

**DIFFERENCES IN ADOLESCENT NON-SUICIDAL SELF-INJURY AND  
SUICIDE ATTEMPTS**

By

Steven C. Fiala

A THESIS

Presented to the Department of Public Health and Preventive Medicine  
and the Oregon Health & Science University

School of Medicine

in partial fulfillment of  
the requirements for the degree of

Master of Public Health

September 2011

Department of Public Health and Preventive Medicine

School of Medicine

Oregon Health & Science University

---

CERTIFICATE OF APPROVAL

---

This is to certify that the Master's thesis of  
Steven Fiala  
has been approved

---

Mentor/Advisor

---

Member

---

Member

---

Member

## TABLE OF CONTENTS

TITLE	PAGE
TABLE OF CONTENTS.....	i
ACKNOWLEDGEMENTS.....	iv
ABSTRACT.....	v
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
INTRODUCTION.....	1
METHODS.....	9
Design.....	9
Participants.....	9
Measures.....	10
<i>Suicide Attempts vs. Non-Suicidal Self-Injury</i> .....	11
<i>Demographics</i> .....	11
<i>Circumstances of Self-Harm and Treatment</i> .....	12
<i>Precipitating Events</i> .....	12
<i>Mental Health Issues and Prior Suicide Attempts</i> .....	12
<i>Methods of Self-Harm</i> .....	13
Procedures.....	13
Data Analysis.....	14
RESULTS.....	16
Self-Harm Group Differences.....	16

<i>Demographics</i> .....	16
<i>Circumstances of Self-Harm and Treatment</i> .....	17
<i>Precipitating Events</i> .....	18
<i>Mental Health Conditions and Prior Suicide Attempts</i> .....	19
<i>Methods of Self-Harm</i> .....	20
<i>First Multivariate Logistic Regression Model</i> .....	21
<i>Second Multivariate Logistic Regression Model</i> .....	22
DISCUSSION.....	23
Self-Harm Group Differences.....	23
<i>Race/Ethnicity</i> .....	25
<i>Mood Disorders</i> .....	25
<i>Problems at School</i> .....	26
<i>Prior Suicide Attempts</i> .....	27
Self-Harm Group Similarities.....	28
Help-Seeking Behavior.....	30
Methods of Self-Harm.....	31
Referral for Follow-Up Care.....	32
Utility of Surveillance Data.....	33
Study Limitations.....	34
Study Strengths.....	35
Summary and Conclusions.....	36
REFERENCES.....	38
APPENDICES.....	44

ASADS Reporting Form.....	44
Pre-adolescents and adolescent self-harm.....	46
Adolescents with and without intent-to-die information.....	48
Creation of mental health condition categories.....	51
Adolescents with and without prior suicide attempt information.....	53
Bivariate analysis for adolescents used in second multivariate model.....	56
Detailed summary of self-harm methods.....	58
Analysis of interaction terms in the first multivariate model.....	60

## **ACKNOWLEDGEMENTS**

I would like to thank William Lambert, Colleen Lewy, Carrie Nielson, and Dawn Peters for their support and critical review of this thesis.

## **ABSTRACT**

Attempted suicide and non-suicidal self-injury (NSSI) are predominant health risks for adolescents. Suicide is the third leading cause of death among adolescents in the United States, and NSSI is becoming increasingly more prevalent in the adolescent population. The rise in NSSI is concerning as it has been associated with suicidal ideation and future suicide attempts. Self-harm research focuses on distinguishing adolescents who self-injure from those who attempt suicide. Differences between the two self-harm groups may implicate characteristics for targeted interventions to limit NSSI from evolving into future attempted suicide. The current study used data from an adolescent self-harm surveillance system in Oregon to examine differences between the two self-harm groups. Data was abstracted from 2008-2010 and included a sample of 872 adolescents with a mean age of 15.4 years ( $SD=1.2$ ). The sample was predominantly female (71%) and non-Hispanic White (84%). Differences in demographic characteristics, household situation, mental health conditions, events precipitating self-harm, help-seeking behavior, and referral for follow-up care were assessed.

In multivariate analysis, the self-harm groups significantly differed by race/ethnicity, presence of a mood disorder, problems at school, and a prior suicide attempt; compared to adolescents who engaged in NSSI, those who attempted suicide were more likely to be a race/ethnicity other than non-Hispanic White, to have a mood disorder, to indicate problems at school as an event precipitating self-harm, and to have a previous suicide attempt. These risk factor differences highlight opportunities for health care providers and public health professionals to target interventions. Schools in particular are an important area for the public health community to recognize and

incorporate into self-harm interventions. Educating school employees, students and their parents about self-harm prevention creates a safe and supportive environment for students to develop emotional regulation. Although there were significant differences between the two self-harm groups, there were more similarities. This highlights the importance of clinicians treating adolescents with NSSI with the same amount of care and concern as those who attempt suicide. Clinicians were more likely to refer adolescents who attempted suicide to follow-up care compared to those who engaged in NSSI, highlighting an opportunity to educate clinicians on the similarities between the groups as well as the potential for the evolution of NSSI to attempted suicide.



## LIST OF TABLES

**Table 1.** Differentiation between suicide and non-suicidal self-injury (Muehlenkamp<sup>10</sup>)

**Table 2.** Group differences on demographic characteristics

**Table 3.** Group differences on circumstances of self-harm and treatment characteristics

**Table 4.** Group differences on events precipitating self-harm

**Table 5.** Group differences on mental health conditions

**Table 6.** Group differences on method of self-harm

**Table 7.** Effect estimates for first multivariate logistic regression model

**Table 8.** Effect estimates for second multivariate logistic regression model

**Table B-1.** Characteristics of pre-adolescent and adolescent self-harm

**Table C-1.** Characteristics of adolescents with and without information on intent to die

**Table E-1.** Characteristics of adolescents with and without information on prior suicide attempts

**Table F-1.** Specific methods of adolescent self-harm

**Table G-1.** Group differences in subset of adolescents used for second multivariate logistic regression model

**Table H-1.** Summary of interaction terms added to first multivariate model

**Table H-2.** Effect estimates for interaction terms in the first multivariate logistic regression model

## **LIST OF FIGURES**

**Figure 1.** Integrated theoretical model of the development and maintenance of self-injury

(Nock<sup>32</sup>)

**Figure 2.** Creation of outcome variable from ASADS reporting form questions

## INTRODUCTION

Deliberate self-harm is a predominant health risk for adolescents. Suicide is self-harm with the intent to die and is the third leading cause of death among adolescents in the United States.<sup>1</sup> In 2007, there were 4,140 completed suicides in the 15-24 year-old age group.<sup>2</sup> Alarmingly, for every one person who completes a suicide, it is estimated that another 11 people make attempts.<sup>3</sup> Non-suicidal self-injury (NSSI) is another deliberate self-harm behavior. Unlike attempted suicide, where self-harm is initiated with the desire to end one's life, NSSI is the direct destruction of the body for purposes not socially sanctioned and without conscious intent to die.<sup>4-6</sup> Adolescents engage in NSSI using a variety of methods including cutting, skin carving, burning, severe abrading/scratching, punching/hitting, and minor overdosing.<sup>7,8</sup>

While suicide has been the primary focus of self-harm research, studies on NSSI have been increasing in the last decade in response to the rising prevalence of the self-injurious behavior.<sup>9</sup> Initially, NSSI was viewed only as an associated symptom of borderline personality disorder, and early research focused on adolescents with developmental disabilities or psychoses.<sup>10-13</sup> Only recently have investigators turned their attention to the prevalence of NSSI in non-clinical populations. Studies examining NSSI in community samples of adolescents have reported a prevalence between 15% and 25% for high school-aged adolescents, and 7.5% in younger adolescents.<sup>14-16</sup> Prevalence of NSSI is higher in clinical samples, with prevalence estimates between 30% and 40%.<sup>17,18</sup> For comparison, the prevalence of NSSI in the general population of adults is reported to be between 1% and 4%, highlighting a greatly increased susceptibility to NSSI during adolescence.<sup>19,20</sup>

The increasing presence of NSSI among adolescents is concerning because superficial self-injury can lead to more serious medical complications with up to 55% of people who self-injure reporting severe tissue damage,<sup>17</sup> and NSSI has been identified as a risk factor for both current suicidal ideation<sup>21</sup> and future suicide attempts.<sup>22,23</sup> Given the potential for co-occurrence of NSSI and attempted suicide, recent self-harm research has focus on establishing a relationship between the two self-harm behaviors. Three conceptualizations of NSSI and attempted suicide inform this research. The first theory views NSSI and suicide attempts as two constructs along a spectrum of suicidal behaviors. Suicidal ideation is the first and least severe point along the spectrum and completed suicide is the most severe and final point. This paradigm stems from research that has identified shared risk factors between these two self-harm types, including childhood depression, alcohol and substance abuse, sexual abuse, interpersonal and family conflicts, isolation and loneliness, impulsivity, a psychiatric diagnosis, and dysregulation of the serotonin and noradrenergic systems.<sup>23,24</sup>

Despite sharing these important correlates, the other dominant conceptualization asserts that adolescents engaging in NSSI are a population of self-harmers clinically distinct from adolescents who attempt suicide. This theory is supported by studies that suggest adolescents who engage in NSSI significantly differ from those who attempt suicide with respect to severity and symptomology of depression, reported suicidal ideation, attitudes toward life, motivation for self-harm, lethality of self-harm, hopelessness, intent to die, and attraction to life.<sup>10,14</sup> Importantly, NSSI has been described as an “anti-suicide” that produces feelings of being alive.<sup>25,26</sup> Most individuals who engage in NSSI make the cognitive distinction between their self-injurious behavior

and suicide,<sup>27</sup> and most do not perceive death as a likely consequence of their self-injuring actions.<sup>28</sup> Muehlenkamp provides a breakdown of features that distinguish NSSI from attempted suicide with regard to intent, lethality, chronicity, methods, cognitions, and aftermath (Table 1).<sup>10</sup>

**Table 1.** Differentiation between suicide and non-suicidal self-injury

<b>Feature</b>	<b>Suicide Attempt</b>	<b>Non-Suicidal Self-Injury</b>
<b>Intent</b>	To cease existence, eliminate life	To avoid or remove distress, to feel better
<b>Lethality</b>	High, requires medical attention	Low, rarely requires medical attention
<b>Chronicity</b>	Infrequent	Repetitive in nature, chronic
<b>Methods</b>	Often one chosen method	Tendency to use multiple methods
<b>Cognitions</b>	Death, dying, suicidal ideations	Thoughts of relief, no thoughts of death
<b>Aftermath</b>	No relief of distress	Sense of relief, calm, satisfaction

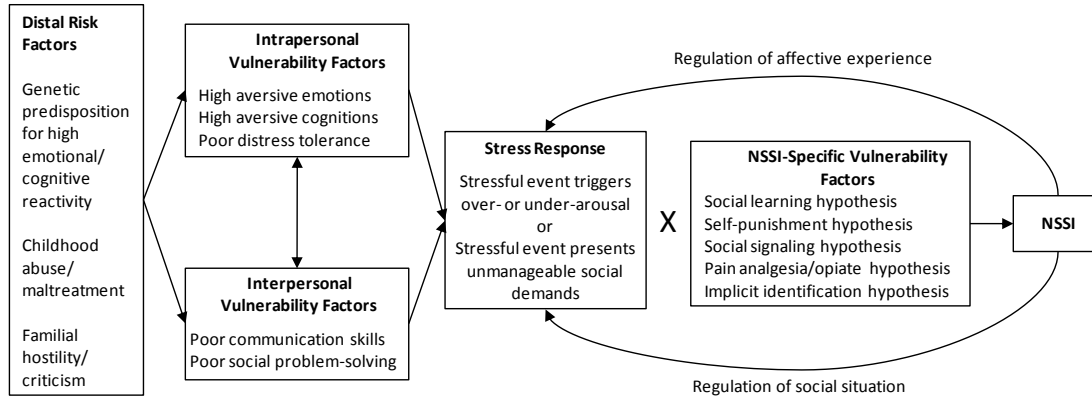
Whitlock and Knox present an alternative concept that serves to bridge the two theories. They hypothesize that although acts of NSSI are rarely undertaken with suicidal intent, NSSI nevertheless signals an attempt to cope with psychological distress that may co-occur or lead to suicidal behavior in individuals experiencing more distress than they can effectively mitigate.<sup>29</sup> The implication of this hypothesis is that NSSI will be more likely to co-exist with or evolve into attempted suicide if the self-injury begins to fail as an effective coping mechanism. Affect regulation has been identified as the most common motivation for self-injury among adolescents who engage in NSSI,<sup>30,31</sup> so this theory has face validity. Although not every adolescent who engages in NSSI will go on to attempt suicide, identifying risk factor differences may provide insight into which conditions or situations create excess stress that leads an adolescent from NSSI to a suicide attempt.

Nock has proposed an integrated theoretical model of the development and maintenance of NSSI that can serve as the basis for discussion on self-harm intervention approaches (Figure 1).<sup>32</sup> The model purports that distal risk factors for self-harm, like

early childhood abuse or maltreatment, create a disposition to have problems regulating one's affective experience or social situation. These intermediate risk factors include conditions like major depressive disorder and contribute to poor distress tolerance. Consequently, when an adolescent is faced with a stressful event (proximal risk factor), NSSI is initiated to regulate the internal environment and/or external environment.

