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Gender Differences in Risks of Suicide and Suicidal Behaviors in the USA: A Narrative Review

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Abstract

Purpose of Review—We review recent research (2018–2023) on gender differences in suicidal behaviors (i.e., suicidal ideations and attempts, death by suicide). We examine research studies in the following areas: developmental period, substance use, and special populations (Veterans, sexual and gender minorities).

Recent Findings—Novel results were found in these different areas. For example, suicide rates for female youth are increasing at a faster rate relative to male youth. Further, some evidence suggests that heavy alcohol use/binge drinking is a significant and growing risk factor for suicidal behaviors in women. Military service may be a more significant risk factor for suicidal behaviors among male Veterans compared to female Veterans. Additionally, suicide rates are rising for gender minority youth/young adults.

Summary—Recent research on gender differences in suicide outcomes demonstrates findings that align with previous research, as well as new insights on this important topic.

Keywords

Suicide gender differences; Youth suicide; Adult suicide; Substance use suicide; Veteran suicide; LGBT suicide

Introduction

Suicide, or death caused by intentionally harming oneself with the intent to die, is a significant public health concern in the USA [1]. In 2021, suicide was among the top nine leading causes of death for individuals ages 10–64. In addition to death by suicide, suicidal behaviors include suicide attempts as well as thoughts about suicide that are never acted upon. Gender differences in risk factors for and prevalence rates of suicidal behaviors have been well documented. For example, findings have consistently demonstrated greater rates

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of suicidal ideation and attempts in women, and a higher prevalence of death by suicide in men [2].

In addition, temporal trends in suicide rates also indicate gender differences. For example, while a recent report by the Centers for Disease Control (CDC) found that age-adjusted suicide rates mostly increased for men and women in the past 20 years, gender differences in trends across shorter periods of time between 2000 and 2021 were observed [3]. For example, the increase in suicide for men after 2008 was much larger than it was for females. This may be attributable to the 2008 economic crisis, which has been linked to an increase in suicide among men in particular [4]. In addition, rises in rates among both genders between 2020 and 2021 may reflect increases in mental health and substance use issues induced by the pandemic, contributing to a greater risk for suicide outcomes [5].

In this narrative review, we examined recent research (2018–2023) on gender differences in suicidal behaviors. We focus our review on studies published using US samples and organize our review in terms of areas in which recent studies on gender differences in suicidal behaviors have been most published: developmental period (preadolescents and adolescents, adults), substance use, and special populations (Veterans, sexual and gender minorities (SGM)). While most studies on gender differences in suicidal behaviors measure gender in terms of sex assigned at birth, in our review of research on gender minorities (GM), we consider gender differences in terms of gender identity, or how individuals experience their gender and what label they use to describe their gender.

Developmental Period

Preadolescents and Adolescents

In considering gender differences in suicide across developmental periods/age groups, most research in the past 5 years has been conducted on preadolescents and adolescents. Between 2010 and 2019, among preadolescents (children under 12), males made up the majority of youth suicide rates (66.7%) despite similar population estimates for males and females (51% and 49% respectively; Table 1) [6•]. Suicide rates for both genders grew between 2010 and 2019. However, this rise in rates was especially pronounced among female youth, increasing 300% ($r = 0.92$) during this period.

Upward temporal trends in poisoning-related suicide attempts and deaths by suicide have also been observed among female youth under age 18 [7]. Poisoning-related suicide outcomes increased significantly in females when comparing 2000–2010 and 2010–2018 percentage rates, whereas rates remained stable for males. These two studies provide some evidence to suggest that suicidal behaviors in female youth are increasing over time at a faster rate than male youth. Future research should continue to monitor gender differences in youth suicide rates over time especially given these concerning trends among female youth.

Recent cross-sectional research on gender differences in suicidal behaviors among preadolescents revealed mixed findings [8, 9]. Lawrence and colleagues found that female preadolescents, compared to males, had a decreased odds of suicidal ideation (OR = 0.71), whereas no gender differences were indicated for odds of suicide attempts [8]. Alternatively,

findings from another study indicated that female preadolescents had an increased odds of experiencing past year suicidal ideation in 2007 (OR = 1.47) and 2010 (OR = 1.50) [9]. However, similar to the study by Lawrence and others, gender did not significantly predict past-year suicide attempts in either year. The lack of gender differences in suicide attempts consists of a developmental perspective of suicidal behaviors, which suggests that gender differences in suicidal behaviors do not develop until adolescence [9, 10].

