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# Cumulative Trauma Exposure and High Risk Behavior in Adolescence: Findings From the National Child Traumatic Stress Network Core Data Set

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Although links between adverse childhood experiences (ACEs) and problems in adulthood are well-established, less is known regarding links between exposure to trauma during childhood and adolescence and high-risk behavior in adolescence. We tested the hypothesis that cumulative exposure to up to 20 different types of trauma and bereavement/loss incrementally predicts high-risk adolescent behavior beyond demographic variables. Adolescents reporting exposure to at least 1 type of trauma ( $n = 3,785$ ; mean age = 15.3 years; 62.7% girls) were selected from the National Child Traumatic Stress Network Core Data Set (CDS). Logistic regression analyses tested associations among both demographic variables and number of types of trauma and loss exposure as predictors, and 9 types of high-risk adolescent behavior and functional impairment (attachment difficulties, skipping school, running away from home, substance abuse, suicidality, criminality, self-injury, alcohol use, and victim of sexual exploitation) as criterion variables. As hypothesized, hierarchical logistic regression analyses revealed that each additional type of trauma exposure significantly increased the odds ratios for each problem behavior (range = 1.06–1.22) after accounting for demographic variables. Some demographic variables (female gender, public insurance eligibility, and older age) were also associated with increased likelihood for some outcomes. Study findings extend previously identified links between childhood trauma and problems later in life to include high-risk behavior and functional impairment during adolescence. The findings underscore the need for a trauma-informed public health approach to systematic screening, prevention, and early intervention for traumatized and bereaved youth in child service systems.

*Keywords:* adverse childhood experiences, adolescence, risk factor, bereavement, child traumatic stress

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Adolescence is the principal developmental period during which many serious health risk behaviors emerge, including substance use, sexual behavior, self-injury, and suicidal behavior. The 2009 National Youth Risk Behavior Survey, which monitors priority health-risk behaviors that serve as precursors to leading causes of death, disability, and social problems among adolescents in the 9th through 12th grades, found that 6.3% of students reported having attempted suicide at least once during the previous 12 months; 20.8% reported using marijuana one or more times during the previous 30 days; and 41.8% reported having at least one drink of alcohol on at least 1 day during the previous 30 days (United States Department of Health and Human Services, Centers for Disease Control and Prevention, 2009). Given the prevalence rates of these health-risk behaviors, as well as their many potential adverse consequences including involvement with the juvenile justice system, school failure, and dropout (Bailey, 2009), high-risk behaviors among the general U.S. adolescent population are a major public health and social welfare concern. The serious social consequences posed by adolescent health-risk behaviors have led to their selection as targets of 11 Health Objectives in Healthy People 2020 (United States Department of Health and Human Services, Centers for Disease Control and Prevention, 2010). These adverse consequences have also inspired efforts to identify relevant predictors, correlates, and risk factors in the interests of developing prevention and early intervention programs that, by targeting multiple risk factors, reduce a range of adverse consequences while promoting positive adolescent development (Bailey, 2009).

Adolescents' social contexts—especially their family, peer, and school environments—have emerged as key predictors of their behavior (Hagan & Foster, 2001; Rutter, 1993; Steinberg & Morris, 2001). For example, findings from the National Longitudinal Study of Adolescent Health (Resnick et al., 1997) indicate that family context explained 5–7% of the variance in adolescent suicidality, 5–7% of the variance in violence perpetration, 6% of the variance in alcohol use, and 6–9% of the variance in marijuana use. The school context accounted for a further 6–7% of the variance in adolescent violent behavior, 4–5% of the variance in alcohol use, and 5–6% of the variance in marijuana use depending on the metrics used. Of particular concern, trauma during developmentally sensitive periods early in life (including child maltreatment, domestic violence, and interpersonal and community violence) has been found to be related to many adverse long-term consequences. For example, childhood trauma may negatively impact child and adolescent development through a number of different pathways including brain development (e.g., Bremner, 2003; De Bellis et al., 1999), neuroendocrinology (e.g., Heim & Nemeroff, 2001; Lupien, McEwen, Gunnar, & Heim, 2009), psychosocial effects (e.g., poor attachment, peer relationships; Maughan & Cicchetti, 2002; Putnam & Trickett, 1997), and such health risk behaviors as smoking (Dube, Felitti, Dong, Giles, & Anda, 2003), substance abuse (Anda et al., 2006), and sexual promiscuity (Trickett, Noll, & Putnam, 2011).

