Prevalence and predictors of PTSD and depression among adolescent victims of the Spring 2011 tornado outbreak

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Abstract

Background—Relatively few studies have examined prevalence and predictors of posttraumatic stress disorder (PTSD) or major depressive episode (MDE) in disaster-affected adolescents. Fewer still have administered diagnostic measures or studied samples exposed to tornadoes, a common type of disaster. Further, methodological problems limit the generalizability of previous findings. This study addressed prevalence estimates and risk factors for PTSD and MDE among adolescents exposed to the spring 2011 tornado outbreak in Alabama and Joplin, Missouri.

Methods—A large (*N*=2,000), population-based sample of adolescents and caregivers, recruited randomly from tornado-affected communities, participated in structured telephone interviews. PTSD and MDE prevalence were estimated for the overall sample, by gender, and by age. Hierarchical logistic regression was used to identify risk factors for PTSD and MDE.

Results—Overall, 6.7% of adolescents met diagnostic criteria for PTSD and 7.5% of adolescents met diagnostic criteria for MDE since the tornado. Girls were significantly more likely than boys to meet diagnostic criteria for MDE, and older adolescents were more likely than younger adolescents to report MDE since the tornado. Female gender, prior trauma exposure, and an injured family member were associated with greater risk for PTSD and MDE. Specific incident characteristics (loss of services, concern about others' safety) were associated with greater PTSD risk; prior disaster exposure was associated with lower MDE risk.

Conclusions—Whereas most adolescents were resilient following tornado exposure, roughly 1 in 15 developed PTSD, 1 in 13 developed MDE, and many more endorsed subclinical mental

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health problems. Information regarding specific risk factors can guide early screening, prevention, and intervention efforts in disaster-affected communities.

Introduction

The spring of 2011 saw an unprecedented outbreak of tornadoes in the United States. In addition to the tragic loss of life and property levied by such storms, affected individuals are at risk for developing mental health problems, such as post-traumatic stress disorder (PTSD) and depression. Little is known about the prevalence and predictors of PTSD and depression among youth—particularly adolescents—following disasters; indeed, Norris (2006) reported that only 12 of 225 disaster studies were conducted with adolescents. Even less is known about the mental health consequences of tornadoes specifically, despite their common frequency in the U.S. and factors such as limited warning time, potential lethality, and destruction that may pose increased risk of mental health problems. The purpose of the present study was to address these gaps in the literature by estimating the prevalence and identifying predictors of PTSD and depression in a large, population-based sample of adolescents aged 12 to 17 who were affected by the tornadoes that devastated the Southern U.S. and Missouri in the spring of 2011 (see online Appendix S1).

Mental Health Problems following Storm Disasters

The disaster recovery process is often long and complicated, and mental health problems can place substantial strain on families and communities as they work to rebuild their lives. Epidemiologic research suggests many people are resilient (i.e., do not experience impairing distress) or experience transient distress but quickly return to pre-disaster functioning (Furr, Comer, Edmunds, & Kendall, 2010; Norris et al., 2002). However, 10–20% of disaster-affected adults experience clinically significant mental health problems (Acierno et al. 2007; Galea et al., 2002). The most commonly assessed and reported mental health problems in the disaster literature are PTSD and depression (Norris et al., 2002). Despite a wealth of research targeting disaster-affected adults, little is known about the mental health impact of disasters on adolescents (Furr et al., 2010). Studies of youth outcomes after a disaster have generally reported higher prevalence estimates of mental health disorders than have been reported in adult samples (La Greca, Silverman, Lai, & Jaccard, 2010; Norris et al., 2002). These findings underscore the need for more research on adolescent mental health following disasters. Existing research on mental health outcomes of tornado-exposed youth is limited because most studies have used convenience or purposive sampling (e.g., school-based) and symptom rating scales instead of diagnostic interviews (Evans & Oehler-Stinnett, 2006; Furr et al., 2010; Polusny et al., 2008, 2011).