Current research has also focused on how risk factors for suicide outcomes differ between male and female adolescents. Cromer and colleagues found that symptoms of depression at age 16 were associated with a greater risk of suicidal ideation at age 18 in females (b = 0.09), but not males [11]. The odds of having suicidal ideation were 1.09 times greater for each one-unit increase in depression symptoms in females while no change due to depression symptoms was observed for males. Further, findings from this study revealed that the indirect effect between cumulative victimization (i.e., childhood physical and sexual abuse, exposure to family violence) and suicidal ideation through depression was significant for females (unstandardized indirect effect = 0.08), but not males. Another study similarly found that among adolescents, depression played a mediating role in the indirect link between victimization (i.e., bullying victimization and sexual dating violence victimization) and suicide attempts, and these indirect effects were stronger for female adolescents (β = 0.045 and β = 0.028 respectively) compared to male adolescents (β = 0.029 and β = 0.009 respectively) [12]. The direct effect of depression on suicide attempts was also greater for female adolescents (β = 0.286) relative to males (β = 0.247). Consistent with previous research [13], these results suggest that depression is a gender-specific risk factor for suicide outcomes in youth, heightening the risk for females more so than males.

Research on youth suicide decedents also revealed gender differences in risk factors for death by suicide. Findings from the National Violent Death Reporting System (NVDRS) indicated that female youth (ages 10–18) suicide decedents, compared to male youth suicide decedents, had higher rates of current mental health problems and treatment history, leaving a suicide note, history of suicidal ideation and attempts, and interpersonal and intimate partner problems contributing to their suicide [14]. The only gender-specific risk factors that emerged for male youth suicide decedents were criminal legal problems and experiencing school problems that contributed to their suicide. These findings are relevant to research indicating externalizing disorders as a risk factor for death by suicide in male adolescents [15], as externalizing problems may include physical fights both in and outside of school. However, other issues that fall under the NVDRS definition for “school problems” include academic problems, problems with a teacher, bullying or isolation at school, detention/suspension, and performance pressures. Future research is needed to disentangle which of these school-related problems are contributing to male youth suicide [14].

Adults

To the authors’ knowledge, only one recent study has focused on gender differences in suicide among a US general sample of adults [16]. Using the National Epidemiologic Survey on Alcohol and Related Conditions-Wave III (NESARC-III), Bommersbach and colleagues found that adult females (OR = 1.78) had a greater lifetime prevalence of suicide attempts

compared to adult males [16]. While both genders shared many risk factors for suicide attempts, other factors appeared to differ between men and women in the magnitude of their association with suicide attempts. Specifically, lifetime incarceration, previous trauma, and earning less than $40,000 emerged as a greater risk for suicide attempts in women, whereas borderline personality disorder, schizophrenia/psychosis, and a parental history of suicide attempt increased risk more for men. While limited new research exists on gender differences in suicidal behaviors among adults in the USA (not including substance use-related suicide and among special populations), multiple studies have been published using adult samples from other countries [e.g., 17, 18]. Future research would benefit from examining gender differences in suicidal behaviors among adults from an international perspective.

Substance Use

Alcohol Use

Multiple studies published in the past 5 years investigated suicide risk by gender among individuals with substance use issues, and alcohol and cannabis use in particular [19•, 20–23]. Lange and colleagues examined alcohol use (defined as blood alcohol concentration [BAC] of ≥ 0.04 g/dl for moderate use or ≥ 0.08 g/dl for heavy use) prior to suicide deaths among adults using data from NVDRS [19•; Table 2]. Between 2003 and 2018, alcohol-related suicide increased among women of all age groups for both moderate (2.80% for young women; 2.20% for middle-aged women; and 4.11% for older women) and heavy (3.09% for young women; 2.03% middle-aged women, and 10.48% for older women) alcohol use. Alternatively, only alcohol-related suicide increased for moderate alcohol use among middle-aged men (0.81%). While previous research has indicated a greater risk of being intoxicated with alcohol before death by suicide in women relative to men [24], this current study suggests that this risk may be increasing.

Two other recent studies focused on alcohol use and suicidal behaviors [20, 21]. Kittel and colleagues found that binge drinking was associated with suicide attempts in women (OR = 1.37), but not in men between 2008 and 2014 [20]. No association was found between binge drinking and suicidal ideation in either men or women. In the other study, which examined adults with depressive symptoms, men with co-morbid alcohol use disorder were more likely to report suicidal behaviors, including suicidal ideation and suicide attempts [21]. However, except for active suicidal ideation, no differences were observed between men and women with co-morbid binge drinking and passive suicidal ideation, suicide plans, and suicide attempts.

Results from these three studies indicate somewhat mixed findings. However, preliminary evidence points to heavy alcohol use/binge drinking in particular as a significant (and growing) risk factor for suicidal behaviors in women. This may be related to converging alcohol use rates between men and women in the past years [25, 26], coupled with poisoning as a more common suicide method in women compared to men [27]. Given growing rates of alcohol use disorder and heavy drinking in women, the association between alcohol use and the risk of suicide is a cause for concern.

