The Relationship of Gender and Trauma Characteristics to Posttraumatic Stress Disorder in a Community Sample of Traumatized Northern Plains American Indian Adolescents and Young Adults

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Objective: Previous studies have identified a high prevalence (25%–80%) of trauma among American Indian and non–American Indian adolescents and adults. However, only a fraction of traumatized individuals develop posttraumatic stress disorder (PTSD). This article examines the relationships of gender and trauma characteristics to a diagnosis of PTSD among a community sample of traumatized American Indian adolescents and young adults.

Method: Complete data were collected from 349 American Indians aged 15 to 24 years who participated in a cross-sectional community-based study from July 1997 to December 1999 and reported experiencing at least 1 traumatic event. Traumatic events and PTSD were assessed using a version of the Composite International Diagnostic Interview. Logistic regression determined the relationships of gender, trauma type, age at first trauma, and number of traumas to the development of PTSD.

Results: Forty-two participants (12.0% of those who experienced a traumatic event) met criteria for lifetime PTSD. While all 4 of the independent variables noted above demonstrated univariate associations with PTSD, multivariate logistic regression analyses indicated that only experiencing a sexual trauma (odds ratio [OR] = 4.45, 95% confidence interval [CI] = 1.76 to 11.28) and having experienced 6 or more traumas (OR = 2.53, 95% CI = 1.06 to 6.04) were independent predictors of meeting criteria for PTSD.

Conclusion: American Indian children and adolescents who experience sexual trauma and multiple traumatic experiences may be at particularly high risk for developing PTSD.

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Trauma and traumatic experiences are highly prevalent in both American Indian[1,2] and non–American Indian populations.[3–7] Perkonigg et al.[8] found that approximately 22% of adolescents and young adults (aged 14–24 years) reported having experienced at least 1 traumatic event. Rosenman[6] found that 57% of a general population sample of adults (18 and older) in Australia reported a positive life history of experiencing 1 or more traumas. Other studies[3–5,9,10] estimate the lifetime prevalence of traumatic exposure at 40% to 80% in adults.

While trauma is a common experience, the development of posttraumatic stress disorder (PTSD) is not, particularly in community studies.[11] Rosenman[6] reported a 12-month prevalence rate of 1.5% among the Australian general population (aged 18 years and older) and of 2.8%

among those who endorsed lifetime trauma. Perkonigg et al.[8] obtained 12-month prevalence rates of 1% in males and 2.2% in females (aged 14–24 years). The National Comorbidity Survey[9] yielded lifetime prevalence rates of 2.8% and 10.3% for male and female adolescents and young adults (aged 15–24 years), respectively, in the U.S. general population.

When contrasted with the high frequency of trauma, the relatively low prevalence of PTSD raises the question of what factors predispose a person to develop PTSD after exposure to trauma. Research to date regarding potential risk factors for developing PTSD has focused on specific characteristics of an individual's traumatic experiences (i.e., type of trauma, number of traumas, and age at traumatic experience) as well as female gender.

The contribution of trauma type to development of PTSD has been explored in several studies. Findings from these studies[6,12–16] suggest that violent traumas are more likely to lead to the development of PTSD than other types of traumas. For example, Runyon and Kenny[15] suggested that in abused children the nature of the abuse is an important predictive factor in the development of PTSD symptomatology. Rosenman[6] suggested that the type of trauma experienced is the most important factor in determining an individual's vulnerability to PTSD. Several studies[12–14,16] suggest that children who are victims of violence are at high risk for developing symptoms of PTSD.

Sexual trauma has also been investigated as a contributor to the development of PTSD. Deblinger et al.[17] explored the relative frequency of PTSD in sexually abused, physically abused, and nonabused children. The study showed trends suggesting that sexual abuse is more likely to lead to the development of PTSD compared to physical abuse. Subsequent studies[6,18–20] also found that sexual assault has a stronger association with the development of PTSD than other types of traumas.

The number of traumatic events experienced by an individual has also been suggested to play a role in the development of PTSD. Perkonigg et al.[8] suggested that experiencing more than 1 trauma was significantly associated with an increased frequency of lifetime PTSD. Rosenman[6] found a modest but significant association between the number of traumas experienced and a diagnosis of PTSD.

With regard to the impact of age at first trauma on the development of PTSD, it has been suggested that experiencing a given trauma at a younger age may be a significant risk factor. In their study of child and adolescent survivors of Hurricane Hugo, Lonigan et al.[21] found that younger children reported more symptoms of PTSD after the natural disaster. Perkonigg et al.[8] suggested that individuals who first experienced their worst traumatic event as young children were significantly more likely to develop PTSD than those who did not.