There are also several vulnerability factors proposed by Nock that explain the use of NSSI over other self-regulating behaviors. One of these NSSI-specific factors is most applicable to self-injury in adolescents and asserts that NSSI is chosen over other methods of self-regulation because youth have less developed coping mechanisms and social skills than adults to mitigate stressful situations and effectively communicate problems among members of their social network. Adolescents also lack access to other means of maladaptive self-regulation (e.g., alcohol and drugs), whereas self-injury is easily accessible and can be performed quickly, quietly, and privately. Nock's integrated model can be further expanded upon by recognizing the co-occurrence of self-injury and attempted suicide when the stress response or vulnerability factors become too many or too severe to be adequately regulated with NSSI. Distal, intermediate, and proximal risk and vulnerability factors are points in the cycle of self-injury at which interventions can be applied by health care providers and public health practitioners to limit self-injury as well as co-occurrence of the self-harm behaviors.

**Figure 1.** Integrated theoretical model of the development and maintenance of self-injury



Previous studies indicate that adolescents who attempt suicide have a higher likelihood of being diagnosed with depression or PTSD compared to those engaging in NSSI and report more depressive symptoms, impulsiveness, anger, and irritability, and fewer reasons for living. However, these studies assessed adolescents with NSSI only or attempted suicide only and did not account for those adolescents with co-occurrence of the self-harm behaviors. Recent studies highlight the importance of controlling for co-occurrence of NSSI and attempted suicide in the assessment of risk factor differences.

Research in clinical populations has found that those with co-occurrence of NSSI and attempted suicide reported significantly higher depression, suicidal ideation, loneliness, externalized anger, and risk-taking behaviors than adolescents who attempted suicide and had no history of NSSI. Youth who attempted suicide and had a history of NSSI were also more likely to have a psychiatric diagnosis of depression, post-traumatic stress disorder, dysthymia, or oppositional defiant disorder compared to those without co-occurrence of the self-harm behaviors.<sup>33,18</sup> Although these studies provided preliminary evidence of risk factor differences between those with and without co-occurrence of NSSI and attempted suicide, the interpretation of the findings is limited to clinical populations and has restricted utility for the general population of adolescents.

Studies investigating co-occurrence of the self-harm behaviors in community samples of adolescents have yielded similar results. One study focusing on potential differences in depressive symptoms, suicidal ideation, and reasons for living found that adolescents reporting both NSSI and suicide attempts had more depression and suicidal ideation, and less reasons for living compared to those who engaged in NSSI only.<sup>6</sup> Another study assessed depressive symptoms, suicidal ideation, social support, self-esteem, body satisfaction, and disordered eating and found that adolescents who engaged in NSSI only reported significantly fewer depressive symptoms, lower suicidal ideation, higher self-esteem, and more parental support than those who had also attempted suicide. The two self-harm groups did not differ by peer support, body satisfaction, disordered eating, and hopelessness.<sup>22</sup> These studies demonstrate that co-occurrence of NSSI and attempted suicide is important to consider and control for when assessing risk factor differences between these two self-harm behaviors. However, these studies used convenience samples drawn from other projects that were not specifically focused on NSSI and were underpowered to detect some differences between self-harm groups due to small sample sizes.

Although several studies have provided preliminary insight into the relationship between adolescent NSSI and attempted suicide and co-occurrence of these self-harm behaviors, continued investigation is required to validate results from these studies, as well as further clarify the relationship through the inclusion of additional risk factor information. This study used data from the Oregon Public Health Division's Adolescent Suicide Attempt Data System (ASADS), a population-based surveillance system that collects demographic and risk factor information for all persons <18-years-old who



present to a hospital in Oregon with signs of self-harm.<sup>34</sup> This is the first study to use surveillance system data to assess risk differences between adolescents who attempt suicide and those who engage in NSSI. ASADS offers a unique opportunity to use an active surveillance system for research of youth self-harm as many state and local health departments lack the resources and infrastructure to conduct self-harm surveillance.<sup>35</sup> As of 2006, five states did not have systems to collect hospital discharge data, and twenty-five states lacked hospital emergency department data systems, which are the main data collection methods used to monitor self-harm. In addition, ASADS is the only state surveillance system that distinguishes between suicidal and non-suicidal self-harm.

ASADS provides a larger sample size to allow for a finer assessment of risk factor group differences. ASADS also captures more distal, intermediate, and proximal risk factors for self-harm than other studies have investigated. Consequently, this study evaluated more independent risk factor differences and controlled for more potential confounders in multivariate analysis than previous studies. Proximal risk factor differences, in particular, have been an acknowledged gap in the literature.<sup>36</sup> Information on prior suicide attempts is also collected, so co-occurrence of the self-harm behaviors was controlled for in multivariate analysis. Furthermore, it is important to assess whether adolescents who have severe enough self-harm to warrant an emergency room visit will have similar risk factor differences as community samples of self-harming adolescents.

ASADS also provides information on adolescents who are currently engaging in self-harm. Previous studies have evaluated either lifetime rates of NSSI and attempted suicide or history of self-harm behaviors in the previous year,<sup>5,37,38</sup> but less information is represented in the literature on adolescents who are current self-harmers.<sup>39</sup> There are

several studies that have addressed NSSI in hospital settings where self-harm is recent,<sup>40,41-43</sup> however, only one of these studies explicitly investigated the correlates and co-occurrence of NSSI and suicide attempts.<sup>40</sup>

The study's results may have important clinical and public health implications. Knowledge of self-harm group differences should enhance health care providers' ability to accurately evaluate risk for NSSI and/or suicidal intent and implement tailored management strategies to limit future self-harm. Risk differences between the two self-harm groups could also implicate characteristics that put some currently self-injuring adolescents at risk for future suicide attempts. Early management of risk factors is important in preventing or mitigating NSSI, since most persons with NSSI do not receive psychiatric interventions.<sup>44</sup>

Clinicians and public health professionals will gain particularly useful insight from the novel analysis of events precipitating self-harm. Self-harm group differences in precipitating events will highlight proximal risk factors that may make adolescents who engage in NSSI particularly vulnerable to future suicide attempts. Knowledge of proximal risk factors common to both self-harm groups will assist clinicians in developing proactive strategies to minimize the risk of self-harm when these events occur. For public health practitioners, common proximal risk factors represent potential areas for population-level interventions.

The goals of this study were to describe the general characteristics of a cohort of adolescent self-harmers presenting at Oregon hospitals, as well as to evaluate differences between adolescents who engaged in NSSI and those who attempted suicide accounting for prior suicide attempts. The study also endeavored to assess the utility of a state-run

surveillance system in addressing the most current research questions pertaining to youth self-harm. Comparing results from this study with other studies on adolescent self-harm will provide insight into the utility of using data from an active surveillance system for this type of research.

## **METHODS**

### Design

The data for this study were obtained from an active surveillance system for adolescent deliberate self-harm called the Adolescent Suicide Attempt Data System (ASADS). The data system is managed by the Oregon Public Health Division and contains both demographic and risk factor information on cases of adolescent self-harm presenting to Oregon hospitals; this includes emergency department admissions and transfers to inpatient units and other facilities. Those providing health care in Oregon hospitals must report cases of self-harm by patients <18 years of age to the Oregon Public Health Division using a standardized reporting form (Appendix A).

### Participants

Data were abstracted from 2008 through 2010 from the total ASADS database. Information on intent to die was not captured in ASADS prior to 2008, so separating NSSI from attempted suicide was possible only for cases after 2007. Initially, cases of self-harm were included in the analysis that were between the ages of 9 and 17 and had a valid response to the question concerning intent to die. However, previous research encourages the separate analysis of pre-adolescents ( $\leq 12$ -years-old) and adolescents (13-17 years-old) based on developmental, psychological, and biological differences. These

age-specific differences may confer distinct risk/protective factors to the two groups that make combined analysis inappropriate.<sup>39</sup> Analysis of ASADS data confirmed that pre-adolescents engaging in self-harm were significantly different from their adolescent counterparts with respect to important risk factors such as sex, mental health conditions, and drug use. As such, pre-adolescents were eliminated from this analysis. (Appendix B contains a detailed description of differences between pre-adolescents and adolescents.)

There were 1,435 cases of self-harm among adolescents aged 13-17. Adolescents who were captured in ASADS were included in the study if they had a response to the question discerning their intent to die. Unfortunately, 563 self-harm cases were missing intent-to-die information and were subsequently excluded from the analysis; 872 (61%) cases of adolescent self-harm were analyzed, including 512 attempted suicides and 360 non-suicidal self-injuries.

Those without intent-to-die information were not significantly different from those with intent-to-die information on all variables except legal problems as an event precipitating self-harm. Adolescents indicating a problem with the law were more likely to have intent information; however, one would expect any potential bias arising from this difference would be non-differential among adolescents with NSSI and attempted suicide. (Appendix C contains a detailed description of differences between adolescents with and without intent-to-die information.)

## Measures

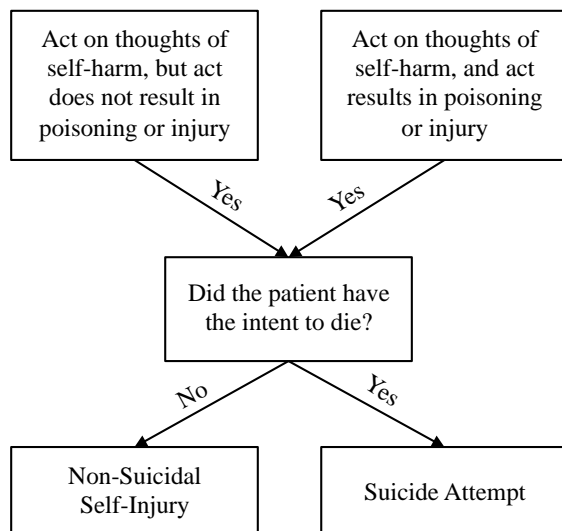
All measures provided in the ASADS database were captured on a standardized reporting form completed by social workers or behavioral health specialists at the hospitals; in hospitals without these positions, the primary physician or nurse fills out the

form. If none of these positions are available, another staff member working with the patient is required to complete the form. The type of provider that completes each form is not recorded.

### *Suicide Attempts vs. Non-Suicidal Self-Injury*

Suicide attempts can be difficult to distinguish from other self-harm behaviors where there is no intent to die. As such, adolescents captured by ASADS are asked whether or not they had any intent to die while engaging in the act of self-harm and if they understood the lethality of their behavior. A case of adolescent self-harm was considered attempted suicide if intent to die was indicated. Conversely, the act of self-harm was deemed NSSI if intent to die was not indicated. Figure 2 illustrates the questions on the ASADS reporting form that were used to determine the outcome variable.

**Figure 2.** Creation of outcome variable from ASADS reporting form questions



### *Demographics*

ASADS captures demographic information on sex, age, and race/ethnicity.

### *Circumstances of Self-Harm and Treatment*

Hospitals reported place of self-harm, household situation, method of self-harm, and whether or not the adolescent told someone of the plan to self-harm. The standardized reporting form also included information on whether the adolescent was treated as an inpatient, outpatient, or was transferred to another facility, as well as whether or not the adolescent received a referral for follow-up care.

### *Precipitating Events*

Precipitating events collected on the standardized reporting form included the following: family discord, school problems, peer pressure or conflict, an argument or breakup with boyfriend or girlfriend, a completed or attempted suicide by a friend or family member, pregnancy, a death of a friend or family member (not by suicide), a move or a new school, physical abuse, sexual abuse, drug abuse, and legal problems.

### *Mental Health Conditions and Prior Suicide Attempts*

History of mental health issues was indicated on the standardized reporting form and contained categories for Major Depressive Disorder, Dysthymia, Bipolar Disorder, Attention-Deficit Hyperactivity Disorder or Attention-Deficit Disorder, Adjustment Disorder, Conduct Disorder, Post-Traumatic Stress Disorder, Eating Disorders, and an “other” category for the hospital to report mental health conditions not captured by these pre-defined categories. Providers were able to indicate more than one mental health condition on the reporting form. Hospitals also reported number of previous suicide attempts, and whether or not there was a gun in the adolescent’s home.

### *Methods of Self-Harm*

Method of self-harm was indicated on the standardized reporting form and included categories for poisoning by solid or liquid substance including drug or alcohol overdoses and other potentially toxic substances, cutting or piercing, hanging or suffocation, firearms and explosives, and other means of self-harm such as motor vehicle crash or drowning.

### Procedures

History of mental health issues was re-categorized according to DSM-IV diagnostic categories using both the pre-defined conditions, as well as the mental health issues reported in the “other” category by the hospital. The DSM-IV categories included mood disorders, anxiety disorders, psychotic disorders, pervasive developmental disorders, attention-deficit/disruptive behavior disorders, and personality disorders. Mental health issues not captured by these categories were combined into an “other” group. (Appendix D contains a more detailed description of the creation of mental health categories.)

Another category for method of self-harm was created for those adolescents who jumped from a structure, out of a moving vehicle, or into traffic. These methods of self-harm were recorded by hospitals in the “other” category for self-harm methods on the reporting form.

Several independent variables were dichotomized to limit small cell sizes during analysis. Race was categorized as non-Hispanic White vs. all other races/ethnicities; household situation was categorized as living with both biological parents vs. all other living situations; location of self-harm was categorized as self-harm in their own home

vs. all other locations; and number of previous suicide attempts was dichotomized as none vs. one or more suicide attempts.

#### Data Analysis

Frequencies of all variables were calculated for the cohort of adolescents with known intent to die ( $n = 872$ ). Bivariate associations between all variables and the outcome of interest (suicide attempt vs. NSSI) were determined with chi-square tests for categorical variables and t-tests for continuous variables. Fisher's exact test was used for contingency tables with expected cell counts less than five and the Mann-Whitney test was used for continuous variables with a skewed distribution. Sex, age, race/ethnicity, household situation, all precipitating events, prior suicide attempts, and history of mental health issues were included in the variable selection process for the multivariate logistic regression model. Predictor variables that achieved a 0.25 level of significance were retained for multivariate modeling.