Traumatic events and other adverse childhood experiences rarely occur in isolation; instead, they are typically interrelated and tend to co-occur in constellations (Anda et al., 2006; Dong et al., 2004; Felitti et al., 1998; Finkelhor, Turner, Ormrod, & Hamby, 2009; Pynoos et al., 2008; Spinazzola et al., 2005; van der Kolk, Roth, Pelcovitz, Sunday, & Spinazzola, 2005). Indeed, multiple episodes of trauma exposure are more likely than not to co-occur (Kessler, 2000) and to exert more potent predictive effects than single exposures alone (Finkelhor et al., 2009; Kisiel et al., 2014, pp. S29–S39; Pynoos et al.,

2014, pp. S9–S17; Spinazzola et al., 2014, pp. S18–S28). For example, multiple trauma exposures predicted youths' increased risk for both delinquency and psychiatric impairment in a recent study (Ford, Elhai, Connor, & Frueh, 2010). Such findings are of particular concern given the risk that trauma exposure poses for disrupting critically important developmental tasks of adolescence (e.g., forming healthy romantic relationships), which disruptions can “snowball” and cascade into longer-term adverse negative physical and psychological sequelae (Kerig, 2014; Layne, Briggs, & Courtois, 2014, pp. S1–S8; Loeber, Lacourse, & Homish, 2005). In this regard, a recent longitudinal study of a high-risk community sample found that female, but not male, adolescents with higher internalizing or externalizing symptoms were significantly more likely to be exposed subsequently to assaultive violence after controlling for family adversities (Haller & Chassin, 2012). This finding is consistent with those documenting a high risk for subsequent victimization among individuals traumatized over the course of childhood (e.g., Duckworth & Follette, 2012).

These findings among child and adolescent populations are buttressed by *retrospective* studies with adults exposed to trauma and other severe childhood adversities. Indeed, a main information source regarding the sequelae of severe childhood adversities in adulthood consists of a series of retrospective studies with adult populations commonly referred to as the Adverse Childhood Experiences (ACE) studies (e.g., Felitti et al., 1998). The ACE and related adult retrospective studies consistently report dose-response associations between the total number of *childhood* adversities and leading causes of death in *adulthood*, including heart disease, cancer, and chronic lung disease (e.g., Appleyard, Ege-land, van Dulmen, & Sroufe, 2005; Brown et al., 2009; Felitti et al., 1998). Childhood adversities are also risk factors for adult psychiatric symptoms and disorders including depression (Chapman et al., 2004; Dube et al., 2003; Edwards, Holden, Felitti, & Anda, 2003; Felitti et al., 1998; Ford et al., 2010; Trickett et al., 2011; Vythilingam et al., 2002), alcohol-related disorders (Clark, Thatcher, & Martin, 2010; Dube et al., 2003; Felitti et al., 1998; Ford et al., 2010), self-regulatory disturbances (Cloitre et al., 2009), generalized anxiety disorder (Cogle, Timpano, Sachs-Ericsson, Keough, & Riccardi, 2010), and posttraumatic stress disorder (PTSD) (Bremner et al., 1993; Cogle et al., 2010; Ford et al., 2010; Kendall-Tackett, Williams, & Finkelhor, 1993).

Notwithstanding their valuable contributions to the identification of links between exposure to trauma and other severe adversity in childhood, and the emergence of mental and physical health problems in adulthood, the ACE and related adult retrospective studies carry significant limitations. These include: (a) concerns regarding the accuracy and validity of adult retrospective reports of adverse events that took place many years before (Hardt & Rutter, 2004), (b) a lack of inclusion of many known severe childhood adversities, (c) the studies give limited attention to *proximal* adverse outcomes as manifest in adolescence, and (d) the studies provide limited information concerning the cumulative impact of multiple adverse events. For example, many ACE-based studies include only a limited number of adverse life events (e.g., emotional abuse, sexual abuse, physical abuse, domestic violence, parental separation/divorce, mental illness in household, household substance abuse, criminal household member, emotional neglect, and physical neglect) (Brown et al., 2010; Brown et al., 2009). Other severe childhood adversities, whether common (e.g., bereavement) or comparatively rare (e.g., natural disaster) are

omitted although they may lead to similarly devastating consequences (see Layne et al., 2010).

