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# Adolescent Suicide in Colorado, 2008-2012

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## Introduction

Suicide is a public health issue of significant concern nationally and in the state of Colorado. Colorado's suicide rate consistently ranks amongst the highest in the nation (11th in 2011, 17.5 per 100,000).[1] The adolescent population is a particularly vulnerable group which is in many ways less understood than adults, and whose suicides rank high in terms of years of life lost. Additionally, suicides in this population could be more easily preventable through parental interaction and limiting access to lethal means. In Colorado there were 269 adolescent suicide deaths between 2008 and 2012. The Colorado age-specific suicide rate for adolescents (ages 10 to 19) is 7.9 per 100,000 which is considerably higher than the national average at 4.6 per 100,000.[2] During this period suicide was the second leading cause of death in adolescents behind unintentional injuries in Colorado.[3] The tragedy of adolescent suicides, including the toll taken on families, peers, and society, make them a serious public health problem.

Since 2004 the Colorado Department of Public Health & Environment (CDPHE) has participated in the National Violent Death Reporting System (NVDRS). NVDRS is a national surveillance system designed to collect epidemiologic data surrounding violent death. Colorado is one of 32 states participating in the program currently. The program is maintained and funded through the U.S. Centers for Disease Control and Prevention. Each participating state aims to collect the most thorough data on all types of violent death in their state.

This report describes the issue of adolescent suicide in Colorado by using the NVDRS surveillance data. The purpose of this report is to increase suicide awareness, as well as present unique aspects and factors of adolescent suicide. These data can be used at the state and local levels in Colorado to help inform intervention and prevention efforts that will reduce adolescent suicide.

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## Methods

The data for this report came from the Colorado Violent Death Reporting System (CoVDRS) at CDPHE as part of the NVDRS. The CoVDRS collects data on all violent deaths in Colorado: These include suicides, homicides, unintentional firearm deaths, and undetermined deaths where there is a possibility it could be one of the previous types. Deaths are selected for inclusion in the CoVDRS based on the manner of death or International Classification of Disease, 10th Revision (ICD-10)-coded underlying cause of death as reported on the death certificate. For cases with undetermined manner of death, cases are selected by the presence of coding or injury descriptions consistent with violent death. The CoVDRS represents an enhanced surveillance program, where along with death certificate data, coroner/medical examiner reports and law enforcement reports are abstracted and entered into the NVDRS web-based system for each incident. The final data include information from all three primary sources. Advantages of this approach include increased circumstantial information, increased weapon information, toxicology information, medical and mental health history.

This report includes all occurrences of adolescent suicide in the state of Colorado. For the purpose of this report, adolescent is defined as ages 10 to 19 years. A death was defined as a suicide according to the CoVDRS criteria, which state that a suicide is any death resulting from the use of "force against oneself when a preponderance of the evidence indicates that the use of force was intentional." [4] Adolescent suicide deaths were analyzed by year, gender, race/ethnicity, method, toxicology results, age group and circumstances. Age group comparisons were made between adolescents and all other ages which include suicides for ages 20 and older. The 20-and-older age group will be referred to as the "adult" population in this report.

Adolescent suicide deaths are presented as number of cases, specific categorical counts, percentages of total suicide deaths for a given category, and demographic-specific mortality rates. For computing demographic-specific mortality rates, population estimates for denominator data are based on 2008-2012 population estimates from the State Demography Office, Colorado Department of Local Affairs.

Method of injury is presented in four categories: Firearm, hanging, poisoning, and other. These four categories represent more than 20 possible categorical options of weapon type in the CoVDRS that are aggregated into these broader groups.

Toxicology information comes from coroner/medical examiner reports where toxicological results at the time of death are reported. In the CoVDRS, specific drug and substance types are entered and recoded into substance categories. For the purpose of this report the following substance categories are presented: Alcohol, marijuana, antidepressant, opioid, amphetamine, and cocaine. These data represent the presence of a substance, and don't speak directly to a cause of death, that is, poisoning or overdose.

## Results

### Adolescent Suicide Deaths

*Suicide Rates*

The adolescent suicide rates between 2008 and 2012 remained stable through the five years. In 2009 there was a 16 percent increase in the rate of adolescent suicide deaths compared to other years. However, the rate has returned to its previous level over subsequent years (Table 1).