Cannabis Use

Two studies examined gender differences in the link between cannabis use and suicidal behaviors, with one focusing on adolescents and the other on adults [22, 23]. Flores and colleagues found that both male and female adolescents with weekly or more frequent cannabis use, relative to their male and female counterparts with no use, had significantly higher rates of any suicidal ideation (+ 14.8 percentage-points and + 12.8 percentage-points respectively) and attempt (+ 13.3 percentage-points and + 18.4 percentage-points respectively) [22]. For any suicide plan, only female adolescents with weekly-plus use indicated a significantly greater rate (+ 15.0 percentage-points), whereas there were no differences between male users and non-users. Among adults ages 18–34, women with cannabis use disorder (CUD) showed higher adjusted prevalence rates of suicidal ideation (13.9% vs. 9.9%), plans (4.1% vs. 2.7%), and attempts (3.0% vs 1.5%) [23]. These significantly higher rates for women with CUD compared to men with CUD remained regardless of whether they had depression. Thus, it is possible that other mental health issues or sociodemographic factors may explain the greater link between CUD and suicidality in women compared to men. Results from these studies provide preliminary evidence to suggest that cannabis use may serve as a more significant risk factor for suicidal behaviors in females relative to males. No recent studies examined gender differences in suicide outcomes for other substances, such as opioids and cocaine.

Special Populations

Veterans

Since 2018, several studies have focused on gender differences in suicide outcomes among the Veteran population [28, 29, 30•, 31]. In general, Veterans have a greater risk of dying by suicide compared to non-Veterans [32]. According to the 2022 National Veteran Suicide Prevention Annual Report, the suicide death rate for Veterans was 57.3% greater compared to non-Veteran US adults [28; Table 3]. Temporal trends in age-adjusted suicide rates were fairly similar between male and female Veterans. Between 2001 and 2020, suicide rates for Veteran men were highest in 2018 (approximately 41.0 per 100,000), then decreased through 2020 (approximately 39.0). For Veteran women, these rates were greatest in 2017 (approximately 20.0), then declined through 2020 (approximately 14.0). In general, rates of veteran suicide have increased since 2001, and especially among younger veterans. Peaking rates in men and women in 2018 and 2017 (respectively) may be due to unique risk factors for suicide associated with serving in post 9/11 wars (e.g., decreased approval of war, increased length of war, higher rates of traumatic brain injury) [29].

Similar to findings from non-Veteran samples, recent research has found that female Veterans indicated higher rates of lifetime and past-year suicidal ideation and lifetime suicide attempts compared to male Veterans [30•, 31]. A study of post-9/11 Veterans found that among both male and female Veterans, the odds of experiencing suicidal ideation were associated with military time period, with increasing odds across comparisons of periods (i.e., during military to premilitary, postmilitary to premilitary, postmilitary to during military) [30•]. The odds of experiencing suicidal ideation postmilitary relative to premilitary was higher for male Veterans (OR = 3.39) compared to female Veterans (OR

= 1.70). In addition, the link between suicide attempts and military period was significant for male Veterans (OR = 2.69), but not female Veterans. While the rate of suicide attempts increased for male Veterans from premilitary (1.3%) to postmilitary (3.4%), it remained largely stable for female Veterans (6.0% to 5.8%). These results suggest that experiences during military service are a greater risk factor for suicidal behaviors in male Veterans compared to female Veterans.

Current research has also identified other gender-specific risk factors for suicidal behaviors in Veterans. Stefanovics and colleagues found that for female Veterans, significant risk factors for suicidal ideation were lower psychological resilience (44.4% of the variance explained), history of non-suicidal self-injury (24.4%), and alcohol use disorder (20.6%) [31]. For male Veterans, significant risk factors were loneliness (19.5%), hostility (19.1%), and lack of purpose in life (16.3%). Among a sample of Veterans experiencing housing instability, male and female Veterans had mostly similar risk factors for suicidal ideation and attempts [32]. For female Veterans, suicidal ideation was associated with being under 40, having a mental health or substance use disorder, and experiencing military sexual trauma. Risk factors for suicide attempts also included having a mental health or substance use disorder and experiencing MST in addition to being younger than 65 and having a service-connected disability. For male Veterans, both suicidal ideation and attempts were similarly linked to being younger than 65, having a mental health or substance use disorder, experiencing MST, and having a service-connected disability.

