Risk Factors for Teen Self-Inflicted Injury and Suicide in Orange County

Orange County
Health Care Agency
and
Sheriff-Coroner
May 2015

Risk Factors for Teen Self-Inflicted Injury and Suicide in Orange County

Orange County Health Care Agency
Mark Refowitz, Director
Richard Sanchez, Assistant Director

Health Policy – Research and Planning
Brianna DeKine, MPH Candidate, UC Irvine Program in Public Health
Hang Nguyen, MPH, Research & Planning Manger I
Curtis J. Condon, PhD, Research & Planning Manager II
Donna L. Grubaugh, Chief

Public Health Services
Eric G. Handler, MD, MPH, FAAP, Health Officer
Helene Calvet, MD, Deputy Health Officer
David Núñez, MD, MPH, Family Health Medical Director

Orange County Sheriff's Department, Coroner Division
Donna Meyers, Research Analyst IV
Tiffany Williams, Senior Deputy Coroner
Robert Osborne, Captain

University of California – Irvine, Program in Public Health
Oladele A. Ogunseitan, PhD, MPH, Chair, Dept. of Population Health & Disease Prevention
Cynthia Lakon, PhD, MPH, Assistant Professor, Dept. of Population Health & Disease Prevention
David S. Timberlake, PhD, Assistant Professor, Public Health, School of Medicine- Epidemiology

Acknowledgements
We would like to acknowledge our colleagues for their insightful comments and feedback on this report including members of the OC Child Death Review Team (CDRT).

Suggested Citation
"Risk Factors for Teen Self-Inflicted Injury and Suicide in Orange County. Orange County Health Care Agency and Orange County Sheriff-Coroner Department. Santa Ana, California, May 2015."

This report is available online at www.ochealthinfo.com/pubs.

INTRODUCTION

Suicide is a serious public health problem and continues to be one of the top ten leading causes of mortality in the nation, with an average of 33,000 lives lost per year between 2001 and 2009 (HHS, 2012). Suicide has a profound social, emotional, and economic impact on those affected, including family, friends, and the community. Importantly, suicide deaths are only a part of a larger problem, namely the much more prevalent *non-fatal* self-inflicted or intentional injuries. In 2006, an estimated 594,000 emergency department visits across the country were the result of self-inflicted, intentional injuries (Pitts et al, 2008). There were multiple reasons why people choose to injure themselves, but most do not have suicidal intent (Klonsky et al, 2014).

Previous research has shown that untreated mental illness (e.g., schizophrenia and mood disorders) and substance abuse disorders are strong contributing factors to self-inflicted injury (Hawton & Heriinggen 2009; Miller et al, 2012; Mars et al, 2014). Individuals left untreated or with periodic care often see their mental illness worsen with time. Many of those who survive their non-fatal self-inflicted injury often harm themselves seriously enough to require immediate medical care and hospitalization.

Non-fatal self-inflicted injuries have been shown to peak during the age of adolescence and young adulthood (Klonsky et al, 2014; Self-Inflicted Injury, 2015). A recent report in Orange County revealed that suicide was the second leading cause of death for 15-24 year olds, accounting for one in five deaths in this age group. It is second only to unintentional injuries, which is also the leading cause of death for youths aged 1-14 years old (Premature Death, 2014). The age of adolescence, is a critical time period in life as it is characterized by mental, physical, and emotional developmental changes. Also developing during this time is the foundation for future health behaviors, like self-inflicted injury, that can impact their lives as adults.

This report presents information on both non-fatal and fatal self-inflicted injury to teen residents (aged 10-19 years old) of Orange County from 2009 to 2013. Data were collected from multiple sources, including Emergency Department records, Patient Discharge records, the Master Death File of Orange County, and Coroner case history reports. For the suicide cases specifically, the Coroner case files were matched to the Master Death File, and data was abstracted to obtain detailed information to help answer the question of why these teens chose to end their lives by suicide. The Population data used in this report was from the 2011 Department of Finance records, unless otherwise specified.

The report is divided into three main sections. The first section presents data on self-inflicted injury behavior that resulted in visits to the emergency room and for the more serious cases that required hospitalization. The second section focuses on the characteristics of suicide, and the final section reveals information about key risk factors contributing to teen suicide deaths. The information throughout all sections will be examined by gender, age group, race/ethnicity, geography, and mechanism.

SELF-INFLICTED INJURY

This section of the report examines intentional self-inflicted injury cases of Orange County teen residents (10-19 years old), who were treated in the emergency department and/or hospital. Self-inflicted injury data was obtained from the emergency department (ED) and hospital patient discharge (PD) records from the *Office of Statewide Health Planning and Development* (OSHPD). Cases were identified according to the International Classification of Diseases, Ninth Revision (ICD-9) codes, for the underlying cause of self-injury **(Table 1)**.

Table 1: ICD-9CM E-Codes (Principal External Cause of Self-Inflicted Injury)

Principal External Cause of Self-Inflicted Injury	*ICD-9 Injury E-Codes*
Poisoning by Solid, Liquid Substance or Gas	*E950.0 - E952.9*
Hanging, Strangulation and Suffocation	*E953.0 - E953.9*
Submersion (Drowning)	*E954*
Firearms, Air Guns & Explosives	*E955.0 - E955.9*
Cutting & Piercing	*E956*
Jumping from a High Place	*E957.0 - E957.9, E958.0*
Other & Unspecified Means	*E958.1 - E958.9*
Late Effects of Self-Injury	*E959*

For the five-year period from 2009 to 2013, there were 3,613 incidents of self-inflicted injury or suicide reported among Orange County residents aged 10-19 years old (**Table 2**). Sixty-five of these incidents were fatal.

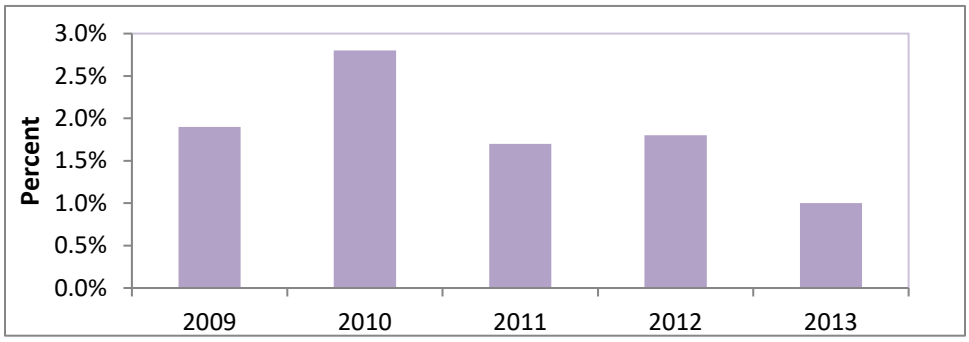
Table 2: Self-Inflicted Injury/Suicide Cases by Year, 2009-2013

Incident Type	2009	2010	2011	2012	2013	Total
Suicide	13	19	12	13	8	65
Self-Inflicted Injury	678	652	682	709	827	3,548
Total	691	671	694	722	835	3,613

Over this period there was a 21% increase (n=149) in self-inflicted injury incidents. This was due to an increase in non-fatal self-inflicted injury from 678 in 2009 to 827 in 2013. In contrast, the number of teen suicide deaths decreased by 38.5% from 13 in 2009, down to 8 in 2013.

On average, a self-inflicted injury resulted in a suicide death in 1.8% of the teen cases. The percentage has declined from a peak of 2.8% in 2010 to 1.0% in 2013 **(Figure 1)**.

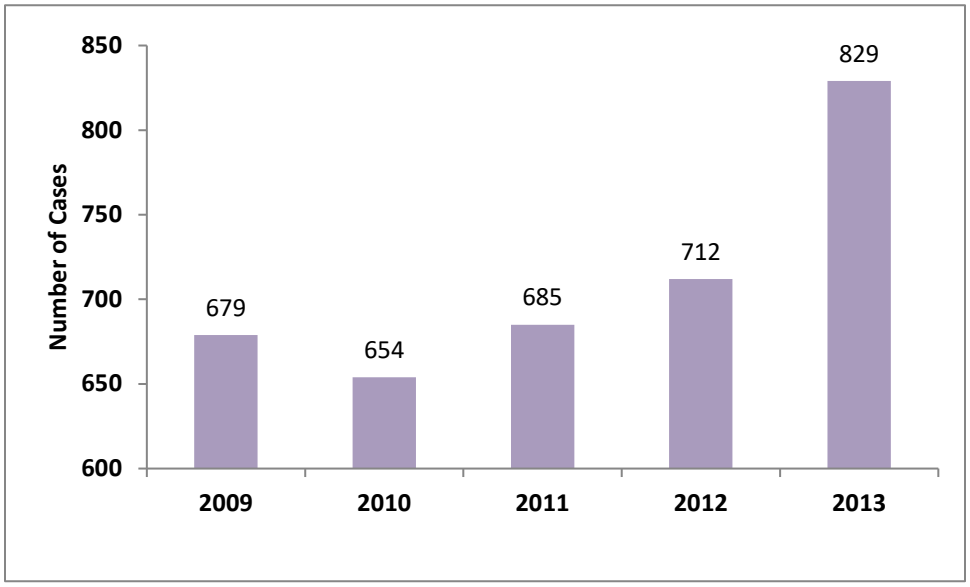
Figure 1: Percentage of Fatal Teen Self-Inflicted Injury Cases by Year, 2009-2013



Self-Inflicted Injury Emergency Department Visits

During 2009 to 2013, a total of 3,559 incidents of self-inflicted injury to teens were treated in the emergency department (ED). Despite a small decrease in the number of cases from 2009 to 2010, a 26.8% increase occurred in the total number of cases from 2010 (n=654) to 2013 (n=829; **Figure 2**). On average, there were 711.8 visits to the ED per year for 10 to 19 year old residents.

