Prevalence Rates of Acute Stress Disorder Symptomatology and Association to Juvenile Crime Involvement

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Little is known about the relationship between acute stress disorder and criminal behavior among youth. This study examined data from the National Comorbidity Survey-Adolescent Supplement (NCS-A). Participants in this survey, which took place between February 2001 and January 2003, consisted of 10,148 youth between the ages of 13 and 18 years. Because the NCS-A was conducted prior to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), symptoms of posttraumatic stress disorder from the fourth edition of the DSM were mapped to DSM-5 criteria for ASD. Due to changes in the DSM-5 criteria for ASD, youth in this study were described as having "ASD symptomatology." Youth with ASD symptomatology were significantly more likely to report involvement in crimes than youth without any lifetime diagnosis, regardless of whether the crimes resulted in arrest. The data presented here provide a more accurate picture of the relationship between ASD and crime. These data suggest that it may be useful to develop prevention and intervention strategies that provide education and support to at-risk youth who develop ASD symptoms. The quality of life for untreated youth decreases significantly, and untreated youth are likely at risk for criminal involvement, suicide, and other comorbid psychiatric disorders.

In 1994, acute stress disorder (ASD) was first included in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) to facilitate identification of individuals at risk of developing posttraumatic stress disorder (PTSD).[1–4] According to the criteria established in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5),[5] ASD may occur in people who experience, witness, or are involved in a situation in which actual or threatened death, serious injury, or actual or threatened physical or sexual violation are possible. Symptoms include, but are not limited to, a sense of detachment or numbing, recurrent memories of the event, avoidance of thoughts of the event, and aggressive behavior.[5] Research also has shown that ASD symptoms are largely predictive of PTSD[6] and suggests that by preventing or treating the symptoms of ASD, the chances of developing PTSD can be decreased.

Given the high incidence of trauma and ASD in youth, it is important to note the negative effects associated with both. By the age of 16 years, a majority of individuals will have experienced at least one trauma.[7] Youth with ASD symptoms exhibit signs of greater emotional problems, demonstrate higher subjective threat appraisal at the time of their trauma exposure, and report more cognitive misappraisals than trauma-exposed youth without ASD symptoms.[8–10] Research also suggests that youth with multiple acute stress symptoms experience increased levels of co-occurring symptoms of depression and anxiety after experiencing a traumatic event.[11] In the

context of ASD, emotional numbing and future stress symptoms can be predicted by physiological provocation directly following a traumatic experience.[12] The literature emphasizes the significant psychological and emotional impact that ASD symptoms can have on youth and highlights the severe problematic nature of the disorder.

Furthermore, studies have found that trauma exposure and related symptoms vary based on several demographic factors. There is evidence that females are at a higher risk for developing posttraumatic stress symptoms when compared with males,[8,13] and that PTSD occurs more commonly in older adolescents.[8] Prior research also suggests that college-aged African-American students experience a higher risk of exposure to more severe types of trauma, higher rates of PTSD,[14] and increased interpersonal violence[15] when compared with European-American college-aged students. Geographic factors may also be important, and one study demonstrated that living in an urban environment greatly increases the risk of trauma exposure and mental health needs in children due to increased instances of community violence, crime, gang activity, drug use, and poverty.[16–18] These risk factors should be taken into consideration when determining who is most vulnerable to developing trauma-related disorders.

