

## Understanding the Relationship between Substance Use and Self-Injury in American Indian Youth

Allison Barlow, M.A., M.P.H.<sup>1</sup>, Lauren Tingey, M.S.W., M.P.H.<sup>1</sup>, Mary Cwik, Ph.D.<sup>1</sup>, Novalene Goklish, A.A., A.S.<sup>1</sup>, Francene Larzelere-Hinton, B.A.<sup>1</sup>, Angelita Lee<sup>1</sup>, Rosemarie Suttle, C.N.A.<sup>1</sup>, Britta Mullany, M.H.S., Ph.D.<sup>1</sup>, and John T. Walkup, M.D.<sup>1,2</sup>

<sup>1</sup>Center for American Indian Health, Johns Hopkins University, Baltimore, MD, USA, <sup>2</sup>Department of Psychiatry, Weill Cornell Medical Center, New York, NY, USA

**Background:** American Indian communities compared to other US populations are challenged by the largest health disparities in substance abuse and suicidal behavior among youth ages 15–24. **Objectives:** This article examines the co-occurrence of substance use and self-injury among reservation-based youth in the US. **Methods:** White Mountain Apache tribal leaders and Johns Hopkins University formed a partnership to address self-injury and substance abuse among Apache youth. Data on suicide (deaths, attempts, ideation), non-suicidal self-injury, and substance use were analyzed from the White Mountain Apache tribally mandated self-injury surveillance registry from 2007 to 2010, including 567 validated incidents from 352 individuals aged 15–24 years. Findings regarding characteristics of co-occurrence – including differences in the type of self-harm behavior, gender, and reported reasons for the act – were interpreted through a community-based participatory research process. **Results:** From 2007 to 2010, 64% ( $n = 7/11$ ) of Apache youth ages 15–24 were “drunk or high” at the time of suicide death with data missing for 2/11 deaths; 75.7% ( $n = 118/156$ ) were “drunk or high” during suicide attempt; 49.4% ( $n = 83/168$ ) during suicidal ideation; and 49.4% (81/166) during non-suicidal self-injury. Co-occurrence of substance use was higher for more lethal acts and among males. **Conclusion:** High rates of co-occurring self-injury and substance use within this population highlight the importance of research to understand relationships between these behaviors to design preemptive and integrated interventions. **Scientific Significance:** Tribal-specific and culturally informed data on the co-occurrence of self-injury and substance use hold promise for reducing the combined toll of years of productive life lost among American Indian youth.

**Keywords:** suicide, self-injury, binge substance use, American Indian, prevention

### INTRODUCTION

Unique to American Indian (AI) populations, the developmental trajectories for substance abuse and suicide behavior are parallel, peaking in adolescence through young adulthood. A broad literature supports that suicide and substance use co-occur (1). However, the relationship and possible shared causes are unknown (2).

While binge drinking and heavy alcohol use peaks in 15- to 24-year-olds in the general US population (3), AI youth are disproportionately affected. Rates of substance dependence and abuse are higher and start younger (3) among AI youth, and the age-adjusted alcohol-related death rate for 15- to 24-year-olds is 12-fold higher compared to US All Races (4.0/100,000 vs. 0.3/100,000) (4).

Suicide death rates for the AI youth and young adults also exceed other racial and ethnic groups (17.9/100,000 vs. 10.8/100,000 US All Races) (4) with youth disproportionately affected. AIs ages 15- to 34-year-olds have the highest suicide death rates (34.2/100,000 for 15–24 and 37.5/100,000 for 25–34 vs. 9.7/100,000 for US All Races), while suicide deaths in the US population rise in the 45- to 54-year-old age range (15.9/100,000) and are highest among 75+-year-olds (16.4–16.9/100,000) (4).

It is unknown whether among AI youth suicidal behavior and drug use are occurring together in the same population or whether rates of each are high but not necessarily co-occurring in the same youth. If suicidal behavior and drug use are occurring together, it is important to understand the nature of the relationship to develop effective interventions.