Collinearity of the predictor variables was assessed using the variance inflation factor with a conservative cutoff of 2.5, rather than the standard cutoff of 10 to account for applying linear regression to a dichotomous outcome. Predictor variables that achieved a 0.05 level of significance in the multivariate model were retained. Interaction terms were constructed and individually added to the preliminary main effects model. Interaction terms were added to the preliminary main effects model if they reached a statistical significance of 0.10 and retained in the final model if they achieved a 0.05 level of significance.

The fit of the multivariate logistic regression model was assessed using the Hosmer-Lemeshow Goodness-of-Fit test, because it contained a continuous variable. In



addition, the model's discriminative ability was assessed using area under the receiver operating characteristic (ROC) curve.

Two multivariate logistic regression models were built. Despite strong statistical significance in bivariate analysis ( $p < 0.001$ ), the first model was built without including information on prior suicide attempts, because 58% of cases were missing this information. Due to the previously discussed importance of controlling for this variable, the modeling process was repeated with the inclusion of prior suicide attempts.

Adolescents with information on prior suicide attempts were not significantly different from those without prior suicide attempt information on all variables included in the multivariate analysis except for problems at school as a precipitating event. Those with information on prior suicide attempts indicated school problems more often than those without prior attempt information ( $p < 0.0002$ ). This could lead to an overestimate of the effect size between school problems and suicide attempts in the second model.

Adolescents with and without information on prior suicide attempts did not differ by type of self-harm (attempted suicide or NSSI) ( $p = 0.52$ ), indicating that neither of the outcome groups was disproportionately affected in terms of sample size by the exclusion of cases without prior attempt information. (Appendix E contains a detailed description of differences between adolescents with and without information on prior suicide attempts).

In addition, bivariate analysis between the outcome and predictors was repeated for the subset of adolescents who had information on prior suicide attempts to compare with bivariate results from the entire cohort. The majority of variables implicated as significant predictors in bivariate analysis for the entire cohort were also implicated in the

subset analysis. The only variable not significant in the subset analysis was gender. This could cause gender to unwarrantedly lose significance in the second multivariate regression model with the inclusion of prior suicide attempts. (Appendix G contains a detailed description of the bivariate analysis for the subset of adolescents with information on prior suicide attempt.)

Whether or not there was a gun in the adolescent's home was eliminated from analysis because 78% of cases were missing a response to this question.

Data abstracted from ASADS was de-identified and analyzed in aggregate.

The Institutional Review Board of Oregon Health & Science University approved this study.

## **RESULTS**

The sample comprised primarily females (71%) and had a mean age of 15.45 years ( $SD=1.22$ ). Eighty-four percent of the sample was non-Hispanic White, 3.7% were non-Hispanic Black, 8.4% were Hispanic, and 4% were of another race/ethnicity.

### **Self-Harm Group Differences**

#### *Demographics*

Demographic group differences are presented in Table 2. In bivariate analysis, adolescents who attempted suicide and engaged in NSSI differed significantly by age and sex. On average, adolescent suicide attempters were slightly older than those who engaged in NSSI ( $p < 0.05$ ), and although there were more females than males in both the suicide attempt (67%) and NSSI (76%) group, adolescents engaging in NSSI were more

likely to be female than those who attempted suicide ( $p < 0.01$ ). The two types of self-harmers did not significantly differ by race/ethnicity.

**Table 2.** Group differences on demographic characteristics ( $n = 872$ )

<b>Characteristic</b>	<b>Suicide Attempt (<math>n = 512</math>)</b>	<b>Non-Suicidal Self-Injury (<math>n = 360</math>)</b>	<b><i>p</i></b>
Age, mean (SD)	15.5 (1.2)	15.3 (1.2)	0.03
Sex ( $n = 810$ )			
Female	320 (67.4%)	254 (75.8%)	
Male	155 (32.6%)	81 (24.2%)	0.009
Race/ethnicity ( $n = 793$ )			
Non-Hispanic White	380 (82.1%)	285 (86.4%)	
Other race/ethnicity	83 (17.9%)	45 (13.6%)	0.10

### *Circumstances of Self-Harm and Treatment*

Adolescents who attempted suicide did not significantly differ from those who engaged in NSSI with respect to household situation or location of self-harm. Both groups of self-harmers lived primarily with someone other than two biological parents (Table 3), and the majority of both suicide attempts and NSSI occurred in the adolescent's own home vs. all other places. The frequency of disclosing self-harm intent also did not significantly differ by self-harm type; 51% of adolescents who attempted suicide and 49% of adolescents who engaged in NSSI told someone of their self-injury intent.

Adolescents who attempted suicide were significantly more likely to be admitted to hospitals as inpatients, whereas adolescents who engaged in NSSI were significantly more likely to be treated on an outpatient basis ( $p < 0.0001$ ). Adolescents who attempted suicide were more likely than those who engaged in NSSI to receive a referral for follow-up care ( $p < 0.001$ ).

**Table 3.** Group differences on circumstances of self-harm and treatment characteristics ( $n = 872$ )

<b>Characteristic</b>	<b>Suicide Attempt (<math>n = 512</math>)</b>	<b>Non-Suicidal Self-Injury (<math>n = 360</math>)</b>	<b><i>p</i></b>
Household Situation ( $n = 797$ )			
Two biological parents	139 (29.5%)	79 (24.2%)	0.10
Other than two biological parents	332 (70.5%)	247 (75.8%)	
Location of Self-Harm ( $n = 789$ )			
Own home	381 (81.2%)	251 (78.4%)	0.33
All other places	88 (18.8%)	69 (21.6%)	
Told Someone of Self-Harm ( $n = 592$ )			
Yes	185 (51.2%)	113 (48.9%)	0.58
No	176 (48.7%)	118 (51.1%)	
Hospital Admission Status ( $n = 837$ )			
Inpatient	235 (47.7%)	68 (19.8%)	<0.0001
Outpatient	171 (34.7%)	257 (74.7%)	
Transferred	87 (17.6%)	19 (5.5%)	
Referred for Intervention ( $n = 837$ )			
Yes	450 (92.4%)	296 (84.6%)	0.0003
No	37 (7.6%)	54 (15.4%)	

### *Precipitating Events*

Adolescents who attempted suicide did not differ from those who engaged in NSSI with respect to almost all precipitating factors, including: family discord, an argument or breakup with a boyfriend or girlfriend, an argument with a peer, completed or attempted suicide by a friend or relative, a pregnancy, the death of a friend or relative, a move or a new school, physical abuse, sexual abuse or rape, alcohol and/or drug abuse, or prior arrests and/or convictions of a crime (Table 4).

The two self-harm groups differed significantly with respect to problems at school. Those who attempted suicide were significantly more likely than those who engaged in NSSI to indicate school problems as an event precipitating self-harm ( $p < 0.05$ ). Group differences on physical abuse and sexual abuse trended toward, but did not achieve, statistical significance. Those who attempted suicide indicated physical abuse ( $p$

= 0.07) and sexual abuse ( $p = 0.08$ ) as precipitating events more than those who engaged in NSSI.

**Table 4.** Group differences on events precipitating self-harm ( $n = 872$ )

<b>Precipitating Event</b>	<b>Suicide Attempt (<math>n = 512</math>)</b>	<b>Non-Suicidal Self-Injury (<math>n = 360</math>)</b>	<b><math>p</math></b>
Family discord	237 (46.3%)	168 (46.7%)	0.91
Argument or breakup with boyfriend or girlfriend	120 (23.4%)	91 (25.3%)	0.53
Peer argument	46 (9.0%)	27 (7.5%)	0.44
School problems	119 (23.2%)	61 (16.9%)	0.02
Suicide or attempt by friend/relative	12 (2.3%)	4 (1.1%)	0.21
Pregnancy	0 (0%)	4 (1.1%)	0.03
Death of friend/relative	27 (5.3%)	14 (3.9%)	0.34
Move or new school	16 (3.1%)	9 (2.5%)	0.59
Physical abuse	19 (3.7%)	6 (1.7%)	0.07
Sexual abuse or rape	46 (9.0%)	21 (5.8%)	0.08
Drug abuse	64 (12.5%)	57 (15.8%)	0.16
Problems with the law	25 (4.9%)	17 (4.7%)	0.91

#### *Mental Health Conditions and Prior Suicide Attempts*

Adolescents who attempted suicide were significantly more likely to have a history of mood disorders compared to those who engaged in NSSI ( $p < 0.01$ ). The two self-injury groups did not significantly differ by any of the other mental health issues, including anxiety disorders, pervasive developmental disorders, disruptive disorders, personality disorders, or other mental health issues (Table 5). More than 10% of adolescents engaging in NSSI and attempting suicide indicated anxiety disorders and nearly 15% reported disruptive disorders.

Adolescents who attempted suicide were more likely than those who engaged in NSSI to have at least one prior suicide attempt ( $p < 0.001$ ). However, 30% of adolescents engaging in NSSI had a previous suicide attempt. Although 58% of cases were missing information on prior suicide attempts, there was no significant difference between

adolescents with and without prior attempt information on the outcome variable of self-harm type.

**Table 5.** Group differences on mental health conditions ( $n = 872$ )

<b>Characteristic</b>	<b>Suicide Attempt (<math>n = 512</math>)</b>	<b>Non-Suicidal Self-Injury (<math>n = 360</math>)</b>	<b><i>p</i></b>
Mood disorder	330 (64.4%)	194 (53.9%)	0.002
Anxiety disorder	66 (12.9%)	40 (11.1%)	0.43
Psychotic Disorder	5 (1.0%)	1 (0.3%)	0.41
Pervasive Developmental Disorder	0 (0%)	1 (0.3%)	0.41
Disruptive disorder	74 (14.4%)	47 (13.1%)	0.56
Personality Disorder	1 (0.2%)	0 (0%)	1.0
Other	8 (1.6%)	2 (0.6%)	0.21
Prior suicide attempt ( $n = 503$ )			
Yes	136 (45.3%)	61 (30.0%)	
No	164 (54.7%)	142 (69.9%)	0.0006

#### *Methods of Self-Harm*

The two self-harm groups significantly differed in their method of self-harm (Table 6). Adolescents who attempted suicide were more likely than those engaging in NSSI to use poison ( $p < 0.0001$ ) and hanging or suffocation ( $p < 0.001$ ), while adolescents engaging in NSSI were more likely than suicide attempters to cut or pierce ( $p < 0.0001$ ). The two self-harm groups did not significantly differ with respect to using a firearm or explosive, jumping, or another mechanism to inflict self-injury (e.g., electrocution). (Appendix F contains a more detailed summary of self-harm methods.)

**Table 6.** Group differences on method of self-harm ( $n = 872$ )

<b>Method</b>	<b>Suicide Attempt (<math>n = 512</math>)</b>	<b>Non-Suicidal Self-Injury (<math>n = 360</math>)</b>	<b><i>p</i></b>
Poisoning	385 (75.2%)	221 (61.4%)	<0.0001
Cutting/Piercing	102 (19.9%)	138 (38.3%)	<0.0001
Hanging/Suffocation	40 (7.8%)	8 (2.2%)	0.0004
Firearms/Explosives	11 (2.1%)	2 (0.6%)	0.08
Jumping	10 (1.9%)	2 (0.6%)	0.14
Other	8 (1.6%)	8 (2.2%)	0.47

*First Multivariate Logistic Regression Model (excluding prior suicide attempts)*

The following predictor variables achieved the 0.25 level of significance and were assessed in multivariate modeling: age, sex, race, school problems, completed or attempted suicide by a friend or relative, physical abuse, sexual abuse, alcohol and/or drug abuse, mood disorders, “other” mental health issues, and household situation. Prior suicide attempt was excluded from the first multivariate analysis due to the high percentage of cases with missing information on prior suicide attempts.

Sex, race (non-Hispanic White vs. other race/ethnicity), problems at school, presence of a mood disorder, and physical abuse all achieved the 0.05 level of statistical significance and were retained in the model. All variables had a variance inflation factor < 2.5, so collinearity was not an issue. Interactions between all of the variables in the preliminary main effects model were tested. (Appendix H contains the analysis and discussion of interaction terms in the first model.) The model provides a good fit for the data (H-L gof  $p = 0.16$ ) and had “acceptable” discriminative ability (AUC = 0.62).

The final multivariate logistic regression model contained sex, race (White vs. other race/ethnicity), history of a mood disorder, problems at school, and physical abuse (Table 7). Compared to adolescents who engaged in NSSI, those who attempted suicide were more likely to be male (OR: 1.55; 95% CI: 1.12 - 2.17), to be of a race/ethnicity other than non-Hispanic White (OR: 1.67; 95% CI: 1.09 - 2.55), to indicate problems at school (OR: 1.62; 95% CI: 1.10 – 2.38) and physical abuse (OR: 2.96; 95% CI: 1.07 – 8.20) as events precipitating harm, and to indicate histories of mood disorders (OR: 1.71; 95% CI: 1.26 – 2.31).

**Table 7.** Effect estimates for first multivariate logistic regression model ( $n = 744$ )

<b>Effect</b>	<b>Point Estimate</b>	<b>95% CI</b>	<b><i>p</i></b>
Sex <sup>a</sup>	1.55	1.12, 2.17	0.01
Race/ethnicity <sup>b</sup>	1.67	1.09, 2.55	0.02
School problems	1.62	1.10, 2.38	0.01
Mood disorder	1.71	1.26, 2.31	0.0006
Physical abuse	2.96	1.07, 8.20	0.04

<sup>a</sup>Male vs. Female (referent)<sup>b</sup>Other race/ethnicity vs. non-Hispanic White (referent)*Second Multivariate Logistic Regression Model (including prior suicide attempts)*

Race (non-Hispanic White vs. other race/ethnicity), problems at school, history of a mood disorder, and prior suicide attempt were retained in the final model (all  $p < 0.05$ ) (Table 8). All variables had a variance inflation factor  $< 2.5$ , so collinearity was not a concern.