Figure 2: Teen Self-Inflicted Injury ED Visits by Year, 2009-2013



Gender and Age Group

The overall rate of self-inflicted injury among teens that resulted in a visit to the ED was 156.3 per 100,000 (**Table 3**). Female teens constituted the large majority (70%) of individuals who engaged in deliberate self-inflicted injury. The rate of self-harm for female teens (222.4 per 100,000) was almost 2.5 times the rate of males at 92.9 per 100,000.

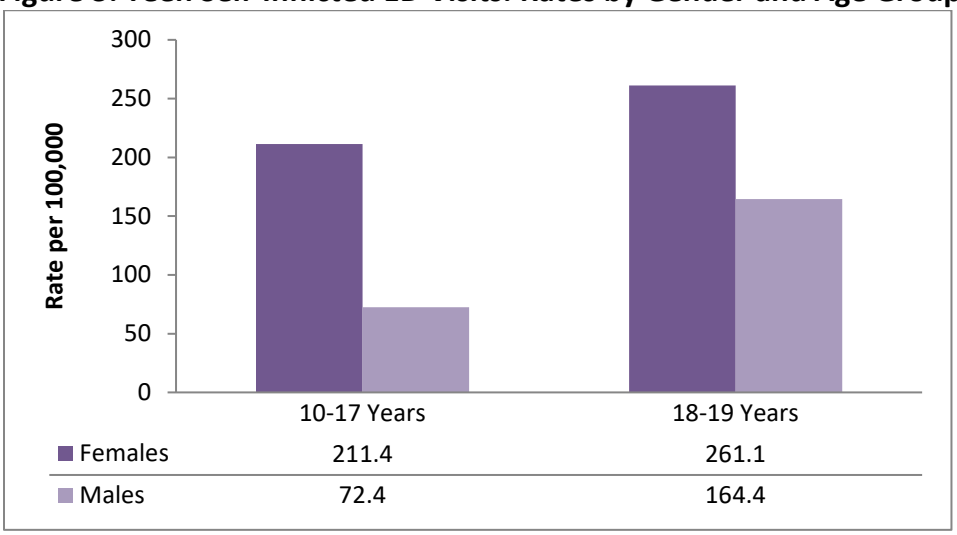
Table 3: Self-Inflicted Injury ED Visits by Gender, 2009-2013

Gender	2009	2010	2011	2012	2013	Total	Percent of Total	5-Yr Average Count	2011 Population	Rate per 100,000 (CI)
Female	458	439	460	500	619	2,476	69.6%	495.2	222,622	222.4 (203.3 – 242.9)
Male	220	215	225	212	210	1,082	30.4%	216.4	232,826	92.9 (80.8 – 106.0)
Unknown	1	0	0	0	0	1	0.0%	0.2	0	NA
Total	**679**	**654**	**685**	**712**	**829**	**3,559**	**100 %**	**711.8**	**455,448**	**156.3 (145.0 – 168.2)**

(CI) 95% Confidence Intervals.

Figure 3 compares the rate of self-inflicted injury for males and females between younger teens (10-17 years old) and older teens (18-19 years old). Separating by age group led to a total of 2,484 younger teens and 1,075 older teens. Across both age groups females had much higher rates than males. Older teens had noticeably higher rates than younger teens, which held true after stratifying by gender. Older teen females had the highest self-inflicted injury rate of 261.1 per 100,000.

Figure 3: Teen Self-Inflicted ED Visits: Rates by Gender and Age Group



Race/Ethnicity

Table 4 summarizes self-inflicted injury ED visits by race/ethnicity. White teens accounted for more than half of all cases (54.1%). Although black teens had the smallest number of cases, and the smallest population size, they had the highest self-inflicted injury rate at 244.1 per 100,000, which is still less than statewide rate for blacks (293.6). White teens had the second highest rate at 240.8 per 100,000. Both black and white teens had higher rates than the overall countywide rate of 156.3 per 100,000. Hispanics and Asian/Pacific Islanders had the lowest self-inflicted injury rates at 114.8 and 63.4 per 100,000, respectively.

Table 4: Self-Inflicted Injury ED Visit Cases: Cases and Rates by Race/Ethnicity

Race/Ethnicity	2009	2010	2011	2012	2013	Total	Percent of Total	5-Yr Average	Population (10-19 years)	Rate per 100,000 (CI)
White	393	311	362	406	452	1924	54.1%	384.8	159,802	240.8 (217.2 – 265.9)
Hispanic	209	260	240	215	260	1184	33.3%	236.8	206,202	114.8 (100.5 – 130.3)
Asian/PI	28	41	33	42	53	197	5.5%	39.4	62,169	63.4 (44.6 – 85.8)
Black	25	13	18	21	19	96	2.7%	19.2	7,867	244.1 (145.4 – 377.2)
Other/Unknown	24	29	32	28	45	158	4.4%	31.6	19,408	162.8 (110.7 – 229.7)
Total	**679**	**654**	**685**	**712**	**829**	**3,559**	**100%**	**711.8**	**455,448**	**156.3 (145.0 – 168.2)**

(CI) 95% Confidence Intervals.

Geography

The geographic distribution of self-injury between 2009 and 2013 that resulted in an ED visit is presented in **Table 5**.

The table is sorted by rates by city. Overall, 16 cities had a higher rate than the countywide rate of 164.5 per 100,000. Although Laguna Beach had the highest rate at 293.7, because of its relatively small population of 10-19 year olds, this could lead to an unstable rate estimate that should be interpreted with caution.

The four highest rates occurred in Laguna Beach (293.7), San Clemente (265.3), Dana Point (237.2) and Aliso Viejo (231.4). All of which have a higher rate than California at 212.7 per 100,000. The four lowest rates of self-inflicted injury occurred in Irvine (122.1), Garden Grove (113.3), La Palma (97.7), and Stanton (78.8). The highest and lowest rates are scattered across the county, not revealing any clear pattern as is shown in the map in **Figure 11** on page 16.

Table 5: Teen Self-Injury by City (2009-2013)	Total Number	5-Year Average	Rate per 100,000
Laguna Beach	33	6.6	293.7
San Clemente	112	22.4	265.3
Dana Point	42	8.4	237.2
Aliso Viejo	73	14.6	231.4
Laguna Niguel	97	19.4	224.3
Costa Mesa	148	29.6	221.0
California	**56,927**	**11385.4**	**212.7**
Placentia	74	14.8	208.1
Huntington Beach	240	48	203.8
Tustin	108	21.6	202.2
La Habra	93	18.6	198.8
San Juan Capistrano	50	10	193.6
Mission Viejo	130	26	188.1
Orange	178	35.6	176.9
Seal Beach	16	3.2	173.5
Newport Beach	75	15	171.5
Laguna Hills	36	7.2	171.0
Orange County	**3,559**	**711.8**	**164.5**
Lake Forest	91	18.2	160.9
Yorba Linda	83	16.6	160.2
Fullerton	163	32.6	160.1
Santa Ana	439	87.8	159.3
Los Alamitos/Rossmoor	29	5.8	156.8
Unincorporated	105	21	152.0
Brea	42	8.4	150.8
Rancho Santa Margarita	63	12.6	148.5
Anaheim	384	76.8	147.3
Buena Park	89	17.8	143.4
Cypress	55	11	143.2
Fountain Valley	53	10.6	140.1
Villa Park	6	1.2	135.7
Westminister	80	16	128.4
Irvine	189	37.8	122.1
Garden Grove	146	29.2	113.3
La Palma	11	2.2	97.7
Stanton	23	4.6	78.8
Laguna Woods	0	0	0.0

Mechanism of Self-Injury

The two most common mechanisms of self-inflicted injury among Orange County teens were poisoning by a solid or liquid substance, and cutting and piercing; together they accounted for 88.6% of all teen self-inflicted injuries treated in the ED (**Table 6**). Poisoning occurred in 57.6% of cases, and cutting and piercing 31%. The mechanisms of hanging and suffocation, jumping from a high place, and firearms, when combined occurred in less than 3% of cases treated in the ED.