Information on risk factors for post-disaster mental health problems in youth can guide assessment, prevention, intervention, and general recovery efforts. Research in this area typically emphasizes multiple levels or domains of influence (Vernberg et al., 1996; Weems & Overstreet, 2008). Across development, commonly identified factors are observed at the

individual level with regard to demographic characteristics (female gender; ethnic minority status; poverty), personal history (living in a highly disrupted community; prior trauma exposure; predisaster psychiatric problems; poor social resources), and response to disaster (sustaining/fearing injury or severe threat to life; poor coping; elevated secondary stress), as well as at the disaster level for factors like severity of the event (extreme, widespread damage; serious, ongoing community financial hardship; high injury rates; threat to or loss of life) (Fan et al., 2011; Furr et al., 2010; La Greca et al., 2013; Norris et al., 2002). When evaluating risk factors for post-disaster mental health problems in adolescents, it is therefore important to consider multiple sources of influence.

Mental Health Consequences of Tornadoes

Tornadoes are commonly experienced by survivors as life-threatening either to themselves or to their loved ones (Polusny et al., 2008), and affected families are often displaced from their homes by the storms. Families have little lead time to prepare for a specific tornado—13 minutes on average—and people rarely evacuate from a tornado's path as is often done in anticipation of a hurricane (National Oceanic and Atmospheric Association [NOAA], 2013). Specific paths are largely unpredictable, and patterns of tornado damage are selective, so some homes in the direct path of the storm may be leveled whereas other homes in the same neighborhoods stand with minimal damage. These factors contribute to high rates of direct storm exposure and variability in the experiences of individuals and families in an affected community.

NOAA (2013) estimates that approximately 1,300 tornadoes occur in the U.S. annually. However, as yet, only three published studies have examined prevalence and predictors of mental health outcomes in tornado-exposed youth. Polusny and colleagues (2011) surveyed nearly 400 adolescents aged 12–19 who were affected by tornadoes in rural Minnesota and found that 37% were afraid they would be injured and nearly 25% feared they would be killed in the tornado; 1 in 8 exceeded the clinical cutoff on the Impact of Event Scale-Revised (IES-R). Higher estimates of PTSD were observed in a sample of school-aged children exposed to a tornado in rural Oklahoma; roughly 25% of youth met *DSM-IV* PTSD criteria (Evans & Oehler-Stinnett, 2006). High estimated prevalence of current re-experiencing (40%) and avoidance (34%) symptoms in particular, as well as problems of daily living (36%) associated with the storm, were reported in this sample. Participants were assessed approximately one year following the tornado, which highlights how durable the mental health effects of these storms can be.

These studies also addressed predictors of post-tornado mental health problems. Neither gender nor age moderated the estimated prevalence of PTSD in children exposed to a severe tornado in one study (Evans & Oehler-Stinnett, 2006). However, youth who were forced to relocate following a severe tornado experienced significantly higher risk for developing internalizing and externalizing psychopathology than youth who did not need to relocate (Houlihan, Ries, Polusny, & Hanson, 1998). This finding is consistent with the broader trend in the disaster mental health literature for higher severity events to be related to higher prevalence estimates of psychopathology (Furr et al., 2010). These findings have not been replicated, however, and little else is known about which specific disaster-related features

are associated with PTSD and depression in adolescents, especially in tornado-exposed samples.

Aims of the Present Study

The overarching goal of this study was to extend the knowledge base on adolescent post-disaster functioning—specifically following tornadoes—to help stakeholders involved in disaster response make well-informed decisions related to assessment, treatment, and allocation of resources. During the spring of 2011, 1,706 tornados were confirmed, spanning most of the Midwest, Southern, and Eastern U.S. The storms resulted in at least 552 fatalities (NOAA, 2011), and $14 billion in total damages (AMBest, 2012). The first aim of the study was to estimate prevalence of PTSD and major depressive episode (MDE) in a large, diverse, population-based sample of adolescents living in narrowly defined geographic areas struck by the Spring 2011 tornado outbreak in Alabama and Joplin, Missouri. The second aim was to identify risk factors for post-tornado PTSD and MDE. Based on prior research supporting the role of multiple levels of influence on post-disaster mental health, we examined individual- and disaster-level variables as potential risk factors. We predicted that female gender, prior trauma history, and greater severity of disaster exposure (i.e., perception of risk to life, disruption of services, displacement) would be associated with higher risk for both PTSD and MDE.