Although links between childhood adversities and later adult health or mental health problems are well-established at the present time, considerably less is known about links between histories of exposure to multiple types of trauma and loss throughout childhood and high-risk behaviors in adolescence. For this reason, studies examining a diverse range of types of traumatic experiences and high-risk adolescent behaviors in diverse samples are needed to explore the proximal sequelae of trauma exposure early in life. In particular, the study of trauma-induced developmental derailment in *adolescence* (as a proximal adverse outcome) is of great interest given that this developmental period creates three valuable windows of opportunity. These include: (a) filling in gaps in scientific knowledge regarding how exposure to trauma, loss, and other severe adversities in childhood lead to subsequent social, emotional, and cognitive *impairments*, as well as the adoption of *health risk behaviors*—adverse proximal outcomes designated in the ACE pyramid as precursors to disease, disability, social problems, and early death in adulthood (Felitti et al., 1998; Layne, Briggs, et al., 2014); (b) identifying early risk markers for developmental derailment in adolescence and beyond (e.g., Loeber et al., 2005); and (c) expanding the range of candidate targets for prevention and early intervention efforts (Saewyc & Edinburg, 2010) by identifying factors that practitioners can flexibly target with the aim of interrupting causal connections (e.g., mediated links) that lead from childhood trauma and loss to adult-era deterioration and premature death (Layne, Briggs, et al., 2014; Layne, Steinberg, & Steinberg, 2014).

The present study sought to fill in knowledge gaps regarding the effects of childhood adversity and trauma on adolescents by examining nearly 4,000 adolescents (aged 13 to 18) with histories of exposure to trauma and loss who were receiving mental health services in community- or hospital-based clinics across the United States. Data on these individuals were captured in the Core Data Set (CDS) as collected by the National Child Traumatic Stress Network (NCTSN) (Pynoos et al., 2008). This study design provided the opportunity to incorporate both a broader range of adverse life events (specifically, by assessing a wide range of types of traumatic experiences and losses in childhood through adolescence), as well as a broader range of psychosocial outcomes (by assessing nine types of high-risk adolescent behaviors and functional impairment) than have been reported previously. We hypothesized that each additional type of trauma exposure would significantly increase the odds likelihood for the presence of each type of high-risk adolescent behavior, after controlling for the predictive effects of demographic variables.

## Method

### Participants

The CDS contains information on a large national sample ( $N = 14,088$ ) of children and adolescents who sought health services through agencies affiliated with the National Traumatic Stress Network (Layne, Briggs, et al., 2014). Given the focus of this study on high-risk adolescent behavior, cases were selected for analysis ( $n = 3,785$ ) based on three criteria: (a) reported at least one confirmed or suspected type of trauma, (b) completed demo-

graphic data and indicators of high-risk behavior at baseline, and (c) were between 13 and 18 years of age at baseline.

### Measures

**Demographics.** Clinicians completed demographic information at baseline, including age (in years), sex (male vs. female), race (White vs. Black vs. Other), ethnicity (Hispanic/Latino vs. not), current primary residence (home, living with relatives, foster care, or residential treatment center), and eligibility for public health insurance (e.g., Medicaid, State Health Insurance) which served as a proxy for low income.

**Trauma exposure.** Lifetime history of trauma exposure was evaluated using the Trauma History Profile (THP; Pynoos et al., 2014), the trauma exposure screening component of the UCLA PTSD Reaction Index (PTSD RI; Steinberg, Brymer, et al., 2013). NCTSN care providers completing the THP were provided with standardized definitions for each trauma type (adapted from the National Child Abuse and Neglect Data System glossary, U.S. Department of Health and Human Services Administration for Children & Families, 2000) as part of their training in administering the CDS. The THP assesses exposure to 20 different types of trauma and loss across childhood and adolescence, including: (a) sexual abuse/maltreatment; (b) sexual assault/rape; (c) physical abuse/maltreatment; (d) physical assault; (e) emotional abuse/psychological maltreatment; (f) neglect; (g) domestic violence; (h) war/terrorism/political violence inside the United States; (i) war/terrorism/political violence outside the United States; (j) illness/medical trauma; (k) injury/accident; (l) natural disaster; (m) kidnapping; (n) traumatic loss/bereavement/separation; (o) forced displacement; (p) impaired caregiver; (q) extreme personal/interpersonal violence; (r) community violence; and (s) other trauma. Providers completed the THP, either at intake or early in the course of services, by judging whether each trauma type was *confirmed*, *suspected*, or *did not occur*. Information about trauma, loss, bereavement, and separation experiences was obtained from multiple informants, including the child or adolescent, parents/caregivers, and other relatives. For purposes of the study, we created a Total Types of Trauma and Loss exposure variable by summing the total number of different types of trauma each youth reported experiencing (theoretical range = 1 to 20). We then used this variable to test hypothesized dose-response relations between exposure to a broad range of types of trauma and loss, and various indicators of high-risk adolescent behavior and functional impairment.

