

A prospective study of the association between living with an adult who misuses alcohol during childhood and major depressive disorder in adulthood: Evaluating the role of child maltreatment, sex, school bonding, and neighborhood bonding.

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Abstract

A prospective study of the association between living with an adult who misuses alcohol during childhood and major depressive disorder in adulthood: Evaluating the role of child maltreatment, sex, school bonding, and neighborhood bonding.

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Purpose: This prospective cohort study evaluated (1) the association between living with adult alcohol misuse during childhood and chronicity of major depressive disorder (MDD) during one's thirties, (2) whether the association is explained by child maltreatment, and (3) whether the association is moderated by sex, school bonding, and neighborhood bonding during childhood.

Methods: Longitudinal data from the Seattle Social Development Project that followed participants from grade 9 (~15 years old) to age 39 were analyzed. Exposure to living with adult alcohol misuse during childhood was measured during the grade 9 interview and was based on the question "*Have you ever lived with an adult who in your judgment was an alcoholic or a problem drinker (while you were living with them)?*" [1=yes; 0=no]. The depression outcome was an ordinal categorical variable (0, 1, or 2 or more times meeting MDD diagnostic criteria

across three time-points in the thirties). Ordinal logistic regression was used to evaluate the three aims of the study.

Results: Living during childhood with an adult who misused alcohol was associated with 63% higher odds for a one-unit increase in number of MDD diagnoses during one's thirties (OR = 1.63; 95% CI: 1.05, 2.52), adjusted for covariates. There was a 49% reduction in the odds ratio and the association was no longer statistically significant when child maltreatment was included in the model (OR= 1.32; 95% CI: 0.84, 2.07). Sex, school bonding, and neighborhood bonding did not moderate the association ($p > 0.05$).

Conclusions: Exposure to living with an adult who misuses alcohol during childhood was associated with greater chronicity of MDD in adulthood, and child maltreatment appeared to explain this association. Interventions that reach families with alcohol misuse in the home may be important to mitigate long-term mental health challenges into later adulthood. Future research should continue to examine potential modifiable environmental factors that could potentially mitigate the long-term negative impacts of exposure to adult alcohol misuse on mental health.

Introduction

Depression is a major public health concern in the United States. One national study found the lifetime prevalence of major depressive disorder (MDD) to be 16.6% among U.S. adults aged 18 years or older, with a median age of onset of 30 years (1). Studies of the etiology of depression have identified a range of risk factors across multiple levels of influence including genetic factors, personality traits, stressful life events, and environmental factors (2). What is less well understood is the developmental timing of risk factors, and specifically the role of childhood factors that may place individuals at higher risk for experiencing MDD later in life.

Adverse childhood experiences (ACEs) have consistently been found to place individuals at risk for life-long adverse consequences, such as poor mental health in adulthood (3, 4, 5, 6). Additionally, there is considerable evidence of a positive relationship between number of ACEs and risk of poor mental health in adulthood (7). ACEs typically include ten constructs: physical abuse, emotional abuse, sexual abuse, physical neglect, emotional neglect, parental separation/divorce, parental incarceration, domestic violence, household mental illness/suicide, and household substance abuse (8). Although an association between ACEs and poor mental health outcomes has been demonstrated, the individual effects of specific ACEs, such as living with adult alcohol misuse during childhood, on adverse mental health outcomes in adulthood requires further examination.

Roughly 7.5 million (10.5%) children ages 17 or younger in the U.S. live in households with at least one parent who has an alcohol use disorder (9), and research has shown these children experience short- and long-term adverse consequences, such as poorer academic functioning; emotional, behavioral, and social problems; developmental delay; and later substance use problems in adolescence and early adulthood (10, 11, 12). However, few studies

have evaluated the specific association between living with an adult who misuses alcohol (rather than substance misuse more broadly) during childhood and depression in adulthood. A recent cross-sectional study of adults (mean age 54 years) found that those who retrospectively reported having lived with an adult who misused alcohol during childhood experienced more days of poor mental health and were more likely to report being diagnosed with any depressive disorder in their lifetime (3). Further, a limited number of prospective studies have found that children and adolescents who had a family history of adult alcohol misuse and substance use disorders were more likely to meet diagnostic criteria for a depressive disorder in the transition to adulthood between ages 18-27 (4, 13). We are aware of no recent prospective studies specifically linking exposure to adult alcohol misuse during childhood with major depressive disorder later in adulthood. Because prevalence of MDD tends to reach its peak in early adulthood and then decline with age (14), childhood experiences that place one at increased risk beyond one's 20s may serve as particularly important targets for early intervention.

An association between living with an adult who misuses alcohol during childhood and later MDD diagnosis in adulthood is supported by developmental theories such as the social development model (SDM). The SDM organizes risks and protective factors into etiological pathways that predict prosocial or antisocial behavior across development. It theorizes that children and adolescents learn patterns of behavior from socializing units including families, schools, and peers (15). The SDM has been applied to health behavior and health outcomes including the development of depression (16, 17). The model hypothesizes that opportunities for involvement with positive socializing units, and reinforcement for positive involvement, promotes prosocial bonds and a commitment to prosocial values and behaviors which, in turn, facilitate positive youth development and well-being. In contrast, the SDM also hypothesizes that

involvement with socializing units that engage in antisocial behavior, such as growing up in a household with alcohol misuse, promotes antisocial or health-risking bonds and values that can increase health-risking behaviors and poor health outcomes, including depression.

Given that child maltreatment is more common in households where adult substance misuse is present (18), child maltreatment could be an important explanatory factor linking living with an adult who misuses alcohol during childhood to later mental health. However, this potential mechanism has not been well-studied. Recent cross-sectional research found that child maltreatment partially explained the relationship between childhood exposure to household substance abuse and depression as well as other outcomes including anxiety, physical health problems, decreased life satisfaction, lower income, and low educational achievement (18, 19). Yet, to our knowledge, no longitudinal studies have examined the extent to which child maltreatment is a key mechanism linking living with adult alcohol misuse during childhood and MDD diagnoses in the thirties.

