

Privacy Notice: https://osf.io/57fcp

Signposting Information: https://osf.io/jmt3h

Consent Form: https://osf.io/kbzmq

Data Analysis Plan: https://osf.io/e4h5x

SPSS Syntax: https://osf.io/zgews

SPSS Output: https://osf.io/3nryj

Appendix H: Data Availability Statement

As detailed in the Participant Information Sheet and Privacy Notice (see Appendix G, pp. 90), participants consented to their anonymous survey data being stored for up to ten years for the purpose of this study and any linked research papers that are submitted for publication.

It is not currently planned that the data from this study will be used for any future projects or secondary analyses; however, a copy of the dataset can be provided (if appropriate). Data will be retained on the University of Glasgow repository (Enlighten) on completion of the project.