HHS Public Access

Author manuscript

Arch Suicide Res. Author manuscript; available in PMC 2022 March 08.

Published in final edited form as:

Arch Suicide Res. ; : 1–17. doi:10.1080/13811118.2020.1811181.

Sexual orientation differences in lethal methods used in suicide: Findings from the National Violent Death Reporting System

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Abstract

We examined sexual orientation and sex differences in seven methods of suicide among adult suicides reported in the United States National Violent Death Reporting System (2012 – 2015; *N*=59,075). Overall, most sexual minorities (i.e., lesbians, gay men, bisexuals) identified in the dataset used hanging (38%) followed by firearm (30%) and drug or poison ingestion (20%). Sexual minorities were more likely than heterosexuals to be younger, female, and Black/African American. Multivariate sex-stratified analyses in the overall sample showed that strong sexual orientation differences in lethal methods existed among men but not among women. However, when we compared sex differences in lethal methods among sexual minorities only, we found that lesbian/bisexual women, as compared to gay/bisexual men, were more likely to use a firearm or drug or poison ingestion than hanging. Findings suggest that the higher rate of suicide mortality among sexual minorities is likely driven by hanging, a method of suicide that is not particularly amenable to lethal method restricted-access prevention approaches. Future research directions, clinical training recommendations, and intervention opportunities are discussed.

Keywords

hanging; firearm; overdose; mortality; death records

Introduction

Sexual minorities (e.g., lesbians, gay men, bisexual people, LGB) are known to be at elevated risk of suicide attempt and mortality as compared to similar heterosexuals (Björkenstam, Andersson, Dalman, Cochran, & Kosidou, 2016; Cochran & Mays, 2015;

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Haas et al., 2010; Hottes, Bogaert, Rhodes, Brennan, & Gesink, 2016; Mathy, Cochran, Olsen, & Mays, 2011; Raifman, Moscoe, Austin, & McConnell, 2017; Remafedi, French, Story, Resnick, & Blum, 1998; Russell & Joyner, 2001). Most research on antecedents of suicide among sexual minorities has generally been limited to studies assessing precursors of suicide attempts or ideation, rather than suicide mortality. Less is known about critical antecedents of suicide mortality in this population, including proximate context or causes of death such as the methods used in suicides (e.g., firearm, hanging) (Haas et al., 2010; Haas & Lane, 2015). This represents a critical gap in the literature given the robust association between chosen method of suicide and lethality of a suicide attempt (Lester, 1998; Mann et al., 2005).

The most proximal factor associated with suicide is the method used (Haas & Lane, 2015; Mościcki, 1995). Case fatality rates from suicide attempts differ depending on the type of lethal method employed. One population-based study demonstrated that over 90% of individuals who attempted suicide with a firearm died compared to just 2% of those who attempted by drug or poison ingestion (Miller, Azrael, & Hemenway, 2004). The lethal method used in a suicide attempt not only varies by regional accessibility of the method (e.g., the disproportionately high firearms suicides in the U.S. as compared to other countries), but also varies by individual status characteristics. For example, the ‘gender paradox in suicide behavior’ – that women are more likely to attempt suicide, but men are more likely to die by suicide – stems partially from the fact that men are more likely than women to use a firearm in their suicide attempt (Canetto & Sakinofsky, 1998; Stark et al., 2004; Tsirigotis, Gruszczynski, & Tsirigotis, 2011). Age is also associated with lethal method use such that older individuals are more likely to use a highly lethal method (hanging, firearm, jump from height) as compared to younger people who attempt suicide and who tend to use a less lethal method (drug or poison ingestion) (Conwell, Rotenberg, & Caine, 1990; Kõlves, McDonough, Crompton, & De Leo, 2018; Spicer & Miller, 2000). Understanding group differences in suicide method preferences can aid in designing targeted interventions for high-risk subpopulations such as sexual minorities.

Recently two studies using US data examined the correlates of suicide among sexual minorities both employing the National Violent Death Reporting System (NVDRS). The first focused on youth and emerging young adults, aged 12-29 years, finding that sexual minority males evidenced reduced risk of using a firearm as compared to heterosexual males (Ream, 2019); however, missing data in this study approached 80% calling into question the study findings (K. Clark, Blosnich, Haas, & Cochran, 2019). The second study conducted by the Centers for Disease Control and Prevention (CDC) compared decedents classified as gay males or lesbians (LG) to all other suicides of which most were unclassified for sexual orientation. LG decedents were less likely to use firearms and more likely to use hanging than non-LG decedents (Lyons et al., 2019). However, this study, too, suffered from a potential statistical bias in that decedents classified as heterosexual and those with missing/unclassified sexual orientation were grouped as ‘non-LGB,’ a conflation which might have skewed estimates toward the null (Lyons et al., 2019).

