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Lifetime history of traumatic events in an American Indian Community Sample: Heritability and relation to substance dependence, affective disorder, conduct disorder and PTSD

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Abstract

American Indians appear to experience a higher rate of traumatic events than what has been reported in general population surveys. American Indians also suffer higher alcohol related death rates than any other ethnic group in the U.S. population. Therefore efforts to delineate factors which may uniquely contribute to increased likelihood of trauma, post traumatic stress disorder (PTSD), and substance use disorders (SUD) over the lifetime in American Indians are important because of the high burden of morbidity and mortality that they pose to American Indian communities. Participants were American Indians recruited from reservations that were assessed with the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA), family history assessment and the *stressful-life-events scale*. Of the 309 participants, equivalent numbers of men and women (94%) reported experiencing traumas; however, a larger proportion of women received a PTSD diagnosis (38%) than men (29%). Having experienced multiple trauma and sexual abuse were most highly associated with PTSD. Having experienced assaultive trauma and having PTSD symptoms were both found to be moderately heritable (30–50%). Logistic regression revealed that having an anxiety and/or affective disorder and having a substance dependent diagnosis, but not having antisocial personality disorder/conduct disorder, were significantly correlated with having a diagnosis of PTSD. These studies suggest that trauma is highly prevalent in this American Indian community, it is heritable, is associated with PTSD, affective/ anxiety disorders and substance dependence. Additionally, trauma, PTSD and substance dependence appear to all co-emerge in early adulthood in this high- risk population.

Keywords

American Indian; PTSD; trauma; substance dependence

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INTRODUCTION

American Indians appear to experience a higher rate of traumatic events (Beals et al., 2005a; Manson et al., 2005; Robin et al., 1997) than what has been reported in general population surveys (Volpicelli et al., 1999). High rates of trauma have also been reported in aboriginal Canadians (Karmali et al., 2005) and in urban American Indian and Alaska Natives (Evans-Campbell et al., 2006; Sugarman & Grossman, 1996). Several studies have also studied PTSD symptoms associated with trauma exposure within specific American Indian communities and in treatment centers (Brinker et al., 2007). The rates of PTSD do not appear to be higher in American Indian adults or adolescents (Gnanadesikan et al., 2005; Robin et al., 1997); especially, when the level of trauma exposure is accounted for (Beals et al., 2002). Thus, the studies to date indicate that American Indians experience more traumas, but do not appear to experience more PTSD related to that trauma. However, the studies so far completed do not represent enough Indian communities to determine if differences across tribal groups impact the development of PTSD.

The comorbidity of trauma, PTSD and substance use disorders is very high with 52% prevalence rates for men and 28% for women in the general population and as high as 85% in clinical samples (Baker et al., 2009; Kessler et al., 1995, 2005; Mills et al., 2006; Petrakis et al., 2002). However, substance use, trauma and PTSD also have some differences across population groups. For instance, there is no published evidence that holocaust survivors have any increased risk for substance dependence (see Amir et al., 2003; Brodaty et al., 2004; Niederland, 1981; Yehuda et al., 1997). However, as pointed out by Szlemko et al. (2006) Native Americans' have a uniqueness in terms of history, culture, and societal position that may have resulted in a distinct set of circumstances unlike those found in other groups. For instance, although alcohol use varies among tribes, American Indians suffer higher alcohol related death rates than any other U.S. ethnic group and five times that of the general U.S. population (May, 1982; May & Smith, 1988; Shalala et al., 1999). Therefore efforts to delineate factors which uniquely contribute to increased likelihood of trauma, PTSD, and substance use disorder (SUD) symptoms over the lifetime in Native Americans are important because of the high burden of morbidity and mortality that these pose to some American Indian communities.

