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Exposure to Childhood Neglect and Physical Abuse and Developmental Trajectories of Heavy Episodic Drinking from Early Adolescence into Young Adulthood

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Abstract

Background—Although the literature suggests that childhood maltreatment (CM) relates to adolescent heavy episodic drinking (HED), few studies have examined the long-term effects of CM on adolescent HED. This study is the first to examine associations between exposure to CM and trajectories of HED from adolescence to young adulthood for the US population.

Methods—Four waves of data from the National Longitudinal Study of Adolescent Health were used. A total of 8,503 adolescents followed from adolescence (7th–12th grades) into young adulthood (ages 24–32) were assessed on CM and past-year HED frequency. Using growth curve modeling, trajectories of adolescent HED were examined, with subtype, frequency, and severity of CM as the primary independent variables. All of our analyses controlled for common risk factors for adolescent HED, including demographics, parental and peer alcohol use, parental education and employment, family income, parent-child relationship, and adolescent depression.

Results—After controlling for potential risk factors, neglect and physical abuse – both individually and in conjunction – were associated with faster increases in HED during adolescence and persistently elevated HED over much of adolescence and young adulthood. The frequency of neglect and physical abuse – individually and in conjunction – was also associated with the trajectory of HED, such that additional instances of these types of maltreatment were associated with faster increases in HED during adolescence and higher rates of peak use during young adulthood.

Conclusions—Child neglect and physical abuse appear to have long-lasting adverse effects on HED beyond adolescence and throughout much of young adulthood.

Keywords

Child abuse; Binge drinking; Adolescents; Physical abuse; Child neglect; Heavy episodic drinking; Child maltreatment

1. Introduction

Excessive alcohol use such as heavy episodic drinking (HED) is one of the top three preventable causes of death and responsible for more than 79,000 deaths in the U.S. each year (CDC, 2004; Lopez et al., 2006; Mokdad et al., 2004). HED, often defined as drinking five or more drinks in a row for males and four or more drinks in a row for females on one or more occasion, is particularly prevalent and even normative during adolescence and young adulthood. According to the 2009 National Survey on Drug Use and Health (NSDUH), rates of past-month HED were 8.8 percent for 12 to 17 year olds and 34 percent for 18 to 20 year olds, with peak rates of 46.5% during emerging adulthood (ages 21-25; Substance Abuse and Mental Health Services Administration, 2010). Furthermore, it appears that many young people do not perceive HED as risky or unhealthy. Nearly half of adolescents (ages 12-17; 40.5%) in the 2009 NSDUH reported positive perceptions about daily HED, indicating that they do not consider heavy daily drinking a great risk to their health.

HED in adolescence is enormously concerning because in this critical developmental period, it can interfere with the achievement of key developmental tasks such as forming an identity and preparing for a career (Berk, 2007; Schulenberg and Maggs, 2002). Numerous studies examining the longitudinal course of HED have reported two notable findings. First, HED is a developmental phenomenon, with first HED usually occurring between ages 14 and 18, peaking in emerging adulthood, and declining thereafter (Chassin et al., 2002; Johnston et al., 2009). Second, although a majority of young people moderate or “mature out” of HED beyond emerging adulthood, many individuals continue to drink heavily into adulthood (Jacob et al., 2005; Schulenberg et al., 1996; Windle et al., 2005). The literature reports that about 20-34% of young people remained stable in their HED involvement during young adulthood. This suggests that not all young adults mature out of HED, and that some young adults persistently engage in HED or progress to a more severe pattern of HED during young adulthood (Schulenberg et al., 1996).

Since adolescent HED is a major public health problem, a substantial body of literature has been devoted to identifying correlates and predictors of HED in adolescence, suggesting a variety of determinants, ranging from genetic and neurobiological to psychological, environmental, and cultural factors (Begleiter and Porjesz, 1999; Brown et al., 2008; Enoch, 2006; Masten, 2009; Zucker et al., 2006). An emerging body of research suggests a strong association between childhood maltreatment (CM) and adolescent HED (Dube et al., 2006; Nelson et al., 2002). CM manifests in multiple forms, including neglect, physical abuse, and sexual abuse (Cicchetti and Valentino, 2006). Although current evidence is not sufficient to support a causal relationship (Schuck and Widom, 2001), many studies have shown cross-sectional relationships between various forms of CM and hazardous drinking among young

individuals in the public service systems (Vaughn et al., 2007; Widom and White, 1997), treatment (Clark et al., 2003; Dube et al., 2006), and community samples (Hamburger et al., 2008; Kendler et al., 2000; Molnar et al., 2001). For example, using a nationally representative sample of adolescents (N=5,513; grades 7-12), Diaz et al. found that exposure to physical abuse was associated with a 3.25-fold increase in the relative risk of adolescent drinking (Diaz et al., 2002). In addition, using a sample of 842 young adults (ages 18-24) in the National Youth Survey, Lo et al. found that physical abuse was associated with about a 30% increase in the relative risk of HED in young adulthood (Lo and Cheng, 2007). Furthermore, in a retrospective study of 8,417 adult health maintenance organization (HMO) members, Dube and colleagues found that neglected children were more likely to engage in early onset alcohol use and adolescent HED (Dube, 2005). Although these findings are relatively consistent in portraying maltreated children a population for engaging in early-onset HED or higher levels of HED during adolescence and young adulthood, most previous research has been based on cross-sectional data. The nature of these findings and the typical developmental trajectory of HED suggest the need to examine the effects of CM on the longitudinal course of adolescent and young adult HED, as CM might be a significant factor in predicting continuing HED beyond adolescence.

Previous research has also been limited in that it has not comprehensively investigated the relationship between the various types of CM and HED. There is substantial variation in exposure to various types and combination of types of CM. The literature reports that less than a quarter of maltreated children experience single types of maltreatment whereas 22% to 55% of victimized children have been abused in multiple ways (Banyard, 1999; McCauley et al., 1997). In our recent cross-sectional study of 12,748 adolescents (ages 13-21), we found that those who reported experiencing both child neglect and physical abuse showed 1.33 times higher odds of reporting alcohol misuse and HED in adolescence than those who reported only a single type of maltreatment and those who did not report any CM (Shin et al., 2009a). Given that risk factors are likely to cluster in the same individuals (Masten and Coatsworth, 1998), separately considering the types of maltreatment experienced by a child may help researchers address the totality of a child's maltreatment experience and its influence on HED trajectories.