Sexual and Gender Minorities

SGMs (i.e., non-heterosexual individuals and those whose gender identity does not align with their sex assigned at birth) experience greater rates of suicidal behaviors compared to heterosexual, cisgender individuals [34, 35, 36•, 37–41]. Most of this research has indicated greater rates of suicidal behaviors in GM adolescents and young adults compared to cisgender adolescents and young adults [36•, 37, 38]. For example, among a sample of both SGM and non-SGM suicide decedents ages 11 to 29, there was a significant increase in death by suicide for transgender individuals 2016 [36•] (Table 4). Specifically, prior to 2016, 2.0% of adolescent/young adult suicide decedents identified as transgender, while after 2016, this rate increased to 6.5%. No significant increases were evident for both sexual minority (SM) and heterosexual cisgender male and female adolescents and young adults. Death by suicide happening after 2016 (compared to before 2016) was linked to a 366% increase in relative risk of the victim being a transgender adolescent/young adult. Because in recent years transgender individuals are increasingly disclosing their gender identity at younger ages, they are more vulnerable to experiences that may confer greater risk for suicide (e.g., family rejection, bullying/victimization) in adolescence/young adulthood [33]. Up-to-date trend analyses for suicidal behaviors in transgender youth will continue to be important given the increasing rate of death by suicide in this population.

Two studies also indicated greater rates of suicidal ideation and attempts in GMs compared to cisgender individuals among samples of college students [37, 38]. Horwitz and colleagues found that among college students screening positive for suicidal ideation and attempts, GMs (female-to-male transgender, male-to-female transgender, female-assigned

genderqueer/nonbinary, male-assigned genderqueer/non-binary) showed increased rates of suicidal ideation (35.3–46.4%) and attempts (23.8–30.19%) compared to both male (10.4% and 3.7% respectively) and female (13.5% and 6.6% respectively) cisgender students [37]. Another study also found that among college students indicating a history of suicidal ideation and attempts, transgender students had higher rates on both suicide outcomes (68.4% and 38.2% respectively) relative to male (21.8% and 7.7% respectively) and female (25.1% and 9.8% respectively) cisgender students [38]. However, while transgender identity (OR = 2.32) and cisgender male identity (OR = 1.07) were linked to greater suicidal ideation, only transgender identity was linked to more suicide attempts (OR = 2.05). These findings are consistent with recent research among GM suicide decedents (35.8%) across all age groups; transgender decedents were more likely to have a history of suicide attempts compared to heterosexual cisgender decedents (19.9%) [39]. Additionally, risk factors for death by suicide independently associated with transgender status compared to heterosexual cisgender status included a depressed mood (OR = 1.87) and having a mental health problem (OR = 4.34).

As is evident in these studies, there is variation in how GM status is measured (e.g., transgender *and* non-binary/gender queer categories versus transgender category only) in research investigating suicidal behaviors among GMs relative to cisgender persons. Future research on differences in suicidal behaviors between GM and cisgender individuals would benefit from including multiple categories of identification (e.g., transgender, genderqueer, nonbinary) in order to encompass a broader range of GMs, as solely using a “transgender” category may not fully capture the experiences of GMs who do not identify as transgender [35]. This is especially important given that younger GM individuals are increasingly using alternative labels such as “genderqueer” to describe their gender identity [42].

Research on gender differences in suicidal behaviors among SMs has revealed mixed results [40, 41]. Using an inpatient sample, Decou and Lynch found that while female adolescents (OR = 2.44) were more likely than male adolescents to attempt suicide, there was no significant interaction between SM status and gender [40]. These findings are consistent with research prior to 2018 on gender differences in suicidal ideation and attempts in SM adolescents [43, 44]. Among a sample of adults ages 18–60, SM women had the highest rate of suicide attempts, followed by SM men, then heterosexual men and women [41]. Additionally, SM women were significantly more likely to report suicide attempts compared to SM men, but only from ages 30 to 42. These findings provide preliminary evidence that gender differences in suicidal behaviors among SMs may vary based on age, with SM youth showing no gender differences, and adults demonstrating greater risk for SM women compared to SM men. However, more research is needed in order to support this conclusion.

Conclusion

Since 2018, research on gender differences in suicidal behaviors using US samples has predominantly focused on specific developmental periods, the role of substance use, and special populations including Veterans and SGMs. The current research covering these different areas suggests trends that align with previous research on gender differences in suicidal behaviors, as well as new insights on this topic.

Regarding youth suicide, current research has pointed to increasing trends in suicide among preadolescent and adolescent females, suggesting that suicide rates may be growing faster for female youths compared to male youths [6•, 7]. Future research should continue to monitor this trend as well as investigate potential explanations for climbing suicide rates in female youth. Consistent with previous research, current findings indicated depression as a greater risk factor for suicidal ideation and attempts in female youth relative to male youth [11, 12]. When considering death by suicide, one study identified school problems as a gender-specific risk factor for male youth [14]. A potential direction for future studies may be to investigate what aspects/types of school problems are contributing to death by suicide in male youth.