Gender is thought to play an important role in vulnerability to the development of PTSD symptoms following a traumatic event. Lonigan et al.[21] suggested that girls may be more susceptible to developing PTSD than boys. In a study of high school juniors exposed to a violent urban environment, Berton and Stabb[12] found that females tended to score higher on measures of PTSD despite a lower rate of exposure to violence. Breslau et al.[3,4] found rates of PTSD to be approximately 1.8 times higher in women than men despite a slightly lower rate of trauma exposure in women compared to their male counterparts. Rosenman[6] found that 3.8% of women reporting trauma met criteria for PTSD, as opposed to 2.0% of men with a history of trauma. Similarly, Perkonigg et al.[8] found that, while females were less likely than males to experience a traumatic event (17% vs. 26%, respectively), females exhibited a significantly higher rate of PTSD.

One potential confounding factor in interpreting data regarding the influence of gender on PTSD is the high rate of sexual trauma among females—the type of trauma strongly associated with the development of PTSD as noted above. Women are 13 times more likely than men to experience rape and 4.4 times as likely to experience sexual assault.[9] However, data comparing rates of PTSD in response to common stressors unrelated to violence or sexual trauma also suggest a greater vulnerability to PTSD in female subjects.[22,23] Some authors suggest that the higher rate of PTSD in women is due primarily to a greater vulnerability to the effects of interpersonal violence among women as compared to men.[24,25]

While researchers have identified specific associations between trauma type and gender and the development of PTSD, the impact of ethnic differences on the prevalence of PTSD is less well characterized. It has been suggested that Hispanic and African American Vietnam war veterans may have a higher rate of PTSD than their white counterparts.[26] More recently, Galea et al.[27] found that Hispanic ethnicity appeared to be a vulnerability factor for development of PTSD among residents of Manhattan following the September 11th terrorist attacks. These studies suggest the possibility that racial and ethnic variations may affect an individual's vulnerability to trauma. It is possible that this association between ethnicity and PTSD could be conferred by as yet uncharacterized factors, such as differences in family structure, community supports, access to care, or comorbid psychiatric or medical illness. More studies are needed to further elucidate the relationship between ethnicity and PTSD symptoms.

Currently, the few available studies on the rates of trauma and PTSD in American Indian and Alaska Native populations suggest that trauma is a prevalent problem in Indian communities. For example, Novins et al.[2] reported that 68% of male and female American Indian adolescents admitted to a residential substance abuse treatment program were victims of sexual, physical, or emotional

abuse. Gray and Nye[1] emphasized the significant psychosocial impacts of trauma on Native communities. Beals et al.[28] found that PTSD was significantly more prevalent among American Indian Vietnam veterans than white Vietnam veterans but demonstrated that such differences can largely be explained by differential exposure to combat stress.

In this study, we examined the prevalence and correlates of PTSD among a community sample of American Indian adolescents and young adults (aged 15–24 years) who had experienced at least 1 traumatic event in their lifetime. More specifically, the objective of this study was to quantify the relative relationships of female gender, type of trauma, number of traumas, and age at first traumatic experience to the development of PTSD in traumatized individuals. We hypothesized that female gender and sexual trauma would be associated with a diagnosis of lifetime PTSD. We also hypothesized that the odds of developing PTSD would increase with the number of traumas experienced. Finally, on the basis of the lower cognitive complexity generally associated with prelatency aged children,[29,30] we also postulated that a first traumatic experience prior to the age of 7 would be associated with a greater likelihood of meeting criteria for PTSD in adolescence and young adulthood. We based this hypothesis on the idea that children below the age of 7 tend to exhibit preoperational thought processes,[31,32] which might make processing the impact of a traumatic event more difficult.

METHOD

Subjects

Participants were selected from 618 American Indian adolescents and young adults aged 15 to 24 years who were members of a Northern Plains tribe and had participated in a community-based epidemiologic study. The participants were pooled from 2 community samples, the American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project (AI-SUPERPFP) and the Healthy Ways project. Data collection for these 2 projects took place concurrently within the same tribe, shared research procedures, and utilized the same selection process (random selection from tribal rolls), the same project staff and interviewers, and identical structured diagnostic interviews (see Measures) with the explicit goal of combined analyses such as those conducted here. There were no significant differences between the 2 study samples in terms of age, gender, or prevalence of trauma and PTSD. More details regarding AI-SUPERPFP may be found in an article by Beals et al.[33]; the interview and training manual are available at http://www.uchsc.edu/ai/ncaianmhr/research/superpfp.htm. More information regarding the Healthy Ways project may be found at http://www.uchsc.edu/ai/ncaianmhr/research/Healthy_Ways.htm. Both projects were approved by the Colorado Multiple Institutional Review Board. Potential participants were interviewed from July 1997 to December 1999. The participation rate was 69.2%.