Furthermore, although previous research has typically treated CM as a dichotomous variable (i.e., presence or absence) or a single type of CM (e.g., physical abuse vs. no maltreatment), some studies also suggest that the frequency and severity of CM may be equally important in understanding the effect of CM on adolescent HED (Litrownik et al., 2005; Manly et al., 1994; Shin et al., 2009a). Although no previous studies have directly examined whether frequency and severity of CM affect adolescent HED trajectories, previous research has shown that the frequency and severity of CM are related differentially to high-risk behaviors including aggression, emotional and behavioral problems, and trauma-related anger, which are known risk factors for adolescent HED (English et al., 2005b; Litrownik et al., 2005; Manly et al., 1994). Using retrospective reports of CM from 17,337 adult HMO members, the Adverse Childhood Experiences (ACEs) Study also found that those who experienced a greater number of ACEs were more likely to initiate alcohol use in early adolescence than their counterparts (Dube et al., 2006).

Given the limitations of previous research on CM and HED, the present study examined the effects of CM on the longitudinal course of adolescent HED using a large, nationally representative sample. Furthermore, we included characteristics of CM including subtype, frequency, and severity in the prediction of initiation of HED and trajectory of HED over time. In addition, taking advantage of our rich, longitudinal data source, we controlled for several common risk factors that have well-established relationships with adolescent HED, which allowed for a more stringent evaluation of the role of CM in predicting HED trajectories. Given previous research, we hypothesize that maltreated children will be more likely to have higher levels of initial HED and a faster rate of HED. In addition, we expect that children who reported experiencing more persistent or severe CM will have a steeper increase in HED during adolescence and young adulthood.

2. Method

2.1. Participants

Data were drawn from the National Longitudinal Study of Adolescent Health (AddHealth). AddHealth is a national longitudinal study of adolescents (grades 7-12) in the U.S., which used a multistage, stratified, school-based, cluster sampling design of 132 high schools and corresponding feeder middle schools. The first component of the AddHealth was an in-school questionnaire administered to 90,000 seventh through twelfth grade students. Then, 200 students were randomly selected from each high school-middle school pair to participate in an in-home interview. Institutional review board (IRB) approval and informed consent were obtained before data collection. The baseline in-home interview data were collected in 1995 with 20,745 adolescents. Of these adolescents, 88% were interviewed in 1996 and 73% in 2002. Finally, of 15,197 Wave 3 respondents, 80% (N=12,157) were interviewed in 2008. Incorporating up to four waves of data for each adolescent, we analyzed a panel containing 31,073 observations (on average each person contributed 3.7 out of 4 waves of data) based on 8,503 respondents (53% girls). The racial/ethnic composition of our sample was as follows: 58% Caucasian, 18% African American, 15% Latino, and 9% Other.

2.2. Measures

2.2.1. Primary Outcome—Adolescent HED was assessed at every wave using a hierarchical structure. Participants were first asked how many days (0 ‘never’, 1 ‘1-2 days’, 2 ‘once a month or less’, 3 ‘2-3 days a month’, 4 ‘1-2 days a week’, 5 ‘3-5 days a week’, 6 ‘every day or almost every day’) they drank alcohol in the past 12 months. Those indicating they drank alcohol at least one day in the past 12 months were then asked how many days they drank five or more drinks in a row in the past 12 months using the same scale.

2.2.2. Main Predictors—CM was assessed at Wave 3 using respondents’ report of abuse or neglect by their parents or other responsible adults who lived with them before they were 6th graders. A computer-assisted self-interviewing (CASI) method, which typically increases reliability in reporting sensitive behaviors such as CM (Turner et al., 1998), was used to assess three CM types. These types included: (1) sexual abuse— “by the time you started 6th grade, how often had one of your parents or other adult caregivers touched you in

a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations?"; (2) physical abuse—"how often had he/she slapped, hit, or kicked you?"; and (3) neglect—"how often had he/she not taken care of your basic needs, such as keeping you clean or providing food or clothing or how often had he/she left you home alone when an adult should have been with you?" Our published paper found these retrospective reports to have strong predictive validity (Shin et al., 2009b). Consistent with our previous work (Shin et al., 2009a; Shin et al., 2009b; Shin and Miller, 2012), using responses to these questions, we created a set of mutually exclusive and exhaustive dichotomous variables (1 one or more time, 0 never): no maltreatment; neglect-only; physical-abuse-only; sexual abuse only or in combination with either neglect or physical abuse; neglect and physical abuse; and neglect, physical abuse, and sexual abuse. Although we would have preferred to use an indicator for sexual abuse only, small sample sizes required that we combine this category with the indicator for sexual abuse in conjunction with either neglect or physical abuse. This classification method allows participants experiencing more than one maltreatment type to be categorized differently from those experiencing only one type. No maltreatment was the reference category.

For each subtype, we also created a set of variables indicating the average number of times each maltreatment occurred to investigate the effects of maltreatment frequency on adolescent HED trajectories. Finally, since children placed in out-of-home care tend to represent children at the higher end of the severity spectrum, severity of CM was measured by the number of times respondents had experienced out-of-home placement after a maltreatment investigation. *2.2.3. Control Variables*. We also included a wide range of common risk factors for adolescent HED all measured at Wave 1. These included gender, race/ethnicity, parental education, employment, family income (divided into four quartiles), an indicator for whether adolescents reported poor relationships with both parents (based on a four-item scale measuring the quality of the relationships with either parent), and depression measured by the Center for Epidemiologic Studies Depression Scale for Children (CES-DC; Weissman et al., 1980). The CES-DC has demonstrated good reliability and validity in adolescent samples (Faulstich et al., 1986; Fendrich et al., 1990; Phillips et al., 2006). In addition, peer alcohol use was measured with the item "Of your 3 best friends, how many drink alcohol at least once a month?" Parental alcohol problems were identified using primary caregivers' responses to questions about whether adolescents' biological mothers or biological fathers had alcohol problems.