Taken together these studies indicate that firearms use may be a less common method in suicides of sexual minorities. The reason for this might be that sexual minorities, as

compared to heterosexuals, are less likely to possess firearms, especially sexual minority men (K. A. Clark et al., 2020). If this is the case, then normative public health interventions that target firearms to reduce suicide risk may be less effective in sexual minority populations (K. A. Clark et al., 2020).

In this study, we draw from the NVDRS dataset to investigate sexual orientation differences in lethal methods of suicide overall and separately among men and women. We adopt a novel approach recognizing the ways in which the NVDRS codes for sexual orientation. In the NVDRS, sexual orientation (heterosexual, gay, lesbian, or bisexual) is coded only if it is relevant to the death or explicitly stated in the medical examiner or law enforcement reports; otherwise, sexual orientation is left as 'unclassified'. Thus, the NVDRS includes a sample for which sexual orientation, heterosexual or otherwise, was relevant to the death, and for both groups this is often in the context of a same-sex or opposite-sex relationship. We expect that the unclassified group is likely predominately heterosexual with a small proportion of sexual minorities. Indeed, sexual minorities represent about 3.5% of the general population (Gates, 2011). Given evidence demonstrating that sexual minorities are overrepresented in suicide (Björkenstam et al., 2016; Cochran & Mays, 2015), we surmise that the proportion of sexual minorities in a population of suicides might be somewhat elevated as compared to in the general population. By including this unclassified group in analyses, we have the unique opportunity to determine if the identification of sexual orientation, whether sexual minority or heterosexual, impacts the critical choice of method of suicide at the population level. This can inform suicide prevention interventions specific to lethal methods in a population vulnerable to suicide.

Materials and Methods

Data source: National Violent Death Reporting System

We use data from the National Violent Death Reporting System (NVDRS; 2012-2015). The NVDRS is a restricted-access CDC database containing reports from states and the District of Columbia on all decedents of violent death, including suicides and homicides. In 2015, the following 27 states officially reported data to the NVDRS: Alaska, Arizona, Colorado, Connecticut, Georgia, Hawaii, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Vermont, Virginia, Wisconsin. Case records are created by trained coders who abstract information from police reports, medical examiner reports, hospital records, toxicology reports, witness statements, suicide notes, if available, and statements from decedents' family and friends (Fowler, Jack, Lyons, Betz, & Petrosky, 2018). Each case record in the NVDRS dataset includes a series of close-ended codes regarding the decedent's demographic characteristics, circumstances associated with the death, and information regarding the cause of death, including method of suicide. Each case record also includes the possibility of two open-ended investigative narratives coded from law enforcement and medical examiner reports.

Analytic Sample

As of 2015, the NVDRS dataset included data on 143,784 suicides. In 2012, the NVDRS officially added a code to denote decedent sexual orientation, if relevant, at the time of death. We first restricted the dataset to all adults, age 18 and older, who died by suicide in the years in which sexual orientation was officially coded (2012-2015; n = 59,250), as well as including 269 adults who died in prior years (2003-2011), but had a coded sexual orientation due to early coding of sexual orientation in some states. We chose to focus on adults because access to lethal methods among children is widely restricted by their parents or caregivers (Allchin, Chaplin, & Horwitz, 2018; Brent & Bridge, 2003); therefore, the processes underlying choice of suicide method among children and adolescents likely warrants its own comprehensive analysis including parental factors beyond the scope of the current study. Decedents with missing data for method of suicide were dropped (n = 416) as well as decedents with completely missing entries other than lethal method (i.e., missing all demographic variables and narratives; n = 28). Thus, the final analytic sample included 59,075 suicide decedents age 18 to 102 years old at time of death.

Included in the sample were 577 decedents classified as lesbian, gay or bisexual, 12,573 classified as heterosexual, and 45,925 decedents for which sexual orientation was unclassified. Selection for sexual orientation (i.e., coded as heterosexual, lesbian, gay, or bisexual) was not entered for all cases as it required that this information was explicitly reported in the law enforcement or medical examiner report. Analytic mechanisms to account for the large proportion of records with unclassified sexual orientation are described in detail below in the Statistical Analysis section.