**High-risk adolescent behavior.** Clinicians evaluated high-risk adolescent behavior using the Indicators of Severity of Functional Problems, a quality assurance tool developed for the CDS to assess the severity of a wide range of types of high-risk behavior, behavioral problems, and functional impairment (Layne, Briggs, et al., 2014). Service providers rated the presence or absence of each problem during the previous 30 days on a 3-point scale ranging from 0 (*not a problem*), 1 (*somewhat a problem*), to 2 (*very much a problem*). We selected 9 of the 14 indicators of high-risk behavior and functional impairment contained in the CDS based on their relevance to assessing adolescent high-risk behavior. These included: (a) *criminal activity* (activities that have resulted in being stopped by the police or arrested), (b) *sexual exploitation* (exchanging sex for money, drugs, or other resources in the role of a victim, e.g., prostitution), (c) *suicidality* (suicidal ideation or at-

tempt), (d) *other self-injurious behaviors* (cutting, pulling out one's hair), (e) *alcohol use*, (f) *substance use*, (g) *running away from home* (staying away for at least one night), (h) *problems with skipping school* (skipped at least 4 days in the past month, or skipped parts of the day for at least half of the school days), and (i) *attachment problems* (difficulty forming and maintaining trusting relationships with other people—conceptualized as an indicator of interpersonal functional impairment). To improve within-cell distributions and design parsimony, we collapsed “somewhat/sometimes a problem” and “very much/often a problem” into one category for each high-risk indicator, deriving a new dichotomous variable (yes/no) for each indicator.

## Results

### Preparatory Analyses

We used SAS Version 9.2 (Cary, NC) to compute raw frequencies and percentages for demographic variables, confirmed/suspected trauma exposure, and functional impairment. We also calculated odds ratios and confidence intervals to investigate potential relations between demographic and trauma exposure variables as predictors and types of high-risk adolescent behavior and functional impairment as criterion variables. To account for possible intraclass correlations arising from youth receiving services at different NCTSN mental health center sites, we adjusted for center-level effects using a random-effects model, thereby controlling for the possibility that participants within the same sites produced scores more similar to one another compared with scores of participants from different sites.

### Demographic Characteristics and Endorsement Rates for Different Types of Trauma Exposure

Table 1 presents sample demographic characteristics. Participating adolescents had a mean age of 15.3 years ( $SD = 1.4$ ); a

Table 1  
*Demographic Characteristics (n = 3,785)*

	Mean ( <i>SD</i> ) or <i>N</i> (%)
Mean age (in years)	15.3 (1.43)
Gender	
Female	2,372 (62.7)
Male	1,413 (37.3)
Ethnicity	
Not Hispanic or Latino	2,295 (64.6)
Hispanic or Latino	1,256 (35.4)
Race	
White	2,041 (63.5)
Black	906 (28.2)
Other	268 (8.3)
Current primary residence	
Home (with parents)	2,140 (62.7)
With relatives	429 (12.6)
Regular foster care	207 (6.07)
Treatment foster care	109 (3.19)
Residential treatment center	310 (9.08)
Independent	33 (0.97)
Correctional facility	30 (0.88)
Homeless	11 (0.32)
Eligible for public insurance	2,286 (60.4)

Table 2  
*Endorsed Types of Trauma Exposure*

Mean trauma types ( <i>SD</i> )	<i>N</i> (%)
Traumatic loss or bereavement	2,100 (57.5)
Domestic violence	1,772 (49.3)
Emotional abuse	1,619 (45.4)
Impaired caregiver	1,532 (44.7)
Physical abuse	1,288 (35.8)
Neglect	1,008 (27.9)
Sexual abuse	968 (26.8)
Community violence	952 (26.6)
Sexual assault	890 (24.9)
School violence	707 (19.9)
Physical assault	673 (18.9)
Serious injury or accident	555 (15.3)
Other	433 (12.9)
Illness or medical trauma	431 (11.9)
Interpersonal violence (not reported elsewhere)	330 (9.59)
Natural disaster	268 (7.32)
Kidnapping	106 (2.89)
Forced displacement	89 (2.43)
War or terror outside the United States	73 (1.97)
War or terror in the United States	57 (1.56)

majority were female (63%) and identified as White (64%). Interviewing clinicians reported that a majority lived at home with parents (63%); the remainder lived with other relatives (13%), in foster care (9%), or residential care settings (9%). The subsample contained a higher proportion of females, as well as White adolescents, compared with the full CDS sample (described elsewhere; see Briggs et al., 2013).