Interactions between all of the variables in the preliminary main effects model were tested, but none of the interaction terms met the 0.10 level of statistical significance to be retained for further multivariate modeling. The model provides a good fit for the data (H-L gof  $p = 0.6352$ ) and had “acceptable” discriminative ability (AUC = 0.643).

Compared to adolescents who engaged in NSSI, those who attempted suicide were more likely to be a race/ethnicity other than non-Hispanic White (OR: 1.70; 95% CI: 1.01 - 2.85), to indicate problems at school as an event precipitating self-harm (OR: 1.69; 95% CI: 1.07 - 2.69), to have a history of mood disorders (OR: 1.83; 95% CI: 1.23 - 2.74), and to have at least one prior suicide attempt (OR: 1.60; 95% CI: 1.06 - 2.41).

**Table 8.** Effect estimates for second multivariate logistic regression model (with prior suicide attempts) ( $n = 462$ )

<b>Effect</b>	<b>Point Estimate</b>	<b>95% CI</b>	<b><i>p</i></b>
Race/ethnicity <sup>a</sup>	1.70	1.01, 2.85	0.04
School problems	1.69	1.07, 2.69	0.02
Mood disorder	1.83	1.23, 2.74	0.003
Prior suicide attempt	1.60	1.06, 2.41	0.02

<sup>a</sup>Other race/ethnicity vs. non-Hispanic White (referent)



## **DISCUSSION**

This is the first study to use data from an adolescent self-harm surveillance system to assess differences between youth who engage in NSSI and those who attempt suicide. It is important to assess risk factor differences between the two self-harm groups, because it provides health care providers and public health professionals with areas in which to focus tailored interventions. It is also imperative to acknowledge the overlap between the two groups and determine what risk factors lead some adolescents who engage in NSSI to later attempt suicide. The similarities between the group of adolescents who attempted suicide and those who engaged in NSSI will inform prevention strategies for self-harm overall. Nock's integrated model of the development and maintenance of self-injury serves as a context in which to discuss both the risk factors that contribute to self-harm, as well as strategies to mitigate these risk factors.

### *Self-Harm Group Differences*

The first multivariate model highlighted several risk factor differences between adolescents who attempt suicide and those who engage in NSSI. Not controlling for previous attempted suicide, there were significant differences between the two self-harm groups with respect to gender, race/ethnicity, problems at school, physical abuse, and mood disorders. Adolescents who were male and a race/ethnicity other than non-Hispanic White were more likely to attempt suicide than engage in NSSI. Adolescents who reported problems at school and physical abuse as events precipitating self-harm and mood disorders as an intermediate risk factor were more likely to attempt suicide than engage in NSSI.

However, upon controlling for prior suicide attempts in the second multivariate model, the two self-harm groups could no longer be differentiated by gender and physical abuse. With the addition of prior suicide attempts in the model, the odds ratio for sex changed from 1.55 to 1.073 and the odds ratio for physical abuse went from 2.96 to 1.96. The effect estimates for both sex and physical abuse were altered by >10% after the inclusion of prior suicide attempts in the model, indicating that prior suicide attempts are a positive confounder in the relationship between sex and self-harm type and physical abuse and self-harm type. The remaining significant differences between adolescents who attempt suicide and those who engage in NSSI included race/ethnicity, history of a mood disorder, problems at school, and prior suicide attempts. The second multivariate model confirms the previously demonstrated importance of accounting for co-occurrence of self-harm behaviors in the assessment of risk factor differences.

Cumulatively, the results from the second multivariate model implicate specific distal, intermediate, and proximal risk factors that differentiate adolescents who attempt suicide from those who engage in NSSI. Previous research has shown that adolescents who attempt suicide and engage in NSSI demonstrate a high prevalence of dysfunctional behavior at school, traumatic life events, and depression, but this study demonstrates significant group differences based on these risk factors. These group differences have important implications for health care providers and public health professionals in developing individual- and population-level management strategies for adolescent self-harm. Factors that distinguish self-harm groups may provide insight into those adolescents who engage in NSSI and later attempt suicide; these risk factors may

contribute to the excess stress proposed by Whitlock and Knox that leads some adolescents to attempt suicide when NSSI is no longer an effective coping mechanism.

### *Race/Ethnicity*

Controlling for prior suicide attempts, the odds of an adolescent who attempted suicide being a race/ethnicity other than non-Hispanic White were 70% greater than the odds of an adolescent who engaged in NSSI being a race/ethnicity other than non-Hispanic White. Not only can race/ethnicity differentiate the two types of self-harm, but it could also represent a distal risk factor in the evolution of NSSI to attempted suicide experienced by some adolescents. Health care providers, public health workers, teachers, and school counselors should be aware of the potential role that race/ethnicity may play in the potential progression of self-harm from NSSI to attempted suicide. Like other distal risk factors in Nock's integrated model of self-injury, race/ethnicity could contribute to vulnerability factors for eventual self-harm, like hyper-arousal or poor distress tolerance. However, these results should be interpreted with caution due to non-Hispanic Whites comprising the majority of the sample. This is the first study to report a significant race/ethnicity difference in self-harm groups. Future research is needed to confirm these findings, as it is important to establish and mitigate social inequities in patterns of adolescent self-harm.

### *Mood Disorders*

Adolescents who attempted suicide were also more likely than those who engaged in NSSI to have histories of mood disorders after controlling for prior suicide attempts. The odds of suicide attempters having a mood disorder were 83% greater than the odds of the NSSI group having a mood disorder. Previous studies have indicated that suicide

attempters were more likely to suffer from depression and symptoms of depression than self-injurers.<sup>5,6</sup> Mood disorders represent an intermediate risk factor that causes poor cognitive or behavioral control and contributes to an adolescent experiencing problematic affect when confronted with a stressful situation. Mood disorders are already a well-established risk factor for attempted suicide and NSSI individually. This study suggests that presence of a mood disorder differentiates the two self-harm types and may play a role in the evolution of NSSI to attempted suicide.

Clinicians in particular can target mood disorders in the management of self-harm behaviors in their patients. Treatment of mood disorders is integral to the remediation of self-harm. One study found that current NSSI is as likely as a recent suicide attempt to predict future suicide attempts in adolescents who are depressed.<sup>36</sup> Treatment of mood disorders can reduce future self-harm in both groups, as well as stem the potential progression of NSSI into attempted suicide.

### *Problems at School*

Adolescent suicide attempters were also more likely than those with current NSSI to indicate problems at school as an event precipitating self-harm. The odds of an adolescent who attempted suicide indicating school problems was 69% greater than the odds of an adolescent who engaged in NSSI reporting school problems. Unlike other proximal risk factors examined in the study, problems at school was the only precipitating event to significantly predict adolescent attempted suicide over engagement in NSSI. An adolescent's experience at school is an important area for the public health community to recognize and incorporate into targeted self-harm interventions. This finding is particularly relevant, as recent cases of bullying-related suicide have reached

the national spotlight.<sup>45</sup> These preventable deaths have illuminated an unfortunate situation in many schools where bullying and adolescent mental health are not being dealt with properly.

The State of Oregon's prevention plan for youth suicide emphasizes that individual suicide impacts the whole community and public health approaches to prevent self-harm must focus on population-wide interventions.<sup>46</sup> One objective of the plan focuses on reducing harassment in schools and training school staff to recognize signs of depression and self-harm. Schools are a natural setting for the identification and management of self-harm in adolescents as so much of an adolescent's time is spent in the school setting. NSSI in particular is used as a coping mechanism to regulate affect; youth frequently report engaging in NSSI as a means to release pent up anger, tension, and emotional pain.<sup>33</sup> Adolescents with higher emotional intelligence and stronger coping skills have been shown to be less likely to engage in NSSI as a means of mitigating emotional stress.<sup>44</sup> Educating school employees, students and their parents about the risks and prevention of self-harm creates a safe and supportive environment for students to develop emotional regulation. Youth who engage in self-harm frequently internalize their emotions, so providing these vulnerable students with access to counselors and school nurses who understand self-harm behaviors may allow them to channel their negative affect in a more healthy manner.

#### *Prior Suicide Attempts*

In addition to race/ethnicity, mood disorders, and problems at school, a prior suicide attempt was also significantly predictive of self-harm type. The odds of an adolescent who attempted suicide having a prior suicide attempt was 60% greater than

the odds of an adolescent who engaged in NSSI having a prior suicide attempt. For adolescents currently engaging in NSSI, the implication is that a past suicide attempt may increase the likelihood that adolescents will cope with future stress through attempted suicide rather than NSSI. NSSI is more likely than attempted suicide to be chronic and increase in severity with each subsequent act of NSSI.<sup>44</sup> As the severity of self-injury escalates, the severity of suicidality increases as well.<sup>7</sup> The interpersonal-psychological theory of suicidal behavior, proposed by Joiner, supports this idea. Joiner purports that individuals will not act on the desire for death unless they have developed the capacity to do so.<sup>47</sup> The capacity is developed through habituation to painful and/or fearsome experiences to overcome the instinct for self-preservation. Repeated suicide attempts contribute to an adolescent's fearlessness about death, and may make the individual more likely to mitigate future negative affect with attempted suicide rather than NSSI.

#### *Self-Harm Group Similarities*

The objective of study was to assess risk factor difference between the self-harm groups, but more similarities than differences were discovered. Self-harm groups were similar with respect to age, sex, household situation, all proximal risk factors except problems at school, and all mental health conditions except mood disorders. While risk factor differences offer areas for intervention that may prevent NSSI from evolving into a suicide attempt, the similarities should encourage health care providers to treat adolescents engaging in NSSI with the same level of urgency and care as those who attempt suicide despite the lack of intent to die.

Commonly cited risk factors implicate additional targets for intervention in the overall group of adolescents who self-harm. The most cited proximal risk factor was

family discord, with nearly half of adolescents indicating a stressful home life as an event precipitating self-harm. Poor family functioning has been associated with both NSSI and suicide attempts<sup>36,44</sup> and arguments with family members have been shown to be the most common precipitants of attempted suicide.<sup>36</sup> Our findings show this may apply to adolescents who engage in NSSI as well, and confirm the importance of involving the adolescent's family in attempts to remediate self-harm behavior in both adolescents who attempt suicide and those who engage in NSSI.

Nearly one-quarter of both groups lived with two-biological parents, one-quarter lived with single mothers, and another 15% lived with a combination of biological parents and stepparents. Only 5% of adolescents who engaged in self-harm were not living in a family unit of some kind (biological, step, adoptive, or foster parents or relatives), indicating that the opportunity for family-based therapy may exist for the majority of these adolescents. In addition, both groups of adolescents primarily engaged in self-harm in their own homes. As the household is the most likely location for adolescent self-harm, clinicians and public health professionals should educate family members on recognizing the warning signs for both NSSI and suicidal behavior. Family therapy has become an integral component of dialectical behavioral therapy, which has shown great promise in remediating adolescent self-injury.<sup>48</sup>

In addition to family discord, nearly one-quarter of adolescents cited an argument or breakup with a boyfriend or girlfriend as an event precipitating self-harm, and almost 10% indicated an argument with peers. Previous research has demonstrated an association between poor peer relationships and attempted suicide,<sup>36</sup> and the results from this study support a similar situation for adolescents engaging in NSSI. Overall, problems

with personal relationships are the most cited proximal risk factor for both self-harm groups and should be the focus of self-harm management strategies. Management strategies that assist adolescents in developing effective communication skills and incorporate family members and peers will benefit both groups of adolescents who self-harm.

### *Help-Seeking Behavior*

Nearly half of the adolescents in this study told someone of their plan to self-harm. A recent population-based study by Nixon et al. found that 56% of youth reporting self-harm indicated that they sought help or support.<sup>8</sup> Of these help-seeking youth, 56% sought help from a friend, 48% sought help from a family member, 32% sought help from a mental health professional, and 30% sought help from a family doctor (youth could indicate multiple sources of help). The relatively high likelihood that an adolescent will tell someone of the plan to self-harm reinforces the importance of educating parents and professionals who frequently interact with adolescents, such as school counselors and clinicians. Primary care providers are an early point of contact for an increasing number of patients presenting with behavioral disorders, including self-injury.<sup>7</sup>

To effectively intervene with an adolescent engaging in self-harm, a substitution for the release of negative emotions must be presented so that NSSI or attempted suicide is no longer the most desirable option. Being able to adequately respond to those adolescents who seek help is particularly important, as help-seeking behavior has been positively associated with frequency of self-harm.<sup>8</sup> Suicide ideation and attempts are more likely to be indicated among adolescents with repeated NSSI, so adolescents who seek help may represent the most severe cases of self-injury.



### *Methods of Self-Harm*

Adolescents choose the method of self-harm that is most easy to access. Assessing methods of self-harm in both adolescents who attempt suicide and those who engage in NSSI can inform management strategies. Adolescents who attempted suicide were significantly more likely to self-harm using poison and hanging/suffocation, while those who engaged in NSSI were more likely to cut or pierce to self-harm. Although suicide attempters were significantly more likely to use poison compared to self-injurers, poison was still used in 61% of the cases of NSSI. The high frequency of NSSI by poison in this cohort was likely due to overdoses requiring hospital visits more often than cutting or piercing, which can be superficial. In the overall group of adolescents who used poison to self-harm, excess ingestion of analgesics (30%) and antidepressants (16%) were the most frequently reported poisoning methods. Thirty-percent of adolescents also used a combination of drugs to self-harm.