**Table 1. Adolescent suicide deaths and age-specific rates, 2008-2012.**

| Year | n | Age-specific rate* |
|---|---|---|
| 2008 | 53 | 7.95 |
| 2009 | 60 | 8.93 |
| 2010 | 50 | 7.46 |
| 2011 | 52 | 7.57 |
| 2012 | 54 | 7.75 |

*per 100,000 population; Colorado adolescents.

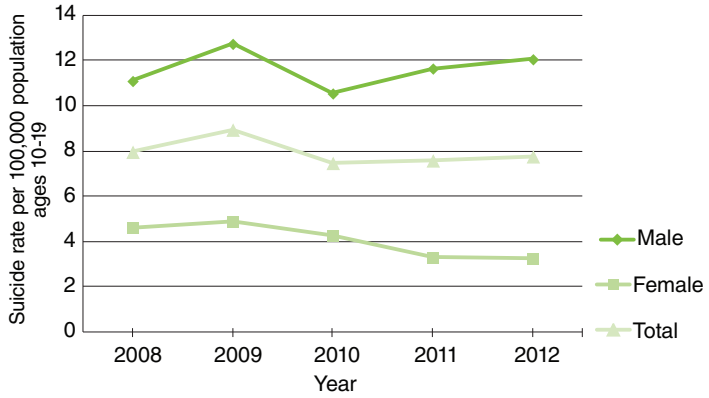
Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

## Adolescent Suicide Demographics

### *Gender*

Figure 1 presents trends of gender-specific suicide rates between 2008 and 2012. Males consistently had higher age-specific suicide rates than females for all five years. On average, males had a 2.8 times higher suicide rate (11.6 per 100,000 population) than females (4.1). This difference in gender-specific suicide rates mirrors the pattern for the adult population. For the 20-and-older age group, male suicide rates were approximately 3.4 times higher (36.6) than females (10.8). While the magnitude is greater in the adult population, there is a similar trend between adults and adolescents in terms of gender differences in suicide rates.

**Figure 1. Adolescent suicide rate by gender, Colorado, 2008-2012.**

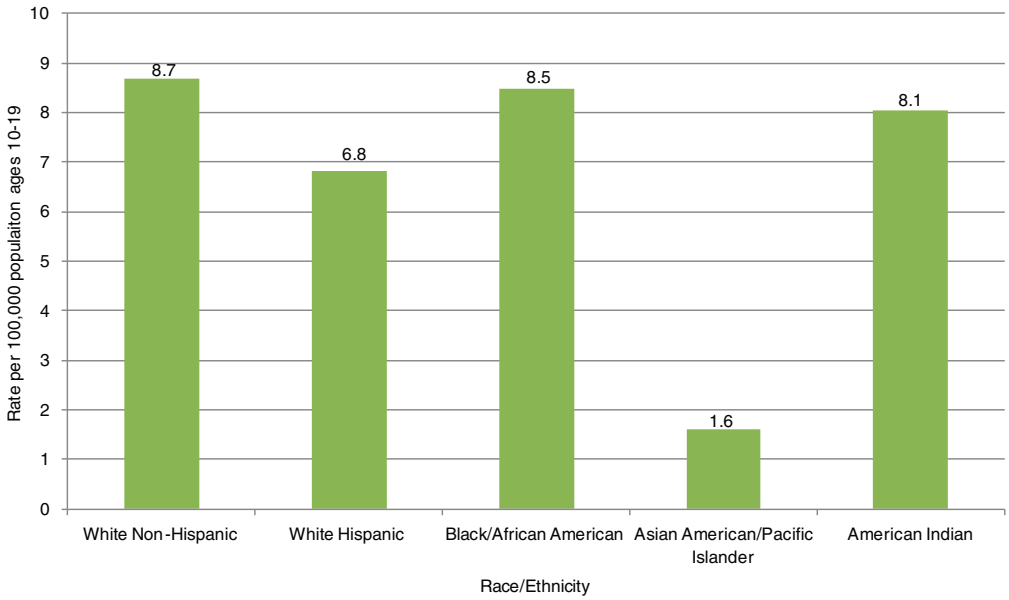



Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

### *Race and Ethnicity*

In terms of race and ethnicity, White Non-Hispanics make up the majority of adolescent suicide deaths between 2008-2012, (68.4%, n=184), with the next highest proportion being White Hispanic (22.7%, n=61). Suicides among Black/African American, Asian American/Pacific Islander, and American Indian adolescents make up less than 10 percent of the total suicide count. Since incidence reflects differences in overall demographic makeup, it is important to look at racial and ethnic-specific suicide rates, as seen in Figure 2. The White Non-Hispanic population has the highest suicide rate for adolescents, whereas, Asian/Pacific Islander has a lower suicide rate than all other groups.