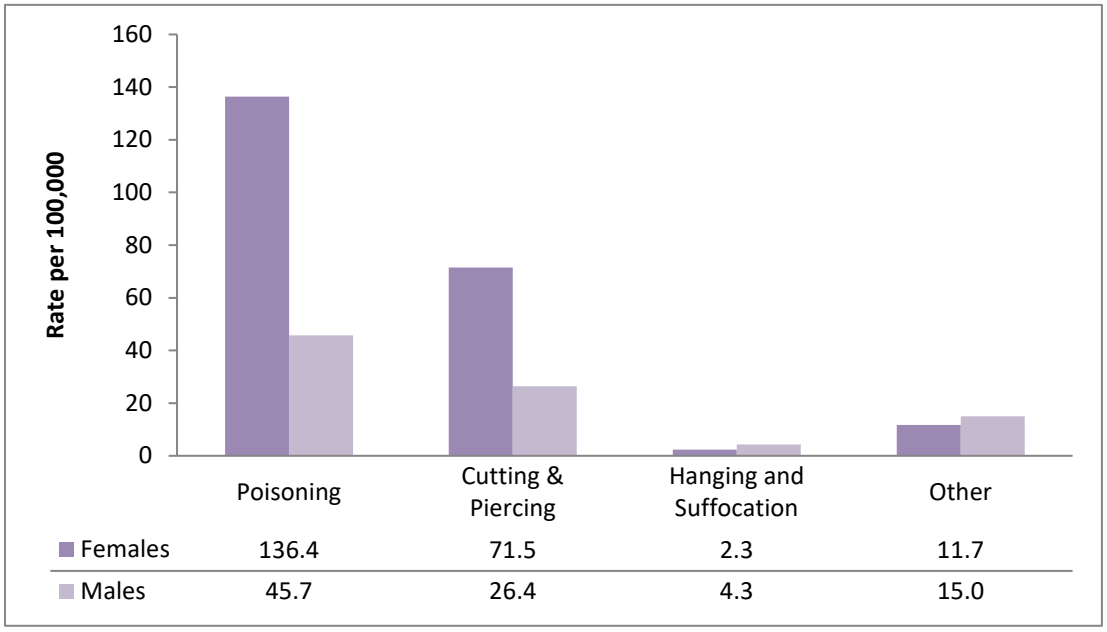
Table 6: Self-Inflicted Injury ED Visits: Mechanism of Injury

Injury Mechanism	Female Total	Male Total	Total	Percent of Total
Poisoning (E950- 952)	1,518	532	2,051	57.6%
Cutting & Piercing (E956)	796	307	1,103	31.0%
Hanging and Suffocation (E953)	26	50	76	2.1%
Firearm (E955)	0	5	5	0.1%
Jump (E957-E958)	6	13	19	0.5%
Other	130	175	305	8.6%
Total	**2,476**	**1,082**	**3,558***	**100 %**

*Gender information was not available for one case.

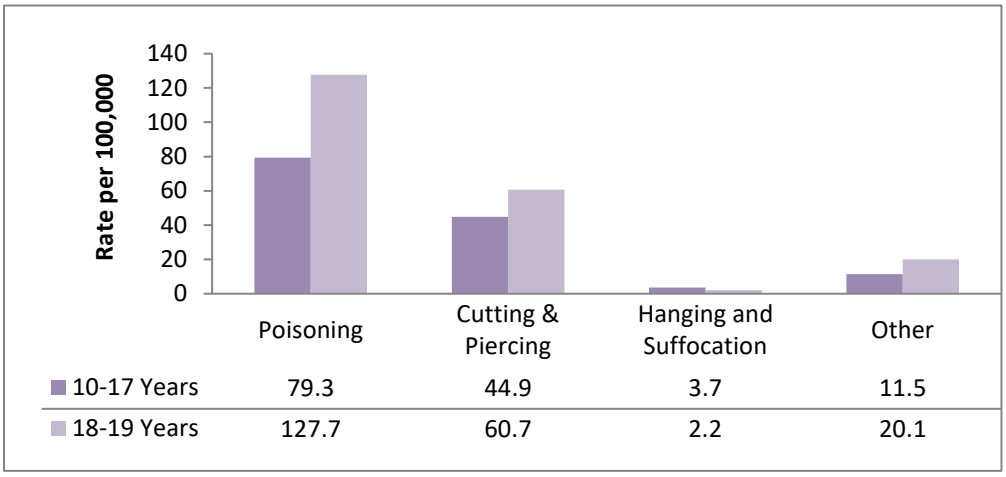
The rate for teen females who poisoned themselves was 136.4 per 100,000, which was three times the rate for males at 45.7 per 100,000 (**Figure 4**). Females also cut themselves more than twice the rate of males at 71.5 and 26.4 per 100,000, respectively. Males had higher rates for hanging and suffocation, and other forms, however, the difference was very small.

Figure 4: Self-Inflicted Injury ED Visits: Rates of Mechanism by Gender



Age group differences were not as great as gender, but still very clear (**Figure 5**). The greatest difference occurred among poisoning cases, as older teens poisoned themselves at a rate of 127.7 per 100,000 compared with 79.3 per 100,000 for younger teens. Another strong difference between older and younger teens was the rate of self-inflicted injury due to cutting. Older teens cut themselves at a rate of 60.7 as opposed to 44.9 for younger teens. There was only a slight different between the use of hanging and strangulation between older and younger teens, but overall the rate was only 3.3 per 100,000.

Figure 5: Self-Inflicted Injury ED Visits: Rates of Mechanism by Age Group



Self-Inflicted Injury Hospitalizations

Approximately 42.5% (n=1,511/3,559) of self-inflicted injury cases by OC teen residents were serious enough to require hospitalization (**Table 7**). This averaged out to about 302 cases per year. For all teen residents, the rate of self-inflicted injury hospitalization was 66.4 per 100,000. Females were well above this rate at 94.2 per 100,000, which was more than double the rate of males at 39.7 per 100,000.

Table 7: Self-Inflicted Injury Hospitalizations Number and Rate by Gender, 2009-2013

Gender	2009	2010	2011	2012	2013	Total	5-Yr Average Number	Percent of Total	Population (10-19 Yrs.)	Rate per 100,000 (CI)
Female	212	185	203	225	223	1,048	209.6	69.4%	222,622	94.2 (81.8 – 107.7)
Male	112	111	75	96	68	462	92.4	30.6%	232,826	39.7 (31.9 – 48.5)
Unknown	1	0	0	0		1	0.2	0.1%	0	NA
Total	**325**	**296**	**278**	**321**	**291**	**1,511**	**302.2**	**100%**	**455,448**	**66.4 (59.0 – 74.2)**

(CI) 95% Confidence Intervals.

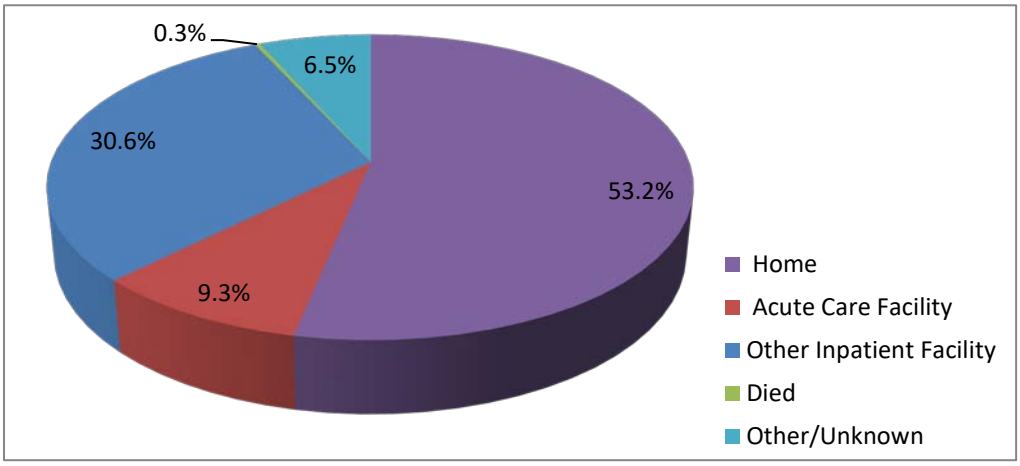
Of the teens admitted for hospitalization, 87% had a known mental illness diagnosis. The most common of which were episodic mood disorders (e.g., Bipolar and Major Depression), Substance Use Disorders (e.g., alcohol/drug abuse, substance-induced mental disorders), and Anxiety/Adjustment Disorders. A total of 6,472 days in the hospital resulted from teen self-inflicted injuries between 2009 and 2013. The average length of stay was 4.3 days. The total cost for days of hospitalization amounted to $34,486,844 with an average cost of

$22,824 per stay. This amount does not take into account the costs of those who were only treated in the ED, which was estimated to be about $2,000 per case. In total this amounts to $38,582,844 spent in the treatment for the self-inflicted injury of teens during this time period.

Patient Disposition and Payer Source

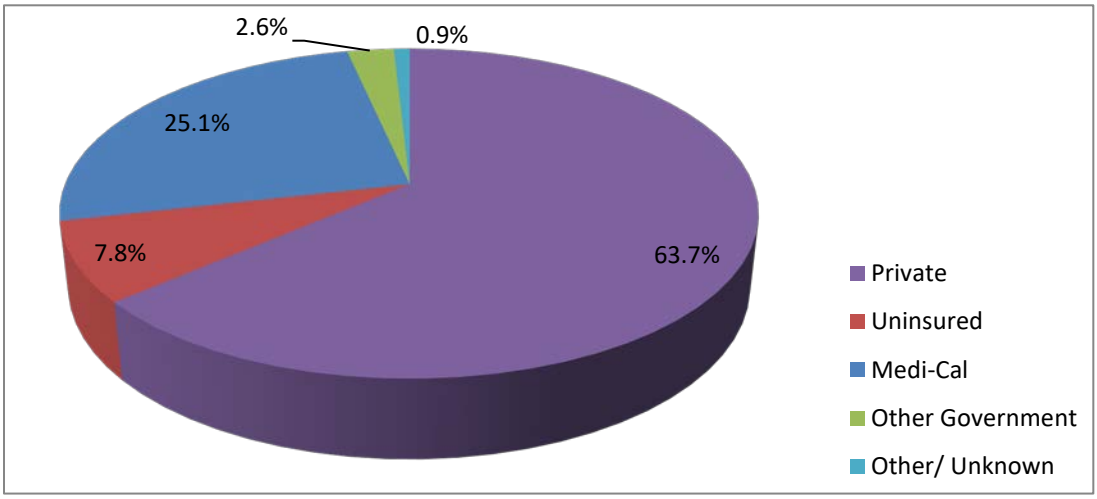
Once released from the hospital, 53.2% of teens were allowed to return home (**Figure 6**). For those who were released into a different facility, 30.6% were transferred into a different inpatient facility, and 9.3% went into another acute care facility. Less than 1% (n=11) died in the hospital.