Although NSSI typically manifests as cutting or piercing, it is important to acknowledge the other mechanisms by which NSSI occurs. A recent population-based study of adolescent self-harm found that 83% of those who engaged in NSSI reported cutting, scratching, and self-hitting, 32% ingested medication in excess of the prescribed or generally recognized dose, and 17% ingested recreational or illicit drugs or alcohol.<sup>8</sup> Although the ASADS cohort had a higher frequency of NSSI cases who used poison, results from both studies encourage parents and clinicians to look beyond the external signs of self-injury like scarring when assessing engagement in NSSI. Parents should be aware of the use of medications to self-harm even if there is no intent to die.

### *Referral for Follow-Up Care*

Although prevention of self-harm is the first priority, treatment and referral for follow-up care are the next step. Approximately 59%-72% of adolescents who engage in NSSI do so without thoughts of suicide and 15%-45% do not have a history of prior suicide attempts;<sup>10</sup> however, clinicians and hospital workers should refer all adolescents who exhibit self-harm to follow-up care as both attempted suicide and NSSI indicate a cry for help. ASADS mandates that hospitals refer all cases of adolescent self-harm to inpatient or outpatient community resources, crisis intervention, or other appropriate intervention by facility staff.<sup>49</sup> Although 92% of suicide attempters and 85% of those who engaged in NSSI received a referral for follow-up care, the group difference was statistically significant. Adolescents who received a referral for follow-up care were more likely to have attempted suicide than engaged in NSSI.

Our data suggest that some clinicians may view NSSI as less serious than attempted suicide due to a lack of conscious intent to die. However, NSSI is an unhealthy method by which an adolescent regulates stress, and current NSSI has been predictive of future suicide attempts. One study reported that 5% of individuals with NSSI seen in an emergency department kill themselves within nine years of being seen for the incident of self-harm.<sup>44</sup> Although the vast majority of both attempted suicides and acts of NSSI were referred for intervention, these findings highlight the need to educate clinicians on the risk for NSSI to increase in severity with each subsequent act of self-injury or potentially evolve into a future suicide attempt. Follow-up care for NSSI should be as important as follow-up care for suicide attempts.

### *Utility of Surveillance Data*

In assessing the utility of the adolescent self-harm surveillance system it is important to give consideration to the variables with missing information as well as those with complete ascertainment. First, 78% of cases were missing information on whether or not there was a gun in the adolescents' homes. A gun in the home has been identified as a risk factor for suicide attempts and should be collected for a thorough understanding of the psychosocial environment that has contributed to self-harm. Complete ascertainment of this variable from reporting facilities is required to inform efforts that restrict youth access to lethal methods of self-harm.

Thirty-nine percent of cases of self-harm were missing intent-to-die information, prohibiting the classification as either a suicide attempt or NSSI. However, the case definition for a suicide attempt was only recently implemented in 2008, so it will take some time to be uniformly incorporated into practice. It is encouraging that ascertainment of this variable has increased each subsequent year after the variable was added to the ASADS reporting form.

Finally, 58% of cases were missing information on prior suicide attempts. This is unfortunate because controlling for co-occurrence of self-harm behaviors is important when addressing risk factor differences. Issues of incomplete variable ascertainment highlight current weaknesses in the surveillance system data capture process for Oregon to remedy. Other states can also learn from Oregon's current shortcomings when implementing their own youth self-harm surveillance system or improving upon an existing system.

### *Study Limitations*

One limitation of the ASADS data is the variation in the uniformity of timely and complete reporting among hospitals, which affects analyses that attempt to compare the numbers or rates of attempts across time periods. However, this limitation is mainly relevant for county-level data, where variation in reporting practices among a small group of hospitals can lead to substantial variation in the number of suicide attempts reported from year to year. As was previously discussed, another limitation of the data is that ASAD forms may not include data for each of the variables requested, which limits analysis of potential risk factors.<sup>50</sup>

Another limitation is that various staff within the hospitals collect data, which raises concerns as to the reliability of the reported data. There is also potential for misclassification of the outcome variable or misreport of the predictor variables because ascertainment of these factors relies on adolescent self-report. In addition, the ASADS report form does not collect information on sexual orientation, which is a known risk factor for youth suicide attempts.<sup>51,52</sup> Although this is an important limitation to consider it is also a common problem with most research studies and should be considered in future revisions to the ASADS report form.

In addition, the ASADS system only captures data on self-harm among persons who present to hospitals or hospital emergency rooms. It is not known how many episodes of self-harm occur among youth in Oregon that are never reported because the person does not present to a hospital emergency room. The ASADS cohort likely represents adolescents with the most severe forms of self-harm relative to the overall population, which could affect the generalizability of the results. However, it is also

important to collect information on the most severe cases of self-harm as they are at the highest risk for accelerated severity and eventual death.

Further, missing data due to incomplete ascertainment of intent to die and prior suicide attempts could bias the results of the study. Although there were no significant differences between adolescents with and without information on intent to die and those with and without information on prior suicide attempts differed only by the precipitating event problems at school, considerable bias could arise from the differential distribution of unobserved confounders. Bias could also arise from unknown confounders that were not measured by ASADS and therefore could not be controlled for in the multivariate analysis. More thorough ascertainment of these variables will allow for a more accurate assessment of adolescent self-harm in the future.

### *Study Strengths*

Although there are some inherent limitations to the ASADS cohort, these concerns are outweighed by the opportunity to analyze population-level data of youth suicide attempts and non-suicidal self-injury. There are few studies on NSSI compared to attempted suicide, and there are even fewer studies that attempt to differentiate between the two self-harm behaviors. Studies that have evaluated group differences have been limited by small sample sizes and have used clinical populations with limited generalizability to the general public. In addition, many of the previous studies in community populations have used convenience samples drawn from projects not specifically focusing on NSSI.<sup>6,22,53</sup> As a result, these studies have been underpowered to detect the differences between the NSSI and suicide attempt groups, instead drawing

conclusions between adolescents with no self-harm and adolescents with self-harm in general.

A major strength of the study is that there are few surveillance systems in the United States that collect information on adolescent suicide attempts. More importantly, there are no other public health surveillance systems to our knowledge that monitor youth self-harm behaviors using operational case definitions that distinguish between NSSI and suicide attempts. This is the first study to utilize surveillance data to assess differences between these self-harm groups and one of few studies to assess current self-harm behaviors rather than past behaviors. Another strength of ASADS is that it captures the majority of risk factors for self-harm that have been identified in the literature including gender, race, history of mental illness, home life characteristics, and history of prior suicide attempts. By including such a comprehensive list of risk factors for self-harm, the study was able to control for more covariates in multivariate analysis than previous studies. The study also evaluated history of mental health conditions in a more granular manner than previous studies by including a variety of disorders not previously assessed for group differences (e.g., anxiety disorder, conduct disorder). This is also the first study to assess self-harm group differences in precipitating events and follow-up care referral practices.

## **SUMMARY AND CONCLUSIONS**

Data from an adolescent self-harm surveillance system was used to compare adolescents who attempted suicide and those who engaged in NSSI. Compared to adolescents who engaged in NSSI, those who attempted suicide were more likely to be a race/ethnicity other than non-Hispanic White, to have a mood disorder, to indicate

problems at school, and to have a prior suicide attempt. These differences indicate areas for health care providers and public health professionals to target interventions to limit NSSI from developing into attempted suicide. Health care providers will play an important role in managing the underlying conditions and individuals close to the adolescent will take on the role of creating an environment that facilitates the development of health coping mechanisms for stress.

While there were some significant risk factor differences, the two self-harm groups exhibited more similarities. Although risk factor differences offer opportunities for targeted intervention, similarities between the two groups indicate that health care providers should treat the two self-harm groups with the same level of attention and urgency.

## REFERENCES

1. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS): [www.cdc.gov/ncipc/wisqars](http://www.cdc.gov/ncipc/wisqars).
2. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS) [Online]. (2003). National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (producer). Available from: URL: [www.cdc.gov/ncipc/wisqars](http://www.cdc.gov/ncipc/wisqars). [2011 Jul 19].
3. National Institute of Mental Health. Suicide in the US: Statistics and Prevention. 2010. Available at <http://www.nimh.nih.gov/health/publications/suicide-in-the-us-statistics-and-prevention/index.shtml>.
4. Favazza, AR. The coming of age of self-mutilation. *J Nerv Ment Dis.* 1998;186:259-268.
5. Jacobson CM, Muehlenkamp JJ, Miller AL, Turner JB. Psychiatric impairment among adolescents engaging in different types of deliberate self-harm. *J Clin Child Adolesc Psychol.* 2008;37:363-375.
6. Muehlenkamp JJ, Gutierrez PM. Risk for suicide attempts among adolescents who engage in non-suicidal self-injury. *Arch Suicide Res.* 2007;11:69-82.
7. Kerr PL, Muehlenkamp JJ, Turner JM. Nonsuicidal Self-Injury: A Review of Current Research for Family Medicine and Primary Care Physicians. *JABFM.* 2010;23(2):240-259.
8. Nixon MK, Cloutier P, Jansson SM. Nonsuicide self-harm in youth: a population-based survey. *CMAJ.* 2008;178(3):306-312.



9. Olfson M, Gameroff MJ, Marcus SC, Greenberg T, Shaffer D. National trends in hospitalization of youth with intentional self-inflicted injuries. *Am J Psychiatry*. 2005;162:1328-1335.
10. Muehlenkamp JJ. Self-Injurious Behavior as a Separate Clinical Syndrome. *Am J Orthopsychiatry*. 2005;75(2):324-333.
11. Carr EG. The motivation of self-injurious behavior: A review of some hypotheses. *Psychol Bull*. 1977;84:800-816.
12. Durand VM, Crimmins DB. Identifying the variables maintaining self-injurious behavior. *J Autism Dev Disord*. 1988;18:99-117.
13. Iwata BA, Pace GM, Dorsey MF, Zarcone JR, Vollmer TR, Smith RG, et al. The functions of self-injurious behavior: An experimental-epidemiological analysis. *J Appl Behav Anal*. 1994;27(2):215-240.
14. Muehlenkamp JJ, Gutierrez PM. An investigation of differences between self-injurious behavior and suicide attempts in a sample of adolescents. *Suicide Life Threat Behav*. 2004;34:12-23.
15. Ross S, Heath N. A study of the frequency of self-mutilation in a community sample of adolescents. *J Youth Adolesc*. 2002;31:67-77.
16. Hilt LM, Nock MK, Lloyd-Richardson EE, Prinstein MJ. Longitudinal study of nonsuicidal self-injury among young adolescents. *J Early Adolesc*. 2008;28:455-469.
17. Darche MA. Psychological factors differentiating self-mutilating and non-self-mutilating adolescent inpatient females. *Psychiatr Hosp*. 1990;21:31-35.

18. Jacobson CM, Muehlenkamp JJ, Miller AL, Turner JB. Psychiatric impairment among adolescents engaging in different types of deliberate self-harm. *J Clin Child Adolesc Psychol.* 2008;37:275-363.
19. Briere J, Gil E. Self-mutilation in clinical and general population samples: prevalence, correlates, and functions. *Am J Orthopsychiatry.* 1998;68:609-20.
20. Klonsky ED, Oltmanns TF, Turkheimer E. Deliberate self-harm in a nonclinical population: prevalence and psychological correlates. *Am J Psychiatry.* 2003;160:1501-1508.
21. Brausch, AM, JJ Muehlenkamp. Body image and suicidal ideation in adolescents. *Body image.* 2007;4(2):207-212.
22. Brausch AM, Gutierrez PM. Differences in non-suicidal self-injury and suicide attempts in adolescents. *J Youth Adolesc.* 2010;39(3):233-242.
23. Maris RW, Berman AL, Silverman MM (2000). Comprehensive textbook of suicidology. New York, NY: Guilford Press.
24. Walsh BW (2006). Treating self-injury: A practical guide. New York, NY: Guilford Press.
25. Ross RR, McKay HB. Self-mutilation. (1979). Lexington, MA: Lexington Books
26. Simpson, MA. Self-mutilation as indirect self-destructive behavior. In N.L. Faberow (Ed.), *The many faces of suicide: Indirect self-destructive behavior* (pp. 257-283). New York: McGraw-Hill.
27. Simpson CA, Porter GL. Self-mutilation in children and adolescents. *Bull Menninger Clin.* 1981;45:528-438.

28. Patton GC, Harris R, Carlin JB, Hibbert ME, Coffey C, Schwartz M, et al. Adolescent suicidal behaviors: A population-based study of risk. *Psychol Med.* 1997;2:715-724.
29. Whitlock J, Knox KL. The Relationship Between Self-Injurious Behavior and Suicide in a Young Adult Population. *Arch Pediatr Adolesc Med.* 2007;161(7):634-640.
30. Nock MK, Prinstein MJ. A functional approach to the assessment of self-mutilative behavior. *J Consult Clin Psychol.* 2004;72:885-890.
31. Guertin T, Lloyd-Richardson E, Spirito A, Donaldson D, Boergers J. Self-mutilative behavior in adolescents who attempt suicide by overdose. *J Am Acad Child Adolesc Psychiatry.* 2001;40:1063-1069.
32. Nock MK. Self-Injury. *Annu Rev Clin Psychol.* 2010;6:339-363.
33. Cloutier P, Martin J, Kennedy A, Nixon MK, Muehlenkamp JJ. Characteristics and Co-Occurrence of Adolescent Non-Suicidal Self-Injury and Suicidal Behaviors in Pediatric Emergency Crisis Services. *J Youth Adolesc.* 2010;39:259-269.
34. Suicide Prevention Action Network USA. *Strategies to Improve Non-Fatal Suicide Attempt Surveillance: Recommendations from an Expert Roundtable.* Washington DC; August 2006.
35. Prinstein MJ. Introduction to the Special Section on Suicide and Nonsuicidal Self-Injury: A Review of Unique Challenges and Important Directions for Self-Injury Science. *J Consult Clin Psychol.* 2008;76(1):1-8.
36. Wilkinson P, Kelvin R, Roberts C, Dubicka B, Goodyer I. Clinical and Psychosocial Predictors of Suicide Attempts and Non-Suicidal Self-Injury in the Adolescent Depression Antidepressants and Psychotherapy Trial (ADAPT). *Am J Psychiatry.* 2011;168(5):495-501.