Methods

Procedure

Two thousand families with adolescents (12- to 17-year-olds) were recruited from areas affected by the tornadoes in Alabama on April 25–28 and Joplin, Missouri on May 22, 2011. A highly targeted address-based sampling strategy was employed to minimize recruitment of unaffected households—a concern due to the localized nature of tornado damage—and to facilitate recruitment of cell phone-only households along with landline households to strengthen representativeness (Henderson et al., 2012). Specifically, tornado track latitude/longitude coordinates obtained from NOAA tornado track incident reports (NOAA, 2011) were used to obtain surrounding radii of affected addresses. The specific distance of the radii surrounding the latitude/longitude coordinates (5 miles for EF-4 and EF-5 tornadoes; 2 miles for EF-2 and EF-3 tornadoes) were chosen to ensure that a high percentage of individual households in the identified sampling area were affected by the tornados that touched down. We then used a two-stage process to identify and recruit eligible participants. First, we identified household addresses within the radii for which a landline telephone match could be made from public listings (matched sample). Second, household addresses for which we were unable to identify a matched landline phone number (unmatched sample; mostly cell-phone-only households) were mailed a letter that explained the study, a screening questionnaire, and an invitation to participate in the study. A telephone number was also requested. Respondents returning the questionnaire received $5 compensation regardless of study eligibility. The survey research firm then contacted households within the matched and unmatched samples to assess and confirm study eligibility.

Caregivers were eligible to participate if they resided in their address at the time of the tornado and were legal guardian of an adolescent between 12 to 17 years of age. Participants were also required to have reliable Internet access at home because data were collected as part of a randomized controlled trial evaluating the utility of a web-based intervention for adolescents and their caregivers to address disaster-related mental health problems. This criterion had minimal impact on recruitment—only 2.1% of screened-out families were excluded based on limited Internet access—or representativeness, given recent data that indicate 95% of adolescents use the Internet and 93% have access to computers in their households (Madden et al., 2013). In homes with more than one eligible caregiver or adolescent, the most recent birthday method was used to select a caregiver and adolescent participant. Only English-speaking families were eligible to participate. Eligible adolescent-parent dyads completed a structured telephone interview at baseline between September 2011 and June 2012, on average 8.8 months after tornado exposure [*standard deviation* (*SD)* = 2.6; range = 4.0–13.5]. Interviews averaged approximately 25 minutes. The overall cooperation rate (i.e., [number screened]/[number screened + screen-outs + unknown eligibility]) was 61%.

Informed consent was obtained from participating parents and adolescents. Households that completed the baseline interview were mailed a $15 incentive. The study was approved by a university Institutional Review Board.

Participants

Demographic characteristics of the adolescent sample are summarized in Table 1. Data were weighted to enhance the generalizability of the sample to the larger population of the communities from which they were recruited.

Measures

Disaster exposure and impact variables—Caregivers were asked several questions about the family's experiences during and after the tornado, including if they were present during the tornado, sustained any physical injuries, were concerned about the safety or whereabouts of loved ones, or were displaced from their home for more than a week. *Time since tornado* was defined as number of months between the date of the tornado experienced and the date of assessment completion. Impact characteristics were entered individually as predictors in analyses.

Property damage—Caregivers were asked about damage caused by the tornado to their homes, vehicles, furniture, personal items, and pets. A property damage scale representing a count of how many different types of property damage were incurred was used as a predictor in analyses (Cronbach's alpha=0.75).

Loss of services—Caregivers were asked whether they were without basic services (i.e., water, electricity, clean clothing, food, shelter, transportation, and spending money) for a period of greater than one week. A loss of services scale representing a count of how many basic services were lost was used as a predictor in analyses (Cronbach's alpha=0.67).

Prior exposure to natural disasters—Adolescents were asked whether they had ever experienced another natural disaster prior to the most recent tornado. Responses were dichotomized (1=yes, 0=no).

Other potentially traumatic experiences—Adolescents were asked whether they had ever experienced each of five different types of potentially traumatic events including physical assault, physical abuse, witnessed domestic violence, witnessed community violence, and serious accidents. Behaviorally specific prompts were used for each trauma type, consistent with reliable and valid questions used in the National Survey of Adolescents (NSA; Kilpatrick et al., 2000). In the current study, a count of the total number of prior potentially traumatic event types endorsed by each adolescent was used as an index of trauma history severity.