2.3. Analysis

A two-level growth curve modeling approach (Singer and Willett, 2003) was used to examine the effects of CM on HED trajectories over time, adjusting for all control variables identified above. After examining the individual HED trajectories of a random subset of our sample, we first ran preliminary quadratic (age-squared) and cubic (age-squared and age-cubed) models, which allow for non-linear HED trajectories from adolescence to young adulthood. Based on model fit, we retained the more parsimonious quadratic model. Thus, all analyses are premised on an average trajectory of HED that increases (decreases) over time before reaching a peak level (nadir) and declining (increasing). Model results present three coefficients for each variable: an intercept indicating initial level of HED, and a

coefficient for change in HED and change in HED squared, which jointly represent the quadratic trajectory of HED over time.

Using the date of data collection for each wave, we calculated each respondent's age in years as equal to the number of his or her most recent birthday. Thus, in our growth curve models, we examined trajectories by age in years spanning from age 12 until age 32. Since respondents were of different ages at each wave of data collection, we combined information from multiple respondents to arrive at a single projected trajectory in what is referred to as an accelerated longitudinal design (Collins, 2006; Duncan et al., 1996). To account for potential cohort differences in the trajectory of HED, we included indicators for age at initial survey in all analyses (Miyazaki and Raudenbush, 2000). The effects of CM on HED trajectories were examined by entering subtype, frequency, and severity of CM in separate models. Prior to analyses, all variables (except CM and HED) were centered at their means (Singer and Willett, 2006), which improves the interpretability of the intercept. Deviance (-2 * log-likelihood), Akaike Information Criteria (AIC), and Bayesian Information Criteria (BIC) were used to assess model fit (Singer and Willett, 2003). All common risk factors were also entered as predictor variables in each model. All analyses were run using the xtmixed command in Stata (version 11-MP).

3. Results

Table 1 provides summary information for HED across four time periods whereas Table 2 shows descriptive information for CM and all control variables. With respect to the mutually exclusive CM subtypes, nearly 22% of respondents experienced neglect only whereas about 11% and 15% experienced physical abuse only and neglect and physical abuse, respectively. Just over 1% experienced sexual abuse only or sexual abuse in conjunction with physical abuse or neglect. Slightly over 3% of respondents experienced all three types of CM.

3.1. Subtype of CM

The results of the models examining the effects of CM subtype and all control variables on HED are shown in Table 3 and Online Table 1, respectively, and HED trajectories are depicted in Figure 1. Our results suggest that the average 12-year-old who experienced no CM engaged in HED with a frequency of .240 (i.e., between 0 'never' and 1 '1-2 days'), and the coefficients for age (.142 and -.006) indicate that the average frequency of HED grew over adolescence before peaking and declining in young adulthood. The significant and opposing signs for change in HED associated with neglect-only, physical-abuse-only, and the combination of neglect and physical abuse indicate that children who experienced these types of maltreatment had HED trajectories that grew more quickly over time and reached a higher peak in young adulthood than the trajectories for children who were not maltreated. Respondents who experienced physical-abuse-only had significantly lower average levels of HED at baseline, but reported faster increases in frequency of HED compared to those who experienced no CM.

3.2. Frequency and severity of CM

Table 3 also presents the results of the models examining the effects of neglect and physical abuse frequency on HED trajectories. The models examining the effects of maltreatment severity found no significant associations and are not presented (but are available upon request). The panels of Figure 2 show predicted trajectories of HED for each possible frequency of the three maltreatment types found to have significant associations with HED trajectories along with the predicted average trajectory for children who reported no CM. The frequency models indicated the predicted additive impact on HED trajectories of experiencing the same type of maltreatment multiple times. The frequency of physical-abuse-only was associated with lower initial levels of HED, and each additional occurrence of neglect-only, physical-abuse-only, and the combination of neglect and physical abuse was associated with a greater quadratic HED effect over the period of adolescence to young adulthood.

4. Discussion

The present study uncovered two notable findings with respect to how CM influences the course of HED development from adolescence to young adulthood. First, compared to respondents who never experienced any maltreatment, respondents with a history of childhood neglect and physical abuse experienced a steeper increase in rates of HED during adolescence and persistently higher HED beyond adolescence and throughout much of young adulthood. Second, greater frequency of neglect and physical abuse – either alone or in conjunction – was also associated with steeper increases in HED rates during adolescence and persistently elevated HED over time. These associations were robust after controlling for demographic and other common risk factors including parental alcohol problems, peer alcohol use, adolescent depression, and the quality of the parent-child relationship. These findings provide some of the first evidence of a longitudinal relationship between childhood neglect and physical abuse and HED trajectories during adolescence and young adulthood within a large, nationally representative sample.

Previous research has suggested that as HED becomes more prevalent, weaker relationships between CM and HED are expected during young adulthood (Bensley et al., 2000; Dube et al., 2006). Our findings, however, underscore that neglect and physical abuse individually and in aggregate contribute to more rapid growth in HED frequencies during adolescence and to persistently higher HED during much of adolescence and young adulthood. Developmental sequelae of neglect and physical abuse such as alterations in brain function, emotional/behavioral problems, and maladaptive coping styles, may manifest as alcohol problems when peer and social environments provide drinking opportunities to young neglect or physical abuse victims who are poorly equipped over time to handle a variety of developmental challenges (Cicchetti and Valentino, 2006; Teicher et al., 2006; White and Widom, 2008). Second, reduced social control and adoption of “adult” roles (e.g., marriage, job), which are both common in young adulthood, have the potential to increase HED among maltreated young adults (Bachman et al., 1997; White and Jackson, 2004/2005). In particular, adolescent victims of neglect or physical abuse who fail to make successful transitions to young adulthood by securing employment or starting their own families may

continue to participate in HED during the period from late adolescence through young adulthood. The present findings suggest the need for prevention and intervention efforts implemented throughout adolescence and young adulthood for those individuals who suffered childhood neglect and physical abuse. Interventions with children who have been exposed to neglect and physical abuse should focus on the developmental outcomes of these types of CM. Furthermore, clinicians who interact with maltreated children must recognize that the presence of neglect alone, physical abuse alone, and the co-occurrence of neglect and physical abuse together may place a substantial number of young people at risk for HED.

