Suicide-Related Mortality and Morbidity: Insights from Rhode Island's Violent Death Reporting and Syndromic Surveillance Systems

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INTRODUCTION

Suicide is a serious public health concern and leading cause of death among individuals 10–64 years old in the United States and Rhode Island.[1] Suicide deaths only reflect part of the problem as suicide-related morbidity also contributes to loss of productivity, healthcare costs, and long-term impacts within communities.[2] Through the Rhode Island Violent Death Reporting System (RIVDRS), the Rhode Island Department of Health (RIDOH) has collected data on suicides occurring in the state since 2004. Data are reported as part of the CDC's National Violent Death Reporting System and variables collected include demographics, toxicology, injury mechanism, and circumstances associated with the death. Complete mortality data in RIVDRS lag by approximately two years, thus timely data for suicide-related morbidity is helpful to inform prevention activities. Since June 2020, all 10 of Rhode Island's acute care hospitals have reported emergency department (ED) visit data into RIDOH's Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE) syndromic surveillance system. The suicide-related syndrome definition in ESSENCE aims to identify visits relating to suicide attempts and/or suicidal ideation based on chief complaint text and discharge diagnoses codes that are reported with the visit.[3] These data can estimate suicide-related morbidity and detect potential changes in a timely manner.

In this article, characteristics of suicide decedents are summarized and compared across the two most recent five-year time periods in RIVDRS. Characteristics of suicide-related ED visits during the two most recent completed years are also compared.

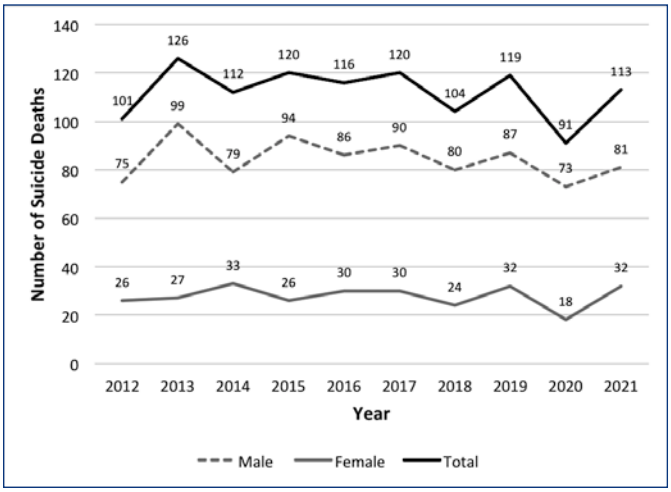
METHODS

Suicide deaths among Rhode Island residents during 2012–2021 were pulled from RIVDRS. Due to small numbers, deaths were combined into two five-year periods (2012–2016 and 2017–2021) and differences by sex, age group, race/ethnicity, residence county, and death mechanism were analyzed. Proportions were calculated based on the denominators for each characteristic and chi-square tests (α=0.05) were performed to determine whether proportions were significantly different over time. ED visits that met the suicide-related syndrome definition in ESSENCE[3] were pulled during 2021 and 2022. Visits among RI residents, ages 10 years and older, were included for this analysis. Similar methodology was used to calculate and compare proportions of suicide-related ED visits in ESSENCE by sex, age group, race/ethnicity, and residence county between 2021 and 2022. All analyses were performed using SAS (version 9.4).

RESULTS

A total of 1,122 suicide deaths among Rhode Island residents were reported in RIVDRS during the 10-year period of 2012–2021 (**Figure 1**). The number of deaths was observed to decrease in 2020; however, it has remained stable over time (annual average of ~112 suicide deaths).

Figure 1. Suicide deaths among Rhode Island residents that occurred in Rhode Island, total by year and sex, 2012–2021.
Data source: Rhode Island Violent Death Reporting System (RIVDRS).



No significant changes have been observed over time for several key characteristics, including sex, age group, mechanism of death, county, or race/ethnicity (**Table 1**, p>0.05). During both time periods, more than three-quarters of deaths occurred among males, and decedents were most likely to be White, Not Hispanic, between 45 and 64 years old, Providence County residents, and to die by means of strangulation/suffocation (**Table 1**).