Figure 6: Self-Inflicted Injury ED Visits by Percentage of Patient Disposition



As seen in **Figure 7**, almost two-thirds (63.7%) of all ED and hospitalization payments came from private insurance. Medi-Cal accounted for 25.1% of the payments. Only 7.8% of cases were uninsured or paid cash. These trends were the same when accounting for race/ethnicity.

Figure 7: Self-Inflicted Injury ED Visits by Percentage of Patient Payer Type



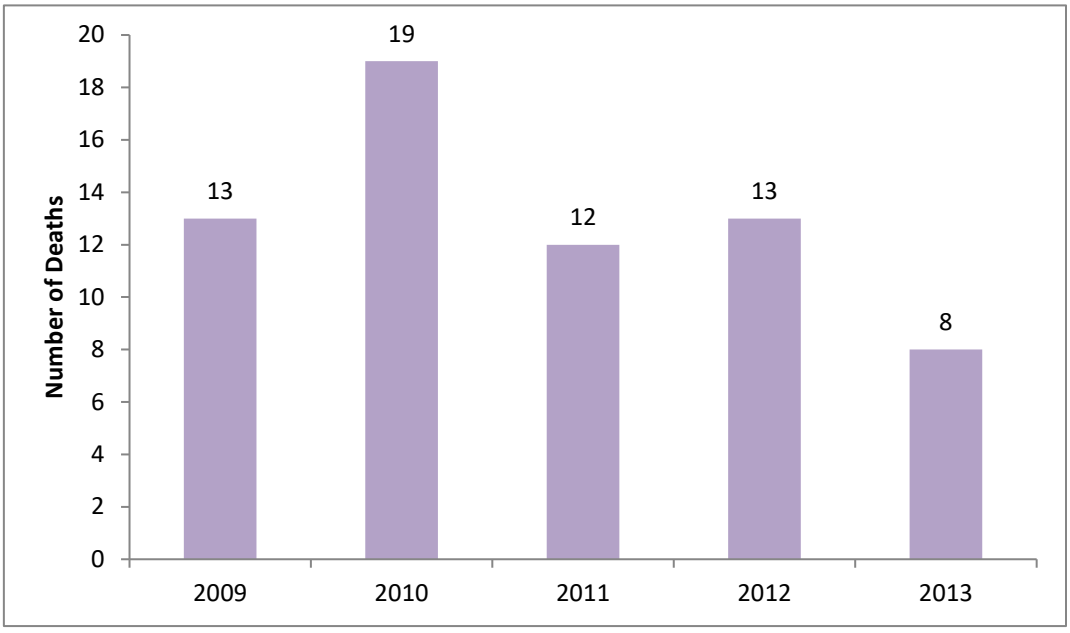
Intentional self-inflicted injury is a strong predictor of a future suicide attempt. Between 2009 and 2013 almost 712 teens per year injured themselves seriously enough to require treatment in the ED or necessitate hospitalization. The next section in this report will characterize the 65 self-injury cases that resulted in death.

SUICIDE

In this section of the report, we examine fatal self-inflicted injury (suicides) among Orange County teens (10-19 years old) and describe trends by method of suicide, gender, age group, race/ethnicity, and geographic location. Suicide death data was obtained from the Orange County Master Death File matched to the Orange County Sheriff-Coroner's case files. The suicide deaths were identified according to International Classification of Diseases, Tenth Revision (ICD-10) codes for the underlying cause of death. Suicide deaths included ICD-10 codes X60-X84 and Y87.0. The OC Coroner data were used if there were any discrepancies between the two data sources. Because the cause of death for suicides can fluctuate from year-to-year and the number of cases is relatively small, examining a single year may not provide the most accurate description of the problem. Thus in this report, we report the rates over a five-year period from 2009 to 2013. The population data specific to Orange County, used to calculate rates, were obtained from the 2011 California Department of Finance population estimates.

From 2009 to 2013, there were **65** incidents of fatal self-inflicted injury or suicide reported among Orange County teen residents; for a five-year average of 13 suicides per year (**Figure 8**). The average rate was 2.9 suicide deaths per 100,000 OC teen residents. Orange County's average teen suicide rate is well below the Healthy People 2020 Objective of no more than 10.2 suicide deaths per 100,000. The rate is also below California's rate at 3.2 per 100,000 and the corresponding national rate of 4.8 per 100,000. For specific details regarding suicides to all Orange County residents, please refer to the separate report titled "*Suicide Deaths in Orange County (2009-2011). Orange County Health Care Agency, Santa Ana, California. August 2014*."

Figure 8: Number of Suicides by OC Teens (10-19 Years), 2009-2013



The mechanism or cause of death for suicides among Orange County teen residents from 2009 to 2013 is presented in **Table 8.** The majority (84.6%) of teen suicides were caused by one of three mechanisms; 53.8% from hanging, strangulation, and suffocation (n=35 of 65 suicides), 23.1% from firearms (n=15 of 65 suicides), and 7.7% from poisoning/overdose (n=5 of 65 suicides). Other mechanisms of suicide used less frequently by OC teens included jumping from a high place (6.2%), using a cutting or piercing instrument (3.1%), jumping or lying before a moving object (3.1%), crashing of motor vehicle (1.5%), and late effects of self-inflicted injury (1.5%).

Table 8. Number and Percentage of Teen Suicides by Mechanism, 2009-2013

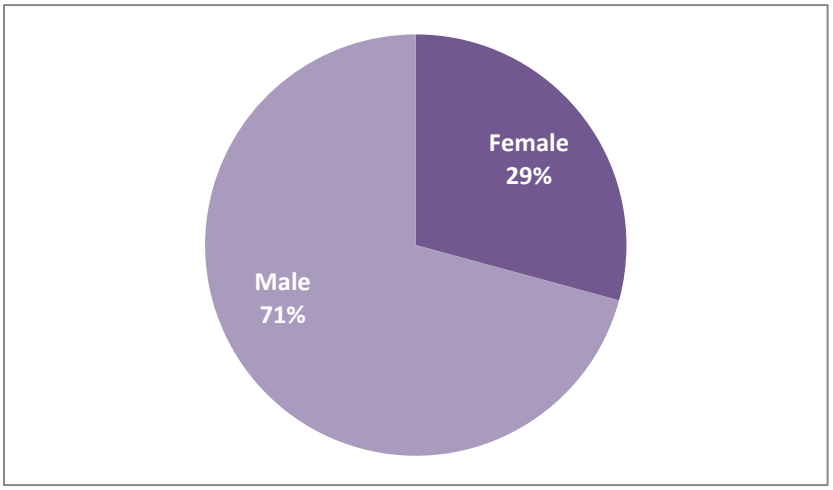
Mechanism (Principal External Cause of Death (ICD-10 Codes)	Total	Percent (%)
Poisoning by Solid or Liquid Substance (X60-X62, X64-X67, X69)	**5**	**7.7%**
Narcotics and psychodysleptics [hallucinogens] not elsewhere classified (X62)	1	1.5%
Other unspecified drugs, medicaments and biological substances (X64)	4	6.2%
Hanging, Strangulation, and Suffocation (X70)	**35**	**53.8%**
Firearms, Air Guns, and Explosives (X72-X74)	**15**	**23.1%**
Intentional self-inflicted injury by handgun discharge (X72)	6	9.2%
Intentional self- inflicted injury by rifle, shotgun and larger firearm discharge (X73)	6	9.2%
Intentional self- inflicted injury by other and unspecified firearm discharge (X74)	3	4.6%
Cutting & Piercing Instrument (X78)	**2**	**3.1%**
Jumping from a High Place (X80)	**4**	**6.2%**
Other and Unspecified Means	**4**	**6.2%**
Jumping or lying before moving object (X81)	2	3.1%
Crashing of motor vehicle (X82)	1	1.5%
Late Effects of Self-Inflicted Injury (Y87.0)*	1	1.5%
Total	**65**	**100%**

*Categories Y87 are to be used to indicate circumstances as the cause of death, impairment or disability from sequelae or "late effects", which are themselves classified elsewhere. The sequelae include conditions reported as such, or occurring as "late effects" one year or more after the originating event. (Y87.0) late effects of intentional self- inflicted injury.

Gender

As shown in **Figure 9**, there was great disparity in teen suicides by gender. In Orange County, more male teens (n=46) ended their lives compared to female teens (n=19), which is consistent with both state and national patterns.

Figure 9: Percent of Suicide Deaths for OC Teens by Gender, 2009-2013



As shown in **Table 9**, Orange County male teens accounted for 70.8% of teen suicides (n=46 out of 65 suicides) although they comprised only 51% of the total county teen population. Whereas, female teens accounted for 29.2% of teen suicides (n=19 out of 65 suicides) and comprised 48.8% of the total county teen population. On average, male teens accounted for 9.2 suicide deaths each year compared to 3.8 for females. At 4.0 (per 100,000 population), males had a higher suicide rate than the County overall teen suicide rate of 2.9 (**Table 9**).