37. Whitlock J, Knox KL. The relationship between self-injurious behavior and suicide in a young adult population. *Arch Pediatr Adolesc Med.* 2007;161:634-640.
38. Lofthouse NL, Yager-Schweller J. Nonsuicidal self-injury and suicide risk among adolescents. *Curr Opin Pediatr.* 2009;21:641-645.
39. Bennewith O, Peters TJ, Hawton K, House A, Gunnell D. Factors associated with the non-assessment of self-harm patients attending an accident and emergency department: Results of a national study. *J Affect Disord.* 2005;89:91-97.
40. Nock MK, Joiner TE, Gordon KH, Lloyd-Richardson E, Prinstein MJ. Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatric Res.* 2006;144:65-72.
41. Bergen H, Hawton K. Variations in time of hospital presentation for deliberate self-harm and their implications for clinical services. *J Affect Disord.* 2007;98:227-237.
42. Harriss L, Hawton K, Zahl D. Value of measuring suicidal intent in the assessment of people attending hospital following self-poisoning or self-injury. *Br J Psychiatry.* 2005;186:60-66.
43. Oregon State Legislature. Oregon Revised Statutes – 2007 Edition. Available at: <http://www.leg.state.or.us/ors/>. Accessed August 2011.
44. Greydanus DE, Apple RW. The relationship between deliberate self-harm behavior, body dissatisfaction, and suicide in adolescents: current concepts. *J Multidiscip Healthc.* 2011;4:183-189.
45. Eckholm E, Zezima K. (2010, March 29). 6 Teenagers Are Charged After Classmate's Suicide. *The New York Times*. Retrieved from <http://www.nytimes.com>.

46. Oregon Public Health Division. A Call to Action: The Oregon Plan for Youth Suicide Prevention. Accessed on 20 August 2011 from <http://public.health.oregon.gov/PreventionWellness/SafeLiving/SuicidePrevention/Documents/YSuicide.pdf>.
47. Joiner T. (2005). Why people die by suicide. Cambridge, MA: Harvard University Press.
48. Wilkinson B. Current Trends in Remediating Adolescent Self-Injury: An Integrative Review. *JOSN*. 2010;27(2):120-128.
49. Oregon Public Health Divisions. Adolescent Suicide Attempt Data System. Accessed 20 August 2011 from <http://public.health.oregon.gov/PreventionWellness/SafeLiving/SuicidePrevention>.
50. Oregon Public Health Division. (2009 March). Youth Suicide Attempts in Oregon: Adolescent Suicide Attempt Data System 2007 Data Report. Accessed on 20 August 2011 from <http://public.health.oregon.gov/DiseasesConditions/InjuryFatalityData/Documents/2007ASADS.pdf>.
51. Remafedi G, French S, Story M, Resnick MD, Blum R. The Relationship between Suicide Risk and Sexual Orientation: Results of a Population-Based Study. *Am J Public Health*. 1998;88:57-60
52. Garofalo R, Wolf C, Wissow LS, Woods ER, Goodman E. Sexual Orientation and Risk of Suicide Attempts Among a Representative Sample of Youth. *Arch Pediatr Adolesc Med*. 1999;153:487-493.
53. Muehlenkamp JJ, Gutierrez PM. An Investigation of Differences Between Self-Injurious Behavior and Suicide Attempts in a Sample of Adolescents. *Suicide Life Threat Behav*. 2004;34(1):12-23.

# APPENDIX A. ASADS Reporting Form

Form 45-119	Oregon Department of Human Services – Public Health Division <b>ORS 441.750 - Adolescent Suicide Attempt Report</b>	Revised 12/08
-------------	--	---------------

1. Name of patient, Last: \_\_\_\_\_ First: \_\_\_\_\_ MI: \_\_\_\_\_  
2. Name of Hospital: \_\_\_\_\_ County: \_\_\_\_\_  
3. Date of Incident (Month/Day/Year): \_\_\_\_/\_\_\_\_/\_\_\_\_  
4. Admitted as Inpatient?  Yes  No  Transferred to another hospital (Specify): \_\_\_\_\_  
5. Patient or Hospital Chart Number: \_\_\_\_\_  
6. Date of Birth (Month/Day/Year): \_\_\_\_/\_\_\_\_/\_\_\_\_ 7. Sex:  Male  Female  
8. Race:  White  Black  Am. Indian  Other (Specify): \_\_\_\_\_ 9. Hispanic:  Yes  No  
10. Residence City: \_\_\_\_\_ County: \_\_\_\_\_  
11. Patient lives with:  Both Parents  Parent and Stepparent  Father only  Mother only  Foster Parents  
 Juvenile Facility  Friends  Homeless  Unknown  Other (Specify): \_\_\_\_\_  
12. Type of self-harm behavior (check only one):  
 Verbalizes thoughts of self-harm with a specific plan  
 Verbalizes thoughts of self-harm without a specific plan  
 Acts on self-harm thoughts, but act does not result in poisoning or injury  
 Acts on self-harm thoughts, and act results in poisoning or injury  
13. Was the act completed?  Yes  No  Unknown  
If the answer is no, was the act:  Stopped by the patient  Stopped by someone else  Unknown  
14. Did the patient have any intent to die?  Yes  No  Unknown  
If the answer is yes, did the patient explicitly state that he/she intended to die?  Yes  No  Unknown  
15. Place of self-harm behavior:  
 Own Home  Other Home  Foster Home  School  Juvenile Facility  Other (Specify): \_\_\_\_\_  
16. Method or Methods of self-harm behavior:  
Poisoning by solid or liquid substance including drug or alcohol overdoses and other potentially toxic substances –  
Specify Substance(s): \_\_\_\_\_  
Cutting or Piercing – Specify instrument and body site: \_\_\_\_\_  
Hanging or Suffocation – Specify method: \_\_\_\_\_  
Firearms and Explosives – Specify type (Hand gun, rifle, etc.) and body site: \_\_\_\_\_  
Other means such as motor vehicle crash, drowning, fire, etc. – Specify: \_\_\_\_\_  
17. History of Mental Health Issues:  
 Major Depression  Dysthymia  Bipolar Disorder  ADHD or ADD  Adjustment Disorder  
 Conduct Disorder  PTSD  Eating Disorder  Other (Specify) \_\_\_\_\_  None  Unknown  
18. Number of previous suicide attempts made during lifetime:  
 0  1  2  3  4  5  6+  Attempts made, but # unknown  History unknown  
19. Precipitating events and risk factors:  Family discord  School problems  Peer pressure/argument  
 Argument or breakup with boyfriend/girlfriend  Suicide or attempt by friend/relative  Pregnancy  
 Death of a friend/relative  Move or new school  None  
 Physical abuse – Specify type and relation to perpetrator, if known: \_\_\_\_\_  
 Sexual abuse or rape – Specify type and relation to perpetrator, if known: \_\_\_\_\_  
 Alcohol and/or drug abuse – Specify substance(s): \_\_\_\_\_  
 Prior arrests and/or convictions of a crime – Specify: \_\_\_\_\_  
 Other – Specify: \_\_\_\_\_  
20. Is there a gun in the adolescent's home?  Yes  No  Unknown  
If yes, is it locked and kept separate from the ammunition?  Yes  No  Unknown  
21. Did the youth tell others of his or her plan to attempt suicide?  Yes  No  Unknown  
22. Was the youth referred for intervention?  No  Yes – Specify to whom: \_\_\_\_\_  
23. Name of the person completing report (Print): \_\_\_\_\_ Dept.: \_\_\_\_\_

*Fax this form no later than the 15<sup>th</sup> of the month, following the month of the attempt to:*  
Fax: 971-673-0990; Injury & Violence Prevention Program, 800 NE Oregon St, #772, Portland, OR 97232; Ph: 971-673-1033

### Instructions for Changes to the ASADS Reporting Form

Please report all incidences of adolescent self-harm (including ideation only cases and those not resulting in an injury or poisoning) from your hospital to the Adolescent Suicide Attempt Data System. The type of self-harming behavior must be classified, and the patient's intent, if known, noted. Following are definitions and guidelines for determining self-harm classifications, as well as some examples of each type of behavior. These are only guidelines, however, and assessments must be made on a case-by-case level using information specific to each case.

#### Question #1: Name of the patient

The collection of personally identifiable data to public health authorities is authorized without patient consent or notification under Oregon law and under HIPAA; however, the reporting of names is *not required* by law. Names are necessary to ensure accurate data, de-duplicate records in the database, and perform special epidemiological studies as authorized by law.

#### Question #12: Type of self-harm behavior

Self-harm ideation without a specific plan: patient has been thinking or talking about harming him/herself. He/she does *not* have a specific plan to do so.

Self-harm ideation with a specific plan: patient has been thinking or talking about a specific plan to harm him/herself; however, he/she has not acted on that plan.

Self-harm act not resulting in injury or poisoning: A patient acts in such a way that he/she intends to harm him/herself. However, the act is either not completed, or simply does not result in an injury or poisoning.

Self-harm act resulting in injury or poisoning: A patient acts in such a way that he/she intends to harm him/herself. The act results in an injury or poisoning.

#### Examples of self-harming behavior:

Self-harm ideation without a specific plan:

A young boy tells a friend at school that he has been very depressed and sometimes talks about "ending it all." He has vague notions of how he would do this, but does not have a plan to do so.

Self-harm ideation with a specific plan:

A young boy tells a friend at school that he can no longer handle the pressures in his life. He talks about using his father's gun to shoot himself. A couple days later he shows his friend his father's gun and ammunition.

Self-harm act not resulting in injury:

A mother of a young girl walks in to her daughter's room and sees that her daughter is about to cut herself. She stops her before she starts to cut her arms with a razor blade.

-OR-

A mother of a young boy walks into her son's room and finds him sitting on his bed with a loaded gun in his hand. He is pointing it at himself, but she is able to get him to put the gun down.

Self-harm act resulting in injury:

A mother brings in her daughter after she finds that she has intentionally cut herself.

-OR-

A mother brings in her son after he has ingested a number of her prescription oxycontin pills.

#### Question #14: Did the patient intend to die?

Answer 'Yes' to this question if the patient had any level of intent to die. Intent can be determined either explicitly by the patient or implicitly by the medical or mental health professional, or social worker, based on the circumstances surrounding the act. Only give an answer of 'Unknown' if the intent of the act cannot be determined.

Explicit intent to die: The patient specifically says that he/she wanted to die, even a little, or that he/she was trying to kill him/herself.

Implicit intent to die: The circumstances surrounding the patient's act of self-harm, or the act itself, are/is so severe that one can infer that the patient intended to take his/her own life. Example: patient has covered himself with gasoline and lit himself on fire.

**Please fax the form to 971-673-0990.** Fax is confidential and secure. The Injury and Violence Prevention Program no longer provides self-addressed stamped envelopes or forms. All printable forms can be found online at <http://www.oregon.gov/DHS/ph/ipe/ysp/ASADS2.shtml>

## **APPENDIX B. Pre-Adolescent and Adolescent Self-Harm**

Age was ascertained in all cases of self-injury. All bivariate associations are in Table B-1. Pre-adolescents did not significantly differ from adolescents with respect to the following risk factors: family discord ( $p = 0.31$ ), peer pressure or an argument with peers ( $p = 0.17$ ), problems at school ( $p = 0.84$ ), exposure to a completed suicide or suicide attempt by a friend or relative ( $p = 0.30$ ), the death of a friend or relative ( $p = 0.58$ ), sexual abuse ( $p = 0.27$ ), problems with the law ( $p = 0.76$ ), a previous suicide attempt ( $p = 0.78$ ), and race ( $p = 0.20$ ). Pre-adolescents also did not differ from adolescents with regard to referral for follow-up care ( $p = 1.0$ ), being treated as an inpatient vs. outpatient ( $p = 0.71$ ), or place of self-injury ( $p = 0.20$ ).

Pre-adolescents and adolescents significantly differed with respect to the following risk factors: sex ( $p = 0.002$ ), a move or a new school ( $p = 0.03$ ), history of a mood disorder ( $p = 0.01$ ), history of an anxiety disorder ( $p = 0.04$ ), and history of a disruptive disorder ( $p < 0.0001$ ). In addition, pre-adolescents and adolescents achieved borderline significant differences with regard to an argument or breakup with a boyfriend or girlfriend ( $p = 0.08$ ), physical abuse ( $p = 0.06$ ), drug abuse ( $p = 0.06$ ), and household situation ( $p = 0.05$ ).

Method of self-harm also appears to be different for pre-adolescents compared to adolescents. Adolescents were significantly more likely to use poison ( $p < 0.0001$ ), while pre-adolescents were more likely to hang or suffocate themselves ( $p < 0.0001$ ). The jumping method ( $p = 0.06$ ) and other methods (e.g., electrocution) ( $p = 0.06$ ) were also borderline significant, indicating that pre-adolescents may use less traditional means of self-injury compared to adolescents. Pre-adolescents and adolescents did not significantly



differ with respect to cutting or piercing ( $p = 0.48$ ), or using firearms or explosives ( $p = 0.24$ ) to self-harm. Pre-adolescents were also significantly less likely to tell someone of their plan for self-harm ( $p = 0.006$ ) and were less likely to complete the act of self-injury ( $p = 0.0004$ ).