Three dominant Western hypotheses about the co-occurrence of suicidal behavior and substance abuse include the following: (1) both behaviors are motivated by a single cause such as unbearable stresses, a sense of

inadequacy or unmet expectations, or an attempt to “escape” life’s difficulties; (2) both behaviors are an expression of a third factor, such as other psychiatric conditions (i.e., depression or disruptive behavior disorders), poor impulse control, or negative life experiences (abuse or trauma); and (3) chronic or episodic substance abuse has biological, legal, emotional, and physical consequences that increase risk for suicide in vulnerable populations (1).

To gain a clearer and culturally informed understanding of how AI youth’s suicidal behavior and substance abuse co-occur, this article explores data from a unique tribally mandated self-injury surveillance system created by the White Mountain Apache Tribe (WMAT) to track community-based data on intentional self-injury and substance use. The WMAT has approximately 15,500 enrolled tribal members who live on the Ft. Apache Reservation in rural east-central Arizona. The surveillance system was created by Tribal Resolution in 2001 following a cluster of youth suicide deaths, and it has been described in detail in previous publications (5,6). The original tribal mandate required community-based reporting of suicide deaths, attempts, and ideation by all health and human service agencies and tribal citizens to a centralized suicide prevention data management team. In 2004, the Tribe partnered with Johns Hopkins University to refine and expand the surveillance outreach protocol, including a process to validate reported incidents through in-person follow-up by Apache community health specialists trained by Johns Hopkins mental health professionals. The follow-up process identified that substance abuse was frequently co-occurring with intentional self-injury, and some incidents of intentional self-injury were non-suicidal. As a result, in 2007, tribal leadership expanded the surveillance mandate to include collection of data on non-suicidal self-injury (NSSI), and in 2010, binge substance use was added as a discreet reportable behavior with or without co-occurrence of other forms of self-injury. This change reflected local understanding that suicidal and substance abuse behaviors are alien to Apache traditions and may share common root causes residing in a multigenerational history of trauma that eroded protective factors embedded in Apache culture. Tribal stakeholders seek understanding as to whether both behaviors may function as self-annihilation that arises in adolescence when vulnerable youth struggle to consolidate identity during the transition to adulthood.

As a first step, using data from the WMAT surveillance system from 2007 to 2010, the tribal and university investigators applied a community-based participatory research process to observe and interpret the degree of overlap between self-injury behaviors and substance abuse among Apache youth ages 15–24, the population at highest risk for both behaviors. The analysis focused on to what degree intentional self-injury and binge substance use co-occur, and whether there are differences in co-occurrence across self-injury categories (death, attempt, ideation vs. NSSI), gender, and reported reasons for self-injury. The ultimate goal of this line of research is to inform culturally tailored prevention interventions for co-occurring self-injury and substance use within AI populations.

## METHODS

### Design

Apache community mental health specialists indigenous to the local community were hired and trained to (1) educate community members regarding the suicide surveillance system and completion of the data registry forms; (2) validate and enter data from registry forms; (3) follow up on registry cases and facilitate referral; and (4) help interpret data in order to develop prevention strategies. As reporting participation is mandated by tribal law, no informed consent/assent is required to collect surveillance data.

The tribally mandated registry form collects data regarding name, age, sex, tribal affiliation, type of self-injurious behavior (including suicide death, attempt, ideation and NSSI, binge alcohol, or drug use), method, date and location, history of previous suicidal behavior, reported reason for the act, and referral information. Registry forms are completed by police, fire, medical, school and social service personnel, religious leaders, family members, and peers of suicidal individuals. Forms are collected and data are entered by Apache community mental health specialists. A secure electronic database is used to store and manage data.