The negative impact that trauma has on adolescent development and decision-making is also well documented.[19] Several studies have found a link between youth trauma exposure and subsequent violence and crime involvement.[20–23] Specifically, studies have revealed that youth in detention have substantial rates of trauma.[24,25] Research also suggests links between trauma exposure and processes associated with transgressive behaviors.[26] In addition, studies have associated trauma with conduct disorder, with one meta-analysis identifying a lifetime PTSD prevalence of 11 percent in youth with conduct disorder, and a 32 percent prevalence in juvenile offenders with conduct disorder.[27] It should be noted that most existing research suggests that the experience of trauma is associated with psychologically distressing symptoms but does not lead to individuals committing crimes because they experienced trauma.[28–30]

Most studies to date have investigated the relationship between crime and psychiatric disorders in detained samples.[31–33] Few studies have investigated this association among those who are not arrested for

their crimes,[34,35] which is an important consideration because many youth are not arrested for the crimes they commit, and out of the portion of youth who are caught, many never go through the juvenile court system.[36] In other words, research that only focuses on individuals already detained within the criminal justice system may not reflect the actual prevalence of criminal activity taking place because not all crimes result in arrests.[37] Furthermore, it is crucial to develop an understanding of the associations among those who do not end up in the criminal justice system because these individuals may also be suitable targets for mental health prevention and intervention strategies.

To our knowledge, there are no studies that provide estimates of ASD symptomatology among a national sample of youth and explore how these rates differ by demographic variables such as gender, race, age, and urbanicity. In addition, there are no studies to date that have examined the association between ASD symptomatology and crime among a nationally representative sample of youth. The goal of this study is to provide an updated picture of the estimated prevalence of youth living in the United States suffering from ASD symptomatology, which may, in turn, have important implications for treatment strategies targeting these youths.

In this study, we analyzed self-reported arrests and crime using data from the National Comorbidity Survey-Adolescent Supplement (NCS-A). We aimed to provide estimates of ASD symptomatology among a national sample of youth, including identifying demographic differences in these rates, and we sought to examine the type of associations that exists between these symptoms and reported crime involvement (violent, property, other). This study includes youth who have been arrested for their criminal behavior and those who have never been arrested.

Methods

Participants and Procedures

Between February 2001 and January 2004, the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan conducted the NCS-A, which was the first epidemiological study to provide estimated national prevalence rates of mental disorders in youth across the United States based on the DSM-IV. The NCS-A included 10,148 youth aged 13–18 years, compris-

ing a school-based sample and a household sample using a dual-framed design.[38] Professional interviewers from the ICPSR at the University of Michigan gathered survey data through computer-assisted personal interviews and computer-assisted telephone interviews. The household sample was randomly selected and stratified using national data collected from the 2000 U.S. Census Bureau.[39] Letters were sent to selected households to notify them of their selection and to provide additional information about the study. Within a few days of receiving the letter, the households were contacted by interviewers; the interviewers answered questions about the study, obtained informed consent, and then conducted the interview. The national school sample was randomly selected and stratified from a master file containing all licensed middle, junior, and high schools in the United States. Selected school districts were sent a recruitment letter providing a description and purpose of the study. Upon approval from the respective district, schools were contacted for class rosters and students were randomly selected from these rosters. The families were contacted to answer questions and to provide informed consent. Based on the study design and sampling procedures, a total of 320 schools across the country participated, which was consistent with the target school sample goal for the study.[38] Due to the sensitive nature of some of the questions, particularly regarding crime involvement, the study obtained a certificate of confidentiality that was explained in the parent and adolescent consent forms. The Human Subjects Committee at both Harvard Medical School and the University of Michigan approved the recruitment and study procedures.

The response rate of adolescents from the household sample was 85.9 percent, which included 904 interviews; the response rate of adolescents in the school sample was 74.7 percent, including 9,244 interviews. Survey data were weighted for within-household probability of selection (only in the household sample) and for residual discrepancies between the sample and population on a wide range of census sociodemographic and geographic variables. The NCS-A gathered data regarding a variety of sociodemographic variables, such as age, sex, race, and urbanicity. There were similar numbers of males (51%) and females (49%), with the sample consisting of 65.6 percent non-Hispanic white, 15.1 percent non-Hispanic black, and 14.4 percent Hispanic

adolescents. The mean age of the sample was 15.2 years.[40]

Measures

Arrests and Offending Variables

Youth were asked if they had ever been involved in certain types of criminal activity and whether their criminal activity had resulted in arrest. The youth were asked if they had ever been arrested for or committed but not been arrested for a property crime, a violent crime, or any other type of crime. This allowed for analyses of differences between youth who did not commit crimes, those who committed crimes that resulted in arrests, and those who committed crimes but were not caught and arrested.