Only one study from 2018 to 2023 examined gender differences in suicide outcomes among the US adult general population [16]. This study found a greater rate of lifetime suicide attempts among women compared to men, which is consistent with previous research. However, between 2018 and 2023, multiple studies were published on this topic using non-US adult samples [e.g., 17, 18]. It may be important for future reviews on gender differences in suicidal behaviors to consider the inclusion of studies from different countries beyond the USA in order to provide an international perspective on gender differences in adult suicide.

While some findings were mixed, research on the links between both alcohol and cannabis use and suicidal behaviors suggests that women may be particularly at risk. Specifically, current research identified growing rates of alcohol-related suicide (for both moderate and heavy alcohol intoxication levels) among young, middle-aged, and older women, while increases were only observed for middle-aged men with moderate alcohol intoxication prior to suicide [19•]. Other studies identified binge drinking and cannabis use as risk factors for suicidal behaviors in women, but not men [20, 22, 23]. Given converging drinking rates between men and women in the past years, future research might hone in on alcohol-related suicidal behaviors among women in particular [25, 26].

Several recent studies examined gender-specific risk factors for suicidal behaviors among Veterans [30•, 31, 32]. Notably, the link between military period and suicide attempts was significant for male Veterans but not female Veterans, suggesting that experiences during military service may take a significant toll on male Veterans' mental health. Traumatic experiences (e.g., combat trauma, military sexual trauma) endured during military service may contribute to the development of PTSD, and in turn increased suicidal behaviors [44]. However, minimal research has addressed gender differences in the link between PTSD and suicidal behaviors among Veterans [45]. Future research might focus on elucidating these differences in order to further understand why military period is a risk factor for suicide attempts in male Veterans but not female Veterans.

Current research on gender differences in suicidal behaviors among SGMs has paid particular attention to differences between GMs and cisgender individuals. Results from these studies revealed upward trends in suicide rates for transgender individuals, but not cisgender SM males and females [36•], as well as greater rates of suicidal ideation and attempts in GMs compared to cisgender individuals [37, 38]. These concerning findings

suggest the need for continued monitoring of temporal trends in GM suicide rates as well as the evaluation and continued development of GM-tailored suicide prevention and intervention efforts. Additionally, a limitation of previous and current research is the lack of inclusive measurement of GM identification. Future research would benefit from incorporating additional labels (e.g., genderqueer, non-binary) for measurement beyond "transgender" to be more inclusive of the GM population within suicide research.

Recent research on gender differences in suicidal behaviors is lacking in a couple areas. Firstly, to our knowledge, only one study within the last 5 years examined how suicide outcomes vary by gender in the general US adult population. Future research should attend to this population (and middle-aged and older adults in particular), especially given that gender differences in adult suicide rates vary over time and are impacted by global events (e.g., economic recession, pandemic). Additionally, there was no research using US samples that examined gender differences in suicidal behaviors among individuals using substances other than alcohol and cannabis. A recent study using NSDUH data found a substantial increase in suicidal ideation among individuals with opioid use disorders between 2009 and 2020 [46]. Future studies should address how suicidal behaviors in individuals struggling with opioid use (in addition to other substances (e.g., cocaine, methamphetamine, polysubstance)) vary based on gender. However, similar to recent suicide research with general adult populations, multiple studies using *non-US* samples have investigated gender differences in suicide outcomes among people struggling with the use of other substances beyond alcohol and cannabis [47–50].