**Table B-1.** Characteristics of pre-adolescent and adolescent self-harm ( $n = 1510$ )

Characteristic	Pre-Adolescents	Adolescents	<i>p</i>
	No. (%) ( <i>n</i> = 75)	No. (%) ( <i>n</i> = 1435)	
Sex ( <i>n</i> = 1410)			
Female	38 (54)	961 (72)	
Male	32 (46)	379 (28)	0.002
Race/ethnicity ( <i>n</i> = 1368)			
Non-Hispanic White	61 (90)	1091 (84)	
Other race/ethnicity	7 (10)	209 (16)	0.20
Household situation ( <i>n</i> = 1364)	13 (18)	374 (29)	0.05 <sup>a</sup>
Location of self-harm ( <i>n</i> = 1371)	51 (73)	1032 (79)	0.20 <sup>b</sup>
Told someone of self-harm ( <i>n</i> = 958)	14 (29)	451 (50)	0.006
Referred for follow-up care ( <i>n</i> = 1443)	65 (89)	1220 (89)	1.0
Precipitating event			
Family discord	38 (51)	641 (45)	0.31
Argument or breakup with boyfriend or girlfriend	12 (16)	357 (25)	0.08
Peer argument	9 (12)	109 (8)	0.17
School problems	15 (20)	301 (21)	0.84
Suicide or attempt by friend/relative	2 (3)	20 (1)	0.30
Death of friend/relative	2 (3)	69 (5)	0.58
Move or new school	6 (8)	44 (3)	0.03
Physical abuse	5 (7)	39 (3)	0.06
Sexual abuse	3 (4)	116 (8)	0.27
Drug abuse	4 (5)	190 (13)	0.04
Problems with the law	2 (3)	57 (4)	0.76
Mental health condition			
Mood disorder	33 (44)	836 (58)	0.01
Anxiety disorder	15 (20)	170 (12)	0.04
Disruptive disorder	27 (36)	191 (13)	<0.0001
Other mental health condition	0	22 (1.5)	0.62
Prior suicide attempt(s) ( <i>n</i> = 822)	16 (36)	299 (38)	0.78
Method of self-harm			
Poisoning	32 (43)	1019 (71)	<0.0001
Cutting/piercing	17 (23)	378 (26)	0.48
Hanging/suffocation	21 (28)	83 (6)	<0.0001
Firearms/explosives	2 (3)	17 (1)	0.24
Jumping	3 (4)	16 (1)	0.06
Other method	4 (5)	26 (2)	0.06

<sup>a</sup>  $\chi^2$  test-statistic compares lives with two biological parents vs. all other living situations

<sup>b</sup>  $\chi^2$  test-statistic compares self-injury in case's own home vs. all other locations

## **APPENDIX C.** Adolescents with and without intent-to-die information

Of the 1,435 adolescents in the sample, 872 (61%) had intent-to-die information, allowing classification as either attempted suicide or NSSI, and 563 (39%) did not have intent-to-die information. Bivariate associations are presented in Table C-1. Those without intent-to-die information did not significantly differ from those with intent-to-die information with respect to the following risk factors: age ( $p = 0.70$ ), sex ( $p = 0.39$ ), race/ethnicity ( $p = 0.94$ ), family discord ( $p = 0.09$ ), an argument or breakup with a boyfriend or girlfriend ( $p = 0.46$ ), peer pressure or argument ( $p = 0.17$ ), problems at school ( $p = 0.70$ ), completed suicide or attempt by a friend or relative ( $p = 0.10$ ), death of a friend or relative ( $p = 0.81$ ), exposure to a move or a new school ( $p = 0.59$ ), physical abuse ( $p = 0.66$ ), sexual abuse ( $p = 0.49$ ), drug abuse ( $p = 0.49$ ), history of a mood disorder ( $p = 0.08$ ), history of anxiety ( $p = 0.65$ ), history of a disruptive disorder ( $p = 0.43$ ), living situation ( $p = 0.11$ ), or a prior suicide attempt ( $p = 0.57$ ). The only risk factor that was significantly different between those with and without intent-to-die information was problems with the law ( $p = 0.04$ ).

The methods of self-injury were also not significantly different. Those with unknown intent were not more or less likely to self-injure using poison ( $p = 0.11$ ), cutting or piercing ( $p = 0.21$ ), hanging or suffocation ( $p = 0.57$ ), firearms or explosives ( $p = 0.22$ ), jumping ( $p = 0.31$ ), or other methods of self-harm (e.g., electrocution) ( $p = 0.93$ ).

In addition, those with known intent did not significantly differ from those with unknown intent with respect to the location of self-injury ( $p = 0.39$ ), telling someone of the plan to self-harm ( $p = 0.52$ ), and receiving a referral for follow-up care ( $p = 0.91$ ).

Knowledge of intent to die was significantly different depending on the year in which adolescent self-harm occurred ( $p = 0.02$ ). Intent-to-die information was missing in higher frequencies for cases of adolescent self-injury in 2008 compared to 2009 and 2010. This is most likely because 2008 was the first year that intent-to-die information was collected on the ASADS reporting form. It is encouraging that complete ascertainment of intent to die has increased each subsequent year after the inclusion of the intent-to-die question on the reporting form in 2008.

**Table C-1.** Characteristics of adolescents with and without information on intent to die ( $n = 1435$ )

<b>Characteristic</b>	<b>Unknown Intent</b>	<b>Known Intent</b>	<b><i>p</i></b>
	<b>No. (%) (<i>n</i> = 563)</b>	<b>No. (%) (<i>n</i> = 872)</b>	
Year			
2008	216 (38)	272 (31)	
2009	221 (39)	374 (43)	
2010	126 (23)	226 (26)	0.02
Age, mean (SD)	15.48 (1.3)	15.45 (1.2)	0.44
Sex ( <i>n</i> = 1340)			
Female	387 (73)	574 (71)	
Male	143 (27)	236 (29)	0.39
Race/ethnicity ( <i>n</i> = 1300)			
non-Hispanic White	426 (84)	665 (84)	
Other race/ethnicity	81 (16)	128 (16)	0.94
Household situation ( <i>n</i> = 1301)	156 (31)	218 (27)	0.11 <sup>a</sup>
Place of self-injury ( <i>n</i> = 1371)	400 (22)	632 (20)	0.39 <sup>b</sup>
Youth told someone of plan ( <i>n</i> = 910)	153 (52)	298 (50)	0.52
Referred for follow-up care ( <i>n</i> = 1370)	474 (89)	746 (89)	0.91
Precipitating event			
Family discord	236 (42)	405 (46)	0.09
Argument or breakup with boyfriend or girlfriend	146 (26)	211 (24)	0.46
Peer argument	36 (6)	73 (8)	0.17
School problems	121 (21)	180 (21)	0.70
Suicide or attempt by friend/relative	4 (1)	16 (2)	0.10
Death of friend/relative	28 (5)	41 (5)	0.81
Move or new school	19 (3)	25 (3)	0.59
Physical abuse	14 (2)	25 (3)	0.66
Sexual abuse	49 (9)	67 (8)	0.49
Drug abuse	69 (12)	121 (14)	0.49
Problems with the law	15 (3)	42 (5)	0.04
Mental health condition			
Mood disorder	312 (55)	524 (60)	0.08

Anxiety disorder	64 (11)	106 (12)	0.65
Disruptive disorder	70 (12)	121 (14)	0.43
Other mental health condition	12 (2)	10 (1)	0.14
Prior suicide attempt(s) ( <i>n</i> = 778)	102 (37)	197 (39)	0.57
Method of self-harm			
Poisoning	413 (73)	606 (69)	0.11
Cutting/piercing	138 (24)	240 (27)	0.21
Hanging/suffocation	35 (6)	48 (5)	0.57
Firearms/explosives	4 (1)	13 (1.5)	0.22
Jumping	4 (1)	12 (1)	0.31
Other method	10 (2)	16 (2)	0.93

<sup>a</sup>  $\chi^2$  test-statistic compares lives with two biological parents vs. all other living situations

<sup>b</sup>  $\chi^2$  test-statistic compares self-injury in case's own home vs. all other locations

## **APPENDIX D.** Creation of mental health condition categories

History of mental health condition indicated on the ASADS reporting form were re-categorized into DSM-IV diagnostic categories including mood disorder, anxiety disorder, psychotic disorder, pervasive developmental disorder, attention-deficit/disruptive behavior disorder, and personality disorder. There was also an “other” group for mental health disorders not captured by these categories that included sleep disorders and learning disabilities. Mood disorder included the major depressive disorder, dysthymia, and bipolar disorder categories on the reporting form, as well as mention of manic-depressive disorder in the mental health condition notes of the form.

Anxiety disorder included the post-traumatic stress disorder and adjustment disorder categories on the form, as well as mention of the following in the mental health condition notes: anxiety disorder, agoraphobia, obsessive-compulsive disorder, panic disorder, stress disorder, social phobia, attachment disorder, or trichotillomania.

Psychotic disorder included mention of the following in the mental health condition notes: schizophrenia, schizo-affective disorder, psychosis, or psychotic disorder.

Pervasive developmental disorder included mention of the following in the mental health condition notes on the form: autism, Asperger's syndrome, pervasive developmental disorder, fetal alcohol syndrome, and developmental disorder.

Attention-deficit/disruptive behavior disorder included the conduct disorder and attention-deficit/hyperactivity disorder and attention deficit disorder categories on the form, as well as mention of the following in the mental health condition notes: oppositional-defiant disorder, anger problems, and disruptive disorder.

Personality disorder included mention of the following in the mental health

condition notes: borderline personality disorder, antisocial behavior, paranoid behavior, histrionic behavior, avoidant behavior, personality disorder, cluster b disorder, multipersonality disorder, or obsessive personality disorder. Other mental health conditions included a valid response to the other mental health condition and eating disorder categories on the form, as well as mention in the mental health notes of learning disabilities, cognitive disabilities, or sleeping disorders. Re-classifying the mental health variable on the form by DSM-IV diagnostic categories was done to create a more clinically relevant mental health variable.

## **APPENDIX E.** Adolescents with and without information on prior suicide attempts

Of the 872 adolescents used in multivariate modeling, 503 (58%) had information on prior suicide attempts and 369 (42%) did not have prior attempt information. All bivariate associations are in Table E-1. The two groups did not significantly differ with respect to the following risk factors: age ( $p = 0.45$ ), sex ( $p = 0.09$ ), race ( $p = 0.10$ ), completed suicide or attempt by a friend or relative ( $p = 0.91$ ), exposure to a move or a new school ( $p = 0.32$ ), physical abuse ( $p = 0.86$ ), sexual abuse ( $p = 0.17$ ), drug abuse ( $p = 0.52$ ), history of a mood disorder ( $p = 0.31$ ), history of anxiety ( $p = 0.98$ ), history of a disruptive disorder ( $p = 0.12$ ), or household situation ( $p = 0.09$ ).

Those with information on prior suicide attempts significantly differed from those without information on prior attempt with regard to the following risk factors: family discord ( $p = 0.002$ ), an argument or breakup with a boyfriend or girlfriend ( $p = 0.03$ ), peer pressure or argument ( $p = 0.01$ ), problems at school ( $p = 0.0002$ ), death of a friend of relative ( $p = 0.04$ ), and problems with the law ( $p = 0.03$ ). The only risk factor variable that differed between the two groups and was included in multivariate analysis was problems at school. Those with information on prior suicide attempts indicated school problems more often than those without prior attempt information ( $p < 0.0002$ ). This could lead to an overestimate of the effect size between school problems and suicide attempts in the second model containing those with prior attempt information.

Some methods of self-harm were also significantly different between the two groups. Those with information on prior attempts were more likely to self-harm using poison ( $p < 0.0001$ ), while those without prior attempt information were more likely to self-harm by cutting or piercing ( $p < 0.0001$ ) and hanging or suffocating ( $p < 0.0001$ ).

The two groups did not differ by self-harm involving firearms or explosives ( $p = 0.78$ ), jumping ( $p = 0.59$ ), or other methods of self-harm (e.g., electrocution) ( $p = 0.91$ ).

Those with prior attempt information were not more or less likely than those with information on prior attempt to tell someone of the self-harm ( $p = 0.83$ ) or to be referred to follow-up care ( $p = 0.14$ ). However, those with information on prior suicide attempts were more likely than those without information on prior attempts to engage in self-harm in their own household versus all other locations of self-harm ( $p < 0.0001$ ).

The two groups did not differ by type of self-harm (attempted suicide or NSSI) ( $p = 0.52$ ), indicating that neither of the outcome groups was disproportionately affected in terms of sample size by the exclusion of cases without prior attempt information.

