

# Surveillance of Suicide and Suicide Attempts Among Rhode Island Youth Using Multiple Data Sources

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In the United States, the need for surveillance of suicide and suicide attempts is well recognized. In 2014, suicide was the second leading cause of death in the United States among young adults 15 to 24 years of age.<sup>1</sup> During 1999-2014, the age-adjusted suicide rate in the United States increased by 50% for females aged 15 to 24, from 3.0 per 100,000 to 4.6 per 100,000. In contrast, the suicide rate for males aged 15 to 24 increased more slowly (16.8 per 100,000 in 1999 to 18.2 per 100,000 in 2014), but adolescent and young adult males are 4.0 to nearly 6.0 times more likely to die by suicide than their female counterparts.<sup>2</sup> We characterize the burden of youth suicide injuries and deaths in Rhode Island (RI) using multiple data sources.

## METHODS

The national and state Youth Risk Behavior Survey (YRBS) monitors self-reported health risk behaviors including violence-related behavior.<sup>3</sup> Data for this study came from the 2003–2015 RI high school and 2009–2015 RI middle school YRBS. Attempted suicide was defined as the number of middle and high school students who, in the 12 months before the survey, actually attempted suicide one or more times.

Data from the 2014 RI Emergency Department (ED) Visit Data and RI Hospital Discharge Data (HDD) for 11 acute care hospitals were used to estimate attempted suicides and self-injuries among children and youth under age 25 using E950-E959 external cause of injury codes.<sup>4</sup> Most payers require a single bill for patients seen in multiple units of the same hospital for a single stay. ED visits in this analysis did not include subsequent admissions to the same hospital.

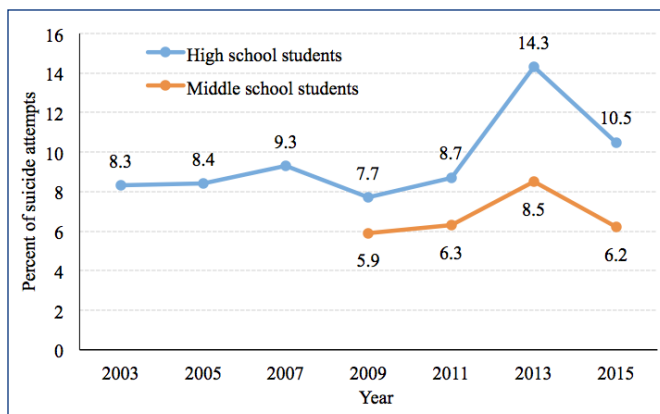
The Rhode Island Violent Death Reporting System (RIVDRS) collects information from death certificates, medical examiner reports, and law enforcement sources. Suicide deaths came from the 2004 to 2014 RIVDRS using ICD-10-CM codes X60–X84, Y87.0.<sup>5</sup>

Characteristics of suicide attempts and suicide deaths, respectively, in young people under age 25 are shown in Tables 1 and 2. We performed all analyses using SAS version 9.4 (SAS Institute, Inc. Cary, NY).

## RESULTS

Trend analysis over 12 years revealed that self-reported suicide attempts among RI middle school and high school students did not change significantly from 2003 to 2015, except for a striking change in 2013 (**Figure 1**).

**Figure 1.** Percentage of RI middle and high school students who, in the 12 months before the survey, actually attempted suicide one or more times.



Data source: 2003–2015 Rhode Island high school and 2009–2015 Rhode Island middle school Youth Risk Behavior Survey.

Across all years, middle and high school students who had attempted suicide were more likely to report recent depression than their peers who had not attempted suicide (data not shown). In 2014, there were 388 ED visits and 474 hospitalizations for suicide attempts among RI youth aged 24 and younger. Most of the children and youth seen in the ED or hospitalized for a suicide attempt were female, non-Hispanic white, and resided in suburban regions. Over half of the suicide attempts seen in the ED were in the public or self-pay insurance category. One-third of patients hospitalized for a suicide attempt were transferred to psychiatric units or psychiatric hospitals (**Table 1**).