PTSD—Adolescent PTSD was assessed using the PTSD module from the NSA and other large-scale epidemiologic surveys conducted by this team (Kilpatrick et al., 2003; Resnick et al., 1993). This structured interview assessed for the presence of each of the *DSM-IV* (American Psychiatric Association, 2000) symptom criteria for PTSD during any of three time periods: lifetime, since the tornado, or during the past 4 weeks. Participants were coded as positive for PTSD if they met diagnostic criteria for PTSD since the tornado. We examined the three PTSD symptom clusters individually: reexperiencing (Criterion B; at least 1 of 5 symptoms), avoidance (Criterion C; at least 3 of 7 symptoms); and hyperarousal (Criterion D; at least 2 of 5 symptoms). Research on this diagnostic interview has provided support for reliability and concurrent validity (Kilpatrick et al., 2003; Resnick et al., 1993).

MDE—Adolescent MDE was assessed using the NSA Depression module. This structured diagnostic interview assessed for the presence of each of the *DSM-IV* symptom criteria for an MDE during any of three time periods: lifetime, since the tornado, or during the past 4 weeks. As with PTSD, participants were coded as positive for MDE if they endorsed enough symptoms to meet criteria for a MDE since the tornado. Psychometric data support internal consistency (Kilpatrick et al., 2003) and convergent validity (Adams, Boscarino, & Galea, 2006).

Data Analysis

Prevalence data and descriptive statistics were calculated for PTSD and MDE since the tornado. We examined whether estimates differed for boys and girls and for adolescents of different ages (12–13, 14–15, 16–17 years). Hierarchical logistic regression was used for the analyses investigating risk and protective factors for PTSD and MDE since the tornado. Predictors were entered in three steps: (a) demographics (gender [female=0, male=1]; age; race [Caucasian=0]; past-year household income [< $20,000=0]), (b) prior trauma history (prior exposure to a natural disaster; number of prior potentially traumatic event types), and (c) tornado exposure characteristics (time since tornado; caregiver was present for the tornado; caregiver was injured during the tornado; caregiver was concerned about the safety of others during or after the tornado; count of types of property damage from the tornado; count of loss of services and resources from the tornado). An alpha level of .05 was set *a priori.*

Results

Sample Characteristics

Over one-fourth of adolescents reported lifetime exposure to a prior natural disaster (Table 1). The majority of participants (over 90%) were present in the affected area when the tornadoes struck. Physical injury was uncommon (2.7%). Almost 75% of caregivers experienced concern about the safety or whereabouts of their loved ones as a result of the tornadoes. Nearly one-tenth of families were displaced from their homes for over a week.

Prevalence of PTSD and MDE Following Tornado Exposure

Prevalence estimates and descriptive statistics for PTSD and MDE since the tornado are presented in Table 2. Estimates are provided for the full sample, as well as by gender and age group.

PTSD—Overall, 6.7% of adolescents met criteria for PTSD since exposure to the tornado. Approximately one-third of adolescents met Criteria B and D, respectively, and roughly one-tenth met Criterion C. Girls were significantly more likely than boys to endorse each of the three symptom clusters, although the difference between boys and girls for full PTSD diagnosis did not reach statistical significance. Adolescents aged 12–13 years were significantly less likely than older adolescents to meet Criterion B. There were no other significant differences among age groups for PTSD diagnosis or criteria.

MDE—An estimated 7.5% of adolescents met diagnostic criteria for MDE since the tornado. Girls were significantly more likely than boys to meet criteria for MDE. Adolescents aged 16–17 were significantly more likely than younger adolescents to meet criteria for MDE.

Risk and Protective Factors for Post-Tornado PTSD and MDE

Results of logistic regression analyses to examine risk and protective factors for post-tornado PTSD and MDE are summarized in Table 3.

PTSD—Male gender was significantly associated with a lower likelihood of meeting criteria for PTSD in the final model (OR=0.48). The extent to which adolescents were exposed to prior traumatic events was associated with greater risk for PTSD (OR=2.27). Whether a caregiver sustained a physical injury during the tornado was the strongest predictor of PTSD (OR=5.63). Among adolescents whose parents were injured, 26.4% met criteria for PTSD. Caregiver concern about the safety or whereabouts of loved ones (OR=2.68) and loss of services (OR=1.25) also were significantly associated with greater risk for PTSD.