Although the comorbidity of alcohol dependence and PTSD has been documented in a number of surveys in the general population (Kessler et al., 1997) and in American Indian Communities (Boyd-Ball et al., 2006), the cause for the co-occurrence is not clearly understood. PTSD in individuals with alcohol dependence may be the result of an independent psychiatric disorder or may be in part caused by the use of alcohol or drugs. For example, PTSD may cause individuals to attempt to self-medicate their symptoms with alcohol and drugs thus leading to substance dependence. In contrast, PTSD may develop in persons with substance dependence given that exposure to multiple traumas is more likely to occur during episodes of heavy drinking and drug usage. A third hypothesis, called the "high risk" hypothesis, posits that exposure to substance abuse and traumatic events are part of a shared trait for vulnerability to engage in high-risk behaviors (Brady et al., 1998; Chilcoat & Breslau, 1998).

One possible common source of variance between PTSD and substance dependence is shared genetic risk. Sartor et al. (2011) recently reported that PTSD and Alcohol Dependence have substantial overlap in genetic influences in an all women's twin sample. Wolf et al. (2010) examined the phenotypic structure of PTSD and a range of other psychiatric disorders in male twin pairs and found that PTSD cross-loaded with both Internalizing and Externalizing disorders (see Green et al., 1990; King et al., 1999; Koenen et al., 2009). A few studies have directly estimated the heritability of trauma exposure and

PTSD symptoms. In one study of 4,042 male-male veteran twin pairs it was found that genetic factors accounted for about 30% of the variance in PTSD symptoms, and that genetic factors also influenced trauma exposure (Lyons et al., 1993; True et al., 1993). In another study of both male and female twin pairs of non-veteran volunteers PTSD symptoms and exposure to assaultive trauma were both found to have moderate heritability (Stein et al., 2002).

The present report is part of a larger family study exploring risk factors for substance dependence in a community sample of American Indians (see Ehlers et al., 2001a, 2001b, 2001c, 2001d, 2004a, 2008c; Gilder et al., 2004, 2006, 2007, 2009). The lifetime prevalence of substance dependence in this Indian population is high and evidence for heritability and linkage to specific chromosome locations and associations with candidate genes have been demonstrated (see Ehlers & Wilhelmsen, 2005, 2007; Ehlers et al., 2004b, 2006b, 2007a, 2007b, 2007c, 2008a, 2008b, 2009b, 2010a, 2010b, 2011; Gizer et al., 2011; Wall et al., 2003; Wilhelmsen & Ehlers, 2005). However, descriptions of traumatic events and PTSD have not been reported in this particular Indian population. Therefore, the aims of the present study were: (1) to document the range of traumatic events reported in this American Indian community; (2) to study the relationship of traumatic events to PTSD; (3) to estimate the heritability of PTSD symptoms and trauma exposure and (4) to determine the comorbidity of trauma and PTSD with substance dependence, affective disorder, and conduct disorder.

METHODS

Participants

American Indian participants were recruited from eight geographically contiguous reservations with a total population of about 3,000 individuals. Participants were recruited using a combination of a venue-based method for sampling hard-to-reach populations (Kalton & Anderson, 1986; Muhib et al., 2001) and a respondent-driven procedure (Heckathorn, 1997) that has been described elsewhere (Gilder et al., 2004). To be included in the study, participants had to be at least 1/16th Native American Heritage (NAH), be between the ages of 18 and 70 years, and be mobile enough to be transported from his or her home to The Scripps Research Institute (TSRI). Given that the present report is part of a larger family study exploring risk factors for substance dependence, study participants are nested within large multigenerational pedigrees. The protocol for the study was approved by the Institutional Review Board (IRB) of TSRI, the Scientific Advisory Committee of the GCRC, and the Indian Health Council, a tribal review group overseeing health issues for the reservations where recruitment was undertaken. Written informed consent was obtained from each participant after the study was fully explained.