Acute Stress Disorder Symptomatology

Youth were administered the World Health Organization Composite International Diagnostic Interview (CIDI), which is a structured interview to determine DSM-IV diagnoses. The CIDI was modified for use with adolescents, and the interview utilized evidence-based procedures that improved participants' recall with the goal of increasing the reliability of identifying prevalence rates of lifetime disorders. The focus of the current study was ASD, which is a recognized DSM-5 trauma-related disorder. Trauma was not a category of disorders in the DSM-IV, and instead ASD was classified as an anxiety disorder.[41] Because the NCS-A is based on the DSM-IV, diagnostic criteria of ASD listed in the DSM-5 were compared with those in the DSM-IV. Differences in criteria for ASD were then mapped to the NCS-A survey questions to locate questions related to each updated DSM-5 ASD-specific symptom criteria. Symptoms were then mapped to PTSD in the DSM-IV because the symptoms are similar and the main difference between ASD and PTSD is the duration of symptoms, which can also be found in the NCS-A. In this case, all symptoms from the criteria of PTSD in the DSM-IV could be mapped to the DSM-5 criteria of ASD. For example, directly experiencing the traumatic event, recurrent memories of the event, dissociative reactions, efforts to avoid the thoughts or feelings associated with the trauma, and sleep disturbances were criteria for both PTSD in the DSM-IV and ASD in the DSM-5. The DSM-5 added one new criterion to ASD: negative mood, which was defined as "persistent inability to experience positive emotions"(Ref. 5, p 281). This

was the only symptom of the DSM-5 criteria for ASD that could not directly be mapped from DSM-IV criteria of PTSD. Given the inability of this study to account for this new symptom of the DSM-5 criteria for ASD, we use the term "ASD symptomatology."

Analytic Strategy

After the mapping process was completed, we used Stata Version 14 (StataCorp, LLC, College Station, Texas)[42] to conduct statistical analyses to identify estimated national prevalence rates of ASD symptomatology using the NCS-A. Because sampling biases naturally occur with large-scale survey studies, the NCS-A researchers provided weights in the data to create a more realistic picture of sampling variability and population characteristics. These weights were used in these analyses to account for survey design, which is available in the NCS-A documentation.[39,43] Frequencies of youth with ASD symptomatology were cross-tabulated by demographic variables such as gender, age, race, and urbanicity. A logistic regression was calculated to identify odds ratios (ORs) for ASD symptomatology among the demographic variables. The data were also analyzed to identify the association between ASD symptomatology and reported crime involvement. A series of logistic regressions were calculated to compare odds of each type of reported crime category that did and did not result in arrest between youth with ASD symptomatology who also did not meet criteria for any other DSM-IV psychiatric disorder to youth without any DSM-IV psychiatric disorders. The analyses controlled for gender, age, race, ethnicity, and income.

With regard to reporting the findings based on the analyses, several researchers have argued that confidence intervals provide more useful information and thus should be used in most instances in preference to p values.[44–46] Although the 95 percent confidence interval does not report statistical significance, these intervals are not only estimates regarding the precision of ORs but also commonly used as a proxy for testing statistical significance.[47] The probability of the null being true is less than 5 percent when the null value (e.g., OR = 1) is not within the 95 percent confidence interval.[44,46] In light of conventional reporting methods for the analyses, an adjusted p value (i.e., p < .01) was used to control for multiple com-