MDE—Male gender was significantly associated with lower likelihood of meeting criteria for MDE in the final model (OR=0.35). The extent to which adolescents were exposed to prior traumatic events was associated with greater MDE risk (OR=2.46). Prior exposure to natural disasters was associated with lower MDE risk (OR=0.58). Whether caregivers

sustained physical injury was the strongest predictor of MDE (OR=5.61). Among adolescents whose parents were injured, 22.6% met criteria for MDE.

Discussion

Mental health problems, such as PTSD and depression, are frequently observed following disasters. However, little is known about the prevalence and predictors of these problems in adolescents, especially following tornadoes. The purpose of this study was to estimate the prevalence and identify theoretically-specified predictors of mental health outcomes in a large, diverse, population-based sample of adolescents affected by major disasters, namely the Spring 2011 U.S. tornado outbreak. The study extends previous work by using a more representative sample and including diagnostic measures.

Approximately 1 in 15 adolescents met criteria for PTSD and more than 1 in 13 met criteria for MDE. This translates into an average of two or more adolescents in every standard classroom. When specific *DSM-IV* PTSD symptom domains were considered, roughly one-third of adolescents met the re-experiencing and hyperarousal criteria, and 1 in 10 met the avoidance criterion since the tornado. Prevalence estimates for these symptom domains are similar to those observed in prior studies of youth mental health outcomes following tornadoes (Evans & Oehler-Stinnett, 2006; Polusny et al., 2011), although our prevalence estimate of PTSD diagnosis was lower compared to what has been documented in the literature. One possible explanation is that the structured interview methodology used to assess PTSD symptoms here conferred a more stringent diagnostic threshold than the self-report symptom measures employed in prior research (Polusny et al., 2011). Additionally, our prevalence estimates for both PTSD and MDE were higher than those observed in a study of adult survivors of hurricanes that used similar assessment and diagnostic strategies (Acierno et al., 2007; Ruggiero, Gros et al., 2012). This finding may reflect heightened vulnerability to psychopathology following disasters for youth (Norris et al., 2006). Our results indicate that many adolescents endorsed at least some symptoms of PTSD or MDE following the tornadoes. Although replication of findings is warranted, the current results indicate potential benefit for low-cost early intervention, such as providing a post-disaster school assembly that includes psychoeducation and basic behavioral coping skills.

This study also identified predictors of PTSD and MDE in adolescents following tornado exposure. It is well-documented that girls are generally more vulnerable to both PTSD and MDE than boys (Furr et al., 2010), and our findings replicate that trend in the aftermath of tornado exposure. Prior trauma history was also associated with elevated risk for PTSD and MDE. This finding is consistent with the broader literature on trauma exposure, which reliably demonstrates higher prevalence and complexity of mental health problems among youth who have experienced multiple traumatic events or trauma types (Cloitre et al., 2009; Kilpatrick et al., 2003). Family physical injury may be viewed as a proxy for the severity and degree of threat posed by the tornado. In addition to raising concerns for adolescents about their mortality and that of their family members, parental injury may have limited the capacity for caregivers to provide support to their children in the days and weeks following the storms. Prolonged loss of essential services was another indicator of disaster severity, which may have been associated with tremendous stress for families. Together, these factors

were associated with increased vulnerability for psychopathology. In contrast, prior disaster exposure was associated with lower risk for MDE in after the tornadoes. It is possible that previous experience with natural disasters could have prepared adolescents and their families for coping with the tornadoes' impact, thereby making an unpredictable disaster somewhat more predictable and manageable with respect to onset of depression, whereas repeat exposure to disasters could serve to exacerbate PTSD symptoms.

Knowledge of these risk factors can inform intervention efforts in the aftermath of tornadoes. For example, emergency medical personnel should be aware that children of injured adults are at substantially elevated risk for post-disaster mental health problems. Providing families with targeted secondary prevention materials, as well as resources for counseling–should it become necessary in the future–could be of benefit. Any medical follow-up and/or case management services provided to these families following disasters might usefully include brief screening of adolescents for potential mental health symptoms.