Measures

Potential participants first met individually with research staff to have the study explained and give written informed consent. During a screening period, participants had blood pressure and pulse taken, and completed a questionnaire that was used to gather information on demographics, personal medical history, ethnicity, and drinking history (Schuckit, 1985). Participants were asked to refrain from alcohol and drug usage for 24 hours prior to testing. Each participant also completed an interview with the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) and the family history assessment module (FHAM) (Bucholz et al., 1994), which was used to make substance use disorder and psychiatric disorder diagnoses according to Diagnostic and Statistical Manual (DSM-IV) criteria in the probands and their family members (American Psychiatric Association, 1987). The SSAGA is a semi-structured, poly-diagnostic psychiatric interview that has undergone both reliability

and validity testing (Bucholz et al., 1994; Hesselbrock et al., 1999). It has been used in another American Indian sample (Hesselbrock et al., 2000, 2003). A trauma questionnaire was supplemented to the SSAGA to assess quantitative trauma exposure in the participants. The stressful life events and response to stressful-life-events scale was used (Green, 1996).

Data Analysis

Data analyses were based on the four specific aims of this study. The first aim was to document the range of traumatic events reported in this American Indian community. To investigate this aim, the number of participants who experienced any of seven types of trauma (Military combat, sexual abuse, injury or assault, natural disaster with loss, witnessed trauma, experienced crime without injury, unexpected death) as documented by the stressful-life-events scale, were tallied and a chi square analysis and Fisher's Exact Test was used to detect gender effects. A weakness of these univariate analyses is that conducting many association tests on small numbers are likely to produce some false positive results.

The second aim was to study the relationship of traumatic events to PTSD. To study this aim, the type of trauma reported by individuals with a diagnosis of PTSD was tallied and a chi square analysis and Fisher's Exact Test used to detect gender effects. In addition, the effects of multiple trauma exposure were evaluated by comparing the total number of traumas experienced by individuals with or without a PTSD diagnosis using ANOVA. A second set of analyses were conducted using the Sequential Oligogenic Linkage Analysis Routines (SOLAR) software (Almasy & Blangero, 1998), in order to control for the genetic relatedness of study participants.

In the third aim analyses were conducted to estimate the heritability of assaultive trauma and PTSD symptoms using SOLAR (Almasy & Blangero, 1998) as previously described (see Ehlers et al., 2009). Participant's age at the time of evaluation and sex were evaluated as potential covariates and retained if they accounted for at least 5% of the total variance. The two phenotypes, which were both dichotomous, were analyzed using a threshold model in which the phenotype is considered as a normally distributed latent trait with a threshold above which an individual is observed to be "affected" (Duggirala et al., 1997; Wilhelmsen & Ehlers, 2005). The total additive genetic heritability (h^2) and its standard error were estimated, and the probability that h^2 was greater than zero was determined using a Student's t-test.

The fourth aim was to determine the comorbidity of trauma and PTSD with substance dependence, affective disorder, and conduct disorder. For these sets of analyses Chi Square and Fisher's Exact Tests, Odds ratios, and 95% confidence intervals were calculated for each diagnosis (yes/no) marijuana dependence (MJ DEP), alcohol dependence (ALC DEP), stimulant dependence (STIM DEP), nicotine dependence (NIC DEP), antisocial personality disorder (ASPD), conduct disorder (CD), post traumatic stress disorder (PTSD), any anxiety disorder (presence of: panic disorder with or without agoraphobia, agoraphobia without panic, social phobia, and obsessive-compulsive disorder, ANY AX), any affective disorder (major depressive disorder, bipolar I disorder, and dysthymic disorder, ANY AF), Major depressive disorder (MDD); by trauma category (no trauma/trauma). The co-morbidity of PTSD (yes/no) with each of the other diagnoses (yes/no) was also estimated. These analyses were also conducted in SOLAR to control for the relatedness of study participants.

