

Differences in Methods of Self-Inflicted Injuries by Sex in Wisconsin, 2002-2014

Nivedita Nair, BS; Joseph Archer, BA; Alexa Statz, MPH; Ousmane Diallo, MD, MPH, PhD

ABSTRACT

Background: Despite suicide prevention efforts, there remains a high burden of self-inflicted injuries in Wisconsin.

Objective: Compare methods of suicide and nonfatal self-inflicted injury by sex in Wisconsin over a 12-year period.

Methods: Suicide and nonfatal self-inflicted injury rates in Wisconsin between 2002 and 2014 were compared by sex and method using data from the Wisconsin Interactive Statistics on Health. Percentages of total suicides by method of injury for each sex were calculated.

Results: Firearms and poisoning were the most common methods of suicide and nonfatal self-inflicted injuries, respectively. Rates of both suicide and nonfatal self-inflicted injuries differed significantly by sex and method.

Conclusions: Suicide prevention strategies in Wisconsin must account for the variability of method of self-inflicted injury between sexes.

INTRODUCTION

Suicide is an important public health issue in Wisconsin. Each year, over 700 residents die by suicide.¹ In addition to this burden, each year an additional 5,500 residents are hospitalized due to self-inflicted injuries, leaving them in need of extensive medical treatment or rehabilitation.¹ In Wisconsin, men have been shown to be at higher risk of completed suicide, while women have been noted to be at higher risk of self-harm.² Overall, the preventable burden of suicide and nonfatal self-inflicted injury in Wisconsin, in conjunction with the complications posed by discrepancies between men and women, present a critical public health prob-

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Author Affiliations: University of Wisconsin School of Medicine and Public Health, Madison, Wis (Nair, Archer, Statz); Wisconsin Division of Public Health, Department of Health Services, Madison, Wis (Diallo).

Corresponding Author: Nivi Nair, Health Science Learning Center, Rm 4263 (Attn: Nivi Nair PHS 803), 750 Highland Ave, Madison, WI 53705; phone 608.692.6819, fax 608.265.3286, e-mail nnair@wisc.edu.

lem. For the purpose of clarity, we will refer to nonfatal self-inflicted injury and self-harm synonymously throughout this paper.

The primary objective of this study was to compare the methods of self-inflicted injury between men and women, aggregated across 2002 to 2014, to provide an overview of the burden of suicide and self-harm in Wisconsin. This paper provides clinical utility in expanding the literature and providing accessible information to physicians about the need for targeted suicide prevention. Particularly, this study has relevance to mental health screening practices in the clinical setting.

METHODS

We used the Wisconsin Interactive Statistics on Health (WISH)³ to examine data from 2002-2014 for both suicides and self-harm. We queried data on suicides using the Injury Related Mortality query—which gathers data from resident death certificates³—and queried data on self-harm using the Injury Related Emergency Department Visits query—which gathers data from the Wisconsin Hospital Association Emergency Department Discharge Billing Claims database on individuals treated and released from emergency departments (ED).³ Suicides and nonfatal self-inflicted injuries were segregated from unintentional injuries, in their respective queries, based on International Classification of Disease (ICD) codes, which are assigned based on physician determination of the manner and/or intent of injury.³

Rates were age-adjusted to the 2000 US Standard Population and examined across the study period to identify trends for method of self-inflicted injury by sex, which proved consistent across the period. We then aggregated data across years for comparison and examined rates by sex in methods of suicide and self-harm. We used the categories of sex and method available

in the WISH database for comparison and analysis (see Table 2). Percentages of self-inflicted injury by sex attributable to each method were calculated by dividing the number of injuries per method in each sex by the total number of injuries for that sex, over the period. We compared 95% confidence intervals provided by the query for method of injury across sexes to determine significant differences in method of self-inflicted injury for both suicide and self-harm between men and women.