From 2004 to 2014, 127 RI youth under age 25 died of suicide. Youth who died by suicide were more likely to be 18–24 years old, male, and non-Hispanic white. Suburban regions had higher proportions of suicide deaths compared to other areas of the state. Hanging, strangulation, or suffocation were the most common methods of suicide (61%). (**Table 2**)

Nearly all suicide deaths had toxicology testing for alcohol, marijuana, antidepressants, and opiates (**Table 3**). Eleven-year combined toxicology data showed 23% of cases tested positive for alcohol, 21% for marijuana, and 21% for antidepressants. In 57 (45%) cases, the decedent had a current mental health problem. About 74% of youth with a current mental health problem had a diagnosis of depression/dysthymia, with attention deficit or hyperactivity disorder (19%), anxiety disorder (16%), bipolar disorder (11%), and

**Table 1.** Characteristics of suicide attempts in young people under age 25<sup>1</sup>

Characteristic	Emergency Department Visits (N=388)		Hospital Discharges (N=474)	
	n	%	n	%
<b>Age group</b>				
Less than 18 years	195	50.3	301	63.5
18-24 years	193	49.7	173	36.5
<b>Sex</b>				
Male	139	35.8	140	29.5
Female	249	64.2	334	70.5
<b>Race/Ethnicity</b>				
Non-Hispanic white	291	75.6	337	71.9
Non-Hispanic black	25	6.5	27	5.7
Hispanic	52	13.5	83	17.7
Other	17	4.4	22	4.7
<b>City/Town of Residence</b>				
Urban core cities <sup>2</sup>	110	28.5	179	38.7
Suburban regions	202	52.3	189	40.8
Rural areas	59	15.3	63	13.6
Out of state	15	3.9	32	6.9
<b>Primary insurance</b>				
Private	191	49.2	295	62.2
Medicaid	164	42.3	157	33.1
Self-pay	28	7.2	17	3.6
Medicare	5	1.3	5	1.1
<b>Patient Status</b>				
Discharged to home/self-care	258	66.5	303	63.9
Transferred to psychiatric unit or hospital	76	19.6	155	32.7
Other	54	13.9	16	3.4

<sup>1</sup> Data source: 2014 Rhode Island Emergency Department (ED) Visit and Hospital Discharge Data (HDD). ED visits do not include those subsequent admissions to the same hospital.

<sup>2</sup> Urban core cities: Central Falls, Pawtucket, Providence, and Woonsocket.

schizophrenia (7%) occurring in smaller proportions (data not shown). Over one-third of youth (36%) were in current mental health treatment. The most common precipitating events were mental health and substance abuse problems, relationship problems, recent crises, and school problems.

## DISCUSSION

Our study found that the 388 ED visits for suicide attempts in youth under the age of 25 resulted in medical charges of almost \$1.2 million dollars with average medical charges of approximately \$3,000 per suicide attempt visit. The total charges for the 474 hospitalizations for suicide attempts in this age group were nearly \$14.7 million dollars; the average medical charges were more than \$30,000 per suicide

**Table 2.** Characteristics of suicide deaths in young people under age 25<sup>1</sup>

Characteristics of Suicide Death	n	%
<b>Age group (mean: 19.7 years)</b>		
Less than 18 years	30	23.6
18-24 years	97	76.4
<b>Sex</b>		
Male	102	80.3
Female	25	19.7
<b>Race/Ethnicity</b>		
Non-Hispanic white	90	70.9
Non-Hispanic black	11	8.6
Hispanic	18	14.2
Other	8	6.3
<b>Occupation</b>		
Middle school student	10	8.0
High school student	27	21.6
College student	28	22.4
Employed	41	32.8
Unemployed	9	7.2
Other	10	8.0
<b>City/Town of Residence</b>		
Urban core cities <sup>2</sup>	38	30.2
Suburban regions	57	45.2
Rural areas	18	14.3
Out of state	13	10.3
<b>Injury Location</b>		
House, apartment	85	67.5
Natural area (e.g., field, river, beaches, woods)	16	12.7
Street/road, sidewalk, alley	<5	2.4
Other*	22	17.4
<b>Injured at Victim Home</b>		
Yes	77	62.6
No	46	37.4
<b>Weapon Type</b>		
Firearm	20	15.8
Hanging, strangulation, suffocation	78	61.4
Poisoning	9	7.1
Other	20	15.7

<sup>1</sup> Data source: 2004–2014 Rhode Island Violent Death Reporting System; N=127

<sup>2</sup> Urban core cities: Central Falls, Pawtucket, Providence, and Woonsocket.

attempt; and length of stay was 4,209 days (data not shown).