In order to test a larger integrated model, the diagnostic variables that were significantly comorbid with PTSD in the Chi Square analyses were entered, with age and gender, into a logistic regression to determine what remained significant for substance dependence and PTSD. Additionally, a series of mediation and moderation models were conducted using hierarchical regression analyses according to the steps described by Baron & Kenny (1986).

These analyses were conducted to more closely examine the relations between alcohol and other substance dependence, assaultive trauma, and PTSD with the specific hypothesis that problem drinking and substance use puts individuals at an increased risk of experiencing trauma that, in turn, leads to increased risk for PTSD. Finally, in order to determine the chronology of PTSD with the other diagnoses, the age at each diagnosis for each individual with PTSD was compared to determine which diagnosis the individual recalled having first. Because SOLAR cannot perform a parallel set of analyses and given the complex nature of the genetic relationships among study participants (subjects are clustered within large multigenerational pedigrees), it was not possible to control for the relatedness of individuals in these analyses.

RESULTS

Three hundred and nine participants completed a SSAGA and had information on traumatic events and PTSD that were available for these analyses. Sample demographics are presented in table 1. There were no significant differences in demographic variables between participants with and without PTSD.

Data analyses for the first aim revealed that a range of traumatic events were experienced in this American Indian community as seen in table 2. Ninety-four percent of the participants reported experiencing at least 1 of 7 types of trauma as documented by stressful-life-events scale. Equivalent numbers of men (92%) and women (94%) endorsed having experienced at least one trauma. The most common type of trauma experienced was unexpected death (74%) followed by injury or assault (66%), crime without injury (49%), witnessing trauma (45%), natural disaster with loss (36%), sexual abuse (22%) and military combat (1%). Only men endorsed having experienced military combat (Fisher's Exact $p=0.036$, SOLAR $p = .008$) and women were more likely to have experienced sexual abuse (Fisher's Exact $p<0.001$, SOLAR $p < 0.001$).

The second aim was to study the relationship of traumatic events to PTSD. Thirty four percent of individuals who had experienced at least one trauma met DSM-IV criteria for PTSD. A larger proportion of women received a PTSD diagnosis (38%) than men (29%). All trauma types were significantly associated with PTSD except natural disaster with loss. The trauma type most likely to be associated with PTSD was sexual abuse with 33% of the participants who had experienced the trauma meeting criteria for PTSD. Women were more likely to experience sexual trauma, but men who experienced sexual trauma were more likely than women to get a PTSD diagnosis (Chi Square = 4.6, $p<0.04$).

In the third aim analyses were conducted to estimate the heritability of trauma and PTSD symptoms. Assaultive trauma was found to be significantly heritable ($h^2=0.34 \pm 0.17$, $p<0.014$), as was having any PTSD symptoms ($h^2=0.33 \pm 0.18$, $p<0.02$).

The fourth aim was to determine the comorbidity of trauma and PTSD with substance dependence, affective disorder, and conduct disorder/ASPD. For the first sets of analyses Chi Squares and Fisher's Exact Tests, Odds ratios, and 95% confidence intervals were calculated for each diagnosis by trauma category (no trauma/trauma) and the results are presented in table 3. The co-morbidity of PTSD with each of the other diagnoses was also estimated using Chi Squares and Fisher's Exact Tests, Odds ratios, and 95% confidence intervals. ALC DEP, NIC DEP, STIM DEP, MJ DEP, MDD, ANY AX, and ANY AF, were all found to be significantly comorbid with PTSD at the $p<0.05$ level, as seen in table 4. Both sets of analyses were also conducted using SOLAR to account for the genetic relatedness of participants with little change in the results (see tables 3 and 4). The effects of multiple trauma exposure was evaluated by comparing the total number of traumas

experienced by those individuals with a PTSD diagnosis with those who did not meet diagnostic criteria using ANOVA. Individuals with a PTSD diagnosis were more likely to experience multiple traumas than those without the diagnosis ($F=8.7$, $p<0.003$, SOLAR $p=0.003$). Higher numbers of traumas were also significantly more likely in individuals with NIC DEP, ASPD, ANY AX, and ANY AF as seen in table 5.