Surprisingly, we found that combined neglect, physical and sexual abuse did not predict HED trajectories. Previous cross-sectional studies have found that experiencing all three CM types increases a maltreated child's vulnerability to HED in adolescence (Moran et al., 2004; Shin et al., 2009a). Our null finding is likely due to the small sample as only 3% of our sample experienced all three types of CM. Utilizing small sample sizes in longitudinal studies may yield results that are spurious and not statistically powerful enough to examine the role of exposure to all CM types in longitudinal course of HED. Since those adolescents who were exposed to all types of CM are the most worrisome group from a clinical perspective (Finkelhor et al., 2007; Rossman and Rosenberg, 1998), future longitudinal research should oversample these cases. Furthermore, it is possible that the adolescents who were at the highest risk by experiencing all CM subtypes may have received early attention from alcohol treatment systems and were subject to unique experiences that may put them at relatively low risk for developing persistent HED in young adulthood. Further research should examine patterns and courses of drinking behaviors among adolescents who simultaneously experience neglect, physical and sexual abuse and to determine how early involvement in alcohol treatment systems might change their longitudinal courses of HED during adolescence and young adulthood.

Our results further suggest that research on the associations between neglect and physical abuse and adolescent HED should take into account frequency, as more frequent occurrences of these types of CM were associated with a steeper increase in rates of HED and persistently elevated HED over time. Although few studies have examined the additive effect of maltreatment frequency on alcohol use, our findings are an interesting complement to those of the ACEs studies, which found that the number of ACEs an individual experienced (not the frequency of each ACE) contributes additively to the risk of a wide variety of substance use problems including early onset of drinking, alcohol problems, and drug dependence (Douglas et al., 2010; Dube et al., 2002; Dube et al., 2006). It is possible that frequency of maltreatment is a proxy for more pervasively hostile home environments. In addition, recent studies have found that there are probably sensitive periods when exposure to maltreatment exerts the greatest effects on the trajectory of development of specific brain regions (Andersen and Teicher, 2008; Andersen et al., 2008). The more frequently an individual experiences maltreatment, the more likely it is that the maltreatment incident would have intersected with a sensitive period. Further research is warranted to examine how frequency of maltreatment influences potential mechanisms which might mediate the association between neglect and physical abuse and adolescent HED, and to

explore how frequency of maltreatment interacts with the developmental period in which the child experienced the maltreatment and how such interactions influence adolescent HED.

Severity of CM was not related to initial levels or growth rates of adolescent HED. The definition of severity used here (i.e., removal of the child from its home) may not be the best way to capture severity of maltreatment. There is an emerging discussion on how maltreatment severity should be defined in research as there is growing consensus that severity of maltreatment needs to be included in understanding the effects of CM on alcohol outcomes (English et al., 2005a). Further research is needed to develop different measures of maltreatment severity and examine how they relate to adolescent and young adult HED. Maltreatment severity might be measured by ratings by victims or case workers, presence of physical injury, receipt of medical treatment as results of maltreatment incidents, or the multiplicity of different events as used in the ACEs studies.

It is important to note some of the limitations of the current study. First, the self-report data on CM were collected retrospectively and may be subject to recall bias. Recent studies, however, suggested that respondents' self-reports of CM are relatively valid (Brewin et al., 1993; Hardt and Rutter, 2004), and when CM is reported, these self-reports are highly concordant with official records such as court records (Bernstein et al., 1997; Swahn et al., 2006), child protective services records (Everson et al., 2008; Hardt and Rutter, 2004; McGee et al., 1995), and medical records (Winegar and Lipschitz, 1999). Second, the present study cannot be used to ascertain the temporal relationship between CM and HED when HED was initiated before 6th grade or CM occurred after 6^{th} grade, because respondents reported on CM that occurred before they were 6th graders. In addition, we performed a growth curve model which assumes that all participants follow a similar trajectory of HED. Given that recent studies have identified several prototypical courses of HED during adolescence and young adulthood (Chassin et al., 2002; Hill et al., 2000; Jackson et al., 2005; Jacob et al., 2005), future studies may use a growth mixture modeling approach to examine whether CM is predictive of membership in HED trajectory subgroups. Finally, sample attrition, missing data due to survey non-response, and the fact that CM questions were not asked until Wave 3, were limitations with the AddHealth dataset. Post-hoc analyses compared members of the analytic sample (n = 8,503) with AddHealth baseline respondents not in the current analysis. Those included in the analysis were significantly more likely to be White, non-Hispanic, female, in the youngest age cohort at Wave 1, and in the highest income quartile at Wave 1. Since these demographic differences might influence both predictor and outcome variables of the present study, future research should attempt to replicate our findings.

The present study extended the literature by including subtype, frequency, and severity measures of CM and investigating the effects of childhood neglect and physical abuse on the course of adolescent HED. The results of the present study clearly suggest that other dimensions of CM including duration (length of time each maltreatment episode lasted) and developmental timing of maltreatment occurrence (e.g., early childhood vs. adolescence) need to be explored in future research that examines the effects of CM on adolescent HED.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

Andersen SL, Teicher MH. Stress, sensitive periods and maturational events in adolescent depression. Trends in Neurosciences. 2008; 31:183–191. [PubMed: 18329735]

Andersen SL, Tomada A, Vincow ES, Valente E, Polcari A, Teicher MH. Preliminary evidence for sensitive periods in the effect of childhood sexual abuse on regional brain development. Journal of Neuropsychiatry and Clinical Neurosciences. 2008; 20:292. [PubMed: 18806232]

Bachman, JG.; Wadsworth, KN.; O'Malley, PM.; AL., E. Smoking, drinking, and drug use in young adulthood: The impacts of new freedoms and new responsibilities. Lawrence Erlbaum Associates; Mahwah, NJ: 1997.