### Definitions

Definitions of events for completing the suicide registry form and validation process are modeled on the Columbia Classification Algorithm for Suicide Assessment (C-CASA) (7). A *suicide* is defined as a death resulting from intentional self-inflicted injury as determined by the local medical examiner or authorized law enforcement official. A *suicide attempt* is defined as intentional self-injury with intent to die. Aborted and interrupted suicide attempts are included as part of the “suicide attempt” categorization. *Suicidal ideation* is defined as thoughts to take one’s own life with or without preparatory action. *NSSI* is defined as intentional self-injury without intent to die. *Binge substance use* – not part of the CASA system – is defined as consuming substances with the intention of modifying consciousness resulting in severe consequences, including blacking/passing out, found unresponsive, or requiring treatment in the Emergency Department. “*Other*” events include incidents that are validated as “non deliberate” or “indeterminant” self-harm with unknown intent to die.

### Sample

Data include all events reported to the White Mountain Apache self-injury surveillance system from January 2007 to December 2010 for tribal members ages 15–24 and validated as suicide death, attempt, ideation, NSSI, or binge substance use through in-person follow-up (see below section, “Validation Process”). Events coded as “other” were excluded from this analysis.

### Validation Process

Suicide deaths were validated through several sources, including tribal police, Bureau of Indian Affairs

investigators, Indian Health Service records, a local high risk task force, and family members and peers of the deceased. Substance use at the time of suicide death was verified by Tribal police, medical charts, or significant others (e.g., family, friends, neighbors, school mates). All other self-injury events were confirmed by Apache community mental health specialists during in-person follow-up with reported individuals. Follow-up procedures assessed intent to die and validated categorization of reported behavior, self-injury method, “reason for the act,” and substance use at the time of act.

### Analysis

Data for Apaches aged 15–24 are presented by year, self-injurious behavior (death, attempt, ideation, NSSI, and binge substance use), co-occurrence of substance use, and gender (Table 1). The individual’s reported reason for the act is also presented by the type of behavior (not available for suicide deaths) (Table 2). Only validated, double-entered data are included in the analysis. All data were analyzed with Stata version 11 (Stata Corp., College Station, TX, USA). This article was reviewed and approved by the White Mountain Apache Tribal Council and Health Board.

## RESULTS

### Self-Injury Events

Between January 2007 and December 2010, a total of 1230 self-injury events from 699 individuals were validated from the White Mountain Apache surveillance system for tribal members of all ages. Among 15- to 24-year-old youth, there were 567 events from 352 youth, representing approximately 11% of this age group over a 4-year period. Youth ages 15–24 (who comprise approximately 20% of the population) accounted for 65% of all deaths (11/17), 53% of all suicide attempts (156/294), 44% of all ideation (168/382), and 43% of all NSSIs (81/232).

### Alcohol and Drug Use-Related Events

Substance use was known to co-occur in 64% of youth deaths (7/11); however, substance use data were not available for 2/4 of suicide deaths. Among attempts, 75.7% ( $n = 118$  of 156) were “drunk or high” at the time of attempt, including 32.1% ( $n = 50$ ) who used overdose as their method; 49.4% (83 of 168) at the time of suicidal ideation; and 34.9% (81 of 232) at the time of NSSI. In 2010, when the surveillance system expanded to include binge substance use as a form of self-harm, 53 incidents of binge substance use were reported and validated.

### Substance Use Type and Self-Injury

When youth reported “being drunk or high” at the time of self-injury, alcohol was the primary substance to co-occur with self-injury events – 97.1% for suicide attempt, 91.6% for ideation, and 48.2% for NSSI. Marijuana was the next most common drug to co-occur with self-injury – 17.7% for attempt, 10.8% for ideation, and 4.8% for NSSI. When overdose was reported as the primary method of suicide attempt, prescription drugs were most common (52%)

followed by over-the-counter drugs (34%), illicit drugs (8%), then alcohol (6%). In 2010, when binge substance use was added as a reportable self-injury, alcohol (96.2%) was predominantly reported.