Table 1 Demographic Variables for Youth With ASD Symptomatology

Youth with ASD, n (%)	192 (2.26)
Gender, n (%)	
Male	36 (0.35)
Female	156 (1.91)
Age, n (%)	
13 y	16 (0.18)
14 y	27 (0.25)
15 y	40 (0.48)
16 y	39 (0.56)
17 y	45 (0.47)
18 y	25 (0.33)
Race, n (%)	
Hispanic	35 (0.20)
Black	31 (0.30)
White	116 (1.70)
Other	10 (<.00)
Urbanicity, n (%)	
Metro	86 (1.11)
Other urban	77 (0.97)
Rural	29 (0.18)

Note: N = 10,148 youth. Percentages have been weighted to account for survey design. Acute stress disorder (ASD) is representative of lifetime symptomatology associated with ASD as established in the DSM-5, with the exception of negative mood.

parisons to test of statistical significance with an emphasis on the ORs and confidence intervals.

Results

Demographics of ASD Symptomatology

Table 1 displays the frequency of youth with ASD symptoms in the study as well as the distribution by various demographic variables. Column percentages, rather than row percentages, are presented in this manner in Table 1 to allow the reader to see the estimates of ASD symptomatology within the national sample of youth respective to their demographics, which is one of the stated aims of the paper. For example, less than 3 percent of the total national sample of youth had ASD symptomatology, and the majority of those with ASD symptomatology were female (n = 156), which reflects less than 2 percent nationally. By race, white youth made up the largest number of youth with ASD symptomatology, albeit less than 2 percent nationally (n = 116), followed by Hispanics, which consisted of only 35 youth.

Table 2 shows the demographic variables that had the strongest associations with ASD symptomatology. Results indicate that the older youth (16–18 years) in the sample were about twice as likely (OR 2.01, 95% CI 1.3–3.2) to be diagnosed with ASD

Table 2 Odds Ratios for ASD Symptomatology

Demographic Variable	Odds Ratio (95% CI)
Age	
13–15 y	Reference
16–18 y	2.01* (1.27–3.16)
Gender	
Male	Reference
Female	6.00* (3.58–10.08)
Race	
White	Reference
Hispanic	0.48 (0.27–0.85)
Black	0.69 (0.38–1.27)
Other	0.51 (0.21–1.22)
Urbanicity	
Metro	Reference
Other urban	1.08 (0.67–1.76)
Rural	0.44 (0.22–0.88)

Note: Estimates are weighted to account for survey design. Acute stress disorder (ASD) is representative of lifetime symptomatology associated with ASD as established in the DSM-5, with the exception of negative mood.
*Adjusted p values ≤ .01.

symptomatology as younger youth (13–15 years), which was statistically significant. In addition, females were significantly more likely (OR 6.00, 95% CI 3.6–10.1) to be diagnosed with ASD symptomatology than were males. Among those diagnosed with ASD symptomatology, the majority were white and resided in metro areas, but neither of these categories was found to be statistically significant.

ASD Symptomatology and Reported Crime

Table 3 displays estimates for each crime type resulting in reported arrest (property crime, violent crime, and other crime), comparing youth with ASD symptomatology to those without any lifetime DSM-IV diagnosis. For example, the property crime arrest category compares the odds of youth with ASD symptomatology being arrested for this crime to youth without any lifetime DSM-IV psychiatric diagnosis. Prior studies have used a similar approach to report ORs and crime categories.[27] Overall, youth with ASD symptomatology were significantly more

likely to report arrest-related crimes than youth without any lifetime diagnosis. Youth with ASD symptomatology had significantly greater odds (OR 25.4, 95% CI 5.3–121.1) to report arrest for a violent crime compared to youth who did not meet criteria for any lifetime diagnosis. In addition, youth with ASD symptomatology had significantly greater odds (OR 8.3, 95% CI 2.5–28.2) to report an arrest for property crimes and significantly greater odds (OR 17.9, 95% CI 7.6–42.1) to report an arrest for other crimes compared with youth without any lifetime diagnosis.