Banyard VL. Childhood maltreatment and the mental health of low-income women. American Journal of Orthopsychiatry. 1999; 69:161–171. [PubMed: 10234382]

Begleiter H, Porjesz B. What is inherited predisposition toward alcoholism? A proposed model. Alcoholism: Clinical and Experimental Research. 1999; 23:1125–1135.

Bensley LS, Van Eenwyk J, Simmons KW. Self-reported childhood sexual and physical abuse and adult HIV-risk behaviors and heavy drinking. American Journal of Preventative Medicine. 2000; 18:151–158.

Berk, LE. Development Through the Lifespan. Allyn & Bacon; Boston: 2007.

Bernstein DP, Ahluvalia T, Pogge D, Handelsman L. Validity of the Childhood Trauma Questionnaire in an Adolescent Psychiatric Population. Journal of the American Academy of Child and Adolescent Psychiatry. 1997; 36:340–348. [PubMed: 9055514]

Brewin C, Andrews B, Gotlib I. Psychopathology and early experience: A reappraisal of retrospective reports. Psychology Bulletin. 1993; 113:82–98.

Brown SA, McGue M, Maggs J, Schulenberg J, Hingson R, Swartzwelder S, Martin C, Chung T, Tapert SF, Sher K, Winters KC, Lowman C, Murphy S. A developmental perspective on alcohol and youths 16 to 20 years of age. Pediatrics. 2008; 121:S290–310. [PubMed: 18381495]

CDC. Morbidity and Mortality Weekly Report. Centers for Disease Control and Prevention; Atlanta: 2004. Alcohol-Attributable Deaths and Years of Potential Life Lost --- United States, 2001; p. 866-870.

Chassin L, Pitts SC, Prost J. Binge drinking trajectories from adolescence to emerging adulthood in a high-risk sample: Predictors and substance abuse outcomes. Journal of Consulting and Clinical Psychology. 2002; 70:67–78. [PubMed: 11860058]

Cicchetti, D.; Valentino, K. An ecological transactional perspective on child maltreatment: Failure of the average expectable environment and its influence upon child development. In: Cicchetti, D.; Cohen, DJ., editors. Developmental Psychopathology: Risk, Disorder, and Adaptation. 2nd ed. Wiley; New York: 2006. p. 129-201.

Clark DB, De Bellis MD, Lynch KG, Cornelius JR, Martin CS. Physical and sexual abuse, depression and alcohol use disorders in adolescents: onsets and outcomes. Drug and Alcohol Dependence. 2003; 69:51–60. [PubMed: 12536066]

Collins LM. Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. Annual Review of Psychology. 2006; 57:505–528.

Diaz A, Simantov E, Rickert V. Effect of abuse on health: Results of a national survey. Archives of Pediatrics & Adolescent Medicine. 2002; 156:811–817. [PubMed: 12144373]

Douglas KR, Chan G, Gelernter J, Arias AJ, Anton RF, Weiss RD, Brady K, Poling J, Farrer L, Kranzler HR. Adverse childhood events as risk factors for substance dependence: Partial mediation by mood and anxiety disorders. Addictive Behaviors. 2010; 35:7–13. [PubMed: 19720467]

Dube SR, Anda RF, Felitti VJ, Edwards VJ, Croft JB. Adverse childhood experiences and personal alcohol abuse as an adult. Addictive Behaviors. 2002; 27:713–725. [PubMed: 12201379]

Dube SR, Miller JW, Brown DW, Giles WH, Felitti VJ, Dong M, Anda RF. Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. Journal of Adolescent Health. 2006; 38:1–44. [PubMed: 16387241]

Dube SR, Miller JW, Brown DW, Giles WH, Felitti VJ, Dong M, Anda RF. Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. Journal of Adolescent Health. 2005; 38:444. [PubMed: 16549308]

Duncan SC, Duncan TE, Hops H. Analysis of longitudinal data within accelerated longitudinal designs. Psychological Methods. 1996; 1:236–248.

English DJ, Bangdiwala SI, Runyan D. The dimensions of maltreatment: Introduction. Child Abuse Neglect. 2005a; 29:441–460. [PubMed: 15970319]

English DJ, Graham JC, Litrownik AJ, Everson M, Bangdiwala SI. Defining maltreatment chronicity: Are there differences in child outcomes? Child Abuse Neglect. 2005b; 29:575–595. [PubMed: 15970326]

Enoch M. Genetic and Environmental Influences on the Development of Alcoholism. Annals of the New York Academy of Sciences. 2006; 1094:193–201. [PubMed: 17347351]

Everson MD, Smith JB, Hussey JM, English D, Litrownik AJ, Dubowitz H, Thompson R, Dawes Knight E, Runyan DK. Concordance between adolescent reports of childhood abuse and Child Protective Service determinations in an at-risk sample of young adolescents. Child Maltreatment. 2008; 13:14–26. [PubMed: 18174345]

Faulstich ME, Carey MP, Ruggiero L, Enyart P, Gresham F. Assessment of depression in childhood and adolescence: an evaluation of the Center for Epidemiological Studies Depression Scale for Children (CES-DC). Am J Psychiatry. 1986; 143:1024–1027. [PubMed: 3728717]

Fendrich M, Weissman MM, Warner V. Screening for depressive disorder in children and adolescents: validating the Center for Epidemiologic Studies Depression Scale for Children. Am J Epidemiol. 1990; 131:538–551. [PubMed: 2301363]

Finkelhor D, Ormrod RK, Turner HA. Re-victimization patterns in a national longitudinal sample of children and youth. Child Abuse & Neglect. 2007; 31:479–502. [PubMed: 17537508]

Hamburger ME, Leeb RT, Swahn MH. Childhood maltreatment and early alcohol use among high-risk adolescents. Journal of Studies on Alcohol and Drugs. 2008; 69:291–295. [PubMed: 18299771]

Hardt J, Rutter M. Validity of adult retrospective reports of adverse childhood experiences: Review of the evidence. The Journal of Child Psychology and Psychiatry. 2004; 45:260–273.

Hill KG, White HR, Chung I-J, Hawkins D, Catalano RF. Early adult outcomes of adolescent binge drinking: Person- and variable-centered analyses of binge drinking trajectories. Alcoholism, Clinical and Experimental Research. 2000; 24:892–901.