### Gender Differences

Of the 567 total youth self-injury events, the male-to-female ratio was 1:1 (289 males vs. 278 females). Of all youth deaths, 73% (8/11) were male vs. 27% (3/11) females. Substance use was known to co-occur in 50% (4/8) of male deaths (and “unknown” for 2/8 males) and 100% ( $n = 3$ ) of females. None used overdose as a method (hanging was the primary method – data not shown) (see Table 1). During youth attempts, two-thirds of males (67%) were drunk or high at the time (51/76) compared with 59% of females (47/80). However, only 12% of males chose overdose as their method compared with 52% of females. During ideation events, males were more often drunk or high than females (61% vs. 33%); however, females increasingly endorsed co-occurring substance use between 2007 and 2010 (29–56%). For NSSI not including binge substance use, males were drunk or high 57% of the time compared with 42.7% of females. Similar to trends with suicide ideation, females’ co-occurrence of substance abuse with NSSI increased during this time period (21–63%). In 2010, when binge drinking and drug use was added to the tribal surveillance system as a category of self-injury, binge substance use was reported nearly 2 times more for males than females ( $n = 37$  males vs.  $n = 16$  females).

### Reported Reason for the Act

Table 2 presents reason for the act by behavior, including suicide attempts, suicidal ideation, NSSI, and binge substance use. The most similar reported reasons for self-harm across suicide and binge behaviors were fight/argument with boy/girl friend, fight/argument with parent/relative, and family or home situation problems. The most dissimilar reported reasons across types of self-injury were death of a loved one and depression, with binge substance users reporting less depression as reason for the act and no “death of a loved one.” Conversely, binge users more frequently reported peer pressure as a reason for the act. There was also a higher proportion of unspecified data for “reason for the act” for binge incidents, including “no reason in particular.”

## DISCUSSION

Our data show high frequency of substance use co-occurring with self-injury among Apaches aged 15–24. While Apache males were drunk or high 50–60% of the time for all forms of self-injury, co-occurrence of substance use among females increased over the study period, reaching or exceeding male rates across injury categories by 2010. Other studies have indicated a climb in AI female substance use during this period (8). Apache females also chose overdose as their primary method of attempt (51.9%;  $n = 41/79$  female attempts) compared to only 12% of

TABLE 1. Suicidal and self-injury events among Apaches aged 15–24: 2007–2010.

n (%)	2007		2008		2009		2010		Total		
	M	F	M	F	M	F	M	F	M	F	All
	n = 69	n = 66	n = 56	n = 69	n = 64	n = 51	n = 100	n = 92	n = 289	n = 278	n = 567
<i>Suicide deaths</i>											
Drunk or high at the time of death (not primary method)	n = 1	n = 0	n = 2	n = 0	n = 3	n = 3	n = 2	n = 0	n = 8	n = 3	n = 11
Overdose was primary method	0	0	1	0	2	3	1	0	4 (50%)	3 (100%)	7 (63.6%)
Unknown/missing alcohol or drug use	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	1	0	2 (25%)	0	2 (18.2%)
<i>Suicide attempts</i>											
Drunk or high at the time of attempt (not primary method)	n = 19	n = 16	n = 20	n = 26	n = 23	n = 20	n = 15	n = 17	n = 77	n = 79	n = 156
Overdose was primary method	12	6	11	7	14	4	9	5	46 (59.7%)	22 (27.8%)	68 (43.6%)
Alcohol	3	9	4	14	1	11	1	7	9 (11.7%)	41 (51.9%)	50 (32.1%)
Illicit drug	0	0	0	0	0	0	1	2	1 (11.1%)	2 (4.9%)	3 (6%)
Prescription drug	0	1	0	0	1	1	0	1	1 (11.1%)	3 (7.9%)	4 (8%)
Over-the-counter drug	1	4	4	8	0	7	0	2	5 (55.6%)	21 (51.2%)	26 (52%)
	2	4	0	6	0	3	0	2	2 (22.2%)	15 (36.6%)	17 (34%)
<i>Suicide ideations</i>											
Drunk or high at the time of ideation (not primary method)	n = 24	n = 15	n = 20	n = 24	n = 25	n = 11	n = 25	n = 24	n = 94	n = 74	n = 168
NSSI <sup>s</sup>	18	3	13	8	14	3	13	11	58 (61.7%)	25 (33.8%)	83 (34.9%)
Drunk or high at the time of NSSI (not primary method)	n = 27	n = 33	n = 14	n = 19	n = 14	n = 16	n = 59	n = 50	n = 114	n = 118	n = 232
	12	3	8	7	7	9	13	22	40 (35.1%)	41 (34.7%)	81 (34.9%)
<i>Binge substance use<sup>1</sup></i>											
Alcohol							37	16	n = 37	n = 16	n = 53
Illicit drug							35	16	35 (94.6%)	16 (100%)	51 (96.2%)
Prescription drug							0	0	0	0	0
Over-the-counter drug							1	0	1 (2.9%)	0	1 (1.9%)
							1	0	1 (2.9%)	0	1 (1.9%)