Study Measures

Outcome Variable: Method of Suicide—Method of suicide was abstracted from the variable ‘weapon type’ in the NVDRS. Method of suicide was categorized into one of the following categories: drug or poison ingestion, hanging, firearm, cut or pierce, jump from height, poison by fumes, or other method of suicide (Spicer & Miller, 2000). All but the last two categories were pre-coded in the NVDRS dataset. To create ‘poison by fumes’ we drew from the International Classification of Diseases (ICD) code attached to each decedent record to extract deaths caused by car exhaust, carbon monoxide, or another gas. To create the ‘other method of suicide’ category, we included all deaths either pre-coded as ‘other’ or those that used a method employed by 1.0% or less of NVDRS suicides (i.e., motor vehicle, other transport vehicle, intentional neglect, biological weapons, drowning, explosive, fire or burns, non-powder gun, and blunt instrument).

Primary Independent Variables—Using NVDRS pre-coded variables, we coded *sex* as male or female. *Sexual orientation* was collapsed into 3 categories: sexual minority (lesbian, gay, bisexual), heterosexual, and unclassified.

Demographic and Circumstantial Variables—*Race/ethnicity* was categorized as White, Black/African-American, American Indian/Alaska Native, Asian/Pacific Islander, Two or more, or Other. *Marital status* was coded as Married/Domestic Partnered, Widowed, Divorced, Separated, Never Married and Single, Unspecified. *Military veteran status* was

coded as yes or no to having ever served in the U.S. Armed Forces. *Region* for where the death was processed was categorized using Census region categories: Northeast, Midwest, South, and West. In addition, the NVDRS includes indicator variables flagging positive reported histories of mental health concerns, substance use, prior suicide attempts, suicidal thoughts, treatment for mental illness, and current or recent substance use problems.

Statistical Analysis

Covariate data were analyzed to determine patterns of missingness. In our final analytic sample (N = 59,075), there was generally very little missing data (ranging from <0.01% missing 'age at death' to 8.40% missing 'military veteran status'). Nevertheless, missing data were imputed following Little's method of predictive mean matching (Little, 1988). A critical challenge for analyses of the NVDRS is the large percent of decedents with unclassified sexual orientation (K. Clark et al., 2019; Mays & Cochran, 2019) including 77.7% of decedents in the current study sample. We chose to conduct analyses with three mutually exclusive and exhaustive categories (sexual minority, heterosexual, unclassified) in order to produce population-based estimates. Statistical analyses proceeded in two stages: (a) descriptive statistics and bivariate analyses by sexual orientation were used to describe and quantify unadjusted associations between sexual orientation and methods of suicide; and, (b) multinomial logistic regression analyses were then used to assess the adjusted association between sexual orientation and each method of suicide. Given that sex is a strong effect modifier of the association between sexual orientation and mental health outcomes including suicidality, and is strongly correlated with method of suicide in the general population (Björkenstam et al., 2016; Canetto & Sakinofsky, 1998; Haas et al., 2010; Möller-Leimkühler, 2003), analyses were conducted both in the full analytic sample and in sex-stratified samples. Subsequently, we investigated the adjusted associations between sex and methods of suicide among sexual minorities to examine the within-group associations of sex with lethal methods among sexual minorities. All multivariate models were adjusted for sex (where appropriate), age at death, race/ethnicity, geographic region, military veteran status, and mental health information including history of a prior suicide attempt and current or recent substance use. Covariates were selected based on prior literature documenting the association between these variables and sexual orientation disclosure (Blosnich, Nasuti, Mays, & Cochran, 2016; Durso & Meyer, 2013; Pachankis, Cochran, & Mays, 2015; Van Gilder, 2017) as well as documented associations between covariates and method of suicide (Bohnert, Roeder, & Ilgen, 2010; Denning, Conwell, King, & Cox, 2000; Horwitz, Smith, Held, & Zalta, 2019; Miller, Azrael, & Barber, 2012). We also conducted two sets of sensitivity analyses: first, we redid all multinomial statistical analyses without imputed data and, second, without covariate adjustment. We report p-values from Wald X^2 test or F tests as appropriate, adjusted odds ratios (aOR), and 95% confidence intervals (95% CIs). This study was determined to be exempt from human subjects review by the University of California, Los Angeles (UCLA) Institutional Review Board. Analyses were conducted in SAS version 9.4 (SAS Inc, 2018).