Jackson KM, Sher KJ, Schulenberg JE. Conjoint developmental trajectories of young adult alcohol and tobacco use. Journal of Abnormal Psychology. 2005; 114:612–626. [PubMed: 16351384]

Jacob T, Bucholz KK, Sartor CE, Howell DN, Wood PK. Drinking trajectories from adolescence to mid-forties among alcohol dependent males. Journal of Studies on Alcohol. 2005; 66:745–755. [PubMed: 16459936]

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the future: national survey results on drug use, 1975-2008. Vol. Volume 1, Secondary school students. National Institute on Drug Abuse; Bethesda, MD: 2009.

Kendler KS, Bulik CM, Silberg J, Hettema JM, Myers J, Prescott CA. Childhood sexual abuse and adult psychiatric and substance use disorders in women: an epidemiological and cotwin control analysis. Archives of General Psychiatry. 2000; 57:953–959. [PubMed: 11015813]

Litrownik AJ, Lau AS, English DJ, Briggs E, Newton R, Romney S, Dubowitz H. Measuring the severity of child maltreatment. Child Abuse & Neglect. 2005; 29:553–573. [PubMed: 15970325]

Lo CC, Cheng TC. The impact of childhood maltreatment on young adults' substance abuse. American Journal of Drug and Alcohol Abuse. 2007; 33:139–146. [PubMed: 17366254]

Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. The Lancet. 2006; 367:1747–1757.

Manly JT, Cicchetti D, Barnett D. The impact of subtype, severity, chronicity, and frequency of child maltreatment on social competence and behavior problems. Development and Psychopathology. 1994; 6:121–143.

Masten AS, Coatsworth JD. The development of competence in favorable and unfavorable environments: Lessons from research on successful children. American Psychology. 1998; 53:205–220.

Masten AS, Faden VB, Zucker RA, Spear LP. A developmental perspective on underage alcohol use. Alcohol Research and Health. 2009; 32:3–15. [PubMed: 23104443]

McCauley J, Kern DE, Kolodner K, Dill L, Schroeder AF, DeChant HK, Ryden J, Derogatis LR, Bass EB. Clinical characteristics of women with a history of childhood abuse: Unhealed wounds. Journal of the American Medical Association. 1997; 277:1362–1368. [PubMed: 9134941]

McGee RA, Wolfe DA, Yuen SA, Wilson SK, Carnochan J. The measurement of maltreatment: A comparison of approaches. Child Abuse and Neglect. 1995; 19:233–249. [PubMed: 7780784]

Miyazaki Y, Raudenbush SW. Tests for linkage of multiple cohorts in an accelerated longitudinal design. Psychological Methods. 2000; 5:44–63. [PubMed: 10937322]

Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. Journal of the American Medical Association. 2004; 291:1238–1245. [PubMed: 15010446]

Molnar BE, Buka SL, Kessler RC. Child sexual abuse and subsequent psychopathology: Results from the National Comorbidity Survey. American Journal of Public Health. 2001; 91:753–760. [PubMed: 11344883]

Moran PB, Vuchinich S, Hall NK. Associations between types of maltreatment and substance use during adolescence. Child Abuse and Neglect. 2004; 28:565–574. [PubMed: 15159070]

Nelson EC, Heath AC, Madden PAF, Cooper ML, Dinwiddie SH, Bucholz KK, Glowinskin A, McLaughlin T, Dunne MP, Statham DJ, Martin NG. Association between self-reported childhood sexual abuse and adverse psychosocial outcomes: Results from a twin study. Archives of General Psychiatry. 2002; 59:139–145. [PubMed: 11825135]

Phillips GA, Shadish WR, Murray DM, Kubik M, Lytle LA, Birnbaum AS. The Center for Epidemiologic Studies Depression Scale With a Young Adolescent Population: A Confirmatory Factor Analysis. Multivariate Behavioral Research. 2006; 41:147–163.

Rossman, BBR.; Rosenberg, MS. Multiple victimization of children: conceptual, developmental, research, and treatment issues. Haworth Maltreatment & Trauma Press; 1998.

Schuck AM, Widom CS. Childhood victimization and alcohol symptoms in females: Causal inferences and hypothesized mediators. Child Abuse and Neglect. 2001; 25:1069–1092. [PubMed: 11601598]

Schulenberg J, Maggs JL. A developmental perspective on alcohol use and heavy drinking during adolescent and the transition to young adulthood. Journal Of Studies on Alcohol Supplement. 2002; 14:54–70. [PubMed: 12022730]

Schulenberg J, O'Malley PM, Bachman JG, Wadsworth KN, Johnston LD. Getting drunk and growing up: Trajectories of frequent binge drinking during the transition to young adulthood. Journal of Studies on Alcohol. 1996; 57:289–304. [PubMed: 8709588]

Shin SH, Edwards E, Heeren T. Child abuse and neglect: Relations to adolescent binge drinking in the National Longitudinal Study of Adolescent Health (AddHealth) Study. Addictive Behaviors. 2009a; 34:277–280. [PubMed: 19028418]

Shin SH, Edwards E, Heeren T, Amodeo M. Relationship between multiple forms of maltreatment by a parent or guardian and adolescent alcohol use. American Journal on Addiction. 2009b; 18:226–234.

Shin SH, Miller DP. A longitudinal examination of childhood maltreatment and adolescent obesity: Results from the National Longitudinal Study of Adolescent Health (AddHealth) Study. Child Abuse and Neglect. 2012; 36:84–94. [PubMed: 22398304]

Singer, JD.; Willett, JB. Applied longitudinal data analysis: Modeling change and event occurrence. Oxford University Press; USA: 2003.

Singer, JD.; Willett, JB. Applied longitudinal data analysis: Modeling change and event occurrence. Oxford University Press; New York: 2006.

Substance Abuse and Mental Health Services Administration. Results from the 2009 National Survey on Drug Use and Health: National Findings. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2010.