Of these 618 American Indian adolescents and young adults, 353 (57.1%) reported experiencing at least 1 of 16 traumatic events (described in further detail in Measures); 349 had a complete set of data for these analyses. These individuals were the focus of our study. Of this selected sample, 56.7% were female. The mean age of the selected sample was 21.0 years (SD = 3.5 years).

Data Collection

Interviews were conducted by tribal members who underwent intensive training in research and interviewing procedures. Questions were administered using a computer-assisted personal interview. Extensive quality control procedures verified that all portions of the location, recruitment, and interview procedures were conducted in a standardized, reliable manner. Tribal approval was given prior to initiation of the study, and parental/guardian consent was obtained prior to administration of the interview to minors.

Measures

Data for these analyses were drawn from the AI-SUPERPFP interview trauma section (section F), which was derived from multiple sources[34–36] and designed to include the most common traumas reported in American Indian and other populations. Respondents were asked about 16 categories of possible traumatic events. Ten of these categories inquired about an event that the respondent may have experienced such as being in a natural disaster, being in a life threatening accident, or being abused. Two concerned witnessing an event like a serious accident. Three concerned events that happened to someone close such as being raped or committing suicide, and 1 provided the respondent an opportunity to identify any other event not mentioned in the list of 15. The PTSD questions in this section of the interview were drawn from a version of the Composite International Diagnostic Interview (CIDI)[37] modified for use with American Indians.[28]

Independent Variables

Independent variables were gender and 3 measures of trauma characteristics: type of trauma, number of traumatic events, and age at first traumatic event. We focused on participants meeting the DSM-IV[11] A1 criterion of PTSD (i.e., "the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others") for definition of a traumatic event and did not require that the A2 criterion (i.e., "the person's response involved intense fear, helplessness, or horror. Note: in children, this may be expressed instead by disorganized or agitated behavior") be met in

order to classify an event as traumatic. We used this approach because the adult A2 criterion for a traumatic event is not strictly required for an event to be characterized as a trauma when experienced in childhood,[11] the alternative childhood reactions described in criterion A2 are not assessed by the CIDI, and researchers have raised questions about the appropriateness of the A2 requirements in assessing traumatic experiences in early childhood.[38,39] In addition, the A2 criterion presents a substantial recall challenge for adolescents and young adults, particularly for events that occurred in early childhood. For type of trauma, we classified each of the 16 traumatic events included in the PTSD module as sexual (involving rape, sexual assault, or molestation), other violent trauma (such as that stemming from physical abuse, nonsexual assault, or combat), or other nonviolent trauma (such as experiencing a natural disaster or witnessing trauma to others) in order to specifically analyze the effects of sexual and nonsexual violence, respectively. The validity of this classification schema has been suggested by previous data detailing the significant traumatogenicity of sexual and nonsexual violence.[6,8,12–14,16,18–20]

We did not require the respondents to identify 1 trauma as "most upsetting" because of our interest in examining the relationships between number of traumas, different trauma types, and the development of PTSD. Our decision was also based on the results of the Detroit Area Study, which suggests that identifying 1 trauma as the cause of PTSD symptoms may lead to an overestimation of the conditional risk of PTSD from a given traumatic event.[4]

The number of traumatic events was calculated from the questions regarding each of the 16 different traumas included in the CIDI. Participants were asked the number of times they had experienced each of these different trauma types. The number of traumatic events was calculated as the sum of all traumatic events experienced by an individual across the 16 different trauma types and categorized into 3 groups (1–2, 3–5, or 6 or more).

Age at first traumatic experience was also obtained from the traumatic events questions in the CIDI, for which participants were asked about the earliest age they had experienced each of the 16 different trauma types they endorsed. We used the earliest age endorsed across these 16 trauma types as the age at first traumatic experience and categorized it into 1 of 4 age groups (0–6 years, 7–12 years, 13–18 years, or 19–24 years).