The reasons for suicide were complex. No single factor causes it. We found that children and youth who committed suicide were more likely to be male, white, living in suburban areas of the state, and having mental health problems. They also were more likely to have had current depression, intimate and non-intimate-partner relationship

**Table 3.** Suicide death toxicology tests and circumstances in young people under age 25<sup>1</sup>

Toxicology Test and Circumstance	n	%
<b>Tested</b>	<b>126</b>	<b>99.2</b>
<b>Toxicology test positive<sup>2</sup></b>		
Alcohol	29	23.0
Marijuana	27	21.4
Antidepressants	27	21.4
Opiates	8	6.4
<b>Mental health/substance abuse circumstance<sup>3</sup></b>		
Current depressed mood	60	47.2
Current diagnosed mental health problem <sup>3</sup>	57	44.9
Depression/Dysthymia	42	--
Attention deficit or hyperactivity disorder	11	--
Anxiety disorder	9	--
Bipolar disorder	6	--
Other	17	--
Current mental health treatment	46	36.2
Other substance abuse problem	20	15.8
Alcohol problem	9	7.1
<b>Interpersonal circumstance</b>		
Intimate partner problem	40	31.5
Other relationship problem (non-intimate)	28	22.1
Family relationship	20	15.8
An argument or conflict led to the victim's death	14	11.0
<b>Life stressor circumstance</b>		
Crisis in past or impending two weeks	37	29.1
School problem	13	10.2
Job problem	9	7.1
Civil legal (non-criminal) problem	6	4.7
Recent criminal legal problem	6	4.7
Financial problem	5	3.9
<b>Suicide event circumstance</b>		
Left a suicide note	41	32.3
Disclosed intent to commit suicide	30	23.6
History of suicide attempt(s)	28	22.1
Suicide thought history	8	6.3

<sup>1</sup> Data source: 2004–2014 Rhode Island Violent Death Reporting System. N=127

<sup>2</sup> Percentages may exceed 100% because test results can be positive for alcohol or multi-drugs.

<sup>3</sup> One victim can have two or three current mental health diagnoses.

problems, experienced a crisis in the preceding two weeks, left a suicide note, disclosed intent to commit suicide, and made prior suicide attempts. Approximately 47% of youth who died by suicide in RI were reported to have a depressed mood, while 36% were receiving mental health treatment. Mental health status could be underestimated. Our findings

are consistent with the Dahlberg et al. study,<sup>6</sup> which found that suicide in youth fundamentally reflects social and emotional problems. Of note is that 47% of suicide deaths among RI youth under age 25 were associated with current depression. Depression, which is a serious problem for adolescents, is the most significant risk factor for teen suicide.<sup>7</sup>

Data from Rhode Island's suicide event surveillance system drew attention to the prevalence of youth suicide attempts and deaths and the magnitude of the problem. National suicide prevention efforts have focused on school education programs, crisis center hotlines, and screening programs to identify at-risk adolescents. RI developed the Suicide Prevention Initiative (SPI) to address the link between suicide and depression; two treatable mental health conditions that, once recognized, can be treated.<sup>8</sup> SPI is a new partnership between the RI Department of Health, Rhode Island Student Assistance Services (RISAS), and Bradley Hospital's Access Center and Kids'Link RI hotline for children in emotional crisis (East Providence, RI). It is funded by a five-year grant from the Substance Abuse and Mental Health Administration (2014–2019). SPI is a direct referral system that links school crisis team members with Kids'Link RI emergency service clinicians. Once parental consent is obtained, Kids'Link clinicians provide emergency mental health assessments for elementary, middle and high school youth who are experiencing a mental health crisis or suicidal ideation. Clinicians are available 24 hours a day, seven days a week to help families find the appropriate next step for managing the child's crisis. SPI is being implemented and evaluated in school districts throughout RI to ensure that all public school students who express suicidal ideation or engage in non-suicidal, self-injurious behavior receive timely (within 24 to 48 hours) access to mental health services; thus avoiding unnecessary and costly emergency department visits.