Swahn MH, Whitaker DJ, Pippen CB, Leeb RT, Tepin LA, Abram KM, McClelland GM. Concordance between self-reported maltreatment and court records of abuse or neglect among high-risk youths. American Journal of Public Health. 2006; 96:1849–1853. [PubMed: 17008582]

Teicher MH, Tomoda A, Andersen SL. Neurobiological Consequences of Early Stress and Childhood Maltreatment: Are Results from Human and Animal Studies Comparable? Annals of the New York Academy of Sciences. 2006; 1071:313–323. [PubMed: 16891580]

Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: Increased reporting with computer sruvey technology. Science. 1998; 280:867–873. [PubMed: 9572724]

Vaughn MG, Ollie MT, McMillen JC, Scott L Jr. Munson M. Substance use and abuse among older youth in foster care. Addictive Behaviors. 2007; 32:1929–1935. [PubMed: 17239547]

Weissman MM, Orvaschel H, Padian N. Children's symptom and social functioning self-report scales. Comparison of mothers' and children's reports. J Nerv Ment Dis. 1980; 168:736–740. [PubMed: 7452212]

White HR, Jackson K. Social and psychological influences on emerging adult drinking behavior. Alcohol Research & Health. 2004/2005; 28:182–190.

White HR, Widom CS. Three potential mediators of the effects of child abuse and neglect on adulthood substance use among women. Journal of Studies on Alcohol and Drugs. 2008; 69:337–347. [PubMed: 18432375]

Widom CS, White HR. Problem behaviours in abused and neglected children grown up: prevalence and co-occurrence of substance abuse, crime and violence. Criminal Behaviour and Mental Health. 1997; 7:287–310.

Windle M, Mun EY, Windle RC. Adolescent-to-young adulthood heavy drinking trajectories and their prospective predictors. Journal of Studies on Alcohol. 2005; 66:313–322. [PubMed: 16047520]

Winegar RK, Lipschitz DS. Agreement between hospitalized adolescents' self-reports of maltreatment and witnessed home violence and clinician reports and medical records. Comprehensive Psychiatry. 1999; 40:347–352. [PubMed: 10509616]

Zucker RA, Wong MM, Clark DB, Leonard KE, Schulenberg JE, Cornelius JR, Fitzgerald HE, Hornish GG, Merline A, Nigg JT, O'Malley PM, Puttler LI. Predicting risky drinking outcomes longitudinally: What kind of advance notice can we get? Alcoholism: Clinical and Experimental Research. 2006; 30:243–252.

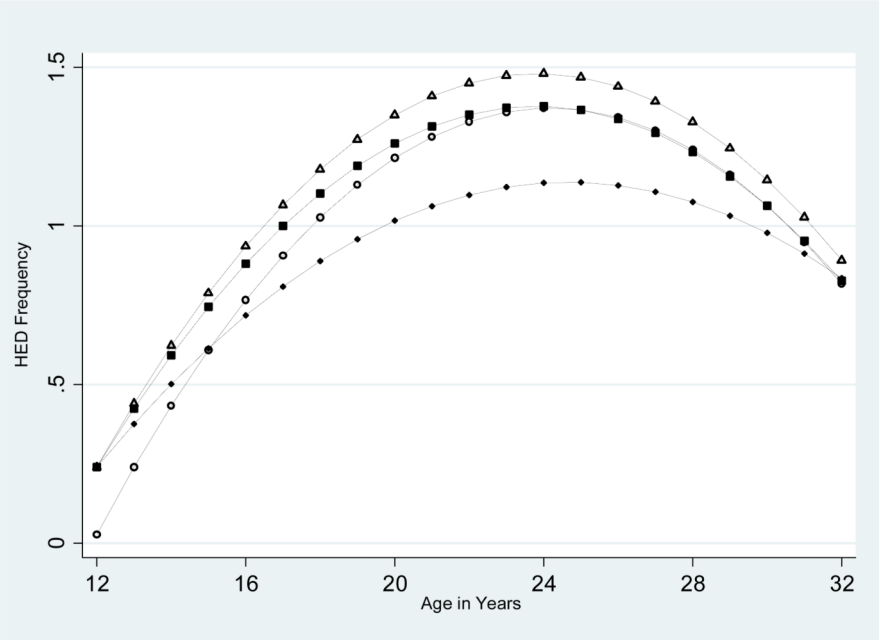

Figure 1.
Predicted HED Frequency by Child Maltreatment Type

* Note: The full range of HED (0-6) is truncated in the Figure.
** Two childhood maltreatment subtypes, experiencing sexual abuse alone or in combination with either neglect or physical abuse and all three types of maltreatment, were included in the model but were not significantly associated with HED and thus are not in portrayed in the figure.
*** The models controlled for demographics, parental and peer alcohol use, parental education and employment, family income, parent-child relationship, and adolescent depression.