RESULTS

Table 1 characterizes demographics of suicides and self-harm in Wisconsin between 2002 and 2014. During this period, men committed a greater number of suicides than women in Wisconsin; nearly 80% of all suicides were committed by men. However, women contributed to a greater number of ED admittances for self-harm than men; over 60% of ED visits for self-harm involved women. Overall, the most common method of suicide was firearms, followed by suffocation and poisoning. The most common method of self-harm overall was poisoning, followed by cutting or piercing objects and other specified cause of injury not elsewhere classifiable. Comparisons between suicide and self-harm by demographic factors, including age, race, and region of residence, are also included in Table 1. We determined age to be a possible confounder; therefore, age was adjusted for analysis of both suicide and self-harm. It is important to note that

the rates of self-harm were 3-fold higher than the rates of suicide across both sexes. The total number of ED admissions for self-harm during this period was 37,733, whereas the total number of suicides was 9,287 (Table 1).

Table 2 characterizes the most common methods of suicide and self-harm based on percentage of total injuries between 2002 and 2014, separated by sex. The methods of suicide for men that carried the highest burden were firearms (53.9%), suffocation (24.8%), and poisoning (14.0%). The methods of suicide for women that carried the highest burden were poisoning (42.8%), suffocation (24.7%), and firearms (22.5%). For men, most suicides could be attributed to firearm use, while among women, most suicides could be attributed to poisoning. Comparison using 95% confidence intervals revealed that differences in age-adjusted

Table 1. Suicide/Self-Inflicted Mortality and Nonfatal Self-Inflicted Injury-Related Emergency Department Visits (Wisconsin, 2002-2014)

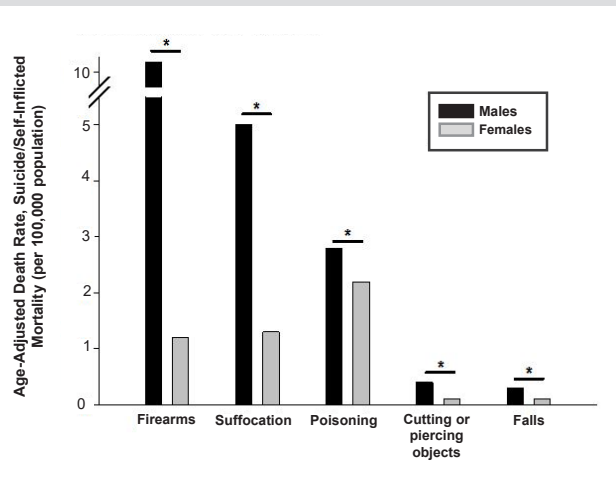
	Suicide		Nonfatal Self-Inflicted Injury	
	No. of Deaths	Age-Adjusted Death Rate (per 100,000 Population)	No. of Injury ED Visits	Age-Adjusted Rate of Injury ED Visits (per 100,000 Population)
All	9,287	12.7	37,733	52.8
Sex				
Male	7,357	20.2	14,857	40.8
Female	1,930	5.2	22,876	65.3
Age of injury				
0-17	337	2	9,993	98.5
18-24	1,032	14.1	10,093	137.7
25-34	1,470	15.8	7,881	84.8
35-44	1,759	17.5	5,284	52.7
45-54	2,132	19.4	3,229	29.3
55-64	1,302	15.4	899	10.7
65-74	628	12.3	216	4.2
75+	627	12.9	138	2.8
Race				
White	8,755	13.3	--	--
Black	297	6	--	--
American Indian	110	13.1	--	--
Asian	125	7.1	--	--
Region of residence				
Southern	1,808	12.9	9,048	64.2
Southeastern	3,068	11.3	12,929	49.0
Northeastern	2,151	13.6	7,897	52.2
Western	1,356	13.6	5,177	52.2
Northern	903	14.1	2,682	45.7
Underlying cause of injury				
Firearms	4,401	6	82	0.1
Suffocation	2,298	3.1	772	1.1
Poisoning	1,855	2.5	19,823	27.7
Cutting or piercing objects	174	0.2	12,140	17.0
Falls	161	0.2	160	0.2
Drowning	108	0.1	20	0.0
Fire, heat, chemical burns	48	0.1	211	0.3
Other specified cause of injury not elsewhere classifiable	51	0.1	3,577	5.0
Unspecified cause of injury	34	0	786	1.1

Abbreviation: ED, emergency department.

death rates between men and women were statistically significant for the top five methods of suicide (Figure 1).