Table 2 shows endorsement rates (combined confirmed/suspected, as noted earlier) for exposure to each of the 20 trauma types. The mean number of reported trauma types was 4.19 ( $SD = 2.68$ ); endorsement rates for a given type ranged from 1.5% (war/terrorism/political violence) to 57.5% (traumatic loss/bereavement/separation). Relatively common types of trauma exposure included intrafamilial events (e.g., domestic violence, abuse), followed by various forms of assault and violence, serious injury, and medical illness. Rarer forms of exposure included natural disasters, kidnapping, and forced displacement. The total number of trauma types reported, as well as rates of endorsement within specific trauma types, were slightly higher in general compared to the full (combined *child and adolescent*) CDS sample (see Briggs et al., 2013). This finding served as a validity check for the study design, given our assumption that various types of trauma and loss co-occur, accumulate in number, and accrue in their risks across childhood and adolescence (Layne, Briggs, & Courtois, 2014).

### Endorsement Rates for Adolescent High-Risk Behavior and Functional Impairment

Endorsement rates for specific types of high-risk adolescent behaviors, as well as an indicator of functional impairment (attachment problems) are presented in Table 3. Nearly half the sample endorsed attachment problems (47.4%), whereas approximately one-fourth endorsed persistent suicidal ideation or attempts (24.5%) as well as skipping school (27.2%). Most other indicators of high-risk behaviors (e.g., alcohol and substance abuse, self-

Table 3  
Adolescent High-Risk Behavior and Functional Impairment  
( $n = 3,785$ )

Variable	<i>N</i>	%
Attachment problems	1573	47.4
Skipping school	942	27.1
Substance abuse	687	20.2
Suicidality	861	24.5
Criminal activity	595	16.8
Self-injurious behaviors	577	16.3
Alcohol use	562	16.4
Running away from home	544	15.3
Sexual exploitation	36	1.0

injurious behavior) were endorsed by 15% to 20% of cases, with the exception of sexual exploitation (1.0%).

To examine hypothesized dose-response predictive relations between demographic variables and the Total Types of Trauma and Loss Exposure variable (as predictors), and indicators of adolescent high-risk behavior and functional impairment (as criterion variables), we constructed a series of logistic regression models, one model per criterion variable. The models consisted of the predictors age (in discrete years), sex (with male as the reference group), race (with White as the reference group), ethnicity (with non-Latino/non-Hispanic as the reference group), public insurance status (a proxy variable for poverty, with no public insurance as the reference group), and total types of trauma and loss exposure (see Table 4 and 5 for odds ratios and confidence intervals). As hypothesized, odds ratios indicated that, after accounting for the predictive effects of the modeled demographic variables, a 1-unit increase in each type of trauma or loss exposure significantly increased the odds likelihood ratios for each of the nine types of adolescent high-risk behavior and functional impairment under study. Odds ratios ranged in magnitude from 1.06 for skipping school to 1.22 for attachment problems. These odds ratios indicate that (after controlling for five demographic variables) *each additional type* of trauma or loss exposure during childhood or adolescence increased the odds ratios for *attachment problems* by 22%; *sexual exploitation* by 18%; *running away from home* by 14%; *criminal activity* by 13%; *suicidality* by 12%; *self-injurious behavior* by 11%; *alcohol use* by 11%; *substance abuse* by 8%; and *skipping school* by 6%.

Also shown in Table 4 and 5, several demographic variables also emerged as significant predictors of high-risk behavior and functional impairment. Girls were significantly more likely than boys to be rated as having difficulties with attachment, suicidality, self-injurious behavior, and sexual exploitation. Further, adolescents rated as eligible for public insurance were also more likely to have problems with criminal activity and attachment. As an additional validity check (and underscoring the relevance of studying high-risk behavior in adolescence), increasing age significantly increased the odds ratios of several indicators of high-risk behavior including skipping school, substance abuse, criminal activity, alcohol use, and running away from home.

## Discussion

Adolescence is a pivotal developmental period that serves as a passageway to adulthood (Macmillan & Hagan, 2004; Piquero, Brame, Mazerolle, & Haapanen, 2002). Identifying risk factors for problematic adolescent transitions to adulthood is of great importance, given that trajectories established during the transition to early adulthood are strongly linked to mental and physical health, quality of life, and citizenship-related outcomes in later adulthood (Piquero, Fagan, Mulvey, Steinberg, & Odgers, 2005; Sampson & Laub, 1993), including the risk of developmental derailment into criminal behavior (Moffitt, 1993; Sampson & Laub, 1993). The purpose of the present study was to replicate and extend the ACEs and related adult retrospective studies (which examine links between severe childhood adversities and adverse outcomes in adulthood) by incorporating an explicit focus on high-risk behavior and functional impairment in adolescence as proximal adverse outcomes. Specifically, we incorporated a broad spectrum of 20 different types of trauma and loss exposure (including "other") as predictors, in conjunction with 9 different types of adolescent high-risk behavior and functional impairment as outcome criterion variables.