Note: <sup>1</sup> Added to registry in 2010.

TABLE 2. Reason for the act: suicidal and self-injury events among Apaches aged 15–24: 2007–2010.

Reason, <i>N</i> (%)	Suicide attempts	Suicide ideations	NSSI (nonsubstance use method)	Binge as NSSI (substance use method)	Total
	<i>N</i> = 156	<i>N</i> = 168	<i>N</i> = 166	<i>N</i> = 66	<i>N</i> = 556
Suicide/death of a loved one/friend/relative	6 (3.9%)	3 (1.8%)	8 (4.8%)	0	17 (3.1%)
Fight/argument with boy/girlfriend/spouse	25 (16%)	22 (13.1%)	25 (15.1%)	6 (9.1%)	78 (14.1%)
Fight/argument with parent/relative	31 (19.9%)	38 (22.6%)	24 (14.5%)	5 (7.6%)	98 (17.6%)
Fight with others	1 (0.6%)	2 (1.2%)	6 (3.6%)	0	9 (1.6%)
Trouble with the law	1 (0.6%)	4 (2.4%)	0	0	5 (0.9%)
Family or home situation/problems	5 (3.2%)	2 (1.2%)	6 (3.6%)	3 (4.5%)	16 (2.9%)
Trouble at school	0	1 (0.6%)	3 (1.8%)	0	4 (0.7%)
Depression	12 (7.7%)	17 (10.1%)	8 (10.8%)	1 (1.5%)	48 (8.6%)
Stress/a lot on the mind	6 (3.8%)	12 (7.1%)	9 (5.4%)	2 (3%)	29 (5.2%)
Peer pressure/copying	1 (0.6%)	0	2 (1.2%)	5 (7.6%)	8 (1.4%)
No reason in particular	1 (0.6%)	4 (2.4%)	7 (4.2%)	9 (13.6%)	21 (3.8%)
Cannot remember much about the event	3 (1.9%)	4 (2.4%)	2 (1.2%)	2 (3%)	11 (2%)
Other	12 (7.7%)	11 (6.5%)	0 (12.1%)	5 (7.6%)	48 (8.6%)
Unknown/unspecified	52 (33.3%)	48 (28.6%)	36 (21.7%)	28 (42.4%)	164 (29.5%)

Apache males. This female preference for overdose is similar to other US populations; however, Apache female suicide death and attempt rates have been found to be higher in previous studies (5).

The greatest co-occurrence between substance use and self-injury was among those who died by suicide (7/9; 77.8% that could be validated (two males who died had unknown substance use)), followed by suicide attempt (75.6%;  $n = 118/156$ ), suicide ideation (49.4%;  $n = 83/168$ ), and NSSI (48.8%;  $81/166$ ). Thus, it appears the more lethal the behavior among the Apaches, the greater the co-occurrence with alcohol and drug use. While explanations from the literature could attribute this fact to the loss of impulse control that comes with substance use (2,9), Apache collaborators seek more culturally relevant explanatory models that posit substance abuse as a co-occurring form of adolescent self-injury that amplifies results of intentional self-harm. This idea is in contrast to dominant Western models of suicide, such as Joiner's (10) and Mann et al.'s (11), that do not include binge substance use in the spectrum of self-injury.