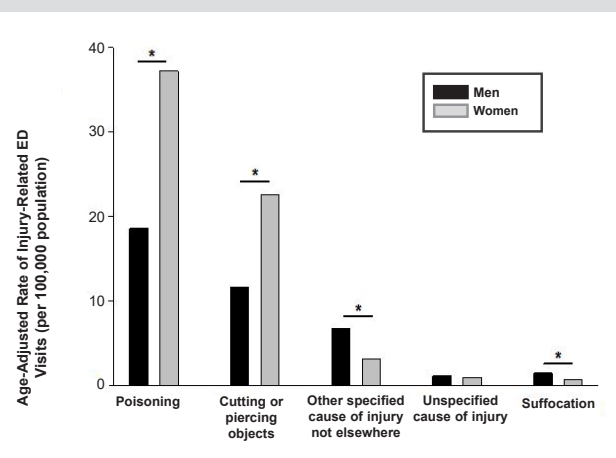
The 3 most common methods of self-harm for men were poisoning (45.5%), cutting or piercing objects (28.6%), and other specified cause of injury not elsewhere classifiable (16.6%). The 3 most common methods of self-harm for women were poisoning (57.1%), cutting or piercing objects (34.5%), and other specified cause of injury not elsewhere classifiable (4.9%) (Table 2). For both men and women, poisoning was the most common method of self-harm. The differences in age-adjusted rates of self-harm between men and women by suffocation, poisoning, cutting and piercing objects, and other specified cause of injury not elsewhere classifiable were statistically significant ($P < 0.05$) (Figure 2).

Figure 1. Top 5 Methods of Suicide by Sex, Wisconsin (2002-2014)



*Significant difference at $P=0.05$ level between men and women.

Figure 2. Top 5 Methods of Nonfatal Self-Inflicted Injury by Sex, Wisconsin, 2002-2014)



*Significant difference at $1=0.05$ level between men and women. Abbreviation: ED, emergency department.

DISCUSSION

Our findings confirm the significant burden of suicide and self-harm in Wisconsin. Additionally, there is a notable discrepancy in the rates of both suicide and self-harm between men and women. In Wisconsin, between 2002 and 2014, nearly 80% of all suicides were committed by men, while over 60% of ED visits for self-harm involved women. These findings are supported by the most recent Burden of Suicide in Wisconsin Report.²

The findings of our study also demonstrate the marked difference in the methods that men and women in Wisconsin employ to self-inflict injury. As mentioned above, the most common method of suicide for men was firearms (53.9%) and for women was poisoning (42.8%). This relationship is also reflected in national data; the Centers for Disease Control and Prevention (CDC) reported that in 2014, the most common method of suicide for American

men was firearms (55.4%) and for American women was poisoning (34.1%).⁴ In Wisconsin, men committed suicide at almost 10 times the rate of women using firearms and 5 times the rate of women using suffocation, while the rates of self-harm for women were almost double those for men when using poisoning and cutting or piercing objects. A variety of factors could explain these differences: substance abuse, prescription psychiatric drug use, history of mental illness, previous suicide attempts, and marital status have been noted to drive sex differences in suicide,⁵ as have culturally assigned expectations of self-harm behaviors that differ between sexes.^{6,7}

Due to the high burden of firearm use in completed suicides, the focus on self-harm reduction in Wisconsin historically has centered on firearms⁸ because of the lethality of firearms and knowledge of the increased risk of firearm suicide with access to firearms.⁹ While this focus is important, the results of our study suggest that this approach leaves significant gaps in addressing suicide in women and self-harm in both men and women. Moreover, trends in method across sex and overall rates for self-harm and suicide have remained largely unchanged in Wisconsin over the last decade. Public health priority in Wisconsin must address methods of self-inflicted injury beyond firearms, especially those responsible for high rates of self-harm. Self-harm must be accounted for in prevention initiatives; not only do high rates of self-harm pose short-term health burdens (ie, health care costs, preventable injury), but individuals whose self-harm has necessitated medical care are at significantly higher risk of both recurrences of nonfatal self-harm and future suicide.¹⁰ Additionally, self-harm with methods other than poisoning or cutting/piercing objects, high medical severity, and repeat events increase the risk of suicide,¹¹ indicating potential risk factors.