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Table 1

Gender differences in suicidal behaviors across developmental periods

Authors	Setting; study design; data source	Suicide outcome	Suicide measure	Findings	Other potential risk/ moderating factors
Bommersbach et al. [16]	Epidemiological sample; cross-sectional; survey data (National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III))	Suicide attempts	Self-reported; indication of lifetime suicide attempt vs. no lifetime suicide attempt	Women were more likely than men to indicate a lifetime suicide attempt (OR = 1.78, 95% CI 1.61–1.96).	Any lifetime incarceration, any lifetime experience of a traumatic event, income less than $40,000, borderline personality disorder, schizophrenia/ psychosis, parental history of suicide attempt
Cromer et al. [11]	Epidemiological sample; longitudinal; survey data (Longitudinal Studies of Child Abuse and Neglect (LONGSCAN))	Suicidal ideation	Self-reported; past year thoughts about attempting suicide	Depression symptoms at age 16 were associated with a greater risk for suicidal ideation at age 18 in females ($b = 0.09$, $p < 0.05$, 95% CI 0.02–0.15), but not males. The indirect relationship between victimization and suicidal ideation through depression symptoms was significant for females (unstandardized indirect effect = 0.08, 95% CI 0.02–0.16), but not males	N/A
Kim et al. [12]	Epidemiological sample; cross-sectional; survey data (Youth Risk Behavior Surveillance System (YRBSS))	Suicide attempts	Self-reported; past-year number of suicide attempts	The indirect effects of school bullying and sexual dating violence victimization on suicide attempts via depression were significantly greater for female adolescent students ($\beta = 0.045$ and $\beta = 0.028$ respectively) compared to male adolescent students ($\beta = 0.029$ and $\beta = 0.009$ respectively)	N/A
Lawrence et al. [8]	Epidemiological sample; cross-sectional; survey data (Adolescent Brain Cognitive Development Study (ABCD Study))	Suicidal ideation and attempts	Self- and parent-reported; lifetime or current (past 2 weeks) suicidal ideation and attempts (questions from Kiddie Schedule for Affective Disorders and Schizophrenia-Present and Lifetime Version for DSM-5)	Female preadolescents, compared to male preadolescents, had a decreased odds of suicidal ideation (OR = 0.71, 95% CI 0.62–0.81); no gender differences were found for odds of suicide attempts	SM status, race, parental marriage status, family income, having any psychiatric condition, have two or more psychiatric conditions
Lee and Wong [14]	National sample; cross-sectional; mortality data (National Violent Death Reporting System; NVDRS)	Death by suicide	Medical examiner, coroner, and/or law enforcement recorded; ICD-10 cause-of-death codes or manner of death specified as suicide	Female youth suicide decedents (aged 10–18) had higher rates of current mental health problems (OR = 1.76, $p < 0.001$) and treatment (OR = 1.76, $p < 0.001$), leaving a suicide note (OR = 1.90, $p < 0.001$), history of suicidal ideation (OR = 1.78, $p < 0.001$) and attempts (OR = 3.30, $p < 0.001$), interpersonal (OR= 1.31, $p < 0.001$) and intimate partner (OR= 1.31, $p < 0.001$) problems that contributed to their suicide compared to male youth suicide decedents, whereas male youth decedents (female reference group) were more likely to have experienced school problems (OR = 0.64, $p < 0.001$) and criminal legal problems (0.48, $p < 0.001$) that contributed to their suicide	Race
Price and Khubchandani [6•]	National sample; cross-sectional; mortality data (Centers for Disease Control and Prevention's Web Based Injury Statistics Query and	Death by suicide	Medical examiner, coroner, and/or law enforcement recorded; ICD-10 cause-of-death codes or manner of death specified as suicide	Between 2010 and 2019, males made up 66.7% of child suicides and females made up 33.3%. The rate of child suicides for males during this time increased by 95.0% (r=0.99; $p < .0.05$) and for females increased by 300% (r– 0.92: $p < 0.05$)	N/A

Authors	Setting; study design; data source	Suicide outcome	Suicide measure	Findings	Other potential risk/ moderating factors
	Reporting System; CDC's WISQARS)				
Spiller et al. [7]	National sample; cross-sectional; survey data (National Poison Data System (NPDS))	Suicide attempts or death by suicide	Healthcare professional reported; exposure to poison from the use of "…a substance for self-harm or for self-destructive or manipulative reasons"	Poisoning-related suicide outcomes increased significantly in females under 18 when comparing 2000–2010 and 2010–2018 percentage rates ($p < 0.05$), with an inflection point occurring in 2011. For males under 18, percentage rates remained largely stable from 2000 to 2018. For males and females ages 19–24, no significant changes were found	Age
Walsh et al. (2020) [9]	State sample; cross-sectional; survey data (Minnesota Student Survey (MSS))	Suicidal ideation and attempts	Self-reported; lifetime any thoughts about suicide and history of attempts (coded as past year if response option chosen was "yes, during the last year")	Female preadolescents (ages 11 and 12) had an increased odds of experiencing past-year suicidal ideation in 2007 (OR = 1.47, 95% CI 1.34–1.58) and 2010 (OR = 1.50, 95% CI 1.38–1.63). Gender did not significantly predict past-year suicide attempts in either year	Free or reduced lunch, low parental support, lifetime physical and sexual abuse, low teachers support, negative attitude towards attending school, low perceived safety at school, low peer social support, bullying victim, threatened at school, physically assaulted at school