Dependent Variable: Posttraumatic Stress Disorder

The diagnosis of lifetime PTSD was determined utilizing a computer algorithm using DSM-IV criteria.[11] In most similar studies, respondents are asked to identify the most traumatic event they have experienced and are then asked questions regarding PTSD symptomatology for this trauma only. In this study, however, respondents were asked to select the 3 worst traumas they had experienced in their lifetimes, and the symptoms questions were asked separately about each of the 3 events. While this approach resulted in a higher prevalence of PTSD, it also allowed for the more complete assessment of multiple qualifying events on the diagnosis of PTSD.

Analyses

We conducted these analyses using the SPSS version 11.5.[40] First, we compared the conditional prevalence of PTSD in individuals who had experienced at least 1 traumatic event by gender and trauma characteristics. Next, we calculated crude and adjusted odds ratios for meeting criteria for PTSD.[41] Crude odds ratios were calculated for gender and the 3 measures of trauma characteristics (i.e., type of trauma, number of traumas, and age at first traumatic event). Adjusted odds ratios were then determined through the development of a logistic regression model following the recommendations of Hosmer and Lemeshow[42] in terms of variable selection and testing of interactions.

RESULTS

Prevalence of PTSD by Gender and Trauma Characteristics

The prevalence of PTSD by gender and trauma characteristics among those who experienced at least 1 traumatic event is summarized in Table 1. Females had a higher prevalence of PTSD than males (16.7% vs. 6.0%, respectively). The prevalence of PTSD also varied significantly by type of trauma. Participants who experienced sexual traumas had the highest prevalence of PTSD (48.1%), followed by participants who experienced other violent traumas (16.4%). Only 2 male subjects had experienced sexual trauma. Participants who experienced nonviolent traumas had the lowest prevalence of PTSD (12.0%). Notably, 30.9% of participants who met criteria for PTSD reported a sexual trauma, even though sexual traumas were the least prevalent trauma type (7.7%).

The prevalence of PTSD also varied by the number of traumas experienced. Only 5.0% of those who experienced 1 to 5 traumatic events met criteria for PTSD compared to 24.6% of those who experienced 6 or more traumas. The prevalence of PTSD also varied by the age at first trauma. Individuals whose first trauma occurred from birth to 6 years of age developed PTSD at a much higher rate than those who experienced their initial traumas at a later age (23.7% vs. 8.8%).

Crude and Adjusted Odds Ratios

The crude and adjusted odds ratios for meeting criteria for PTSD are detailed in Table 2. Univariate analyses yielded significant crude odds ratios for female gender (OR = 3.16), sexual trauma (OR = 7.62), and other violent trauma (OR = 6.46). Participants who experienced a

Table 1. Prevalence of PTSD (DSM-IV) by Gender and Trauma Characteristics in a Sample of Traumatized American Indian Adolescents and Young Adults

	Total Subjects (N = 349)		Prevalence of PTSD[a]	
Characteristic	N	%	N	%
Gender				
Female	198	56.7	33	16.7
Male	151	43.3	9	6.0
Type of trauma				
Sexual[b]	27	7.7	13	48.1
Other violent[c]	238	68.2	39	16.4
Nonviolent[d]	284	81.4	34	12.0
No. of traumas				
1–2	127	36.4	2	1.6
3–5	96	27.5	9	9.5
6 or more	126	36.1	31	24.6
Age at first trauma				
Birth through 6 y	76	21.8	18	23.7
7–12 y	100	28.7	12	12.0
13–18 y	138	39.5	11	8.0
19–24 y	35	10.0	1	2.9

[a]Participants with a particular characteristic who also met criteria for PTSD.
[b]Trauma involving rape, sexual assault, or molestation.
[c]Trauma such as that stemming from physical abuse, nonsexual assault, or combat.
[d]Trauma such as experiencing a natural disaster or witnessing trauma to others.
Abbreviation: PTSD = posttraumatic stress disorder.