A sobering finding was that study participants had histories of exposure to an average of more than four different *types* of trauma and loss during childhood and adolescence. Consistent with the concept of a risk factor caravan, characterized by a cluster of co-occurring adversities that accumulate over time (Layne, Briggs, & Courtois, 2014), the most frequently reported adverse events among adolescents were traumatic loss/bereavement/separation and various types of intrafamilial trauma. Trauma-exposed adolescents also reported numerous high-risk

Table 4  
Odds Ratios and Confidence Intervals for Attachment, Skipping School, Substance Abuse, Suicidality, and Criminal Activity

	Attachment	Skipping school	Substance abuse	Suicidality	Criminal activity
Age	1.04 (0.98, 1.11)	1.20 (1.12, 1.28)***	1.36 (1.25, 1.46)***	1.02 (0.96, 1.09)	1.10 (1.02, 1.19)*
Female	1.25 (1.05, 1.49)*	0.86 (0.72, 1.04)	0.58 (0.46, 0.72)***	1.60 (1.32, 1.94)***	0.41 (0.33, 0.51)***
Hispanic <sup>a</sup>	0.91 (0.70, 1.17)	1.32 (1.01, 1.71)*	0.85 (0.61, 1.19)	0.98 (0.75, 1.29)	0.75 (0.53, 1.05)
Black <sup>b</sup>	0.95 (0.75, 1.18)	0.92 (0.72, 1.17)	0.63 (0.47, 0.85)**	0.64 (0.50, 0.82)***	1.03 (0.78, 1.36)
Other <sup>b</sup>	1.09 (0.79, 1.49)	1.17 (0.84, 1.62)	0.92 (0.62, 1.36)	0.74 (0.52, 1.04)	0.83 (0.55, 1.25)
Public insurance	1.39 (1.14, 1.68)***	1.17 (0.95, 1.44)	0.94 (0.73, 1.20)	0.83 (0.67, 1.02)	1.34 (1.04, 1.73)**
Number of trauma types <sup>c</sup>	1.22 (1.17, 1.26)***	1.06 (1.03, 1.10)***	1.08 (1.03, 1.12)***	1.12 (1.08, 1.16)***	1.13 (1.08, 1.18)***

<sup>a</sup> Reference ethnic category: non-Hispanic. <sup>b</sup> Reference race category: White. <sup>c</sup> ORs are associated with a 1-unit increase in total number of types of trauma and bereavement loss.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Table 5

*Odds Ratios and Confidence Intervals for Self Injurious Behaviors, Alcohol Use, Running Away From Home, and Sexual Exploitation*

	Self-injurious behaviors	Alcohol use	Running away from home	Sexual exploitation
Age	0.96 (0.89, 1.04)	1.42 (1.31, 1.54)***	1.09 (1.00, 1.18)*	0.89 (0.66, 1.19)
Female	2.27 (1.78, 2.90)***	0.88 (0.70, 1.11)	1.18 (0.93, 1.50)	12.89 (1.73, 96.19)*
Hispanic <sup>a</sup>	0.80 (0.59, 1.09)	0.88 (0.63, 1.23)	1.11 (0.80, 1.56)	0.66 (0.21, 2.06)
Black <sup>b</sup>	0.34 (0.24, 0.46)***	0.46 (0.33, 0.64)***	1.43 (1.07, 1.91)*	1.44 (0.56, 3.72)
Other <sup>b</sup>	0.71 (0.48, 1.06)	0.69 (0.45, 1.05)	0.86 (0.56, 1.33)	1.96 (0.62, 6.16)
Public insurance	0.95 (0.74, 1.21)	1.05 (0.81, 1.35)	1.14 (0.88, 1.49)	1.03 (0.41, 2.61)
Number of trauma types <sup>c</sup>	1.11 (1.06, 1.15)***	1.11 (1.07, 1.16)***	1.14 (1.09, 1.19)***	1.18 (1.03, 1.35)*

<sup>a</sup> Reference ethnic category: non-Hispanic. <sup>b</sup> Reference race category: White. <sup>c</sup> ORs are associated with a 1-unit increase in total number of types of trauma and bereavement loss.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

behavior problems, as well as functional impairment (attachment problems). At least 20% of participants reported difficulties with attachment, skipping school, substance abuse, and suicidality. These findings are consistent with prior ACE-related studies reporting robust relations between adverse childhood events and many types of high-risk behaviors including delinquency (Ford et al., 2010), impaired attachment (Maughan & Cicchetti, 2002; Putnam & Trickett, 1997), substance abuse (Anda et al., 2006), and sexual promiscuity (Trickett et al., 2011) (see Kerig, 2014, for a review).