In order to determine the chronology of PTSD with the other diagnoses, the age at diagnosis of PTSD and the other psychiatric disorders where there was data available in the SSAGA was compared. The mean age at PTSD diagnosis was 21 ± 0.89 yrs. In general, PTSD diagnoses appeared at similar ages to the other diagnoses except MDD 25.78 ± 0.97 which occurred later in time. To more precisely determine whether each individual recalled that PTSD occurred before or after the diagnosis of MJ DEP, ALC DEP, STIM DEP or MDD, data from each individual was assessed and tallied. In the case of ALC DEP 24 individuals recalled having PTSD first and 24 recalled having ALC DEP first and 6 said they occurred at the same time. In the case of MJ DEP 16 individuals recalled having PTSD first and 13 recalled having MJ DEP first and 1 said they occurred at the same time. For STIM DEP 16 individuals recalled having PTSD first and 13 recalled having STIM DEP first and 3 said they occurred at the same time. Whereas for MDD, 23 individuals recalled having PTSD first and only 6 recalled having MDD DEP first and 15 said they occurred at the same time. Thus these data also confirmed that these disorders generally co-emerge during the same general age range in young adulthood.

The diagnostic variables that were significantly co-morbid with PTSD in the Chi Square analyses were entered, with age and gender, into a logistic regression to determine what remained significantly correlated with PTSD in a larger integrated model. To reduce the number of variables entered into the regression MDD, ANY AX, and ANY AF were combined to produce the variable ANY AXAF, and NIC DEP, STIM DEP, and ALC DEP were combined to produce the variable SUBDEP. In the larger model, age and gender were not significant, but ANYAXAF (Wald=27.486, $p<0.0001$) and SUBDEP (Wald= 11.9, $p<0.001$) remained significantly associated with PTSD. In order to further test the relationship between PTSD and SUBDEP, age, gender, ANYAXAF, ASPD/CD and PTSD were entered into a logistic regression to test their ability to contribute to the variance in SUBDEP. In the final model only ASPD/CD (Wald=17.1, $p<0.0001$) and PTSD (Wald=14.7, $p<0.0001$) were found to be significant. These data suggest that ASPD/CD has an important contribution to SUBDEP but not to PTSD, whereas ANYAXAF has an important contribution to PTSD but not to SUBDEP.

Finally, mediation and moderation analyses were conducted to evaluate the hypothesis that problem drinking and substance use puts individuals at an increased risk of experiencing trauma that, in turn, leads to increased risk for PTSD. First, a series of hierarchical logistic regression models were run according to the steps outlined by Baron & Kenny (1986) to test whether the relation between alcohol dependence and PTSD is mediated by the experience of a traumatic event, thus providing a test of the described hypothesis. In an initial analysis, SUBDEP showed a significant relation with PTSD (Wald $\chi^2(n=302) = 19.38$, $p=0.00001$, Nagelkerke $R^2=0.08$). This relation was reduced by approximately half when controlling for assaultive trauma (Wald $\chi^2(n=302) = 10.66$, $p=0.00110$, Nagelkerke $R^2=0.04$) and a Sobel test of this mediation effect conducting using the Mplus software (Muthén & Muthén, 2010) was also significant ($\beta=0.37$, $t=3.86$, $p=0.00014$). Together, these results suggest that experiencing an assaultive trauma partially mediates the relation between SUBDEP and PTSD. Alternative models in which assaultive trauma and PTSD predicted substance dependence diagnostic status were also significant making it difficult to draw strong conclusions regarding the directionality of these relationships (data not shown). The moderation analysis was also significant suggesting an interaction between SUBDEP and

assaultive trauma in predicting PTSD (Wald $\chi^2(n=302) = 5.31, p=0.021$, Nagelkerke $R^2=0.03$). Follow-up analyses suggested that participants with negative histories of substance dependence and assaultive trauma were less likely to develop PTSD than participants with positive histories of substance dependence, assaultive trauma, or both. Notably, the latter three groups did not differ in their rates of PTSD.