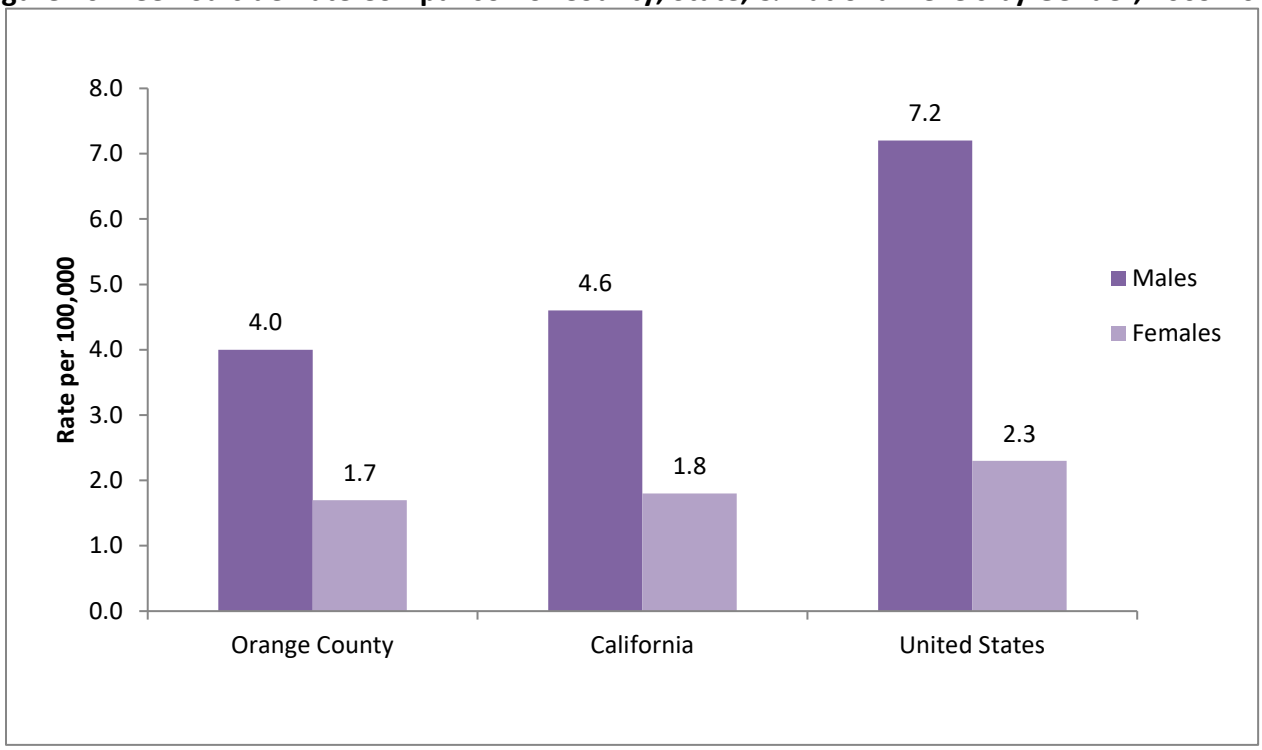
Table 9: Orange County Teen Residents, Suicide Deaths by Gender (2009-2013)

Gender	Number					Total 2009-2013	5-Year Average	2011 Population	Rate per 100,000 (CI)
	2009	2010	2011	2012	2013				
Male	8	14	8	9	7	46	9.2	232,826	4.0 (1.8 - 7.3)
Female	5	5	4	4	1	19	3.8	222,622	1.7* (0.4 - 4.3)
Total	**13**	**19**	**12**	**13**	**8**	**65**	**13.0**	**455,488**	**2.9 (1.5 - 4.9)**

*Rates are unreliable when the 5-year average was < 5 case, interpret with extreme caution. 95% Confidence Intervals (CI).

Figure 10 displays the comparison between suicide rates at the county, state, and national levels. California teens had similar rates compared with Orange County teens, although slightly higher for both males (4.6 per 100,000, CI: 3.8 - 5.4) and females (1.8 per 100,000, CI: 1.3 - 2.3). In comparison with national rates, Orange County teens had much lower rates, particularly seen with males who had a national rate of 7.2 per 100,000 (CI: 6.8 - 7.6). Female teens had a rate of 2.3 (CI: 2.1 - 2.5) per 100,000 at the national level.

Figure 10: Teen Suicide Rate Comparison of County, State, & National Levels by Gender, 2009-2013



*CA Source: CDPH Vital Statistics Death Statistical Master Files
**US Source: CDC WONDER Online Database

As shown in **Table 10**, the leading mechanism of suicide for both male and female teen residents in Orange County was by hanging, strangulation, and suffocation (males=54.4%; females=52.6%). The second most frequent method of suicide for male teens was via firearms (32.6%); this method was exclusively used by males. The second most frequent method of suicide for female teens were jumping from a high place (15.8%) and poisoning/drug overdose (15.8%).

Table 10: External Cause of Deaths by Gender (2009-2013)

External Cause of Death (ICD-10 Codes)	Male N (%)	Female N (%)
Poisoning by Solid or Liquid Substance (X60-X62, X64-X67, X69)	**2 (4.4%)**	**3 (15.8%)**
Narcotics and psychodysleptics [hallucinogens] not elsewhere classified (X62)	1	0
Other unspecified drugs, medicaments and biological substances (X64)	1	3
Hanging, Strangulation, and Suffocation (X70)	**25 (54.4%)**	**10 (52.6%)**
Firearms, Air Guns, and Explosives (X72-X74)	**15 (32.6%)**	**0 (0%)**
Intentional self- inflicted injury by handgun discharge (X72)	6	0
Intentional self- inflicted injury by rifle, shotgun and larger firearm discharge (X73)	6	0
Intentional self- inflicted injury by other and unspecified firearm discharge (X74)	3	0
Cutting & Piercing Instrument (X78)	**0 (0%)**	**2 (10.5%)**
Jumping from a High Place (X80)	**1 (2.2%)**	**3 (15.8%)**
Other and Unspecified Means	**3 (6.5%)**	**1 (5.3%)**
Jumping or lying before moving object (X81)	1	1
Crashing of motor vehicle (X82)	1	0
Late Effects of Self-Inflicted Injury (Y87.0)*	1	0
Total	**46 (100%)**	**19 (100%)**

Age Group

As shown in **Table 11,** comparison between the incident of suicide among younger teens (10-17 years old) and older teens (18-19 years old) showed disparity. Nearly half of all suicides occurred among teens 18-19 years old. Younger teen and older teen residents had similar five-year average number of suicides (6.6 and 6.4 deaths per year, respectively). However, at 6.3 deaths per 100,000, older teens had an average rate that was over three times higher than younger teens (1.9 per 100,000).

Table 11: Orange County Teen Residents, Suicide Deaths by Age Group (2009-2013)

Age Group	Number					Total 2009-2013	5-Year Avg.	2011 Population	Rate per 100,000 (CI)
	2009	2010	2011	2012	2013				
10-17 years old	9	7	6	5	6	33	6.6	353,946	1.9 (0.7 – 3.9)
18-19 years old	4	12	6	8	2	32	6.4	101,502	6.3 (2.2 – 12.9)
Total	**13**	**19**	**12**	**13**	**8**	**65**	**13.0**	**455,488**	**2.9 (1.5 – 4.9)**

(CI) 95% Confidence Intervals.

Race/Ethnicity

White teens accounted for the majority of suicides among Orange County teen residents between 2009 and 2013 with 46.2%, followed by Hispanic teens with 29.2% of all suicides (**Table 12**). The remaining quarter of suicides was divided among Asian/PI (13.8%), Black (4.6%) and Other/Unknown (6.2%).

White teens were the only group to have an average number of cases high enough to result in a reliable rate of 3.8 per 100,000, during the five-year period. Suicide rates for Hispanics (1.8) and Asian/PIs (2.9), while comparable with statewide rates, should be interpreted with caution due to the small case numbers.

Table 12. Orange County Teen Residents, Suicide Deaths by Race/Ethnicity (2009-2013)

Race/Ethnicity	Number					Total 2009-2013	5-Year Avg.	2011 Population	Rate per 100,000 (CI)
	2009	2010	2011	2012	2013				
White	7	7	5	7	4	30	6.0	159,802	3.8 (1.4 – 8.2)
Hispanic	4	9	2	2	2	19	3.8	206,202	1.8* (0.4 – 4.6)
Asian/PI	1	2	3	3	0	9	1.8	62,169	2.9* (0.2 – 10.3)
Black	0	0	2	1	0	3	0.6	7,867	NS
Other/ Unknown	1	1	0	0	2	4	0.8	19,408	NS
Total	**13**	**19**	**12**	**13**	**8**	**65**	**13.0**	**455,448**	**2.9 (1.5 – 4.9)**

NS- Rate is Not Stable. *Rates are unreliable and when the 5-year average was < 5 case, interpret with extreme caution. (CI) 95% Confidence Intervals.

Geography

The geographic distribution of suicide deaths from 2009 to 2013 are presented in **Table 13**. Due to the low numbers of teen suicide deaths, rates cannot be calculated by cities.

Based on percentage of total number of suicides from 2009 to 2013, the two most populous cities, Anaheim and Santa Ana had the highest number of teen suicides; each with seven suicides or 10.8% of all teen suicides. This was followed by Fullerton with 9.2% and San Clemente with 7.7% of all teen suicides.

The majority (65%; n=22 out of 34 cities) of Orange County's incorporated cities and unincorporated areas had at least one teen resident(s) who died by suicide. The remaining 12 cities, or 35% of the incorporated cities, did not have any teen suicides between 2009 and 2013.

The map (**Figure 11**) illustrates the relationship between the number of suicide deaths and self-inflicted injury rate for 2009-2013 by the descendant's city of residence. The two suicides, which occurred in an unincorporated area, were excluded from the map.