Our findings also contribute to the study of the adverse consequences of cumulative developmental risks (e.g., Evans, 2003) by examining relations between the cumulative number of types of trauma and loss exposure and behavior problems and functional impairment in adolescence. Consistent with our hypothesis, and with the findings of prior studies with adults reporting strong relations between ACEs and maladaptive outcomes later in life (e.g., Appleyard et al., 2005), each additional type of trauma and loss exposure significantly increased the odds ratios for high-risk adolescent behavior problems and/or functional impairment by 6% to 22% in each of the nine domains under study. Some demographic variables (e.g., gender) were also significant predictors of some, but not all, types of high-risk adolescent behavior and functional impairment. Our finding of an increased odds likelihood for attachment problems, suicidality, self-injury, and sexual exploitation among trauma-exposed girls is consistent with prior research identifying an increased risk among adolescent girls for internalizing problems (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Zahn-Waxler, 1993). In addition, our finding that publicly insured trauma-exposed adolescents were at significantly greater risk for criminal activity and impaired attachment is consistent with prior research documenting the far-reaching adverse impacts of economic disadvantage among youth (Dodge & Pettit, 2003), and illustrates links that are theorized to exist between socioeconomically disadvantaged “caravan passageways,” risk factor caravans, and consequent loss cycles (Layne, Briggs, et al., 2014).

### Study Implications

These study results are useful in filling in scientific knowledge gaps regarding how exposure to trauma, loss, and other severe adversities in childhood may contribute to *risk factor*

*caravans*—the central theme of this special section (Layne, Briggs, et al., 2014). These caravans are characterized by the accumulation of co-occurring risk factors over time, which accrue in their adverse effects and cascade forward into subsequent developmental stages. Our results are consistent with the proposition that these “cascading effects” may manifest in adolescence as various forms of high-risk behaviors (e.g., running away, self-injurious behavior), as well as social, emotional, and cognitive impairments (particularly attachment problems). These factors carry their own separate risks and are theorized to serve as causal precursors that contribute to an elevated risk for disease, disability, social problems, and early death in adulthood (Felitti et al., 1998; Layne, Steinberg, et al., 2014).

Findings from this study are of particular societal concern given the cascading negative impacts, including societal costs, that high-risk behavior and functional impairment in adolescence can have on adolescent development, the transition to young adulthood (e.g., Dodge & Pettit, 2003), and the overall life course (Kerig, 2014; Laub & Sampson, 2003). For example, difficulties with school and/or peer relationships are linked to persistent physically aggressive behavior, academic failure, and school dropout (e.g., Maguin & Loeber, 1996), which may in turn set the stage for other negative consequences including teen pregnancy (Maynard, 1995), substance abuse (e.g., Bryant, Schulenberg, Bachman, O’Malley, & Johnston, 2000), and delinquency (e.g., Hawkins et al., 1998; Herrenkohl, Herrenkohl, & Egolf, 1998; Huizinga & Jakob-Chien, 1998; Lipsey & Derzon, 1998; Maguin & Loeber, 1996; Moffitt, 1993). Of particular interest is the identification of factors within children’s and adolescents’ physical and social ecologies that are both causally influential and therapeutically modifiable, and thus could play a significant role in preventing, interrupting, or slowing the accumulation of risk factor caravans before they “cascade” into adulthood. Such “high-value” intervention targets have been termed evidence-based intervention foci and merit careful scrutiny (e.g., feasibility, cost-benefit analysis) from both intervention and public policy perspectives (Layne, Steinberg, et al., 2014). For example, youths’ caregiving environments appear to be of key importance in preventing or interrupting adverse cascades leading from severe childhood adversity to adverse outcomes in adolescence and adulthood (e.g., early loss of a mother, followed by precocious sexual

behavior, followed by teenage pregnancy, followed by increased risk for depression and divorce in adulthood; Brown, Harris, & Bifulco, 1986). Such caregiving environments thus constitute promising evidence-based intervention foci (Layne, Briggs, et al., 2014).