DISCUSSION

American Indians appear to be at higher risk than other Americans for exposure to traumatic events (see Manson et al., 2005). In the present study, equivalent numbers of men (92%) and women (94%) endorsed having experienced at least one trauma and 66% reported having experienced assaultive trauma. Our finding of equivalent numbers of men and women experiencing at least one traumatic event is consistent with the two other reservation based studies (Manson et al., 2005; Robin et al., 1997) but does not support one of the most consistent observations in studies of traumatic exposure in general population surveys which is that men are significantly more likely to experience trauma than women (Breslau et al., 1999; Bromet et al., 1998; Hidalgo & Davidson, 2000; Norris, 1992). However, in the present study a larger proportion of women who had experienced trauma received a PTSD diagnosis than men, a finding that has been reported in numerous previous studies in general population samples and combat veterans (Breslau et al., 1997; Brewin et al., 2000; Fullerton et al., 2001; King et al., 1999).

In this study the diagnosis of PTSD was also found to be significantly co-morbid with several internalizing diagnoses (any anxiety or affective disorder). There have been several large studies that have linked anxiety and depressive disorders with an increase in the risk for PTSD (see Breslau et al., 1997; Bromet et al., 1998; Perkonig et al., 2000). Fewer other studies have investigated the co-morbidity of PTSD with other psychiatric disorders in American Indian communities. In one study of American Indian Veterans, conduct disorder was found to be associated with elevated war-related PTSD symptoms among males (Dillard et al., 2007). In the present study ASPD but not CD, was associated with having experienced injury or assault, having witnessed a trauma, and crime. However, ASPD was not associated with PTSD. It may be that the discrepant results between these studies of American Indians resulted because the Veterans study included only male combat veterans whereas in the current study females were the majority and very few individuals had experienced combat related trauma. Taken together what these studies do suggest is that there may be differential risk factors for PTSD depending on the type of trauma experienced.

Another set of highly co-morbid disorders that were observed in the present study was the substances dependencies. All four substance dependencies assessed (ALC DEP, NIC DEP, STIM DEP, MJ DEP) were found to be co-morbid with PTSD in the present study. Associations between PTSD symptom clusters and cigarette smoking have been reported in general population samples (Greenberg et al., 2012). A greater frequency of cannabis use has also been found in military veterans after residential treatment for PTSD (Bonn-Miller et al., 2011) and in general population samples (Cougle et al., 2011). In the long standing psychiatric epidemiology study of two northern plains and one southwest American Indian population high rates of alcohol use disorders and traumatic stress were found when compared to other populations (Beals et al., 2005a, 2005b; Boyd-Ball et al., 2006). High rates of trauma and PTSD symptomatology have also been reported in American Indian adolescents in substance abuse treatment (Deters et al., 2006), and in American Indian veterans (Westermeyer et al., 2009). In the current study, substance dependence remained significantly correlated with PTSD in logistic regression analyses.

Unfortunately, none of these studies can account for the direction of the association between substance dependence, trauma, and PTSD. In the present study both assaultive trauma and having any PTSD symptoms were found to be moderately heritable. Notably, these heritability estimates were generated using relative pair correlations as the primary unit of measurement. Because monozygotic twin pairs were not included, the effects of genetic influences could not be distinguished from the shared environment of the sibling pairs, which could positively bias the heritability estimates. Nonetheless, these findings are very similar to what has been reported previously in a study of both male and female twin pairs of non-veteran volunteers. In that study PTSD symptoms and exposure to assaultive trauma were both found to have moderate heritability (Stein et al., 2002). What is being inherited in these studies is not known, however, Sartor et al. (2011) have recently reported that PTSD and Alcohol Dependence have substantial overlap in genetic influences in an all women's twin sample. It may be that risk for alcohol dependence, assaultive trauma and PTSD symptoms share genetic influences. In one study, severe traumatic events in American Indian adolescents were found to be correlated with parental alcohol use, also suggesting that alcohol use may be a cause of or result in, traumatic events (Boyd-Ball et al., 2006).