Limitations

This study addressed several gaps in our understanding of adolescents' mental health functioning following tornado exposure. However, the study also had limitations that may be addressed in future research. One limitation is that *DSM-IV-TR* diagnostic criteria were used to assess PTSD and depression, and different prevalence estimates may be observed if *DSM-5* criteria (American Psychiatric Association, 2013) were used instead. Future epidemiologic studies of adolescent PTSD should evaluate applicability of diagnostic criteria across the lifespan in light of evidence that PTSD manifests differently across development (e.g., Dogan-Ates, 2010; Pynoos et al., 2009). Also, although PTSD and depression are the most common mental health problems observed following disasters, assessing a broader range of problems could provide valuable information about the full range of disaster-related psychopathology. In particular, careful assessment of externalizing behaviors (disruptive behavior, aggression) should be performed in future studies given that irritability, anger, and reckless behavior have been added to the *DSM-5* PTSD diagnostic criteria and in light of evidence supporting internalizing and externalizing subtypes of PTSD (Miller & Resick, 2007). Logistical constraints also precluded assessment of pre-disaster mental health, comprehensive assessment of prior trauma and victimization histories, evaluation of other plausible risk factors (e.g., coping skills), and parental report of adolescent symptoms. Evaluating these areas in future research will help to further develop comprehensive models of risk for adolescent psychopathology after disaster exposure.

Although time since tornado was not significantly associated with risk for PTSD or MDE, another limitation of this study is that assessments took place an average of 8 months following the tornadoes. Given the unpredictability of disasters, it is often difficult to initiate data collection before or immediately following an event (Furr et al., 2010). Very few large-scale population-based studies have been conducted with disaster-affected adolescents, and even fewer have administered structured interviews to such a large sample of adolescents within 8 months of an incident. These challenges are not unique to adolescent samples, and are reflected in the larger disaster mental health literature. New policies are needed to increase funding capacity to deploy empirical and clinical programs more rapidly in the

wake of disaster. Web-based methodologies offer a promising platform for this kind of work (Clough & Casey, 2011; Ruggiero, Resnick et al., 2012; Shapiro et al., 2013), but have not yet been fully explored for their capacity to yield representative data in epidemiologic research and warrant further study.

Conclusions

Most adolescents appeared to be resilient following tornado exposure, but many endorsed some mental health problems, including meeting diagnostic criteria for PTSD or MDE. Information regarding specific risk factors should guide early screening, prevention, and intervention efforts in disaster-affected communities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Key Points

- Little is known about post-disaster mental health outcomes in adolescents; few studies have specifically examined the psychological sequelae of tornadoes.

- Prevalence estimates and predictors of PTSD and major depressive episode (MDE) were assessed in adolescents from communities impacted by the Spring 2011 tornado outbreak in Alabama and Joplin, Missouri.

- 6.7% of the sample met criteria for PTSD and 7.5% met criteria for MDE since the tornado.

- Female gender, prior trauma exposure, and family injury were associated with greater PTSD and MDE risk. Loss of services and concern about others' safety were also associated with greater PTSD risk. Prior disaster exposure was associated with lower MDE risk.

- Findings inform future assessment, prevention, and intervention efforts in disaster-affected communities.

Table 1

Demographic and vulnerability factors for PTSD and MDE in a sample of tornado exposed adolescents.

Characteristic	%	Mean (SD)
Gender (Female)	50.9	
Age		14.5 (1.7)
Race (White/Caucasian)	70.5	
Black/African-American	25.6	
Other	3.9	
Household annual income <$20,000	24.0	
Prior natural disaster	26.9	
Prior traumatic events		1.0 (1.1)
Time since tornado (months)		8.8 (2.6)
Present during tornado	90.6	
Physical injury	2.7	
Concerned about safety of loved ones	74.8	
Displacement (>1 week)	9.0	
Property damage		1.4 (1.6)
Loss of services		0.6 (1.1)

Table 2

Prevalence of PTSD and depression since tornado, by gender and by age cohort.