Table 2. Crude and Adjusted Odds Ratios for Factors Associated With a Diagnosis of PTSD (DSM-IV) in a Sample of Traumatized American Indian Adolescents and Young Adults

	Crude (unadjusted)		Adjusted	
Factor	OR	95% CI	OR	95% CI
Gender				
Male (reference group)	1.00		1.00	
Female	3.16*	1.46 to 6.82	2.31	1.00 to 5.37
Type of trauma				
Sexual[a]	7.62*	3.19 to 18.20	4.45*	1.76 to 11.28
Other violent[b]	6.46*	1.89 to 22.10	1.33	0.30 to 6.01
Nonviolent[c]	1.46	0.61 to 3.51	0.81	0.31 to 2.15
No. of traumas				
1–2	0.15*	0.03 to 0.73	0.20	0.03 to 1.17
3–5 (reference group)	1.00		1.00	
6 or more	3.15*	1.42 to 7.00	2.53*	1.06 to 6.04
Age at first trauma				
Birth through 6 y	3.58*	1.59 to 8.07	1.42	0.54 to 3.69
7–12 y	1.57	0.66 to 3.73	1.00	0.39 to 2.56
13–18 y (reference group)	1.00		1.00	
19–24 y	0.34	0.04 to 2.72	1.20	0.12 to 11.72

[a]Trauma involving rape, sexual assault, or molestation.
[b]Trauma such as that stemming from physical abuse, nonsexual assault, or combat.
[c]Trauma such as experiencing a natural disaster or witnessing trauma to others.
*$p < .05$.
Abbreviation: PTSD = posttraumatic stress disorder.

first trauma by 6 years of age were more likely to meet criteria for PTSD than participants who experienced their first trauma from the ages of 13 to 18 years (OR = 3.58). Participants who experienced 1 to 2 traumas were less likely to meet criteria for PTSD than participants who experienced 3 to 5 traumas (OR = 0.15); participants who experienced 6 or more traumas were more likely to meet criteria for PTSD (OR = 3.15).

A multiple logistic regression model yielded adjusted odds ratios that were significant only for sexual trauma (OR = 4.45) and experiencing 6 or more traumatic events (OR = 2.53). No significant interactions were identified.

Since only 2 of the 4 variables that demonstrated a crude association with PTSD also demonstrated an adjusted association, we decided to explore the interrelationships of our independent variables to better explain these findings. The crude association of female gender with meeting criteria for PTSD was explained by the greater likelihood of females to experience a sexual trauma (12.6% vs. 1.3%, $\chi^2 = 15.33$, $p < .001$) compared to males. Similarly, the crude association of early age at first trauma with meeting criteria for PTSD was explained by the greater likelihood of individuals who experienced an early trauma to have experienced a sexual trauma (15.8% vs. 5.5%, $\chi^2 = 8.83$, $p < .005$) and to have experienced 6 or more traumas (65.8% vs. 27.8%, $\chi^2 = 37.12$, $p < .001$) compared to individuals who experienced their first trauma after age 6. Participants who experienced nonsexual violent trauma had a higher prevalence of PTSD, but the variable measuring the experiencing of these types of traumas was not significant in our final logistic regression model. Our finding that sexual traumas, but not other violent traumas, had an independent association with meeting criteria for PTSD was also explained by the greater likelihood of individuals who experienced nonsexual violent trauma to also experience a sexual trauma (10.1% vs. 2.7%, $\chi^2 = 5.78$, $p < .05$) and 6 or more traumas (51.3% vs. 3.6%, $\chi^2 = 74.53$, $p < .001$) compared to individuals who experienced nonviolent traumas.

DISCUSSION

We tested several hypotheses regarding the likelihood of meeting diagnostic criteria for PTSD among a community sample of American Indian adolescents and young adults who had experienced at least 1 traumatic event. First, on the basis of a large study of adults done by Rosenman,[6] we postulated that sexual trauma would be an independent risk factor for the development of PTSD. In our study, this indeed appeared to be true for female participants, and the higher prevalence of sexual trauma among females appeared to account for much of the difference between male and female subjects in the frequency of PTSD. Although neither of the 2 male participants who experienced a sexual trauma also met criteria for PTSD, the low prevalence of sexual trauma among

male participants precluded any firm conclusions regarding the relationship of sexual traumas to PTSD among males. Participants who experienced nonsexual violent trauma had a higher prevalence of PTSD, but the variable measuring the experiencing of these types of traumas was not significant in our final logistic regression model. This was because the participants who experienced nonsexual violent traumas were significantly more likely to have experienced a sexual trauma and to have experienced 6 or more traumas compared to those individuals who had not experienced a nonsexual violent trauma. Thus, of the trauma types examined here, only sexual traumas had an independent relationship to the development of PTSD in these American Indian adolescents and young adults.