Using retrospective reports we attempted to further explore the relations between substance dependence, trauma, and PTSD by ascertaining whether a PTSD diagnosis preceded, followed, or emerged within a similar time frame of the development of substance dependence. The results of these analyses generally support the idea that substance dependence, trauma and PTSD appear to co-emerge within a short period of time within young adulthood. Thus these data best support the "high risk" hypothesis which posits that exposure to substance abuse and traumatic events co-emerge in high risk individuals residing in high risk environments (Brady et al., 1998; Chilcoat & Breslau, 1998). These findings further suggest that substance abuse treatment programs for American Indians may benefit from addressing issues related to trauma exposure, PTSD and the associated symptomatology.

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Table 1**Demographics**

	No PTSD	PTSD	Total
Age	31.58 ± 15.21	33.65 ± 13.89	32.24 ± 14.81
Education	11.65 ± 1.56	11.52 ± 1.66	11.61 ± 1.59
Age at First intoxication	15.91 ± 3.71	15.00 ± 5.23	15.60 ± 4.30
Gender			
Male	99	36	135
Female	111	63	174
Currently Employment			
No	155	73	228
Yes	55	26	81
Economic Status			
<\$20,000	70	42	112
>\$20,000	106	52	158
Married			
No	188	81	269
Yes	22	18	40
Percentage of Native American Heritage			
<50%	141	63	204
>50%	69	36	105

Table 2

Number of People Endorsing Trauma by Type

	Military Combat	Sexual Abuse	Injury or Assault	Natural Disaster with loss	Witnessed Trauma	Crime without Injury	Unexpected Death
Male	4 *	9	91	50	67	64	98
Female	0	60 **	113	61	73	86	130
Total (N=309)	4 (1%)	69 (22%)	204 (66%)	111 (36%)	140 (45%)	150 (49%)	228 (74%)
PTSD cases by trauma type							
Male	1 (25%)	4 (44%)	7 (8%)	2 (4%)	2 (3%)	6 (9%)	14 (14%)
Female	0 (0%)	19 (32%)	16 (14%)	1 (2%)	7 (10%)	4 (5%)	16 (12%)
Total	1 (25%)	23 (33%)	23 (11%)	3 (3%)	9 (6%)	10 (7%)	30 (13%)

* p<0.05,

** p<0.001 (gender effect)

Table 3
Odds Ratios 95% Confidence Intervals for Significant Findings for Diagnoses Based on Type of Trauma

Sexual Abuse	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
Alc Dep	6.245	1.984	1.15 to 3.41	0.016	0.007
Stim Dep	5.726	2.027	1.13 to 3.64	0.024	0.031
MDD	13.380	2.777	1.59 to 4.86	<0.001	<0.001
Any AX	6.376	2.382	1.20 to 4.74	0.017	0.011
Any AF	28.022	4.297	2.45 to 7.53	<0.001	<0.001
PTSD	33.913	4.994	2.83 to 8.81	<0.001	<0.001
Injury/Assault	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
Alc Dep	21.573	3.556	2.05 to 6.17	<0.001	<0.001
MJ Dep	16.726	4.340	2.06 to 9.16	<0.001	<0.001
Stim Dep	18.169	4.343	2.12 to 8.88	<0.001	<0.001
Nicotine Dep	10.138	2.332	1.38 to 3.95	0.002	0.005
MDD	10.544	2.580	1.44 to 4.62	0.001	0.002
ASPD	14.058	9.939	2.34 to 42.29	<0.001	<0.001
Any AF	15.999	3.105	1.76 to 5.49	<0.001	<0.001
PTSD	18.346	3.479	1.93 to 6.28	<0.001	<0.001
Natural Disaster	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
MJ Dep	6.020	1.970	1.14 to 3.40	0.022	0.018
Stim Dep	7.088	0.447	0.25 to 0.82	0.008	0.005
Any AX	3.620	1.867	0.97 to 3.57	0.062	0.190
Witnessed	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
Alc Dep	6.705	1.843	1.16 to 2.93	0.013	0.008
MJ Dep	17.559	3.27	1.85 to 5.78	<0.001	<0.001
Stim Dep	4.004	1.707	1.01 to 2.89	0.060	0.066
ASPD	10.868	3.457	1.60 to 7.48	0.001	<0.001
Any AX	9.876	2.893	1.46 to 5.73	0.003	0.002
PTSD	7.451	1.953	1.20 to 3.17	0.007	0.007