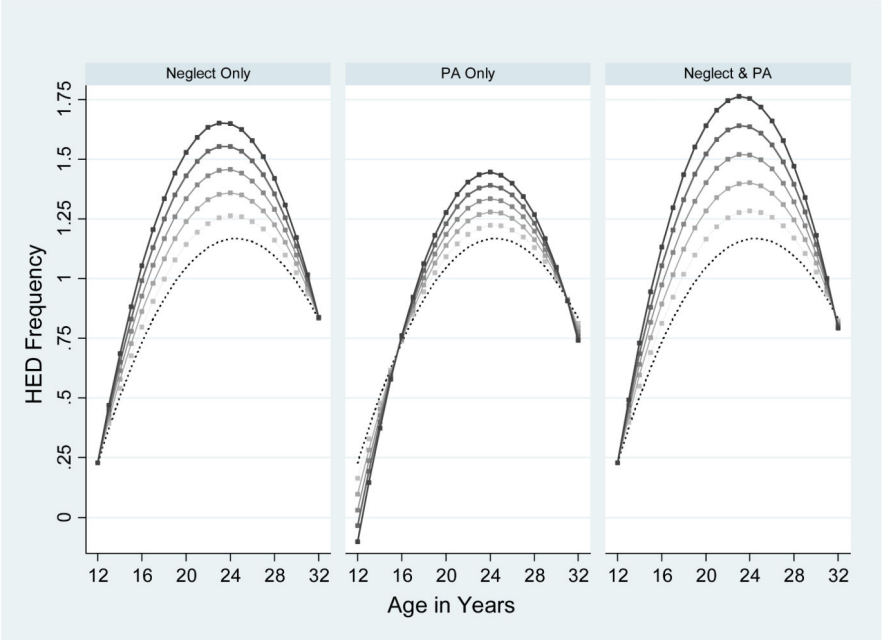

Figure 2.
Predicted HED Frequency by Child Maltreatment Subtype Frequency

* Note: The full range of HED (0-6) is truncated in the Figure.
** Two childhood maltreatment subtypes, experiencing sexual abuse alone or in combination with either neglect or physical abuse and all three types of maltreatment, were included in the model but were not significantly associated with HED and thus are not in portrayed in the figure.
*** The models controlled for demographics, parental and peer alcohol use, parental education and employment, family income, parent-child relationship, and adolescent depression.

Table 1

Descriptive statistics for heavy episodic drinking (n = 8,503 unique respondents)

	Percent and Sample Size by Wave			
	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**
	n=8,483	**n=6,722**	**n=8,486**	**n=7,382**
Heavy Episodic Drinking in the Past 12 Months				
Never (referent; =0)	74.5%	70.1%	49.9%	51.0%
l or 2 days (=1)	9.7%	11.8%	17.1%	17.6%
Once a month or less (=2)	5.8%	6.9%	10.7%	11.7%
2 or 3 days a month (=3)	4.3%	4.9%	9.0%	8.9%
1 or 2 days a week (=4)	3.6%	3.7%	9.4%	7.3%
3 to 5 days a week (=5)	1.5%	1.6%	3.2%	2.8%
Every day or almost every day (=6)	0.6%	1.0%	0.7%	0.8%

Table 2

Descriptive statistics for child maltreatment and covariates (n = 8,503 unique respondents)

Main Predictor Variables	Percent	Range	Mean	SD
Child Maltreatment Types				
No Child Maltreatment (referent)	48.2%			
Neglect Only	21.8%			
Physical Abuse Only	10.9%			
Neglect & Physical Abuse	14.7%			
Neglect, Physical Abuse, & Sexual Abuse	3.3%			
Sexual Abuse Only or combined with Physical Abuse or Neglect	1.3%			
Child Maltreatment – Frequency (if ever)*				
Neglect Only		0.5-5	1.5	0.9
Physical Abuse Only		1-5	2.7	1.5
Neglect & Physical Abuse		0.8-5	2.3	1.0
Neglect, Physical Abuse, & Sexual Abuse		0.8-5	2.2	1.1
Sexual Abuse Only or combined with Physical Abuse or Neglect		1-5	2.7	1.3
Child Maltreatment – Severity (if ever)*				
Neglect Only		1-6	2.0	1.9
Physical Abuse Only		1-1	1	0
Neglect & Physical Abuse		1-4	1.4	0.7
Neglect, Physical Abuse, & Sexual Abuse		1-11	2.0	1.9
Sexual Abuse Only or combined with Physical Abuse or Neglect		3-3	3	0

Covariates	Percent	Range	Mean	SD
Number of Peers who Drank Alcohol in Past Month		0-3	1.1	1.2
Adolescent Depression		0-2.4	0.8	0.3
Adolescent had a Parent with Alcohol Problems	16.2%			
Adolescent is Male	46.8%			
Adolescent Race				
White not Hispanic (referent)	57.8%			
Black not Hispanic	18.2%			
Hispanic, any race	14.8%			
Other race/ethnicity	9.2%			
Parental Education				
Less than High School (referent)	15.2%			
High School Degree or Equivalent	29.0%			
Some College	30.1%			
College Degree or Higher	25.7%			
Parent Employment at Wave 1				
Not Working (referent)	24.7%			
Working Part Time	15.8%			
Working Full Time	59.4%			
Family Income Quartile at Wave 1				

Covariates	Percent	Range	Mean	SD
1st Quartile	21.9%			
2nd Quartile	24.4%			
3rd Quartile	26.5%			
4th Quartile (referent)	27.2%			
Adolescent has Poor Relationship w. Both Parents	6.7%			
Adolescent is Age 11-14 at Wave 1	30.7%			
Adolescent is Age 15-17 at Wave 1	56.4%			
Adolescent is Age 18+ at Wave 1 (referent)	12.9%			

Table 3

Effects of child maltreatment type and frequency on trajectories of heavy episodic drinking from adolescence to young adulthood

	Types of Child Maltreatent			Frequency of Child Maltreatment		
	Initial Level of Heavy Episodic Drinking	Δ in Heavy Episodic Drinking Over Time	Δ in Heavy Episodic Drinking Over Time - Squared	Initial Level of Heavy Episodic Drinking	Δ in Heavy Episodic Drinking Over Time	Δ in Heavy Episodic Drinking Over Time - Squared
Fixed Effects	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Main Predictor Variables						
Neglect Only	−0.05	0.05***	−0.01***	−0.01	0.02**	−0.01**
Physical Abuse Only	−0.21**	0.08***	−0.01***	−0.07**	0.02***	−0.01***
Neglect and Physical Abuse	−0.10	0.07***	−0.01***	−0.03	−0.03***	−0.01***
Neglect Physical & Sexual Abuse	0.18	−0.02	−0.00	0.04	−0.01	0.00
Sexual Abuse Only or combined with Physical Abuse or Neglet	−0.28	0.08	−0.01	−0.05	0.01	−0.00
Random Effects						
Between Person		1.21***			1.21***	
Within Person						
Initial Status		0.12***			0.12***	
Age		0.01***			0.01***	
Age-Squared		0.00***			0.00***	
Model Fit						
Deviance		101,803.4			101,831.0	
AIC		101,955.4			101,983.0	
BIC		102,589.5			102,617.2	

* p <.05;

** p <.01;

*** p <.001

SE = Standard Error

AIC = Akaike Information Criteria

BIC = Bayesian Information Criteria

Note: The results of the models examining the effects of all control variables on HED are presented in Online Table 1.