Disorder	Total	Male (n=981)	Female (n=1,019)	Analysis of Gender Difference		12–13 Years (n=662)	14–15 Years (n=644)	16–17 Years (n=689)	Analysis of Age Difference	
	%	%	%	χ^2 (df=1)	p	%	%	%	χ^2 (df=2)	p
PTSD	6.7	5.6	7.7	3.33	.07	5.2	6.7	7.9	3.97	.14
Criterion B	35.3	31.5	39.0	12.17	<.001	29.6	38.1	38.2	14.17	.001
Criterion C	10.4	9.0	11.7	4.20	.04	8.4	10.8	11.9	4.63	.10
Criterion D	27.6	24.0	31.1	12.36	<.001	25.9	27.5	29.3	1.80	.41
Depression	7.5	5.2	9.6	13.52	<.001	6.6	6.0	9.6	6.77	.03

Note. Percentages reflect proportion of valid cases.

Table 3

Hierarchical logistic regression of characteristics predicting since-tornado prevalence of PTSD and MDE in adolescents.

	Step					Final model				
	B	SE	W	OR	95% CI	B	SE	W	OR	95% CI
Regression A: PTSD (n=1,493)										
Step 1										
Gender	−0.36	0.21	2.83	0.70	[.46–1.06]	−0.73	0.24	9.40	0.48**	[.30–.77]
Age	0.11	0.06	3.08	1.11	[.99–1.25]	0.03	0.07	0.25	1.03	[.91–1.18]
African-American	0.44	0.23	3.66	1.56	[.99–2.46]	0.18	0.26	0.50	1.20	[.72–2.00]
Other race	0.20	0.50	0.16	1.22	[.46–3.21]	0.08	0.52	0.03	1.09	[.39–3.02]
Household income	0.44	0.24	3.50	1.55	[.98–2.46]	−0.07	0.27	0.06	0.94	[.56–1.58]
Step 2										
Prior natural disaster	−0.02	0.25	0.01	0.98	[.60–1.62]	0.01	0.26	0.00	1.01	[.60–1.69]
Prior traumatic events	0.79	0.10	65.78	2.21***	[1.82–2.68]	0.82	0.10	65.03	2.27***	[1.86–2.77]
Step 3										
Time since tornado						0.04	0.05	0.58	1.04	[.95–1.14]
Present during tornado						−0.54	0.37	2.08	0.58	[.28–1.21]
Physical injury						1.73	0.55	10.06	5.63**	[1.94–16.39]
Concerned about others						0.99	0.33	8.71	2.68**	[1.39–5.16]
Displacement						0.11	0.41	0.07	1.12	[.50–2.48]
Property damage						−0.16	0.09	3.23	0.85	[.71–1.02]
Loss of services						0.22	0.10	4.86	1.25*	[1.03–1.52]
Regression B: MDE (n=1,541)										
Step 1										
Gender	−0.66	0.20	10.67	0.52**	[.35–.77]	−1.05	0.22	22.34	0.35***	[.23–.54]
Age	0.09	0.06	2.61	1.09	[.98–1.22]	−0.24	0.06	0.10	1.02	[.91–1.15]
African-American	0.51	0.22	5.68	1.67*	[1.10–2.54]	0.38	0.24	1.00	1.27	[.80–2.02]
Other race	0.58	0.41	1.98	1.78	[.80–3.97]	−0.24	0.44	0.75	1.46	[.62–3.45]

	Step					Final model				
	B	SE	W	OR	95% CI	B	SE	W	OR	95% CI
Income	0.21	0.22	0.87	1.23	[.80–1.90]	−0.55	0.25	0.96	0.79	[.48–1.27]
Step 2										
Prior natural disaster	−0.52	0.25	4.55	0.59*	[.37–.96]	0.90	0.25	4.18	0.58*	[.35–.94]
Prior traumatic events	0.87	0.09	87.11	2.38***	[1.99–2.86]	−0.01	0.10	88.03	2.46***	[2.04–2.96]
Step 3										
Time since tornado						−0.01	0.04	0.10	0.99	[.91–1.07]
Present during tornado						−0.36	0.36	0.99	0.70	[.35–1.41]
Physical injury						1.73	0.50	11.96	5.61**	[2.11–15.92]
Concerned about others						0.38	0.26	2.10	1.46	[.87–2.45]
Displacement						0.07	0.39	0.03	1.07	[.50–2.29]
Property damage						−0.12	0.08	2.14	0.89	[.75–1.04]
Loss of services						0.09	0.10	0.84	1.09	[.90–1.33]

Note. PTSD=posttraumatic stress disorder. MDE=major depressive episode.