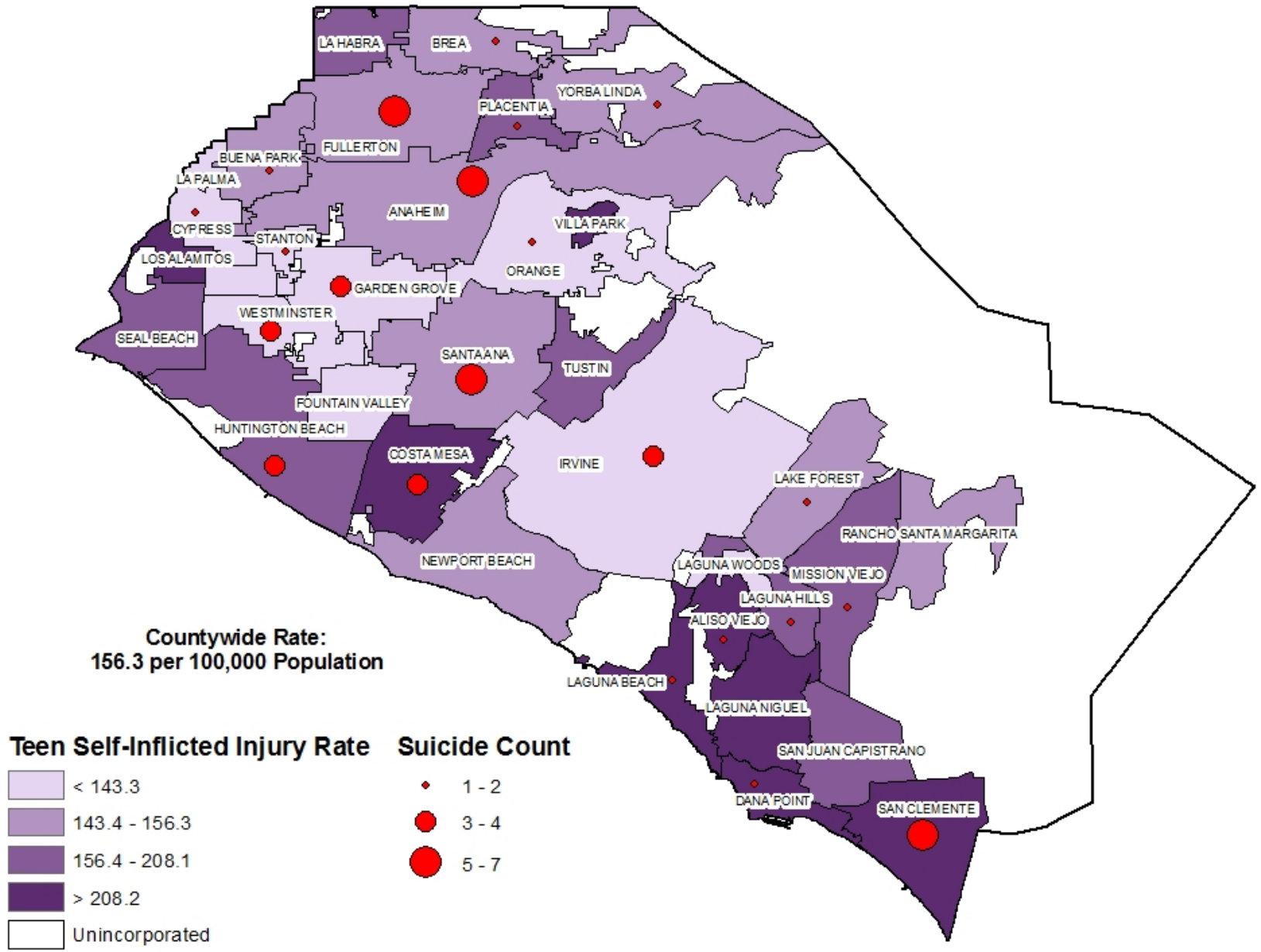
Teen suicides were not concentrated in any particular area of the county. Notable, is the relatively low to non-existent numbers of teen suicides in some of the more populous cities in central Orange County such as Tustin, Fountain Valley, and Newport Beach. Not surprisingly, cities with very low numbers of teens (e.g., Laguna Woods, Seal Beach) did not see any teen suicides during the five-year period.

There was no correlation of a higher suicide count in cities with a higher self-inflicted injury rate. Higher self-inflicted injury rates are clustered in the southern part of the County in the cities of Dana Point, San Clemente, Laguna Beach, and Aliso Viejo. Each of these cities had only one teen suicide take place during the five-year span, with exception of San Clemente, which had five.

Table 13. OC Teen Suicide Deaths by City (2009-2013)

City	Total Number	% of Total
Anaheim	7	10.8%
Santa Ana	7	10.8%
Fullerton	6	9.2%
San Clemente	5	7.7%
Costa Mesa	4	6.2%
Garden Grove	4	6.2%
Huntington Beach	4	6.2%
Irvine	3	4.6%
Westminster	3	4.6%
Brea	2	3.1%
Lake Forest	2	3.1%
Orange	2	3.1%
Unincorporated Area	2	3.1%
Aliso Viejo	1	1.5%
Buena Park	1	1.5%
Cypress	1	1.5%
Dana Point	1	1.5%
Laguna Beach	1	1.5%
Laguna Hills	1	1.5%
Mission Viejo	1	1.5%
Placentia	1	1.5%
Stanton	1	1.5%
Yorba Linda	1	1.5%
Fountain Valley	0	0.0%
La Habra	0	0.0%
La Palma	0	0.0%
Laguna Niguel	0	0.0%
Laguna Woods	0	0.0%
Los Alamitos	0	0.0%
Newport Beach	0	0.0%
Rancho Santa Margarita	0	0.0%
San Juan Capistrano	0	0.0%
Seal Beach	0	0.0%
Tustin	0	0.0%
Villa Park	0	0.0%
Orange County	**65**	**100%**

Figure 11: Teen Self-Inflicted Injury and Suicide Deaths by City (2009-2013)



SUICIDE RISK FACTORS

This final section will address key risk factors involved in the suicide deaths of OC teens. One question that always comes up after a suicide is *why*, and this section hopes to answer that at least in part. Data were obtained through a review of the Coroner cases files which is summarized in the remainder of this report. Each case was reviewed by at least two of the three study-team members. The two suicides of teen residents who died outside of Orange County were excluded from the analysis because their case files were not available.

Risk Factors by Gender

Table 14 lists the most prominent risk factors found among the decedents and is separated by gender. The top risk factor showed that nearly 71.9% of teen suicide victims had mental illness symptoms, with 65% of all cases being diagnosed with a mental illness. A history of self-inflicted injury appeared in almost 71% of the cases, and 68% of teens had made previous suicide threats. A history of substance abuse was indicated in 66% of the cases, and 65% of teens had a recent or ongoing school or job conflict.

Table 14: Risk Factors for Suicide by OC Teen Residents (10-19 Years) by Gender, 2009-2013

Risk Factors	Female (%) (n=19)	Male (%) (n=44)	Total (%) (n=63)
Mental Illness Symptoms	76.5%	70.0%	71.9%
History of Self Harm	60.0%	78.6%	70.8%
Previous Suicide Threats	64.3%	69.7%	68.1%
History of Substance Abuse	69.2%	64.3%	65.9%
School or Job Conflict	66.7%	64.3%	65.0%
Diagnosed Mental Illness	75.0%	60.7%	65.0%
Positive Toxicology Screen	42.1%	53.7%	50.0%
Recent Relationship Issues	58.8%	36.4%	44.0%
Previous Suicide Attempts	42.9%	42.9%	42.9%
Child Abuse Registry Report	53.8%	33.3%	41.2%
Criminal Justice Involvement	21.4%	37.5%	32.6%
Parental Conflict	26.3%	27.3%	27.0%

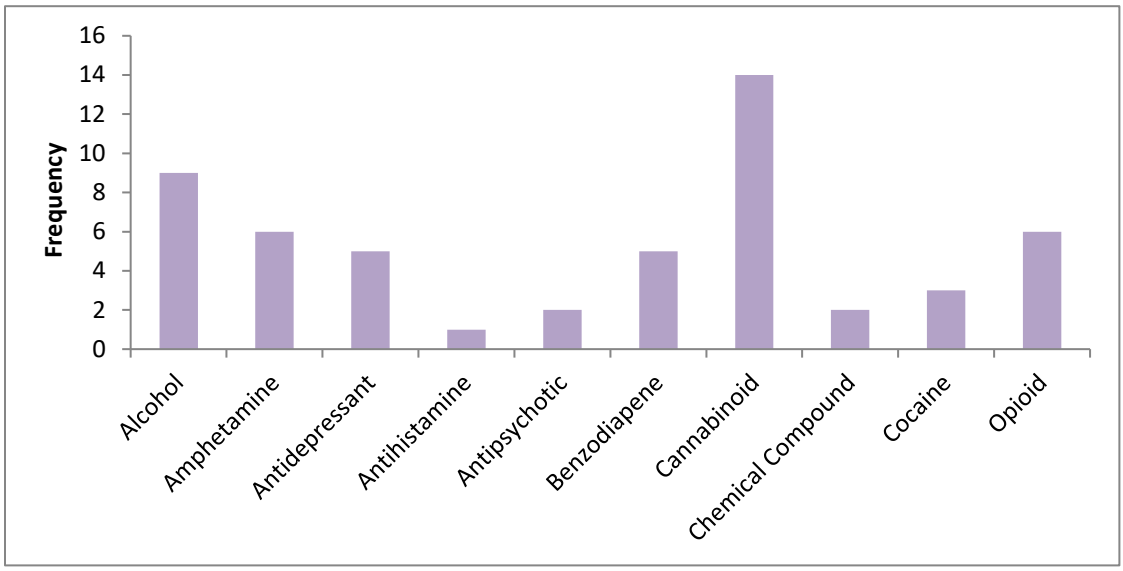
As seen in **Table 14**, recent relationship issues and Child Abuse Reports (CAR) investigations did not yield as high percentages overall, yet it is clear that the impact was more pronounced for females than for males. Specifically, 58.8% of females were influenced by a recent relationship issue, compared with only 36.4% of males. Conversely, criminal justice involvement had a greater influence on males, but involved less than a third of all teens. Cases with a history of self-inflicted injury also showed a distinguishable difference, as this occurred among 78.6% of males and 60% of females. Previous suicide attempts occurred in 43% of the cases; equally for males and females. Parental conflict had the lowest overall percentage with only about a quarter of teens having this issue.