Considering the method and sex issue may help Wisconsin health care professionals to augment suicide screening tools with sex-specific risk considerations.¹² For example, a suicide screening tool for men may incorporate questions about access to firearms as a risk assessment. Furthermore, Wisconsin public health advocates may utilize these findings to develop more specific prevention strategies.¹³ Future studies should seek to unravel the sources of sex differences in method of self-inflicted injury in Wisconsin and to determine how residents gain access to given methods of self-inflicted injury, which would further inform public health interventions.

Three limitations must be considered when addressing the results of this study. First, we determined that querying nonfatal self-inflicted injury-related ED visits provided the most accurate estimate for our assessment of self-harm. While it cannot be assumed that those who nonfatally self-harmed had suicidal intent in their actions, we felt this to be an appropriate estimate because these intentional, nonfatal injuries were severe enough to warrant immediate and emergent medical attention. This assumption is backed by the progression of suicidal behavior developed in the

most recent Burden of Suicide Report.² Conversely, because this query only records individuals who visit the ED, it is possible this estimate is conservative. Our rate neglects any individual who engaged in serious self-harm but failed to seek medical attention, or sought it outside of an ED. Finally, a limitation to consider involves the classification of suicide. In some cases, a ruling of suicide may be obvious, but often the cause of death can be vague, due to incomplete or inaccurate details.¹⁴ For example, it is possible that a death from opioid overdose that was classified as “accidental poisoning” could have instead been a suicide, which potentially could lead to an underestimation of suicide rates.

CONCLUSIONS

Self-inflicted injury, both fatal and non-fatal, remains an important public health issue in Wisconsin. Based on the results of this study, greater attention must be focused on specializing suicide prevention. Given the variability of method of self-inflicted injury between sexes found in this study, considerations should be made to tailor suicide screenings and prevention strategies based on sex and method. More evidence is needed to further evaluate differences in suicide trends to improve intervention strategies.

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Table 2. Method of Self-Inflicted Injury by Sex, Wisconsin (2002-2014)

Underlying Cause of Injury	Suicides (%Total)		Nonfatal Self-Inflicted Injury ED Visits (%Total)	
	Male	Female	Male	Female
Firearms ^a	3,967 (53.9%)	434 (22.5%)	71 (0.5%)	11 (<0.1%)
Suffocation ^{a,b}	1,822 (24.8%)	476 (24.7%)	546 (3.7%)	226 (1.0%)
Poisoning ^{a,b}	1,028 (14.0%)	827 (42.8%)	6,767 (45.5%)	13,056 (57.1%)
Cutting or piercing objects ^{a,b}	140 (1.9%)	34 (1.8%)	4,254 (28.6%)	7,886 (34.5%)
Falls ^a	120 (1.6%)	41 (2.1%)	102 (0.7%)	58 (0.3%)
Drowning	71 (1.0%)	37 (1.9%)	5 (<0.1%)	15 (0.1%)
Non-traffic land transportation	63 (0.9%)	13 (0.7%)	--	--
Fire, heat, chemical burns	28 (0.4%)	20 (1.0%)	109 (0.7%)	102 (0.4%)
Other specified classifiable cause of injury	54 (0.7%)	27 (1.4%)	68 (0.5%)	23 (0.1%)
Other specified cause of injury not elsewhere classifiable ^{a,b}	43 (0.6%)	8 (0.4%)	2,467 (16.6%)	1,110 (4.9%)
Unspecified cause of injury	21 (0.3%)	13 (0.7%)	426 (2.9%)	360 (1.6%)
MVT - Self-inflicted/assault/undetermined	--	--	32 (0.2%)	19 (0.1%)
Natural or environmental factors	--	--	10 (0.1%)	10 (<0.1%)

^aSignificant difference ($P<0.05$) between male and female age-adjusted death rate.

^bSignificant difference ($P<0.05$) between male and female age-adjusted rate of injury ED visits.

Abbreviations: ED, emergency department; MVT, motor vehicle traffic.

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