Sexual Abuse	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
Crime	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
Alc Dep	12.729	2.338	1.46 to 3.74	<0.001	0.001
Stim Dep	5.862	1.921	1.13 to 3.27	0.017	0.015
MDD	4.888	1.75	1.06 to 2.88	0.033	0.027
ASPD	8.276	2.98	1.38 to 6.44	0.006	0.006
Any AF	5.271	1.749	1.08 to 2.82	0.029	0.028
PTSD	9.966	2.182	1.34 to 3.56	0.002	0.001
Bereavement	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
ASPD	4.461	3.029	1.03 to 8.87	0.040	0.008
PTSD	10.976	2.845	1.51 to 5.37	0.001	<0.001

Table 4

Odds Ratios and 95% Confidence Intervals of PTSD by Diagnoses

	Chi-Square	Odds Ratio	95% C.I.	Fisher's Exact p	SOLAR p
Alc Dep	17.229	2.8	1.71 to 4.59	<0.001	<0.001
MJ Dep	5.842	1.968	1.13 to 3.43	0.019	0.034
Stimulant Dep	7.045	2.061	1.2 to 3.53	0.010	0.012
Nicotine Dep	4.596	1.707	1.04 to 2.79	0.042	0.039
MDD	17.380	2.933	1.75 to 4.91	<0.001	<0.001
ASPD	1.149	1.482	0.72 to 3.05	0.336	0.218
CD	0.021	0.938	0.39 to 2.24	>0.999	0.970
Any AX	12.967	3.217	1.67 to 6.21	<0.001	<0.001
Any AF	27.753	3.786	2.28 to 6.29	<0.001	<0.001

Table 5

Total Number of Traumas by Diagnosis

	Number	Mean	SE	F-stat	Sig.	SOLAR p-value
No Alc Dep	192	8.53	2.133			
Alc Dep	117	14.38	2.025	3.427	0.065	0.069
No MJ Dep	241	9.51	1.791			
MJ Dep	68	15.10	2.877	2.277	0.132	0.142
No Stim Dep	235	9.49	1.829			
Stim Dep	74	14.73	2.702	2.124	0.146	0.164
No Nic Dep	198	7.84	0.784			
Nic Dep	111	15.93	4.010	6.486	0.011	0.012
No CD	283	11.00	1.674			
CD	26	7.92	1.267	0.309	0.579	0.543
No ASPD	274	9.52	1.598			
ASPD	35	20.34	5.040	5.044	0.025	0.025
No Anxiety	266	8.37	0.803			
Any Anxiety	43	25.44	9.667	15.466	<0.001	<0.001
No Affective	207	7.90	0.919			
Any Affective	102	16.52	4.225	7.090	0.008	0.011
No MDD	220	10.04	2.0			
MDD	89	12.48	2.020	0.517	0.473	0.508
No PTSD	210	7.67	0.990			
PTSD	99	17.26	4.256	8.685	0.003	0.003