One risk factor of particular interest was a diagnosed mental illness. The two most common diagnoses of mental illness were Depression and Bipolar Disorder. Almost 81% had Depression, while 27% were diagnosed with Bipolar Disorder. Substance Abuse Disorder (SUD), Post Traumatic Stress Disorder (PTSD), and Attention Deficit

Hyperactivity Disorder (ADHD) were each diagnosed in 7.7% of cases. Only one decedent was diagnosed with Schizophrenia. The mental illness diagnoses were not mutually exclusive, as over half (54%) of decedents were diagnosed with two or more mental illnesses.

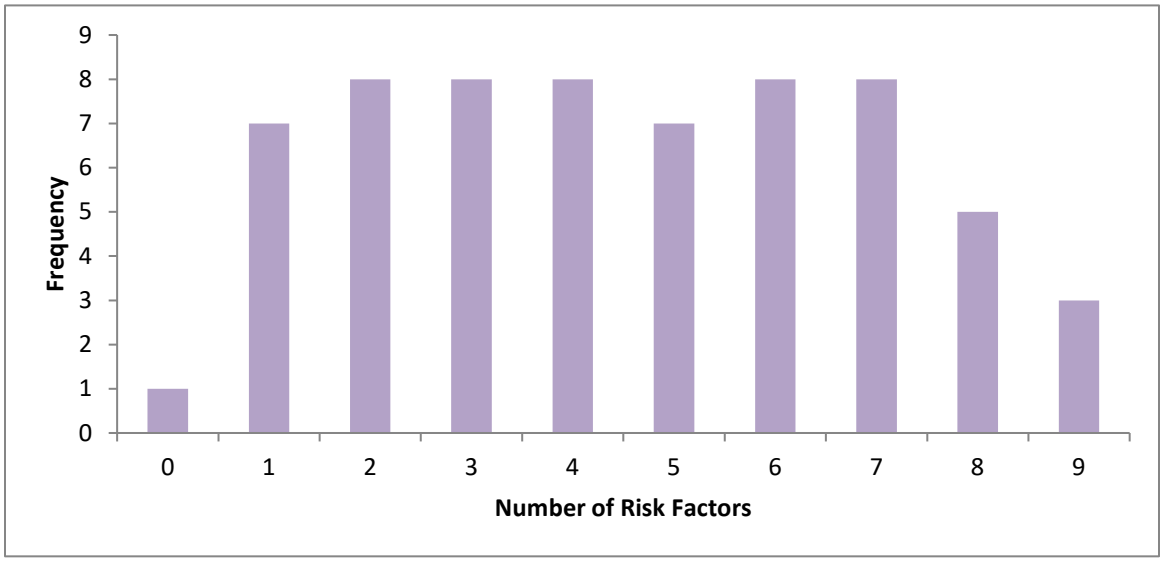
Another risk factor of interest was the decedents' toxicology screen, in which half of all teens tested positive. Of the ten drug classifications found, the most common occurrence was Cannabinoids (i.e., marijuana), followed by Alcohol, Opioids, and Amphetamines (**Figure 12**).

Figure 12: Toxicology Findings by Drug Type among Teen Suicides in OC, 2009-2013



Overall, almost all the teen suicide victims had least one risk factor which may have contributed to their decision to die by suicide. However, a large majority had multiple risk factors that contributed to their death. On average, each teen had 4.5 risk factors (**Figure 13**). There was no clear pattern in the number of risk factors, suggesting there is no threshold that leads to suicide, and the amount depended on each individual.

Figure 13: Average Number of Risk Factors per Teen Suicide in OC, 2009-2013



Modeled after the Hempstead and Phillips (2015) study, the 12-risk factors listed in **Table 13** were classified into one of three major categories or placed as a planning/intent indicator. The first category is Personal Circumstance, which describes the mental and physical health of the decedents. The Personal Circumstance category contains the risk factors of mental illness symptoms, diagnosed mental illness, history of self-inflicted injury, history of substance abuse, and positive toxicology screen. The second major category is Interpersonal Circumstance, which reflects certain relationships the decedent had. This category contains the factors of relationship conflict, parental conflict, and child abuse report. The third and final major category is External Circumstance, which includes the environment related factors of school or job conflict, and a criminal history. The planning/intent factors represent indications of the decedent's suicidal nature and are under each major category. These factors are previous suicide threats, previous suicide attempts, a suicide note, and a recent crisis. The recent crisis was characterized by the three major categories. **Table 15** on the following page depicts the major categories and intent factors by gender.

Personal Circumstances occurred amongst 100% of female suicides and 86.4% of male suicides. More females had a diagnosed mental illness than males, 75% vs. 65.4%. However, 84.6% of males had a history of self-inflicted injury in comparison with 60% of females. A history of drug abuse appeared equally among females and males at 69.2%. However, male were more likely to have a positive toxicology screen (61.1%) compared to 47.1% of females. Previous suicide threats was the planning/intent factor that affected the most teens at 78.0% overall, with 75% of females and 79.3% of males expressing suicidal ideation. A recent personal crisis clearly impacted more females (78.6%) than males (58.3%) for an overall total of 65.8%.

Similar to Personal Circumstances, Interpersonal Circumstances showed up amongst more females than males. Almost 90% of females were affected as opposed to 66.7% of males. Relationship issues showed the greatest difference between females and males of any interpersonal risk factors; 71.4% of females were impacted and 52.2% of males. Parent or guardian conflict was not very common amongst females (27.8%) or males (33.3%). Child Abuse Reports were roughly seen in half of female and male cases. A recent interpersonal crisis was the largest planning/intent factor under Interpersonal Circumstances, having occurred in 97.1% of teens. This impacted 100% of females and 95.2% of males. Previous suicide threats appeared in a little more than two-thirds of the Interpersonal cases.

External Circumstances had a greater impact on males than females, at 69.2% and 64.7% respectively. A school or job problem was the most common External Circumstance seen in 88.9% of females and 85.7% of males. A criminal record occurred in 54.5% of males but only 33.3% of females. A recent external conflict was the largest planning/intent factor that appeared, and showed up in in 73.1% of teens. There was a distinct difference between females at 85.7% and males at 68.4%. Previous suicide threats occurred in about three-quarters of both female and male teens dealing with an External Circumstance. While suicide notes are not very common, 54.5% of females left a suicide note compared with only 16% of males who faced an External Circumstance.

Table 15: Prevalence of Major Circumstance Categories, with Intent Factors, among Teens Aged 10-19 Years in Orange County California, 2009-2013

	Females (%) (n=19)	Males (%) (n=44)	Total 10-19 Years (%) (n=63)
Major Category: Personal Circumstances	**100.0%**	**86.4%**	**90.2%**
Includes one or more of these specific circumstances			
Mental Illness Symptoms	86.7%	80.0%	82.0%
Diagnosed Mental Illness	75.0%	65.4%	68.4%
History of Self-Inflicted Injury	60.0%	84.6%	73.9%
History of Drug Abuse	69.2%	69.2%	69.2%
Positive Toxicology Screen	47.1%	61.1%	56.6%
Planning and intent factors for this major category			
Recent Personal conflict or crisis	78.6%	58.3%	65.8%
Left a suicide note	35.3%	20.6%	25.5%
Previous suicide threats	75.0%	79.3%	78.0%
Previous suicide attempts	50.0%	52.2%	51.4%
Major Category: Interpersonal Circumstances	**88.9%**	**66.7%**	**74.1%**
Includes one or more of these specific circumstances			
Relationship Issues	71.4%	52.2%	59.5%
Parent or Guardian conflict	27.8%	33.3%	31.5%
Child Abuse Registry Report	50.0%	45.5%	47.8%
Planning and intent factors for this major category			
Recent Interpersonal conflict or crisis	100.0%	95.2%	97.1%
Left a suicide note	25.0%	17.4%	20.5%
Previous suicide threats	66.7%	63.2%	64.5%
Previous suicide attempts	41.7%	52.9%	48.3%
Major Category: External Circumstances	**64.7%**	**69.2%**	**67.9%**
Includes one or more of these specific circumstances			
School or Job problem	88.9%	85.7%	86.7%
Criminal Record	33.3%	54.5%	48.4%
Planning and intent factors for this major category			
Recent External conflict or crisis	85.7%	68.4%	73.1%
Left a suicide note	54.5%	16.0%	27.8%
Previous suicide threats	75.0%	73.7%	74.1%
Previous suicide attempts	57.1%	44.4%	48.0%

Of the three major categories, Personal Circumstance affected the most teens at 90.2%. For females, Interpersonal Circumstance was next highest (88.9%), followed by External Circumstance (64.7%). However, this was not the case for males who were impacted more by External Circumstances at 69.2% rather than Interpersonal Circumstances at 66.7%. Overall, for teens plagued by Personal Circumstances, a mental illness symptom was the most common risk factor, followed by a history of self-inflicted injury. Of the teens who had

Interpersonal Circumstances, relationship conflict was the most common. And for teens with External Circumstances, a school or job problem occurred most often. Regarding planning/intent factors, previous suicide threats and a recent crisis were the two most common factors. Previous suicide attempts occurred in about 50% of cases under each of the major categories, and suicide notes were found in less than the 30%.