Youth with ASD symptomatology were more likely to report having committed a crime without getting arrested as opposed to having been arrested for a crime. Youth with ASD symptomatology had significantly greater odds (OR 11.6, 95% CI 5.5–24.6) of reporting crime involvement that did not result in arrest for a property crime, significantly greater odds (OR 24.2, 95% CI 7.4–79.6) for reporting involvement in a violent crime, and significantly greater odds (OR 10.9, 95% CI 5.2–23.0) for reporting involvement in any other crime compared with youth who did not meet the diagnostic criteria for any DSM-IV lifetime diagnosis.

Overall Crime Outcomes

Youth reported having committed three categories of crimes (property, violent, and other). For comparison purposes, this criminal involvement was separated into subcategories of youth with ASD symptomatology and youth who did not have any lifetime diagnosis. These categories were then broken down one step further to differentiate those youth arrested for their crimes versus the youth who committed crimes but were never arrested. The most common type of reported crime committed among youth with and without ASD symptomatology was "other" crime. Out of 4368 youth, arrests for violent crime were reported by only 9 youth with ASD symptom-

Table 3 Odds Ratios (95% CI) for Reported Crimes for Youth With ASD Symptomatology Compared to Youth with No Lifetime DSM-IV Diagnosis

	Property Crime, Theft, Burglary	Violent Crime	Any Other Crime
Arrested*	8.31 (2.45–28.19)	25.42 (5.34–121.05)	17.91 (7.63–42.07)
Not arrested†	11.64 (5.50–24.64)	24.24 (7.38–79.64)	10.89 (5.15–23.03)

Note: Estimates are weighted to account for survey design. The estimates were also adjusted for income, race/ethnicity, age, and gender. Acute stress disorder (ASD) is representative of lifetime symptomatology associated with ASD as established in the DSM-5, with the exception of negative mood. For all odds ratios, adjusted p values ≤ .01.
*Based on entire sample of youth (n = 10,148).
†Based on a subsample of youth who reported never being arrested (n = 9,397).

atology, which was slightly less than the 13 youth without a DSM-IV lifetime disorder who also reported being arrested for violent crime. Results show that 36 youth without a DSM-IV lifetime disorder reported being arrested for property crime, which was nearly four times the number of youth with ASD symptomatology who reported being arrested for property crimes. There were 18 youth with ASD symptomatology who reported being arrested compared with 52 youth without a DSM-IV lifetime disorder. Among youth with ASD symptomatology who reported never having been arrested, 9 reported having committed a violent crime compared with 24 youth without a lifetime DSM-IV disorder. There were 27 youth with ASD symptomatology who reported committing a property crime that did not result in arrest compared with 118 youth without a lifetime DSM-IV disorder. There were 32 youth with ASD symptomatology who reported committing any other type of crime that did not result in arrest compared with 119 youth without a lifetime DSM-IV disorder.

Discussion

The data presented demonstrate a relationship between ASD symptomatology and crime, suggesting that early intervention to treat affected youth may be a preventative measure to attenuate the risk for delinquent or criminal behavior and entrance into the criminal justice system.

The overall prevalence rate of 2.26 percent of youth in this study meeting ASD symptomatology criteria appears low given the likelihood that many participants had experienced a traumatic event, but this figure provides a rare estimate of the prevalence of ASD symptomatology in a large, nationally representative sample of adolescents. Estimates of overall ASD prevalence rates are lacking in the literature, and when ASD prevalence rates are reported, it is usually in the context of the specific type of trauma experienced, which results in wide variance. It is important to note that, with regard to prevalence in this study, the concept of ASD symptomatology used here likely underestimates cases of DSM-5 ASD because one symptom has been omitted.