Results

Demographics by sexual orientation

Demographic characteristics, stratified by sexual orientation, are presented in Table 1. As anticipated, heterosexual deaths generally demonstrated few or negligible differences in demographic characteristics as compared to decedents with unclassified sexual orientation. A notable exception was that heterosexuals were more likely to be married/domestic partnered (54.6%) than decedents with unclassified sexual orientation (29.5%).

A larger proportion of sexual minorities as compared to heterosexuals and decedents with unclassified sexual orientation were younger, female, and Black/African American. A smaller proportion of sexual minorities than heterosexuals or decedents with unclassified sexual orientation were married, living with a domestic partner, or had served in the U.S. Armed Forces. Mental health and substance abuse history demonstrated that a greater proportion of sexual minorities had documented mental health issues as compared to heterosexuals or decedents with unclassified sexual orientation. Sexual minorities demonstrated an elevated propensity for a prior suicide attempt, history of suicidal thoughts or plans, prior mental illness treatment, history of alcohol dependence or having an alcohol problem, and having a non-alcohol substance use problem.

Bivariate analyses evaluating sexual orientation differences in suicide methods

Results from overall and sex-stratified bivariate analyses assessing unadjusted associations between sexual orientation and methods of suicide are presented in Table 2. Across the three sexual orientation categories, firearms, hanging, and drug or poison ingestion were the three most commonly employed methods of suicide. Firearms were used in substantially fewer suicides among sexual minorities (30.2%) than suicides among heterosexuals (54.7%) and decedents with unclassified sexual orientation (50.3%; $p < 0.001$). In contrast, 38% of sexual minorities employed hanging compared to approximately one-quarter of both heterosexuals (25.8%) and decedents with unclassified sexual orientation (25.7%, $p < 0.001$). One-in-five sexual minority suicides resulted from drug or poison ingestion (20.3%) compared to 11.4% of heterosexuals and 14% of decedents with unclassified sexual orientation ($p < 0.001$).

Multivariate analyses evaluating sexual orientation and sex differences in suicide methods

Table 3 presents partial results from multinomial logistic regression models evaluating the adjusted association between sexual orientation and suicide methods in the overall sample and in sex-stratified samples. Firearms represented the base category to which the other methods of suicide were compared. Sex-stratified analyses suggest that sexual orientation group differences were primarily driven by robust suicide method differences among men. As compared to heterosexual men, sexual minority men evidenced significantly greater odds of death by using hanging (aOR = 2.39, 95% CI: 1.83, 3.12), drug or poison ingestion (aOR = 4.69, 95% CI: 3.39, 6.50), cut or pierce (aOR = 2.51, 95% CI: 1.27, 4.93), jump from height (aOR = 6.67, 95% CI: 3.92, 11.31) and poison by fumes (aOR = 2.78, 95% CI: 1.59, 4.89) than by using a firearm. When comparing sexual minority men to those with an unclassified sexual orientation, results trended in a similar direction but were slightly attenuated. Compared to heterosexual women, sexual minority women were not significantly

more or less likely to die by any method of suicide other than firearms. As compared to women with an unclassified sexual orientation, sexual minority women exhibited substantially reduced odds of using drug or poison ingestion rather than a firearm (aOR = 0.59, 95% CI: 0.59, 0.87).

Post hoc multinomial analyses were conducted evaluating within-group sex differences in method of suicide among sexual minorities (see Table 4). For these analyses, hanging represented the base category to which other methods of suicide were compared. Analyses revealed that among sexual minorities, women as compared to men were significantly more likely to use firearms (aOR = 1.75, 95% CI: 1.12, 2.75) and drug or poison ingestion (aOR = 1.76, 95% CI: 1.05, 2.96) and substantially less likely to jump from height (aOR = 0.13, 95% CI: 0.03, 0.70) than use hanging.

Supplemental Tables 1 and 2 present results from multinomial analyses without imputation for missing data. Supplemental Tables 3 and 4 presents results from multinomial analyses without adjustment for covariates. These sensitivity analyses show that non-imputed and unadjusted results are consistent with the main findings albeit with somewhat attenuated risks (for unadjusted results) and less precision (for both models).

Discussion

Findings from this study of 59,075 adult suicides in the CDC's National Violent Death Reporting System (NVDRS) determined that sexual orientation is a significant predictor of method used in suicides, and that sex appears to be a key modifier of this association.