Risk Factors by Age Group

Nine of the twelve risk factors were more common in older teens except; for a history of self-inflicted injury, parent conflict, and school or job conflict (**Table 16**). Older teens had percentages of 50% or higher for eight out of the twelve risk factors compared to younger teens, who had six risk factors at 50% or higher .

Table 16: Suicide Risk Factors for OC Teen Residents by Age Group, 2009-2013

Risk Factors	Younger Teens (%) (n=33)	Older Teens (%) (n=30)	Total (%) (n=63)
Mental Illness Symptoms	62.5%	84.0%	71.9%
History of Self-Inflicted Injury	73.3%	66.7%	70.8%
Previous Suicide Threats	58.3%	78.3%	68.1%
History of Substance Abuse	55.0%	76.2%	65.9%
School or Job Conflict	72.4%	45.5%	65.0%
Diagnosed Mental Illness	60.0%	70.0%	65.0%
Positive Toxicology Screen	30.0%	70.0%	50.0%
Recent Relationship Issues	30.8%	58.3%	44.0%
Previous Suicide Attempts	36.4%	50.0%	42.9%
Child Abuse Registry Report	40.6%	*	41.2%
Criminal Justice Involvement	14.3%	48.0%	32.6%
Recent Parental Conflict	42.4%	9.7%	27.0%

*less than 5 cases

For younger teens, the two most pronounced risk factors were a history of self-inflicted injury at 73.3%, and school or job conflict at 72.4%; both greater than older teens at 66.7% and 45.5%, respectively. This deviated from the previous pattern of mental illness symptoms having been the foremost risk factor as it was for older teens. The biggest difference in risk factors between younger and older teens was a positive toxicology screen, where 70% of older teens had a positive toxicology screen compared with only 30% of younger teens. Another large difference between younger and older teens was with the risk factor of recent parental conflict. This occurred in 42.4% of younger teens, but only for 9.7% of older teens.

The results of breaking down the three major categories of Personal, Interpersonal, and External circumstances based on younger and older teens are shown in **Table 17.**

Table 17: Occurrence of Major Categories Resulting in Suicide for OC Teen Residents by Age Group, 2009-2013

Major Categories	Younger Teens (%) (n=33)	Older Teens (%) (n=30)	Total (%) (n=63)
Personal	83.9%	96.7%	90.2%
Interpersonal	73.3%	75.0%	74.1%
External	67.7%	68.0%	67.9%

Source: Extracted from OC Sheriff-Coroner's Case History Reports.

Personal Circumstances occurred most often for both age groups, but were notably higher for older teens (96.7%) compared to 83.9% of younger teens. This difference was largely driven by higher percentage of older teens with mental illness symptoms/diagnoses and active drug/alcohol use as indicated by a positive toxicology screen. There was less of a disparity between age groups for Interpersonal Circumstances, though older teens had a higher percentage of recent relationship problems, while younger teens tended to have more parental conflict. External Circumstances overall were similar between age groups, however, young teens had more school problems, whereas older teens tended to have more criminal justice issues.

Summary

Self-inflicted injury is a health behavior that is most prevalent among adolescents and young adults (Suicide Deaths in OC, 2014). While most self-inflicted injury does not result in death, it is an important risk factor for a future suicide attempt. On average, over 700 teens in Orange County intentionally injured themselves each year, requiring a visit to the ED or hospitalization. This resulted in a rate of 156.3 per 100,000 which is well below the California rate of 212.7 per 100,000. Nearly 70% of teen self-inflicted injuries that resulted in an ED visit were to females. The two most common mechanisms of self-injury were poisoning and cutting and piercing.

Of the 65 suicides that occurred, 70% were male. The more lethal methods of hanging and strangulation, and firearms were the two most common mechanisms of suicide. Hanging and strangulation occurred in 50.8% of the cases, and firearms in 23.1% of the cases.

In comparison with the state and national levels, Orange County had overall lower suicide rates for teens between 2009 and 2013. While the state rates were roughly similar, comparison with the national rates showed the largest difference, especially for males, where the county and state are notably lower.

Suicide is almost never the result of just one circumstance, but the combination of personal, interpersonal, and external events. This was seen among OC teens as there was an average of 4.5 risk factors per teen who died by suicide. The most prominent risk factors were mental illness symptoms, diagnosed mental illness, a history of self-inflicted injury, a history of substance abuse, previous suicide threats, and school or job conflict. Depression was the most commonly diagnosed and undiagnosed mental illness, highlighting the need to improve upon mental health access, services, and treatment for this age group.

One main goal of the Mental Health Services Act (MHSA), passed in 2004 by California voters, is to identify those most at risk of self-inflicted injury. MHSA funding supports a wide range of mental health services, including a state administered project to address Prevention and Early Intervention (PEI) program. The PEI programs hope to reduce multiple risk factors, and promote well-being in order to prevent the initial onset of, worsening of, or suffering associated with mental health problems.

As a preventable action, it is important to reach teens before they make the decision to intentionally self-injure themselves. In Orange County, teens have the highest number of intentional self-harm cases among all age groups (Self-Inflicted Injury, 2015), and suicide is the second leading cause of death for 15-24 year olds (Premature Death, 2014). The findings of this study reveal some aspects regarding why teens might take their own life by suicide, and hopefully it will help target prevention and intervention efforts for those teens most at risk of intentional self-injury and suicide in Orange County and elsewhere.

References

1. Centers for Disease Control and Prevention. External Cause of Injury Mortality Matrix for ICD-10. Available at http://www.cdc.gov/nchs/data/ice/icd10_transcode.pdf. Last accessed March 25, 2015.

2. Hawton, K & van Heeringen, K. (2009). *Suicide*. Lancet, 373, 1372-1381.

3. Hempstead, KA, Phillips, JA . *Rising suicide among adults aged 40-64 Years: the role of Job and Financial Circumstances*. American Journal of Preventative Medicine. 2015 Article in Press.

4. Klonsky, ED, Victor, SE, & Saffer, BY. (2014). *Non-suicidal self-injury: What we know, and what we need to know*. Canadian Journal of Psychiatry, 59(11), 565–568.

5. Mars, B, Heron J, Crane, C, et al. (2014). *Differences in risk factors for self-harm with and without suicidal intent: Findings from ALSPAC cohort*. Journal of Affective Disorders, 168(100): 407-414.

6. Miller, M., Azrael, D., & Barber, C. (2012) *Suicide mortality in the United States: The importance of attending to method in understanding population-level disparities in the Burden of Suicide*. Annual Review of Public Health, 33, 393-408.

7. Pitts, SR, Niska, RW, Xu, J, & Burt ,CW. (2008). *National Hospital Ambulatory Medical Care Survey: 2006 emergency department summary*. National health statistics reports; no 7. Hyattsville, MD: National Center for Health.

8. Premature Mortality in Orange County. Orange County Health Care Agency, Santa Ana, California. September 2014. http://ochealthinfo.com/about/admin/pubs/deathoc.

9. Self-Inflicted Injury in Orange County. Orange County Health Care Agency, Santa Ana, California. March 2015. http://ochealthinfo.com/about/admin/pubs/selfharm.

10. Suicide Deaths in Orange County (2009-2011). Orange County Health Care Agency. Santa Ana, California, August 2014. http://ochealthinfo.com/suicide.

11. U.S. Department of Health and Human Services (HHS) Office of the Surgeon General and National Action Alliance for Suicide Prevention. *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action.* Washington, DC: HHS, September 2012.

SUICIDE PREVENTION RESOURCES

24 Hour Suicide Prevention Line
877-7-CRISIS (877-727-4747)

The Suicide Prevention Line provides 24-hour, immediate, confidential over-the-phone suicide prevention services to anyone who is in crisis or experiencing suicidal thoughts. The line is also available to support those concerned about others who may be at risk. The service is provided 24/7 in English and Spanish. Vietnamese and Korean services are available during limited hours in the evenings. Interpretation for other languages is available via a language translation service.

Know The Signs
800-273-TALK (800-273-8255)
www.suicideispreventable.org

If you are feeling suicidal (or if you are concerned about someone), there is help available right now. A trained counselor is ready to talk to you and provide help. Pain isn't always obvious, but most suicidal people show some signs that they are thinking about suicide. If you see even one warning sign, step in or speak up. Take the time to learn what to do now, so you're ready to be there for a friend or loved one when it matters most.

NAMI WarmLine
877-910-WARM (877-910-9276)

The NAMI WarmLine provides telephone-based, non-crisis support for anyone struggling with mental health and/or substance abuse issues. Services are available in English, Spanish, Vietnamese, Farsi and other languages.

OC Links

855 OC-LINKS (855-625-4657)
www.ochealthinfo.com/oclinks

OC Links is an information and referral phone and online chat service to help navigate the Behavioral Health Services (BHS) system within the Health Care Agency for the County of Orange. Callers are connected to clinical Navigators who are knowledgeable in every program within the BHS system. This includes children and adult mental health, alcohol and drug inpatient and outpatient programs, crisis services, and prevention/early intervention programs. Once a program is identified, the Navigator will make every effort to link the caller directly to that program while still on the call.

Centralized Assessment Team (CAT)
866-830-6011

The Centralized Assessment Team performs assessment and evaluation of individuals experiencing psychiatric emergencies including threats to harm self, others, or gravely disabled.

Veterans' Crisis Line
800-273-TALK, Option 1 (800-273-8255)
www.vetcenter.va.gov

Veteran and Family crisis hotline services are available by calling the National Suicide Prevention Hotline. Callers are connected to a skilled, trained counselor at a crisis center in your area, anytime 24/7.