**Figure 2. Adolescent suicide rate by race/ethnicity, Colorado, 2008-2012.**



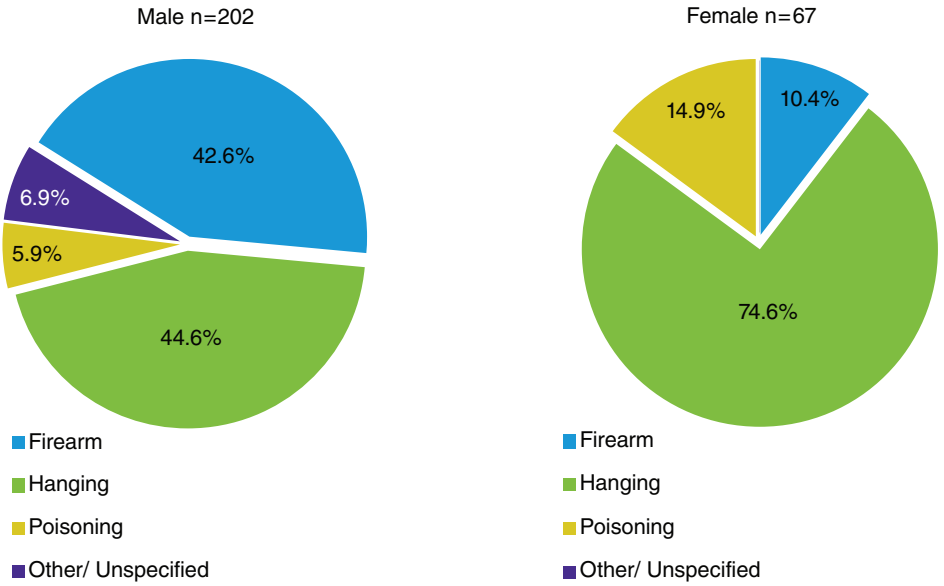

Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

## Adolescent Suicide Method

### *Method by Gender*

Figure 3 compares gender differences in method or mechanism of injury for adolescent suicides. There are several unique characteristics for both genders. The first noticeable difference is the higher percentage of female suicides by hanging (74.6%) compared to males (44.6%). This percentage difference also is reflected in firearm use, where adolescent males are more than 4 times as likely to use a firearm (42.6%) than females (10.4%). Females also were more likely to commit suicide by poisoning (14.9%) than males (5.9%).

**Figure 3. Adolescent suicide method by gender, Colorado, 2008-2012.**

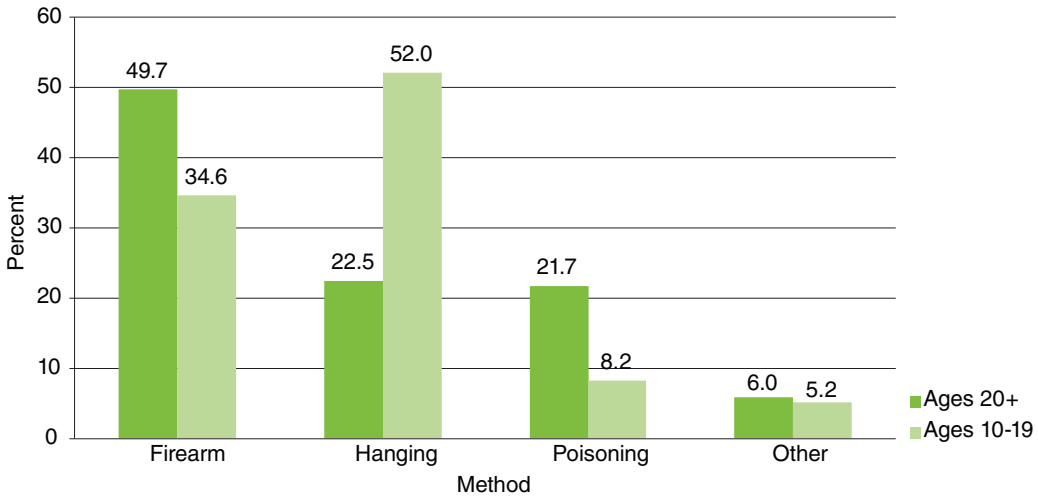



Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

### *Method and Age Group*

There are some differences in suicide method among adolescents compared to adults, which are demonstrated in Figure 4. Hanging in adolescents (52.0%) is more than twice as prevalent as hanging in the adult population (22.5%). The adult population is more likely to use firearms (49.7%) than adolescents (34.6%), as well as poisoning (adults, 21.7%; adolescents, 8.2%).