In order to shed light on the Apache hypothesis that adolescent binge substance use is functioning as a maladaptive form of self-injury, we explored similarities and differences in reported reasons for the act in Table 2. The most commonly reported reasons for self-injury across suicide and binge categories were partner conflict, family conflict, and family problems. However, youth reported for binge substance use were less likely to report death of a loved one or depression as a reason for their act and were more likely to report peer pressure. Due to study limitations, we could not clarify inferences regarding substance use function when substance use co-occurred with suicide attempts or ideation. Further research is needed to determine whether alcohol or drug use preceded ideation or attempt consciously or unconsciously, intentionally or unintentionally. In addition, the fact that when overdose

was the method of attempt, prescription and over-the-counter drugs were the favored substance choice may indicate a stronger intention to self-harm. Nonetheless, alcohol co-occurring with Apache self-injury behavior was a pervasive phenomenon.

Ultimately important in understanding alcohol use among AIs is the historical literature which charts a course whereby alcohol was inflicted by the dominant society as a tool of economic, political, moral, and social subjugation of AIs (12,13). Before the arrival of European explorers, fermented substances were generally unknown and taboo to indigenous North Americans. As the new colonies formed, alcohol became an instrument used by settlers to coerce tribes into signing treaties; conduct unfair trades of furs, food, and other resources; and denigrate and stereotype the "drunken savage" in the colonial consciousness (12,13). In this light, the Apache's modern-day hypothesis begs many questions regarding the lasting role of alcohol (and other non-ceremonial drugs) in collective Indian psyche and society. Are alcohol and illegal drugs continuing to function as a direct form of individual, family, and community self-destruction? Could this cultural understanding better equip tribes to address the dual problems of suicide and binge substance use among youth attempting to transition to productive adulthood?

There are several limitations to this study. The co-occurrence of substance use with self-injury events may be underreported due to individual's and families' reluctance to report binge and illegal substance use among their youth due to social undesirability, stigmatization, or fear of legal consequences, in spite of the fact registry information is protected from legal investigation. In addition, self-injury data in this analysis included only validated events, which could create a bias toward reporting individuals who were easier to find and potentially less challenged than those whose reports were not validated. Expansion of the surveillance data collection system over time (i.e., the

inclusion of binge drinking and drug use as a reportable act in 2010) changed data trends, with more binge substance use incidents ascertained in 2010; however, the addition of this data category provided increased opportunity for exploring shared characteristics of suicide and substance abuse behaviors in this setting. Finally, while the data collection was prospective, the analysis is cross-sectional. Therefore, we cannot discern the extent to which substance use preceded or prompted suicide or other self-harm behaviors.

## CONCLUSION

The White Mountain Apache tribally sanctioned surveillance system presents a unique platform to examine self-injury within a reservation setting. Its parameters for data collection reflect distinct tribal understanding of the relationship between suicide and substance abuse as part of continuum self-injury. Apache community mental health specialists' in-person follow-up to validate specific intentions (suicidal vs. non-suicidal) and reported reason for the act, the primary method (i.e., hanging involving intoxication vs. overdose), and the role of substance abuse produced preliminary insights into how substance abuse may function in the spectrum of self-harm. This line of research has high importance to AI communities who suffer a large burden of years of productive life lost due to these acute behavior problems converging in adolescence.

## Declaration of Interest

John T. Walkup declares the following: Dr. John Walkup received free medication and placebo from Lilly, Pfizer, and Abbott for NIMH-funded studies. He is a consultant for Shire Pharmaceuticals. He is a paid investigator on grants funded by Pfizer. He receives honoraria and expenses for continuing education presentations from the joint Tourette Syndrome Association and Center for Disease Control outreach program. He receives royalties from Guilford Press and Oxford Press for books on Tourette syndrome. He receives grant funding from the Tourette Syndrome Association. He serves on the advisory board of the Tourette Syndrome Association, Trichotillomania Learning Center, and the Anxiety Disorder Association of America without pay but with travel expenses covered.

The other authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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