Last, these findings underscore the value of screening for exposure to a broad range of types of trauma and loss when evaluating the developmental history of adolescents presenting with high-risk behavior or attachment-related functional impairment. Moreover, systematically assessing for both exposure to a diverse variety of exposures to trauma and loss, in conjunction with multiple types of high-risk behavior and functional impairment, will permit researchers and clinicians to examine more comprehensively the role that trauma and loss exposure plays in the development and maintenance of specific adolescent behavioral and functional problems (Kerig, 2014). Such efforts should reflect the assumption that different types of trauma and loss exposure at different developmental periods can operate through different pathways of influence and may lead to distinctly different sequelae (Layne et al., 2009; Layne, Briggs, et al., 2014; Layne et al., 2010).

### Study Strengths

Study strengths include the large size and national breadth of the NCTSN, which spans many diverse geographic regions and settings and ensures considerable diversity in geographic settings, staff size and composition, institutional affiliations, areas of specialization, and populations served (Pynoos et al., 2008). In addition, the study established that a broad range of types of traumatic and loss-related experiences during childhood and adolescence each constitutes a risk marker (Layne et al., 2009; Layne, Steinberg et al., 2014) for many different types of high-risk adolescent behaviors, as well as functional impairment (specifically attachment problems). Further, our study design addressed some of the limitations of the ACEs adult retrospective studies. Specifically, we (a) used a diverse national sample of children and adolescents referred for mental health services at clinics specializing in trauma-focused assessment and intervention, and (b) included a broader range of trauma, losses, and other severe adversities in childhood and adolescence (Layne, Briggs, et al., 2014; Layne et al., 2006). We also (c) focused on adolescent-era high risk behavior and functional impairment as *proximal* adverse outcomes, which we theorized may mediate and/or moderate the causal links between childhood ACEs and adult pathology (Felitti et al., 1998; Layne, Steinberg, et al., 2014), and (d) gave greater attention to the cumulative impact of multiple adverse events as these may accrue across adolescence and cascade forward into young adulthood (Layne, Briggs, et al., 2014).

### Study Limitations

This article is the first in a series of planned studies involving the NCTSN CDS focused on “unpacking” elements of risk factor caravans and ways in which they intersect with other trauma-related variables (e.g., PTSD symptoms) as a function of developmental stage. Given its foundational role of initially testing hypothesized dose-response relations between total

number of types of trauma and loss exposure and high-risk adolescent behavior, our study design unit-weighted (i.e., accorded similar weights to) different types of trauma and loss—a methodology that can obscure differential relations between causal precursors and causal consequences, and predictors and criterion variables, where they exist (see Layne, Steinberg, et al., 2014; Layne et al., 2010). This study examined lifetime exposure to different types of trauma and did not incorporate different parameters of exposure to trauma and loss (e.g., age of exposure onset, duration across years, weapon use, and developmental span). Such variables will be important to incorporate into subsequent study designs to better unpack the social and physical ecologies that “risk factor caravan passageways”—passageways that give rise to trauma and loss exposure early in life and continue to shape ongoing risk, vulnerability, and adjustment into early adulthood and beyond . . . (Layne, Briggs, et al., 2014). Moreover, the cross-sectional study design did not permit monitoring of changes in high-risk behavior and functional impairment over time as a function of participation in trauma-focused intervention. Notably, preliminary analyses have yielded encouraging results in this regard, suggesting that participation in trauma-focused treatment is linked to significant reductions in a variety of such “high risk” indicators (Layne, Ostrowski, et al., 2010). Last, although the CDS facilitates exploration of questions within “real world” clinical settings, it was primarily established as a quality improvement initiative; thus, CDS data should not be presumed to be nationally representative. Rather, these findings can be reasonably expected to generalize to programs in child service settings that are similar to the diverse array of NCTSN sites that participated in this study (e.g., community- and school-based mental health, juvenile justice).

### Directions for Further Study

Planned studies include utilizing the CDS to “unpack” differential predictive effects of different constellations of trauma exposure and distress symptom clusters in relation to specific types of adolescent high-risk behavior and functional impairment (Layne et al., 2010)—a line of inquiry that has yielded promising initial findings (Ostrowski, Greeson, Briggs-King, Fairbank, & Layne, 2010). Other planned studies will examine the effectiveness of trauma-focused intervention in reducing the likelihood of these same problem outcomes, as a function of treatment sessions, in an innovative approach to defining and evaluating “clinically significant change” (Layne, Ostrowski, et al., 2010) as gauged using a variety of “real world” metrics that carry direct relevance for consumers (see Kazdin, 2006). The broad range of assessment tools making up the CDS will also permit studies examining differential associations linking specific constellations and different parameters of trauma and loss exposure, including age of onset, duration, and sequencing of specific trauma types within and across childhood and adolescence, to specific sequelae (see Steinberg et al., 2014, pp. S50–S57).

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