A critical finding of our study is that overall hanging is the most common method of suicide used by sexual minorities. Key determinants in chosen suicide methods in general include physical availability of the method and sociocultural acceptability (Cantor & Baume, 1998; Chotai, Renberg, & Jacobsson, 2002; Lester, 2013; Marks & Abernathy, 1974). In light of our findings, suicide prevention efforts that focus predominantly on method restriction might be less effective as a primary suicide prevention strategy for sexual minorities given that hanging materials are physically widely available (Yip et al., 2012). Instead, suicide prevention efforts targeting the sociocultural acceptability of hanging among sexual minority populations could be a better strategy in national efforts to reduce suicides including *Zero Suicides* (Office of the Surgeon General, 2012). Sociocultural norms have been shown to influence health behaviors among sexual minorities (e.g., alcohol misuse, substance use, sexual risk behavior, tobacco use, and eating behavior (Bergeron & Senn, 1998; Hamilton & Mahalik, 2009; Matthews, Li, Kuhns, Tasker, & Cesario, 2013)); whether sociocultural norms might also influence hanging as an acceptable suicide method among sexual minorities is unknown but represents a critical opportunity for research. Indeed, the sociocultural acceptability of hanging is a driving factor in its popularity as a method of suicide (Lester, 2013), and sociocultural influences are thought to be one cause of differences in rates of hanging between nationalities (Ajdacic-Gross et al., 2008; Starkuviene, Kalediene, & Petrauskiene, 2006), language groups (Burrows, Auger, Tamambang, & Barry, 2013), religions (Wu, Chen, & Yip, 2012), and some occupational subgroups (Sarma & Kola, 2010). In addition to sociocultural acceptability, qualitative

research with people who attempt suicide in the general population has investigated practical motivations for choosing hanging over another suicide method. One qualitative study with 22 presumably-heterosexuals in the United Kingdom who had survived a near-lethal suicide attempt (eight with hanging) found that hanging was adopted for two primary reasons: accessibility of the method and the view that the death would be "clean," quick and painless (Biddle et al., 2010). Yet, the comparison group who attempted suicide with a method other than hanging perceived that hanging could lead to a "messy," slow and painful death and believed that technical knowledge was necessary to complete the hanging. Practical perceptions of hanging among sexual minorities is unknown but represents an opportunity for exploration. Future research should seek to investigate both sexual minority-specific sociocultural acceptability of – and practical motivations for – hanging.

In contrast to the well-documented moderating effect of gender among heterosexual suicides (that heterosexual men are vastly overrepresented in firearm suicides compared to heterosexual women, e.g., Miller et al., 2004), the opposite trend emerged in our findings such that sexual minority women who died by suicide were significantly *more* likely to use firearms compared to sexual minority men. This finding raises the question of whether to modify thinking about the 'gender paradox of suicide behavior' as it may not be as applicable to sexual minority women. Prior research finds that the primary mechanism by which heterosexual women access firearms is through their husbands, and this is a probable reason for why married women are historically more likely to die by firearms than non-married women (Kaplan, Adamek, Geling, & Calderon, 1997). However, our finding that sexual minority and heterosexual women demonstrated similar rates of firearm suicides appears to support recent evidence suggesting that sexual minority women are more likely than heterosexual women to personally own firearms (K. A. Clark et al., 2020). Method-focused suicide prevention efforts include training clinicians to ask about firearm ownership and counsel individuals at-risk of suicide and their families or friends to store firearms away from the home or make household firearms inaccessible (Barber & Miller, 2014; Johnson, Frank, Ciocca, & Barber, 2011). Recent legislative efforts to increase physicians' training on how to counsel patients about firearms and how to intervene when necessary include California's 2019 bill designating funding to firearm violence training for physicians (UC Davis Health, 2019). Findings from the current study suggest that such physician trainings warrant inclusion of coursework or modules related to sexual orientation differences in lethal methods, including sexual minority women's propensity for using a firearm, that might be overlooked in clinical practice.