More than half of the suicide-related ED visits were observed among females during both 2021 and 2022; no

significant differences by sex were observed over these years (**Table 2**, p>0.05). Significant changes over time were also not observed by race/ethnicity or residence county. Differences were observed by age group between 2021 and 2022 (data not shown); however, when stratified by sex, significant changes by age were only observed among females (p=0.0012). While the greatest proportion of suicide-related ED visits were observed among the 10–24 age group for both males and females, the proportion of visits observed among females in this age group was much higher. Notably during 2021, more than half of suicide-related ED visits detected among females were observed among those 10–24 years old, compared to approximately one quarter of the visits observed among males.

Table 1. Characteristics of Rhode Island suicide deaths reported in the Rhode Island Violent Death Reporting System (RIVDRS) during the five-year periods of 2012–2016 and 2017–2021.*

Decedent Characteristics	2012–2016 N=575 n (%)	2017–2021 N=547 n (%)	p–value†
Sex			
Male	433 (75.3)	411 (75.1)	0.9483
Female	142 (24.7)	136 (24.9)	
Age Group			
10–24	55 (9.6)	52 (9.5)	0.3884
25–34	81 (14.1)	87 (15.9)	
35–44	87 (15.1)	91 (16.6)	
45–54	148 (25.7)	112 (20.5)	
55–64	112 (19.5)	120 (21.9)	
65+	92 (16.0)	85 (15.5)	
Race/Ethnicity			
Hispanic	32 (5.6)	45 (8.2)	0.1281
White, Not Hispanic	515 (89.6)	471 (86.1)	
Black, Not Hispanic	22 (3.8)	19 (3.5)	
Other, Not Hispanic	6 (1.0)	12 (2.2)	
Residence County			
Bristol	33 (5.7)	28 (5.1)	0.8754
Kent	96 (16.7)	94 (17.2)	
Newport	48 (8.4)	46 (8.4)	
Providence	321 (55.9)	294 (53.9)	
Washington	76 (13.2)	83 (15.2)	
Mechanism of Death			
Strangulation, suffocation	236 (41.0)	223 (40.8)	0.8882
Firearm	148 (25.7)	148 (27.1)	
Poisoning	107 (18.6)	104 (19.0)	
Other	84 (14.6)	72 (13.2)	

*Percent calculations based on the characteristic totals with available data, thus some categories do not sum to the yearly totals. Percentages may not sum exactly to 100 due to rounding.
†Chi-square test; α=0.05.

Table 2. Characteristics of Rhode Island emergency department patients, ages 10 years and older, who were reported in RIDOH's syndromic surveillance system (ESSENCE) and found to meet the suicide-related syndrome definition during 2021 and 2022.*

Patient Characteristics	2021 N=6,004 n (%)	2022 N=5,935 n (%)	p–value†
Sex			
Male	2,872 (47.9)	2,900 (48.9)	0.2457
Female	3,126 (52.1)	3,025 (51.1)	
Age Group (Males)			
10–24	731 (25.5)	719 (24.8)	0.4584
25–34	626 (21.8)	581 (20.0)	
35–44	485 (16.9)	513 (17.7)	
45–54	459 (16.0)	485 (16.7)	
55–64	369 (12.8)	403 (13.9)	
65+	202 (7.0)	199 (6.9)	
Age Group (Females)			
10–24	1,568 (50.2)	1,363 (45.1)	**0.0012**
25–34	477 (15.3)	473 (15.6)	
35–44	319 (10.2)	348 (11.5)	
45–54	264 (8.4)	322 (10.6)	
55–64	251 (8.0)	263 (8.7)	
65+	247 (7.9)	256 (8.5)	
Race/Ethnicity			
Hispanic	840 (14.0)	786 (13.3)	0.5704
White, Not Hispanic	4,351 (72.6)	4,329 (73.2)	
Black, Not Hispanic	448 (7.5)	432 (7.3)	
Other, Not Hispanic	353 (5.9)	369 (6.2)	
Residence County			
Bristol	155 (2.6)	163 (2.7)	0.8779
Kent	1,319 (22.0)	1,340 (22.6)	
Newport	292 (4.9)	284 (4.8)	
Providence	3,471 (57.8)	3,411 (57.5)	
Washington	767 (12.8)	737 (12.4)	

*Percent calculations based on the characteristic totals with available data, thus some categories do not sum to the yearly totals. Percentages may not sum exactly to 100 due to rounding.
†Chi-square test; α=0.05.