Table 2

Gender differences in suicidal behaviors with comorbid substance use

Author	Setting; study design; data source	Suicide outcome	Suicide measure	Findings	Other potential risk/ moderating factors
Han et al. (2021) [23]	Epidemiological sample; cross-sectional; survey data (NSDUH)	Suicidal ideation, plans, and attempts	Self-reported; past-year suicidal ideation, plans, and attempts	The prevalence of suicidal ideation, plans, and attempts was higher among women with cannabis use disorder (13.9% vs. 9.9% and 4.1% vs. 2.7% and 3.0% vs 1.5%, respectively)	Major depressive episode
Flores et al. [22]	Epidemiological sample; cross-sectional; survey data (NSDUH)	Suicidal ideation, plans, and attempts	Self-reported; past-year suicidal ideation, plans, and attempts	Relative to their no cannabis use counterparts, females with weekly-plus cannabis use had higher rates of any suicide plan (+ 15.0 percentage-points; 95% CI 8.9–21.2%; $p < 0.001$), while both male and females had higher rates of any suicidal ideation (+ 14.8 percentage-points; 95% CI 7.7–21.9%; $p < 0.001$ and + 12.8 percentage-points; 95% CI 7.4–18.1%; $p < 0.001$, respectively) and any suicide attempt (+ 13.3 percentage-points; 95% CI 5.0–21.8%; $p < 0.01$ and + 18.4 percentage-points; 95% CI 11.1−25.8%; $p < 0.001$, respectively)	N/A
Kelly et al. [21]	Epidemiological sample; cross-sectional; survey data (National Survey on Drug Use and Health (NSDUH))	Suicidal ideation, plans, and attempts	Self-reported; past-year suicidal ideation, plans, and attempts	Among study participants with depressive, men were more likely than women to report all types of suicidal behaviors (i.e., passive and active suicidal ideation, suicide plans, suicide attempts) comorbid with alcohol use disorder (ORs = 1.38–1.84)	N/A
Kittel et al. (2019) [20]	Epidemiological sample; cross-sectional; survey data (NSDUH)	Suicidal ideation, plans, and attempts	Self-reported; past-year suicidal ideation, plans, and attempts	Binge drinking was associated with suicide attempts in females (OR = 1.37, 95% CI 1.09–1.73) but not in males (OR = 1.07, 95% CI 0.80–1.43). Binge drinking was not associated with suicidal ideation in either males or females	N/A
Lange et al. [19•]	Nation sample; cross-sectional; mortality data (NVDRS)	Death by suicide	Medical examiner, coroner, and/or law enforcement recorded; ICD-10 cause-of-death codes or manner of death specified as suicide	From 2003 to 2018, the proportion of suicides that were alcohol-involved wherein the decedent had a BAC ≥ 0.08 g/day significantly increased on average annually for women of all age groups, including young women (average annual percentage change (AAPC) = 3.09%, 95% CI 1.70–4.49%), middle-aged women (AAPC = 2.03%, 95% CI 1.12–2.95%), and older women (AAPC = 10.48%, 95% CI 1.17–20.65%), while only middle-aged men experienced a significant average annual percentage increase (AAPC = 0.81%, 95% CI 0.003–1.62%)	N/A

Table 3

Gender differences in suicidal behaviors among Veterans

Authors	Setting; study design; data source	Suicide outcome	Suicide measure	Findings	Other potential risk/ moderating factors
Hoffmire et al. [30•]	Epidemiological sample; cross-sectional; survey data (Comparative Health Assessment Interview Study (CHAI))	Suicidal ideation and attempts	Self-reported; adapted version of Columbia-Suicide Severity Rating Scale	Prevalence of lifetime suicidal ideation and attempt was significantly higher for female veterans (28.8%; 12.4%) compared to male veterans (24.0%; 5.6%). Prevalence of suicidal ideation for both men (6.5 to 18.7%) and women (13.3 to 19.9%) increased across military service (premilitary, during-military, postmilitary); whereas for suicide attempt, prevalence increased for men (1.3 to 3.4%) but remained stable for women (6.0 to 5.8%)	Childhood vs adulthood, military service period
Montgomery et al. [32]	Veteran Health Administration (VHA) medical center; cross-sectional; electronic medical record and administrative data	Suicidal ideation and attempts	Clinician-reported; indication of suicidal ideation and/or attempt identified via ICD codes and/or indication in Veteran Health Administration internal suicide event tracking system (Suicide Prevention Applications Network)	For female veterans with housing instability, suicidal ideation was associated with being younger than 40, having a mental health/ substance use disorder, and experiencing military sexual trauma (MST); suicide attempt was associated with being younger than 65, having a mental health/substance use disorder, experiencing MST, and having a service-connected disability. For male veterans with housing instability, both suicidal ideation and attempt were associated with being younger than 65, having a mental health/substance use disorder, experiencing MST, and having a service-connected disability	N/A
Stefanovics et al. [31]	Epidemiological sample; cross-sectional; survey data (The National Health and Resilience in Veterans Study (NHRVS))	Suicidal ideation	Self-reported; past-year thoughts about suicide (question 2 of Suicide Behaviors Questionnaire-Revised)	Male veterans were less likely to report past-year suicidal ideation compared to female veterans (OR = 0.6; 95% CI 0.4–0.8). For female veterans, significant risk factors for suicidal ideation were lower psychological resilience (44.4% variance explained), history of non-suicidal self-injury (24.4%) and alcohol use disorder (20.6%); whereas for male veterans, they were loneliness (19.5%), hostility (19.1%), and lack of purpose in life (16.3%)	Homelessness, incarceration, military sexual trauma, ACEs and trauma history, severity of somatic symptoms, mental health and drug use disorders, psychiatric distress, medical conditions, disability, poorer physical health, lack of social support, insecure attachment style
U.S Department of Veteran Affairs [28]	VHA sites; cross-sectional; electronic medical record and mortality data	Death by suicide	Healthcare professional or other recorded; Veteran Health Administration suicide indicators, site-documented suicides, on-campus suicides, VHA emergency department data, national death certificates	Between 2001 and 2020, the suicide rate for Veteran men was highest in 2018 (approximately 41.0 per 100,000), which then decreased through 2020 (approximately 39.0); whereas for Veteran women, the suicide rate was highest in 2017 (approximately 20.0), then similar to male Veterans, decreased through 2020 (approximately 14.0)	N/A