We found that sexual minorities were significantly more likely to use drug or poison ingestion than their heterosexual or unclassified peers, especially among men. We surmise that this finding stems from two key factors. First, clear and consistent evidence demonstrates that sexual minorities are significantly more likely to engage in substance use than heterosexuals (Cochran, Ackerman, Mays, & Ross, 2004; Green & Feinstein, 2012). In the general population, engaging in substance use predicts a subsequent suicide attempt, and substance users who attempt suicide are more likely to use drugs as the method than the general population (Borges, Walters, & Kessler, 2000; Darke & Ross, 2002). Second, population-level estimates show that sexual minorities are two to seven times more likely to attempt suicide in their lifetime than similar heterosexuals (Haas et al., 2010). Drug or

poison ingestion is the most commonly used method in non-lethal suicide attempts, with 86% of non-lethal suicide attempts that result in hospitalization utilizing drug or poison ingestion (Spicer & Miller, 2000). While only about 2% of suicide attempts using drug or poison ingestion will end in death (Miller et al., 2004; Spicer & Miller, 2000), we expect that the gross overrepresentation of sexual minorities who attempt suicide as compared to heterosexuals results in a higher proportion of sexual minorities dying by drug or poison ingestion than non-sexual minorities. The elevated likelihood of suicide by drug or poison ingestion among sexual minorities calls for existing substance use interventions targeting sexual minorities to incorporate suicide risk assessments and suicide prevention programming. Further, this disparity underscores the public health imperative of conducting research and developing interventions focused on preventing suicide attempts among sexual minorities.

Limitations

Three key limitations should be considered in interpretation of these results. The primary limitation of this study stems from the coding of sexual orientation in the NVDRS and the large proportion of records for which sexual orientation is unclassifiable. Estimates of method of suicide among sexual minorities in the sample might not generalize to all sexual minorities at risk for suicide because decedents coded as lesbian, gay or bisexual in the NVDRS are sexual minorities whose sexual orientation was noted – and likely salient – to their death. Whether or not similar patterns would emerge among the total population of sexual minority suicide decedents is unknown. To understand this would require modernization of U.S. mortality data, including adding sexual orientation to the U.S. federal death certificate and linking electronic health records and medical databases to mortality data (Mays & Cochran, 2019). A second limitation is that, during the time of data collection, not all states were represented in the dataset (Centers for Disease Control and Prevention (CDC), 2019). Thus, the data might not be fully representative of U.S. suicides. In 2018, the NVDRS expanded to include all 50 states and the District of Columbia, which will allow for the calculation of population-level estimates in future research. Third, data included in the NVDRS contains limitations similar to psychological autopsy studies, including questions around reliability of the information, whether the information was garnered systematically, how information was deemed relevant to include, and sampling biases (Cavanagh, Carson, Sharpe, & Lawrie, 2003; Hawton et al., 1998; Pouliot & De Leo, 2006). Triangulating findings from the NVDRS with results from other post-mortem data sources (e.g., National Death Index, international mortality data) is one method to increase evidence about associations in sexual minorities suicides (Björkenstam et al., 2016; Cochran & Mays, 2015; Mathy et al., 2011; Mays & Cochran, 2019).

Conclusions

In general, a higher proportion of sexual minorities who died by suicide were female, younger, and African American, subgroups which previously have not been the focal targets of sexual minority suicide prevention efforts. Results of our study further documented that the higher rate of suicide mortality among sexual minorities, as compared to heterosexuals, is likely driven by hanging, a method of suicide that is not particularly amenable to restricted-access prevention approaches. Qualitative and quantitative research studies are

warranted to investigate sociocultural acceptability and practical motivations for hanging among sexual minorities with suicidal intent. Our findings suggest that existing and emerging firearms restriction and counseling trainings for physicians should consider incorporating information on sexual orientation differences in lethal methods. Finally, the overrepresentation of suicides by drug or poison ingestion among sexual minorities calls attention to disproportionate rates of substance use and suicide attempt in this population, especially among men. In sum, future research, clinical practice, and suicide prevention interventions should be attuned to sexual orientation differences in lethal methods used in suicide to identify overlooked pathways to reducing suicide among at-risk sexual minorities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

This study was partially supported by the UCLA School of Public Health Gun Violence Prevention Pilot Grant (K.A. Clark) and the National Institute of Mental Health (S.D. Cochran; R21MH115344) and the National Institute of Minority Health and Health Disparities (V.M. Mays; P60 MD006923).

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Table 1.