**Figure 4. Adolescent suicide method by age, Colorado, 2008-2012.**




Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

## Adolescent Suicide Toxicology

### *Toxicology*

Table 2 illustrates the toxicological results, that is, what substances were present at the time of death. The table presents suicides in which toxicological substance type was present, as a percent of total cases for which toxicology results were available and reported. The highest substance present is marijuana (16.1 %) followed by alcohol (12.7 %); the other four substance categories were present in 5 percent or fewer of adolescent suicide cases.

**Table 2. Toxicology of suicides among adolescents ages 10-19, Colorado, 2008-2012.**

| Substance type present | n | Percent* |
|---|---|---|
| Alcohol | 34 | 12.7 |
| Opioid | 14 | 5.2 |
| Antidepressant | 13 | 4.9 |
| Marijuana | 43 | 16.1 |
| Amphetamine | 5 | 1.9 |
| Cocaine | 4 | 1.5 |

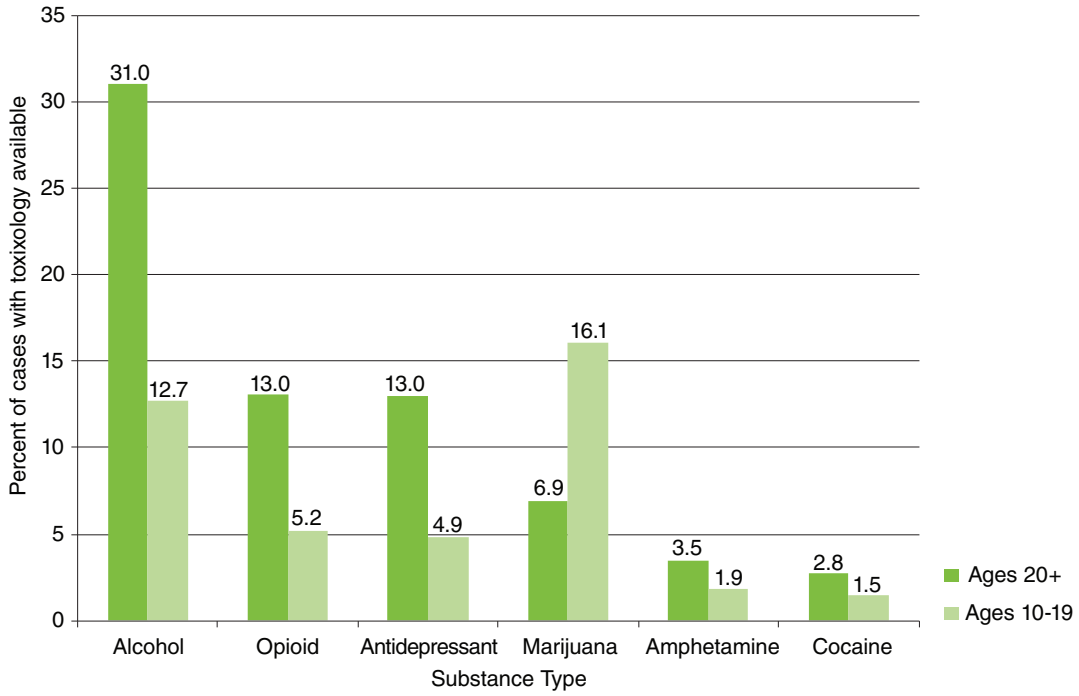
*Represents the percent of cases where the toxicology was available.

Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

### *Toxicology Results Compared by Age Group*

Figure 5 compares adolescent suicide toxicology results with those of adult suicide cases. Adults had higher percentages of substances present in all but one substance type; marijuana was present in 16.1 percent of adolescent cases compared with just 6.9 percent of adult cases.