**Table E-1.** Characteristics of adolescents with and without information on prior suicide attempts ( $n = 872$ )

Characteristic	Prior Attempt Information	No Prior Attempt Information	<i>p</i>
	No. (%) ( <i>n</i> = 503)	No. (%) ( <i>n</i> = 369)	
Year			
2008	151 (30)	121 (33)	
2009	213 (42)	161 (44)	
2010	139 (28)	87 (24)	0.38
Age, mean (SD)	15.48 (1.21)	15.42 (1.24)	0.45
Sex ( <i>n</i> = 810)			
Female	346 (73)	228 (68)	
Male	127 (27)	109 (32)	0.90
Race/ethnicity ( <i>n</i> = 793)			
Non-Hispanic White	379 (82)	286 (86)	
Other race/ethnicity	83 (18)	45 (14)	0.10
Household situation ( <i>n</i> = 797)	139 (30)	79 (24)	0.09 <sup>a</sup>
Place of self-injury ( <i>n</i> = 789)	402 (83)	230 (72)	< 0.0001 <sup>b</sup>
Youth told someone of plan ( <i>n</i> = 910)	185 (50)	113 (51)	0.83
Referred for follow-up care ( <i>n</i> = 837)	437 (90)	309 (87)	0.14
Precipitating event			
Family discord	256 (51)	149 (40)	0.002
Argument or breakup with boyfriend or girlfriend	135 (27)	76 (21)	0.03
Peer argument	52 (10)	21 (6)	0.01
School problems	126 (25)	54 (15)	0.0002
Suicide or attempt by friend/relative	9 (2)	7 (2)	0.91



Death of friend/relative	30 (6)	11 (3)	0.04
Move or new school	12 (2)	13 (3)	0.32
Physical abuse	14 (3)	11 (3)	0.86
Sexual abuse	44 (9)	23 (6)	0.17
Drug abuse	73 (14)	48 (13)	0.52
Problems with the law	31 (6)	11 (3)	0.03
Mental health condition			
Mood disorder	295 (59)	229 (62)	0.31
Anxiety disorder	61 (12)	45 (12)	0.98
Disruptive disorder	62 (12)	59 (16)	0.12
Other mental health condition	7 (1)	3 (1)	0.43
Method of self-harm			
Poisoning	385 (76)	221 (50)	< 0.0001
Cutting/piercing	113 (22)	127 (34)	< 0.0001
Hanging/suffocation	21 (4)	27 (7)	0.04
Firearms/explosives	8 (2)	5 (1)	0.78
Jumping	6 (1)	6 (2)	0.59
Other method	9 (2)	7 (2)	0.91
Type of self-harm			
Suicide attempt	300 (60)	212 (57)	
Non-suicidal self-injury	203 (40)	157 (43)	0.52

<sup>a</sup>  $\chi^2$  test-statistic compares lives with two biological parents vs. all other living situations

<sup>b</sup>  $\chi^2$  test-statistic compares self-injury in case's own home vs. all other locations

## **APPENDIX F.** Detailed summary of self-harm methods

A detailed breakdown of specific self-harm methods is presented in Table F-1. Nearly 70% of adolescents used poison to self-harm. The use of poison was significantly different depending on intent to die, with 75% of suicide attempters using poison versus 61% of those engaging in NSSI ( $p < 0.0001$ ). Of adolescent self-harmers who used poison, 30% used an analgesic alone, 15.7% used an antidepressant alone, 3.8% used a narcotic alone, 6.5% used other drugs acting on the autonomic nervous system alone, 4.6% used other drugs alone, and 6.3% used an unspecified drug alone. Thirty-three percent used multiple drugs to self-harm.

Twenty-seven percent of adolescents engaged in self-harm by cutting or piercing. Self-harm by cutting or piercing was significantly different depending on intent to die with 20% of suicide attempters using cutting or piercing versus 38% of those engaging in NSSI ( $p < 0.0001$ ). Of the adolescent self-harmers who engaged in cutting or piercing, 18% used a knife, 21% used a razor blade, and 61% used an unknown implement.

Five percent of adolescent self-harmers engaged in hanging or suffocation. Self-harm by hanging or suffocation was significantly different depending on intent to die with 7.8% of suicide attempters using hanging or suffocation vs. 2.2% of those engaging in NSSI ( $p < 0.001$ ). Of the adolescents who self-harmed by hanging or suffocating, 65% hanged themselves, 2% suffocated by plastic bag, 25% used an unknown implement to suffocate, and 8% of these adolescents had an undetermined method of hanging or suffocation.

One percent of adolescents used a firearm or explosive to self-harm. Of these adolescents, 53.8% used a handgun, 7.7% used a rifle, and 38.5% used some other type of firearm. No explosives were used to self-harm. One percent of adolescents jumped to

self-harm. Of these adolescents, 42% jumped from a man-made structure and 58% jumped in front of a moving vehicle. Two percent of adolescents used atypical methods to self-harm. Of these adolescents, 19% percent were involved in an intentional car crash, 31% banged their head against a solid object, 25% punched a solid object, 6% burned themselves, 6% restricted food, and 12% engaged in an atypical method of self-injury that was not ascertained.

**Table F-1.** Specific methods of adolescent self-harm (*n* = 872)

<b>Method</b>	<b>No. (%)</b>
Poison	606 (69)
Analgesics alone	182 (30)
Antidepressants alone	95 (16)
Narcotics alone	23 (4)
Other drugs of ANS alone	39 (6)
Other drugs alone	38 (6)
Multiple drugs	200 (33)
Alcohol alone	8 (1)
Organic solvents alone	8 (1)
Other gasses and vapors alone	3 (0.50)
Pesticides alone	2 (0.33)
Other substances alone	3 (0.50)
Unknown	5 (0.8)
Cutting/Piercing	240 (27)
Knife	44 (18)
Razor blade	51 (21)
Unknown implement	145 (60)
Hanging/Suffocation	48 (5)
Hanging	31 (65)
Suffocation by plastic bag	1 (2)
Other suffocation	12 (25)
Unknown	4 (8)
Firearms/Explosives	13 (1.5)
Handgun	7 (54)
Rifle	1 (8)
Other firearm	5 (38)
Jumping	12 (1.4)
Jumping from man-made structure	5 (42)
Jumping or lying before moving vehicle	7 (58)
Other method	16 (2)
Intentional car crash	3 (19)
Banging head against solid object	5 (31)
Punching solid object	4 (25)
Burning self	1 (6)
Food restriction	1 (6)

**APPENDIX G.** Group differences in subset of adolescents used for second multivariate logistic regression model

Bivariate analysis between the outcome and adolescent characteristics was repeated for the subset of youth who had information on prior suicide attempts (Table G-1). The results of the bivariate analysis for this subset of adolescents were compared with results from the entire sample. The majority of variables implicated as significant predictors in bivariate analysis for the entire cohort were also implicated in the subset analysis. Compared to adolescents who engaged in NSSI, those who attempted suicide were slightly older ( $p = 0.03$ ), indicated problems at school as an event precipitating self-harm ( $p = 0.04$ ), had histories of mood disorders ( $p = 0.0004$ ), and had at least one prior suicide attempt ( $p = 0.0006$ ). The two self-harm groups also differed by method of self-harm with suicide attempters more likely to use poison ( $p = 0.01$ ) or hanging/suffocation ( $p = 0.01$ ), while adolescents who engaged in NSSI were more likely to cut or pierce to self-harm ( $p = 0.04$ ). There was also a group difference with respect to receiving a referral for follow-up care. Adolescents who attempted suicide were more likely than those who engaged in NSSI to receive a referral for follow-up care ( $p = 0.0004$ ). The only variable that was significant for the entire sample of adolescents, but not the subset, was gender ( $p = 0.59$ ).

**Table G-1.** Group differences in subset of adolescents used for second multivariate logistic regression model ( $n = 503$ )

Characteristic	Suicide Attempt No. (%) ( $n = 300$ )	Non-Suicidal Self-Injury No. (%) ( $n = 203$ )	$p$
Year			
2008	85 (28)	66 (33)	
2009	127 (42)	86 (42)	
2010	88 (30)	51 (25)	0.48
Age, mean (SD)	15.53 (1.2)	15.34 (1.2)	0.03
Sex ( $n = 473$ )			

Female	203 (72)	143 (74)	
Male	78 (28)	49 (26)	0.59
Race/ethnicity ( <i>n</i> = 462)			
Non-Hispanic White	221 (80)	158 (85)	
Other race/ethnicity	55 (20)	28 (15)	0.18
Household situation ( <i>n</i> = 470)	85 (30)	54 (29)	0.98 <sup>a</sup>
Place of self-harm ( <i>n</i> = 471)	243 (86)	159 (84)	0.40 <sup>b</sup>
Youth told someone of plan ( <i>n</i> = 370)	112 (51)	73 (49)	0.75
Referral for follow-up care ( <i>n</i> = 483)	269 (94)	168 (85)	0.0004
Precipitating event			
Family discord	156 (52)	100 (49)	0.55
Argument or breakup with boyfriend or girlfriend	75 (25)	60 (30)	0.26
Peer argument	33 (11)	19 (9)	0.55
School problems	85 (28)	41 (20)	0.04
Suicide or attempt by friend/relative	6 (2)	3 (1.5)	0.74
Death of friend/relative	20 (7)	10 (5)	0.42
Move or new school	10 (3)	2 (1)	0.13
Physical abuse	10 (3)	4 (2)	0.36
Sexual abuse	29 (10)	15 (7)	0.37
Drug abuse	40 (13)	33 (16)	0.36
Problems with the law	18 (6)	13 (6)	0.85
Mental health condition			
Mood disorder	195 (65)	100 (49)	0.0004
Anxiety disorder	42 (14)	19 (9)	0.12
Disruptive disorder	36 (12)	26 (13)	0.79
Prior suicide attempt(s)	136 (45)	61 (30)	0.0006
Method of self-harm			
Poisoning	241 (80)	144 (71)	0.01
Cutting/piercing	56 (19)	57 (28)	0.01
Hanging/suffocation	17 (6)	4 (2)	0.04
Firearms/explosives	6 (2)	2 (1)	0.48
Jumping	5 (2)	1 (0.5)	0.41
Other method	5 (2)	4 (2)	1.0

<sup>a</sup>  $\chi^2$  test-statistic compares lives with two biological parents vs. all other living situations

<sup>b</sup>  $\chi^2$  test-statistic compares self-injury in case's own home vs. all other locations

## **APPENDIX H.** Analysis of interaction terms in the first multivariate model

Sex, race (non-Hispanic White vs. other race/ethnicity), problems at school, presence of a mood disorder, and physical abuse all achieved the 0.05 level of statistical significance and were retained in the preliminary main effects model and tested for interactions. Although age ( $p = 0.05$ ), sexual abuse ( $p = 0.05$ ), and drug abuse ( $p = 0.07$ ) were only borderline significant, they were retained in the model for testing of interactions due to the co-morbid nature of many risk factors.

The results of interaction term tests are in Table H-1. The interaction between presence of a mood disorder and drug abuse and problems at school and drug abuse were the only interaction terms that reached the 0.10 level of significance when included in the preliminary main effects model. Both interaction terms met the 0.05 level of significance to remain in the final multivariate logistic regression model. The final multivariate logistic regression model with interaction terms contained sex, race (non-Hispanic White vs. other race/ethnicity), problems at school, physical abuse, sexual abuse, drug abuse, age, presence of a mood disorder, the interaction between drug abuse and school problems, and the interaction between drug abuse and presence of a mood disorder.

The effect estimates for the significant interaction terms are in Table H-2. Without the presence of drug abuse, adolescents who attempted suicide were more likely than those who engaged in NSSI to have problems at school (OR: 2.02; 95% CI: 1.31 - 3.12) and to have histories of mood disorders (OR: 1.55; 95% CI: 1.12 - 2.16). With the presence of drug abuse, adolescents who attempted suicide were no longer different from those who engaged in NSSI with respect to problems at school as an event precipitating self-harm (OR: 0.498; 95% CI: 0.185 - 1.34), but they were even more likely than those

who engaged in NSSI to have histories of mood disorders (OR: 4.58; 95% CI: 1.69 - 12.5).

**Table H-1.** Summary of interaction terms added to first multivariate model ( $n = 744$ )

<b>Variable</b>	<b>-2 Loglikelihood</b>	<b>G</b>	<b>DF</b>	<b><i>p</i></b>
Main effects model	964.155	45.8066		
Sex * Race	964.151	45.8103	1	0.95
Sex * Age	963.033	46.9280	1	0.29
Sex * Mood disorder	964.074	45.8867	1	0.78
Sex * Drug abuse	962.006	47.9550	1	0.14
Sex * School problems	962.925	47.0359	1	0.26
Sex * Physical abuse	963.656	46.3050	1	0.50
Sex * Sexual abuse	963.258	46.4331	1	0.96
Race * Age	963.931	46.0304	1	0.64
Race * Mood disorder	964.143	45.8177	1	0.92
Race * Drug abuse	963.930	46.0309	1	0.64
Race * School problems	963.259	46.7024	1	0.36
Race * Physical abuse	963.396	46.5651	1	0.37
Race * Sexual abuse	964.154	45.8069	1	0.99
Age * Mood disorder	964.058	45.9027	1	0.76
Age * Drug abuse	964.140	45.8215	1	0.90
Age * School problems	963.424	46.5373	1	0.39
Age * Physical abuse	964.140	45.8210	1	0.90
Age * Sexual abuse	963.938	46.0235	1	0.64
Mood disorder * Drug abuse	960.863	49.0981	1	0.08
Mood disorder * School problems	963.662	46.2988	1	0.48
Mood disorder * Physical abuse	963.544	46.4172	1	0.44
Mood disorder * Sexual abuse	961.459	48.5018	1	0.11
Drug abuse * School problems	958.622	51.3387	1	0.02
Drug abuse * Physical abuse	964.126	45.8353	1	0.87
Drug abuse * Sexual abuse	963.530	46.4308	1	0.44
School * Physical abuse	962.261	47.7006	1	0.15
School * Sexual abuse	964.153	45.8083	1	0.97
Physical abuse * Sexual abuse	963.958	46.0036	1	0.65

**Table H-2.** Effect estimates for interaction terms in the first multivariate logistic regression model ( $n = 744$ )

<b>Contrast</b>	<b>Estimate</b>	<b>95% CI</b>	<b>Wald Chi-Square</b>	<b><i>p</i></b>
School problems (drug abuse not present)	2.02	1.31, 3.12	10.2413	0.001
School problems (drug abuse present)	0.50	0.185, 1.34	1.9012	0.17
Mood disorder (drug abuse not present)	1.55	1.12, 2.16	6.8526	0.009
Mood disorder (drug abuse present)	4.58	1.69, 12.5	8.9036	0.003