Characteristics of suicide decedents age 18 years and older in the National Violent Death Reporting System by sexual orientation (*N*=59,075)

	Lesbian, Gay or Bisexual (*n*=577)	Heterosexual (*n*=12,573)	Unclassified Sexual Orientation (*n*=45,925)
Demographics	**n (%)**	**n (%)**	**n (%)**
Sex			
Male	380 (65.9)	9794 (77.9)	35566 (77.4)
Age at Death (M, SD)[a]	38.6 (13.9)	48.6 (17.1)	47.4 (17.6)
Race/ethnicity			
White	496 (86.0)	11217 (89.2)	40780 (88.8)
Black/African American	44 (7.6)	600 (4.7)	2909 (6.3)
American Indian/Alaska Native	10 (1.7)	254 (2.0)	555 (1.2)
Asian/Pacific Islander	14 (2.4)	249 (2.0)	814 (1.8)
Two or more	11 (1.9)	144 (1.2)	494 (1.1)
Other	2 (0.4)	109 (0.9)	373 (0.8)
Marital Status[c]			
Married/Domestic Partnered	65 (11.3)	6826 (54.6)	13528 (29.5)
Widowed	10 (1.8)	617 (4.9)	3011 (6.6)
Divorced	58 (10.1)	1978 (15.7)	11291 (24.6)
Separated	15 (2.6)	457 (3.6)	1233 (2.7)
Never Married	403 (71.3)	2346 (18.8)	15686 (34.7)
Single, Unspecified	23 (4.1)	286 (2.3)	861 (1.9)
Census Region			
Northeast	80 (13.9)	1922 (15.3)	6251 (13.6)
Midwest	114 (19.8)	3280 (26.1)	9619 (21.0)
South	210 (36.4)	3978 (31.6)	13316 (29.0)
West	173 (30.0)	3393 (27.0)	16739 (36.5)
Ever served in U.S. Armed Forces[d]			
Yes	40 (7.6)	2310 (21.1)	7965 (18.7)
Mental Health and Substance Abuse			
History of prior suicide attempt			
Yes	203 (35.2)	2341 (18.6)	8045 (17.5)
History of suicidal thoughts, plans or attempts			
Yes	226 (39.2)	3924 (31.2)	11725 (25.5)
History of treatment for mental illness			
Yes	275 (47.7)	4082 (32.5)	15761 (34.3)
Alcohol dependence or alcohol problem			
Yes	117 (20.3)	2362 (18.8)	7285 (15.9)
Non-alcohol substance use problem			
Yes	119 (20.6)	1820 (14.5)	6861 (14.9)

Note. Statistical significance evaluated by Wald X^2 test or F test as appropriate. All sexual orientation group differences $p < 0.001$, except non-alcohol substance use problems where $p < 0.01$.

M: mean; SD: standard deviation

Table 2.

Method of suicide by gender and sexual orientation, National Violent Death Reporting System (N = 59,075)

	Lesbian, Gay or Bisexual (*n*=577)	Heterosexual (*n*=12,573)	Unclassified Sexual Orientation (*n*=45,925)	
Overall Sample	**n (%)**	**n (%)**	**n (%)**	**P**
Firearm	174 (30.2)	6871 (54.7)	23102 (50.3)	<.001
Hanging	219 (38.0)	3247 (25.8)	11805 (25.7)	<.001
Drug or Poison Ingestion	117 (20.3)	1436 (11.4)	6428 (14.0)	<.001
Poison by Fumes	19 (3.3)	365 (2.9)	1133 (2.5)	0.01
Cut or Pierce	13 (2.3)	217 (1.7)	914 (2.0)	0.14
Jump from Height	22 (3.8)	147 (1.2)	1055 (2.3)	<.001
Other Suicide Method[a]	15 (2.4)	290 (2.3)	1488 (3.2)	<.001
Women Only (*n*=13,335)	**n (%)**	**n (%)**	**n (%)**	**P**
Firearm	69 (35.0)	1004 (36.1)	3143 (30.3)	<.001
Hanging	68 (34.5)	695 (25.0)	2483 (24.0)	0.002
Drug or Poison Ingestion	44 (22.3)	822 (29.6)	3592 (34.7)	<.001
Poison by Fumes	4 (2.0)	77 (2.8)	251 (2.4)	0.53
Cut or Pierce	3 (1.5)	47 (1.7)	179 (1.7)	0.97
Jump from Height	2 (1.0)	42 (1.5)	283 (2.7)	0.001
Other Suicide Method[a]	7 (3.3)	92 (3.3)	428 (4.1)	0.14
Men Only (*n*=45,740)	**n (%)**	**n (%)**	**n (%)**	**P**
Firearm	105 (27.6)	5867 (59.9)	19959 (56.1)	<.001
Hanging	151 (39.7)	2616 (26.3)	9873 (26.9)	<.001
Drug or Poison Ingestion	73 (19.2)	614 (6.3)	2836 (8.0)	<.001
Poison by Fumes	15 (4.0)	288 (2.9)	882 (2.5)	0.01
Cut or Pierce	10 (2.6)	170 (1.7)	735 (2.1)	0.08
Jump from Height	20 (5.3)	105 (1.1)	772 (2.2)	<.001
Other Suicide Method[a]	6 (1.6)	198 (2.0)	1060 (3.0)	<.001

Note. Statistical significance evaluated by Wald X^2 tests.