Second, we hypothesized that the odds of meeting criteria for PTSD would increase with the number of traumas experienced. While we expected a roughly linear relationship between number of traumas and the odds of meeting criteria for PTSD, our results suggested a threshold effect, with those who experienced 6 or more traumas being much more likely to meet criteria for PTSD than participants who had experienced 5 or fewer traumas. This effect was independent of any significant interactions with gender, trauma type, or age at first traumatic event. This finding may be of particular significance for future studies contrasting the impact of discrete traumatic events with repeated, ongoing, or "chronic" trauma. From these results, it appears that a repetitive pattern of traumatic events is substantially more likely to result in PTSD than discrete traumas.

Our next hypothesis was that the more primitive coping mechanisms and cognitive skills of prelatency aged children might put them at special risk for developing PTSD. While our analysis demonstrated that individuals who experienced early trauma (prior to age 7 years) showed a significantly elevated rate of PTSD, we were unable to demonstrate this relationship when adjusting for the effects of experiencing a sexual trauma and 6 or more traumas. It appears that participants who experience traumas at early ages are more prone to the development of PTSD because of their greater likelihood to experience both multiple traumas and sexual traumas rather than age at their first trauma per se. It should be noted that a small, nonsignificant effect remains for early trauma after controlling for these other variables, suggesting that a follow-up study with a larger sample size is warranted to further test this hypothesis.

Our final hypothesis was that female gender would be a significant independent risk factor for developing PTSD. These results did not support this theory. While females had a higher prevalence of PTSD than males, this difference was explained by the greater likelihood of females to experience a sexual trauma. This finding is in agreement with the data of Rosenman,[6] who attributed gender differences in PTSD prevalence to the higher rate of sexual trauma experienced by women. However, our results conflict with the findings of several authors. The National Comorbidity Survey found that the significantly higher risk for PTSD among women was not explained by differential exposure to sexual traumas.[9] Stein et al.[7] reported that, even when controlling for trauma type and number of traumas, women were more likely to develop PTSD after experiencing trauma. Breslau[25] suggested that, while it is true that women are more likely to experience sexually assaultive events, this alone does not explain the higher rates of PTSD. Instead she concluded that women may be more traumatized than men by assaultive violence of all types.

The apparent discrepancies in these studies may be explained by methodological and sampling differences in the studies themselves. For example, the National Comorbidity Survey data focused on a model whereby the "worst trauma" (also described as the "most upsetting trauma") was assumed to be the sole cause of PTSD.[9] Traumas experienced prior to the trauma rated as most upsetting were not considered as potential etiologic factors or compared by gender. In our study, all traumatic events reported by the individual were used to model the likelihood of developing PTSD. It is also possible that these findings are particularly reflective of the relationship of gender to PTSD among rural, American Indian adolescents and young adults. Indeed, the focus on this understudied population represents a unique contribution to current PTSD literature. Finally, as was the case with early traumas, the nonsignificant parameter estimate is large enough to warrant a follow-up study with a larger sample size to further test this hypothesis.

Limitations

While this study had 2 key strengths—a relatively large sample size of an understudied population and the use of state-of-the-art epidemiologic assessments—it also had several key weaknesses that should be considered in interpreting the results of these analyses. First, with regard to our sample, it should be noted that it was drawn from a single American Indian tribe, and the results may therefore not apply to other tribes. Second, as is typical of community-based epidemiologic studies,[3–9,12,35] the information used in these analyses was based solely on the reports of the research participants themselves without independent corroboration. Third, the employment of tribal members as interviewers may have raised concerns about potential breach of confidentiality among participants in this study. To minimize these risks, each staff member signed a confidentiality statement that included the specific provision that any breach would be grounds for immediate dismissal. Each interviewer carried a copy of this policy to show to participants. In addition, field supervisors (also tribal members) ensured that interviewers were not assigned to potential participants who were family

members or otherwise well known to them. While some participants may still have been uncomfortable in discussing certain issues, in particular males who experienced sexual traumas, the rates reported here are in the high range of those reported by other community-based studies (with other populations), suggesting that the effects of participants being uncomfortable discussing certain issues were likely to have been minimal. Ultimately, we believe that the advantages of employing tribal members as interviewers, which included their knowledge of their communities and cultural protocols, greatly outweighed any disadvantages. Finally, the methodology of the study involved a cross-sectional design, which yields data on correlates of PTSD but precludes the identification of true risk factors.