**Figure 5. Toxicology results by age goup, Colorado, 2008-2012.**




Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

## Adolescent Suicide Circumstances

Table 3 lists the fifteen circumstances that were most commonly reported for adolescent suicides. The most common circumstance was a "current depressed mood" (48.2%), as perceived by self or others at the time of injury. A large proportion of cases also left a suicide note (40.7 %) and/or had recently disclosed intent to commit suicide to another person (37.6%).

Mental health circumstances look at documented evidence about a suicide victim's mental health status. Around a third of adolescent suicide cases had a current mental health problem (33.2%) and/or were ever treated for a mental health problem (32.4%). It also was found that 27.7 percent of adolescent suicides had a previous suicide attempt.

A problem with an intimate partner (32.8%) in adolescents is the most prevalent among circumstances related to personal relationships. Relatively low on the overall list are a job problem (5.5 %), financial problem (4.7 %) and physical health problem (4.0%).

**Table 3. Circumstances for suicides among adolescents ages 10-19, Colorado, 2008-2012.**

| Circumstance | n | Percent* |
|---|---|---|
| Current depressed mood | 122 | 48.2 |
| Left a suicide note | 103 | 40.7 |
| Disclosed intent to commit suicide | 95 | 37.6 |
| Current mental health problem | 84 | 33.2 |
| Intimate partner problem | 83 | 32.8 |
| Ever treated for mental health problem | 82 | 32.4 |
| History of previous suicide attempts | 70 | 27.7 |
| Current mental health treatment | 69 | 27.3 |
| Diagnosis of depression | 47 | 18.6 |
| Problem with other substance | 42 | 16.6 |
| Problem with alcohol | 31 | 12.3 |
| Crisis within two weeks of the suicide | 28 | 11.1 |
| Job problem | 14 | 5.5 |
| Financial problem | 12 | 4.7 |
| Physical health problem | 10 | 4.0 |

*Represents the percent of cases where at least one circumstance was present.

Source: Colorado Violent Death Reporting System, Colorado Department of Public Health and Environment.

## Discussion

The Colorado Governor's office has cited the improvement of mental health as one of the focus areas in the 2013 State of Health report.[5] The report presents a goal of better data collection to understand mental health problems. These results from the CoVDRS lend themselves to a better understanding of the mental health issues of adolescent suicide in Colorado.

The data show several aspects of suicide that differ considerably between male and female adolescents. The age-specific suicide rate was higher in males than females, which has been found consistently in other research.[6-9] Additionally, adolescent males are much more likely to die from suicide by firearms, whereas females are more likely to die by hanging, and on a lesser scale, poisoning. The tendency for males to use a more lethal method (firearms) may account for the higher rates of suicide deaths in males when compared to females. Other research has shown that females have higher rates of attempted suicides,[6,7] in part because the method used is less likely to result in death. These differences have been referred to as the gender paradox,[7] a concept that can help guide prevention efforts, both for gender specificity as well as access to lethal means.

Analysis of the toxicological results show relatively low prevalence for all substances in cases of adolescent suicide. The one substance that was higher in adolescents than adults was marijuana (16.1 % versus 6.9% in adults). This is an interesting finding, but one that ought to be cautiously interpreted because of the small percentages for both adults and adolescents. Additionally this could be a sign of higher overall use of marijuana in the adolescent population as a whole, rather than just adolescent suicide victims. In terms of marijuana and suicide, previous research shows that in states with medical marijuana legalization, suicide rates actually fell in men ages 20-39.[10] The continuation of medical marijuana use, and the recent legalization of retail marijuana in Colorado (which went into effect in January 2014 and therefore isn't reflected in the data presented) are areas of future exploration and analysis.

Adolescent suicides have revealed some unique circumstance findings as well. The finding that nearly one-third of adolescent suicide cases have past suicide attempts highlights the need for working with at-risk adolescents with a history of attempt. The high percentages of certain circumstances, including current depressed mood and disclosed intent to commit suicide, demonstrate there are opportunities for implementing crisis interventions, as well as educating parents, stakeholders and community members.

The information provided in this report represents the most recent detailed trends in Colorado adolescent suicides. These data as well as other CoVDRS data can serve as a great resource to help address the lack of mental health information available in Colorado. By providing this information to partner agencies, stakeholders, and community members, we can help increase the awareness of this public health challenge and burden. Additionally, these data can be useful in informing evidence-based interventions and prevention efforts throughout the state. Future research and analyses also have been suggested by many of the trends highlighted in this report. The results aim to collectively work to help reduce the occurrence and effects of adolescent suicide in our community.

## Acknowledgments

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