[a]Other Suicide Method includes: motor vehicle, other transport vehicle, intentional neglect (e.g., starving oneself), biological weapons, personal weapons (i.e., hands and fists), drowning, explosive, fire or burns, non-powder gun, blunt instrument

Table 3.

Partial results from multinomial logistic regression models evaluating method of suicide by sexual orientation and gender, National Violent Death Reporting System (*N* = 59,075)

	Lethal Method Used in Suicide[a]																	
	Hanging			Drug or Poison Ingestion			Cut or Pierce			Jump from Height			Poison by Fumes			Other[b]		
Overall Sample	**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**	
Sexual Minority vs. Heterosexual	1.82***	1.46	2.25	2.25***	1.73	2.93	1.90*	1.06	3.42	3.58***	2.20	5.81	1.88*	1.15	3.07	1.06	0.59	1.91
Sexual Minority vs. Unclassified	1.69***	1.37	2.09	1.75***	1.36	2.26	1.58	0.89	2.80	1.83**	1.16	2.89	2.05**	1.26	3.32	0.75	0.42	1.32
Likelihood Ratio χ^2																16370.97***		
Men (*N* = 45,740)	**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**	
Sexual Minority vs. Heterosexual	2.39***	1.83	3.12	4.69***	3.39	6.50	2.51**	1.27	4.93	6.67***	3.92	11.31	2.78***	1.59	4.89	1.07	0.46	2.48
Sexual Minority vs. Unclassified	2.27***	1.75	2.95	3.65***	2.66	5.00	2.10*	1.08	4.05	3.48***	2.12	5.70	3.04***	1.75	5.28	0.76	0.33	2.95
Likelihood Ratio χ^2																8488.61***		
Women (*N* = 13,335)	**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**	
Sexual Minority vs. Heterosexual	0.98	0.67	1.43	0.77	0.51	1.16	1.13	0.34	3.82	0.56	0.13	2.40	0.71	0.25	2.04	0.86	0.38	1.97
Sexual Minority vs. Unclassified	0.84	0.59	1.21	0.59**	0.39	0.87	0.91	0.28	2.97	0.26	0.06	1.09	0.78	0.28	2.18	0.58	0.26	1.29
Likelihood Ratio χ^2																2822.00***		

aOR = Adjusted Odds Ratio; CI = Confidence Interval

[a]Base category is 'Firearm'

[b]Other Method includes: motor vehicle, other transport vehicle, intentional neglect, biological weapons, personal weapons, drowning, explosive, fire or burns, non-powder gun, and blunt instrument

Analyses adjusted for sex (where appropriate), age at death, race/ethnicity, geographic region, military veteran status, and mental health history including prior suicide attempt and substance use

*$P < 0.05$

**$P < 0.01$

***$P < 0.001$

Table 4.

Partial results from multinomial logistic regression model evaluating method of suicide by gender among sexual minorities, National Violent Death Reporting System (N = 577)

	Lethal Method Used in Suicide[a]																	
	Firearm			Drug or Poison Ingestion			Cut or Pierce			Jump from Height			Poison by Fumes			Other[b]		
Sexual Minorities	**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**		**aOR**	**95% CI**	
Women vs. Men	1.75*	1.12	2.75	1.76*	1.05	2.96	0.73	0.18	3.01	0.13*	0.03	0.70	0.69	0.21	2.24	2.97	0.87	10.15
Likelihood Ratio χ^2																	195.55***	

aOR = Adjusted Odds Ratio; CI = Confidence Interval

[a] Base category is 'Hanging'

[b] Other Method includes: motor vehicle, other transport vehicle, intentional neglect, biological weapons, personal weapons, drowning, explosive, fire or burns, non-powder gun, and blunt instrument

Analyses adjusted for age at death, race/ethnicity, geographic region, military veteran status, and mental health history including prior suicide attempt and substance use

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$