The results of this study suggest that youth with ASD symptomatology are also involved in committing crimes, and specifically, violent crimes. According to one study, youth who have experienced trauma are likely to exhibit callous or unemotional traits, including emotional numbing.[48] This relationship may play a role in how youth with ASD symptomatology are at increased odds for committing violent crimes. The most commonly reported type of crime committed by youth with ASD symptomatology was "other" crime, which accounted for 32 of 192 youth (17%). Youth who never had any lifetime DSM-IV diagnosis accounted for a smaller fraction of "other" crime (119 of 4,177, or 3%). This disparity in proportions accounted for the greater odds of reported crime involvement for youth with ASD symptomatology. However, youth without any lifetime diagnosis accounted for more of the reported crime because there were substantially more of them in the sample. These results suggest that the presence of ASD symptomatology is a risk factor for involvement in crime but does not suggest that those with ASD symptomatology are likely to commit crime. These findings are also consistent with similar studies about youth crime and psychiatric disorders.[27] Although it is possible that certain demographic characteristics might place youth at increased risk of both delinquent behaviors and development of ASD symptomatology, the data in this study did not provide information on whether crimes occurred before or after the development of ASD symptomatology. There may also be other social and environmental factors not included in this study that account for an increased risk of involvement in crime, and these could be key areas of future research.

This study is unique in that the youth being analyzed were not in the criminal justice system at the time they participated in the survey. This allowed for a more accurate analysis of crimes because not all crimes committed result in arrests. While studying youth who are already detained, it is difficult to determine if a trauma-related disorder existed before detention, or, perhaps, because of experiences while in detention. Also, having youth already in the criminal justice system participate may hinder the search for useful preventive measures. In other words, it may be difficult to learn how to treat youth and prevent them from entering the criminal justice system if some of those being studied are already in the criminal justice system. Youth who are not in the juvenile justice system might still be diverted from it.

This study also has several limitations. The number of youth identified with ASD symptomatology was not very large, and their rates of reported involvement in crime was relatively low. In addition, data

were not collected about the specific type(s) of crime that fall into the "other" crime category. Data were not collected about the timing of the criminal activity, which prevented the possibility of additional analyses to examine the trajectory of ASD symptomatology and subsequent crime. Another limitation is that the youth in this NCS-A were not directly assessed for ASD; we had to develop algorithms to map the DSM-IV PTSD diagnosis to ASD symptoms, which may affect the accuracy of the prevalence estimates. Furthermore, the determination of ASD symptomatology was based on the DSM-IV ASD diagnosis, which, compared with the DSM-5 update of ASD, does not include negative alterations in mood, placed more of an emphasis on dissociative symptoms, and required the presence of several categories of trauma symptoms. Another change in the DSM-5 was that nine symptoms were required for the diagnosis of ASD. Despite these discrepancies between the DSM-IV and the DSM-5, there are reasons that this study's findings and the data utilized for this study are still informative and relevant. First, there is likely a high concurrence rate between the two versions of ASD, with a recent study of 208 traumatized youth finding that 14.2 percent met DSM-5 and 18.6 percent met DSM-IV criteria for ASD.[49] Second, because some have argued that current DSM-5 criteria of ASD are too stringent and may overlook many cases of clinically significant ASD, a sub-threshold category of ASD symptomatology may be more useful in studying ASD.[50]

Conclusions

Despite the limitation of using data gathered during the DSM-IV era, this study provides an estimate of the prevalence of ASD symptomatology in a large, nationally representative sample and a more accurate picture of the relationship between ASD symptomatology and crime. Because many youth will experience trauma,[7] it may be wise to develop early-intervention strategies for those youth experiencing ASD symptoms. Conversely, not identifying and treating youth who are experiencing symptoms of ASD may result in the development of more severe trauma-related disorders.[1-4] It may be difficult to identify all at-risk youth because not all youth who develop PTSD show signs of ASD or meet diagnostic criteria. Future research might explore trajectories of PTSD that are not permitted with the data for this study as well as the potential public safety benefit of early ASD treatment. By targeting youth at risk of developing ASD symptomatology and youth experiencing ASD symptoms, action might be taken to prevent worsening symptoms. Preventing the development of ASD symptomatology may play a role in reducing youth crime involvement.

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