DISCUSSION

Using the most recent 10 years of suicide death data from RIVDRS and two years of suicide-related ED visit data from ESSENCE, this article summarizes general characteristics of suicide mortality and morbidity in Rhode Island and changes over time. RIVDRS data show the burden of suicide deaths has remained relatively stable over time, without significant changes in the proportion of deaths by sex, age, race/ethnicity, county, or injury means. Decreasing suicide deaths during 2020 and increasing deaths during 2021 were observed in Rhode Island and nationally.[4] As characterized nationally, the risk for suicide death was consistently observed to be about three times higher among Rhode Island males compared to females.[5] White, Not Hispanic individuals represent the largest proportion of suicide deaths; however, these proportions have been observed to decrease relative to other racial and ethnic groups in Rhode Island and the United States.[6]

RIVDRS data are subject to some limitations of note. RIVDRS doesn't include Rhode Island residents who die in other states and several years of data often need to be aggregated to have sufficient sample size for analyses. Thus, year-to-year changes, if present, are difficult to identify due to limited sample power. Despite these limitations, RIVDRS data are critical to describe the burdens and trends in suicide deaths over time. RIVDRS data also include known circumstances associated with deaths, which help identify risk factors and inform prevention activities. These variables were not summarized in this analysis; however, should be considered in future publications.

ESSENCE syndromic surveillance data detected changes in suicide-related ED visits over time by age groups among females. This finding was likely driven by the increased proportion of suicide-related ED visits among females 10–24 during 2021. Increases in suicide-related morbidity among young females were also observed nationally during 2021. An analysis found ED visits relating to suicide attempts were higher during 2021 compared to 2019 and the largest relative increase was observed during March 2021.[7] These findings suggest young females may have suffered more distress due to impacts from the COVID-19 pandemic and should be targeted for prevention. Timely suicide-related morbidity data should continue to be analyzed among this group nationally and in Rhode Island.

Syndromic surveillance data are also subject to several limitations. Chief complaint and discharge diagnosis data are used to identify visits meeting the syndrome definition. Thus, visits may be misclassified as suicide-related visits based on word terms present in the chief complaint and coding errors for discharge diagnosis codes. Similarly, visits may be related to suicide attempts or suicidal ideation, but missing data in the chief complaint of diagnosis fields would prohibit the visit from being detected. Thus, syndromic data should be considered preliminary and may not represent the true burden of suicide-related visits. Despite these limitations, syndromic data are helpful to detect potential changes in real time and provide context to complementary data sources. While this analysis did not separate ED visits relating to suicide attempts from suicidal ideation, syndrome definitions exist for these conditions in ESSENCE. Suicide attempt-related visits represented approximately 15% of the suicide-related visits included in this analysis and further disparities among females were observed. In comparison to suicide-related visits shown in **Table 2**, approximately 63% of attempt-related visits were observed among females and more than 52% of these visits were observed among females in the 10-24 age group during 2021 and 2022.

This analysis was limited to patients 10 years old and older as suicide risk is difficult to ascertain among individuals less than 10 years old and no suicide deaths were observed in Rhode Island among individuals in this age group. Significant increases in suicide deaths among younger females was not observed in our analysis and has not been observed nationally; however, national data has shown rates of suicide deaths among females have generally decreased for age groups 25 years and older, while increasing for younger age groups.[5] Suicide death rates among females ages 10–15 were observed to increase by approximately 15% in 2021 compared to 2020; however, this increase was not statistically significant.[4]

Several factors likely contribute to the observed contrasts in suicide-related mortality and morbidity by sex and age. Attempt methods among males tend to be more violent, increasing the risk for suicide death. For example, 31.5% of suicide deaths among Rhode Island males involved firearms, compared to 9.7% among females. Younger individuals may be more likely to be seen at the ED for depression or other mental health concerns, which are linked with suicidal ideation. More frequent depression diagnoses among females have been observed and would contribute to the observed disparities. Younger females may also disproportionally experience feelings of isolation and other negative impacts from social media, which should be investigated further.

Despite significant changes in suicide mortality not being observed by the characteristics included in this analysis, findings from morbidity data suggest that it's important to continue to monitor data to identify and support people at greatest risk for suicide in Rhode Island. Strategies that promote healthy connections, improve access to care, and create protective environments are part of the comprehensive framework needed to reduce suicide-related mortality and morbidity.[2]

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