Table 4

Gender differences in suicidal behaviors among sexual and gender minorities

Authors	Setting; study design; data source	Suicide outcome	Suicide measure	Findings	Other potential risk/ moderating factors
DeCou and Lynch [40]	Psychiatric hospital; cross-sectional; electronic medical record data	Suicide attempts	Clinician recorded; lifetime suicide attempt	Female adolescents (ages 11 to 17) were more than 2 times more likely than male adolescents (OR = 2.44, 95% CI 1.50–3.97) to attempt suicide, but there was no interaction between SM orientation and gender	Age, high rurality, history of sexual abuse, substance use
Fish et al. [41]	Epidemiological sample; cross-sectional; survey data (NESARC-III)	Suicide attempts	Self-reported; suicide attempt in the last 5 years vs. no suicide attempt or suicide attempt more than 5 years ago	SM women had the highest rate of suicide attempts, followed by SM men, then heterosexual men and women Between ages 30 and 41, SM women had a significantly greater risk of previous suicide attempts relative to SM men	Anti-SM discrimination
Horwitz et al. [37]	Community sample; cross-sectional; survey data	Suicidal ideation and attempts	Self-reported; past-year thoughts about suicide and lifetime suicide attempt	Gender minority (male-to-female and female-to-male transgender, non-binary/gender queer male- and female-assigned) college students had significantly higher rates of suicidal ideation (35.3–46.4% across all gender minority groups) and attempts (23.8–30.9%) relative to male cisgender (10.4% and 3.7% respectively) and female cisgender (13.5% and 6.6% respectively) college students	None
Liu et al. [38]	Epidemiological sample; cross-sectional; survey data (American Health Association-National College Health Assessment (NCHA))	Suicidal ideation and attempts	Self-reported; if/when (e.g., in the last 12 months, in the last 30 days) seriously considered suicide and attempted suicide	Transgender (OR = 2.32; 95% CI 1.62–3.32) and male college students (OR = 1.07; 95% CI 1.01–1.13) were more likely to indicate suicidal ideation; whereas transgender college students only (OR = 2.05; 95% CI 1.47–2.87) were more likely to indicate a suicide attempt	Race, sexual orientation, transfer student status, number of stressful events
Patten et al. [39]	National sample; cross-sectional; mortality data (NVDRS)	Death by suicide	Medical examiner, coroner, and/or law enforcement recorded; ICD-10 cause-of-death codes or manner of death specified as suicide	Transgender suicide decedents were more likely to have a history of suicide attempts relative to heterosexual cisgender suicide decedents (35.8% vs. 19.9%, $p < 0.001$)	Age, depressed mood, weapon type, mental health problem, current and history of mental illness treatment, history of child abuse, suicide intent disclosed to a family member
Ream [36•]	National sample; cross-sectional; mortality data (NVDRS)	Death by suicide	Medical examiner, coroner, and/or law enforcement recorded; ICD-10 cause-of-death codes or manner of death specified as suicide	Transgender adolescents and young adults (ages 11 to 29) showed a greater increase in death by suicide from prior to 2016 (2.0%) to after 2016 (6.5%; relative risk ratio = 3.66, $p < 0.001$) compared to cisgender adolescents and young adults	Age, race, urbanicity, veteran status