Clinical and Research Implications

These results have important implications for clinicians and researchers. For clinicians, our data suggest that traumatic experiences are common among American Indian adolescents and young adults (57.1% of this community-based sample) and that sexual trauma among females and multiple traumas for both genders place an individual at significantly elevated risk for the development of PTSD. For researchers, these results leave several important questions unanswered. Because of the low prevalence of sexual traumas among the American Indian males participating in this study, future research should focus on the relationship of this type of trauma to the development of PTSD among males. Because of well-documented variability in health, risk factors, and culture, the extension of this research to diverse American Indian tribes is critical if we are to understand the consistency of these findings.[43–45] Studies with larger sample sizes would also assist in assessing the probability of modest but significant relationships between early traumatic experiences and gender and PTSD that were not significant in this study. Also, while this study focused on the critical relationships of gender and trauma characteristics to the likelihood of meeting criteria for PTSD, other key factors such as involvement in traditional cultural activities, family factors, comorbid substance use and non–substance use psychiatric disorders, and biological markers were not examined. Finally, longitudinal studies that can identify risk factors rather than correlates will be particularly valuable in understanding and addressing the impact of trauma on American Indian children, adolescents, and adults.

REFERENCES

1. Gray N, Nye PS. American Indian and Alaska Native substance abuse: co-morbidity and cultural issues. Am Indian Alsk Native Ment Health Res 2001;10:67–84
2. Novins DK, Beals J, Shore JH, et al. Substance abuse treatment of American Indian adolescents: comorbid symptomatology, gender differences, and treatment patterns. J Am Acad Child Adolesc Psychiatry 1996;35: 1593–1601
3. Breslau N, Davis GC, Andreski P, et al. Traumatic events and posttraumatic stress disorder in an urban population of young adults. Arch Gen Psychiatry 1991;48:216–222
4. Breslau N, Davis GC, Andreski P, et al. Sex differences in posttraumatic stress disorder. Arch Gen Psychiatry 1997;54:1044–1048
5. Resnick HS, Kilpatrick DG, Dansky BS, et al. Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. J Consult Clin Psychol 1993;61:984–991
6. Rosenman S. Trauma and posttraumatic stress disorder in Australia: findings in the population sample of the Australian National Survey of Mental Health and Wellbeing. Aust N Z J Psychiatry 2002;36:515–520
7. Stein MB, Walker JR, Hazen AL, et al. Full and partial posttraumatic stress disorder: findings from a community survey. Am J Psychiatry 1997;154:1114–1119
8. Perkonigg A, Kessler RC, Storz S, et al. Traumatic events and posttraumatic stress disorder in the community: prevalence, risk factors and comorbidity. Acta Psychiatr Scand 2000;101:46–59
9. Kessler RC, Sonnega A, Bromet E, et al. Posttraumatic stress disorder in the National Comorbidity Survey. Arch Gen Psychiatry 1995;52: 1048–1060
10. Stein JA, Newcomb MD, Bentler PM. An 8-year study of multiple influences on drug use and drug use consequences. J Pers Soc Psychol 1987;53:1095–1105
11. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington, DC: American Psychiatric Association; 1994
12. Berton MW, Stabb SD. Exposure to violence and post-traumatic stress disorder in urban adolescents. Adolescence 1996;31:489–498
13. Ensink K, Robertson BA, Zissis C, et al. Post-traumatic stress disorder in children exposed to violence. S Afr Med J 1997;87:1526–1530
14. Mazza JJ, Reynolds WM. Exposure to violence in young inner-city adolescents: relationships with suicidal ideation, depression, and PTSD symptomatology. J Abnorm Child Psychol 1999;27:203–213
15. Runyon MK, Kenny MC. Relationship of attributional style, depression, and posttrauma distress among children who suffered physical or sexual abuse. Child Maltreat 2002;7:254–264
16. Ward CL, Flisher AJ, Zissis C, et al. Exposure to violence and its relationship to psychopathology in adolescents. Inj Prev 2001;7:297–301
17. Deblinger E, McLeer SV, Atkins MS, et al. Post-traumatic stress in sexually abused, physically abused, and nonabused children. Child Abuse Negl 1989;13:403–408
18. McLeer SV, Deblinger E, Henry D, et al. Sexually abused children at high risk for post-traumatic stress disorder. J Am Acad Child Adolesc Psychiatry 1992;31:875–879
19. McLeer SV, Callaghan M, Henry D, et al. Psychiatric disorders in sexually abused children. J Am Acad Child Adolesc Psychiatry 1994;33: 313–319
20. Norris FH. Epidemiology of trauma: frequency and impact of different potentially traumatic events on different demographic groups. J Consult Clin Psychol 1992;60:409–418
21. Lonigan CJ, Shannon MP, Taylor CM, et al. Children exposed to disaster, 2: risk factors for the development of post-traumatic symptomatology. J Am Acad Child Adolesc Psychiatry 1994;33:94–105
22. Fullerton CS, Ursano RJ, Epstein RS, et al. Gender differences in posttraumatic stress disorder after motor vehicle accidents. Am J Psychiatry 2001;158:1486–1491
23. Verger P, Hunault C, Rotily M, et al. Risk factors for post traumatic stress symptoms five years after the 1992 flood in the Vaucluse (France) [in French]. Rev Epidemiol Sante Publique 2000;48(suppl 2):2S44–2S53
24. Breslau N, Chilcoat HD, Kessler RC, et al. Vulnerability to assaultive violence, further specification of the sex difference in post-traumatic stress disorder. Psychol Med 1999;29:813–821
25. Breslau N. Gender differences in trauma and posttraumatic stress disorder. J Gend Specif Med 2002;5:34–40
26. Penk WE, Robinowitz R, Black J, et al. Ethnicity: post-traumatic stress disorder (PTSD) differences among black, white, and Hispanic veterans who differ in degrees of exposure to combat in Vietnam. J Clin Psychol 1989;45:729–735
27. Galea S, Ahern J, Resnick H, et al. Psychological sequelae of the September 11 terrorist attacks in New York City. N Engl J Med 2002;346:982–987
28. Beals J, Manson SM, Shore JH, et al. The prevalence of posttraumatic stress disorder among American Indian Vietnam veterans: disparities and