There are several limitations to the data reported in this study. Data obtained from medical examiner reports could only determine the mental health status of the victims through medical records or the presence of certain prescription drugs, but not all persons with a mental illness seek treatment.<sup>9</sup> Data on a person's mental health status from interviews with victims' family members, relatives, friends, or other informants, may be incomplete and inaccurate because of recall bias. Information on mental health history was unknown in some RIVDRS cases.

Despite these limitations, RI's surveillance system for suicide attempts and deaths are extremely useful for describing the characteristics and patterns of suicidal behavior among RI youth under age 25. Ongoing surveillance of suicide-related events across the suicide-related spectrum (e.g., thoughts, attempts, deaths) in population subgroups (e.g., sex, age, and racial/ethnic groups, geographic regions of the state) provide a much needed foundation for establishing state priorities to reduce and prevent youth suicides and for developing successful prevention efforts.<sup>10</sup>

## Acknowledgments

This brief was funded by a Centers for Disease Control and Prevention (CDC) grant (1U17CE002615-01 Revised) awarded to the Rhode Island Department of Health. We would like to express our special thanks to data abstractors Karen Foss and Shannon Young, who spent hours compiling the data and constructing sound narratives to make RIVDRS one of the best. We thank Kathy Taylor who provided the 2014 emergency department and hospital discharge data. We also thank Tara Cooper for her contribution as the YRBS coordinator.

## References

- Centers for Disease Control and Prevention. 10 Leading Causes of Death by Age Group, United States – 2014 [http://www.cdc.gov/injury/wisqars/pdf/leading\\_causes\\_of\\_death\\_by\\_age\\_group\\_2014-a.pdf](http://www.cdc.gov/injury/wisqars/pdf/leading_causes_of_death_by_age_group_2014-a.pdf)
- Curtin SC, Warner M, Hedegaard H. Increase in suicide in the United States, 1999–2014. NCHS Data Brief No. 241. 2016:1-8. <http://www.cdc.gov/nchs/products/databriefs/db241.htm>
- Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance System (YRBSS) <http://www.cdc.gov/healthyyouth/data/yrbs/index.htm>
- Thomas KE, Johnson RL. State injury indicators report: Instructions for Preparing 2014 Data. In. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2016.
- Centers for Disease Control and Prevention. National violent death reporting system (NVDRS) coding manual revised [online] version 5.1. 2015.
- Dahlberg LL, Mercy JA. History of violence as a public health issue. *AMA Virtual Mentor*. 2009;11(2):167-172.
- Galaif ER, Sussman S, Newcomb MD, Locke TF. Suicidality, depression, and alcohol use among adolescents: A review of empirical findings. *Int J Adolesc Med Health*. 2007; 19(1): 27–35.
- American Academy for Child and Adolescent Psychiatry. Facts for Families. Teen Suicide. No. 10; Updated October 2013. [http://www.aacap.org/AACAP/Families\\_and\\_Youth/Facts\\_for\\_Families/FFF-Guide/Teen-Suicide-010.aspx](http://www.aacap.org/AACAP/Families_and_Youth/Facts_for_Families/FFF-Guide/Teen-Suicide-010.aspx)
- Lyons BH, Fowler KA, Jack SP, Betz CJ, Blair JM. Surveillance for Violent Deaths - National Violent Death Reporting System, 17 States, 2013. *MMWR Surveill Summ* 2016;65(10):1-42.
- Data and Surveillance Task Force of the National Action Alliance for Suicide Prevention. Improving national data systems for surveillance of suicide-related events. *Am J Prev Med*. 2014; 47(3 Suppl 2): S122-9.

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## Disclosure

The authors have no financial interests to disclose.

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