context. J Trauma Stress 2002;15:89–97
29. Sophian C, Garyantes D, Chang C. When three is less than two: early developments in children's understanding of fractional quantities. Dev Psychol 1997;33:731–744
30. Vacc NA, Greenleaf W. Sequential development of cognitive complexity. Percept Mot Skills 1975;41:319–322
31. Piaget J. The Origins of Intelligence in Children. New York, NY: International Universities Press; 1952
32. Piaget J. The Construction of Reality in the Child. New York, NY: Basic Books; 1954
33. Beals J, Manson SM, Mitchell CM, et al. Cultural specificity and comparison in psychiatric epidemiology: walking the tightrope in American Indian research. Cult Med Psychiatry 2003;27:259–289
34. Turner RJ, Lloyd DA. Lifetime traumas and mental health: the significance of cumulative adversity. J Health Soc Behav 1995;36:360–376
35. Kessler RC, McGonagle KA, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the National Comorbidity Survey. Arch Gen Psychiatry 1994;51: 8–19
36. Manson S, Beals J, O'Nell T, et al. Wounded spirits, ailing hearts: PTSD and related disorders among American Indians. In: Marsella AJ, Friedman MJ, Gerrity ET, et al., eds. Ethnocultural Aspects of Posttraumatic Stress Disorder: Issues, Research, and Clinical Applications. Washington, DC: American Psychological Association; 1996:255–283
37. World Health Organization. Composite International Diagnostic Interview (CIDI), Version 1.0. Geneva, Switzerland: World Health Organization; 1990
38. American Academy of Child and Adolescent Psychiatry. Practice parameters for the assessment and treatment of children and adolescents with posttraumatic stress disorder. J Am Acad Child Adolesc Psychiatry 1998;37(10 Suppl):4S–26S
39. Scheeringa MS, Zeanah CH, Myers L, et al. New findings on alternative criteria for PTSD in preschool children. J Am Acad Child Adolesc Psychiatry 2003;42:561–570
40. SPSS 11.5 Brief Guide. Chicago, Ill: SPSS, Inc; 2002
41. Mausner J, Bahn A. Epidemiology: An Introduction. Philadelphia, Pa: WB Saunders; 1984
42. Hosmer DW, Lemeshow S. Applied Logistic Regression. New York, NY: John Wiley & Sons; 1989
43. Beals J, Manson SM, Whitesell NR, et al. Prevalence of DSM-IV disorders and attendant help-seeking in two American Indian reservation populations. Arch Gen Psychiatry 2005;62:99–108
44. Novins D, Beals J, Roberts R, et al. Factors associated with suicide ideation among American Indian adolescents: does culture matter? Suicide Life Threat Behav 1999;29:332–346
45. Spicer P, Novins DK, Mitchell CM, et al. Aboriginal social organization, contemporary experience, and American Indian adolescent alcohol use. J Stud Alcohol 2003;64:450–457