It is important to identify potential protective factors that could mitigate long-term harms on mental health associated with living with an adult who misuses alcohol. Prior research has suggested that social factors outside the family (e.g., community engagement, school attachment) may be important protective factors for children of parents who misuse alcohol (20). Given the potential for long-term, adverse effects, it is particularly important to understand if and how mutable factors, such as school and neighborhood environments, might buffer against deleterious effects of childhood exposure to adult alcohol misuse and thereby serve as intervention targets (21, 22, 23). No prior studies have evaluated the possible protective effects of school and neighborhood bonding among children who lived with adult alcohol misuse and later MDD in adulthood.

The association between adult alcohol misuse during childhood and depression in adulthood might also be expected to differ by sex. As coping strategies for stressful situations during childhood may differ between girls and boys due to learned gender norms of acceptable behavior (e.g., girls are more likely to seek social support and problem solve compared to boys, and boys are more likely to use avoidant strategies compared to girls) (24), this may manifest as downstream sex differences in adult mental health of those who experienced adult alcohol misuse in childhood.

This study used a prospective cohort design to evaluate the association between living with an adult who misuses alcohol during childhood and chronicity of major depressive disorder (MDD) across three time points during one's thirties. Next, we evaluated the extent to which child maltreatment explained the hypothesized association. We also examined whether our associations of interest were moderated by school and neighborhood bonding during childhood and by sex. We hypothesized that living with an adult who misuses alcohol during childhood would be associated with higher odds of meeting MDD diagnostic criteria in adulthood. Further, we hypothesized that child maltreatment would partially explain the exposure-outcome relationship. Finally, we hypothesized that the association between living with an adult who misuses alcohol during childhood and MDD in later adulthood would be stronger among those with low relative to high neighborhood and school bonding during childhood and among females relative to males.

Methods

Sample and Study Procedures

Data for this study were from the Seattle Social Development Project (SSDP) (25). SSDP is a longitudinal study that began in 1985 to study health behavior and health outcomes across development among higher risk pre-adolescent youth. All students entering the 5th grade (mean age 10.01, SD=.55) during 1985 in 18 public schools serving higher crime neighborhoods in Seattle, Washington, were eligible for study participation. Of the 1,053 eligible students, 808 (77%) youth and their parents consented to participate in the longitudinal study. Data were collected annually from ages 10-16 and in eight additional assessments from ages 18 to 39. Study subjects for this analysis included those enrolled in the longitudinal study and who participated in the grade 9 interview (n=783). The current study included data from assessments at grade 9 and ages 24, 30, 33, and 39. At grade 9 and age 24, study assessments were conducted in person typically at the participant's home and interviews were administered by trained study staff. At ages 30, 33, and 39, assessments combined in-person surveys and password-protected web-based surveys or, by request, a telephone or paper survey. Informed consent was obtained from all participants and the study was approved by the Human Subjects Review Committee at the University of Washington.

Study Measures

Living with an adult who misused alcohol during childhood. This was measured during the grade 9 (mean age 15.51, SD=.55) interview and was based on the question “*Have you ever lived with an adult who in your judgment was an alcoholic or a problem drinker (while you were living with them)?*” [1=yes; 0=no].

Major Depressive Disorder (MDD) diagnoses during adulthood. DSM-IV-based diagnosis of past year MDD was assessed at the age 30, 33, and 39 interviews using the Diagnostic Interview Schedule (DIS-IV) based on the DSM-IV (26, 27, 28). The DIS is frequently used in

epidemiological studies of psychiatric disorders among adults and has been demonstrated to be reliable and valid when assessed against a clinical diagnosis (29, 30). The outcome was operationalized based on severity/chronicity of MDD across these three waves as follows: 0=no MDD diagnosis; 1= one MDD diagnosis across the three waves; 2=two or more MDD diagnoses across the three waves.

Child maltreatment. At the age 24 interview (1999), a 25-item *Retrospective Child Nurturance and Abuse Questionnaire* was included to capture information on the subject's experience of different forms of child abuse and neglect prior to age 18. Specifically, the questionnaire included questions on experience of physical abuse, emotional abuse, sexual abuse, physical neglect, and emotional neglect. Responses to the items were measured on a five point Likert scale (0=never true; 1=rarely true; 2=sometimes true; 3=often true; 4=always true). One item from the *Retrospective Child Nurturance and Abuse Questionnaire* was excluded as it indirectly inquired about alcohol and substance misuse in the home during childhood, and therefore overlapped with our exposure of interest. A continuous child maltreatment variable was created by summing the scores from the included 24 items, with higher scores representing more chronic and severe child maltreatment experiences (range: 0-96).

School and neighborhood bonding. At the grade 9 assessment, school bonding was measured on a 4-point Likert scale (1=NO!; 2=no; 3=yes; 4=YES!) in response to the following five statements: 1) "I like school"; 2) "I like my social studies teacher this year"; 3) "I like my other teachers this year"; 4) "Most mornings I look forward to going to school"; and 5) "I like my class this year." This scale showed good internal consistency (*Cronbach's alpha* = 0.76). The scores of the five school bonding items were summed (range: 4-20) and then dichotomized for ease of interpretation in analyses (1=high level of bonding [total score ≥ 15]; 0=low level of bonding

[total score <15]). Neighborhood bonding was measured using the same 4-point Likert scale in response to the following four statements: 1) “I like my neighborhood”; 2) “If I had to move, I would miss the neighborhood I now live in”; 3) “I want to stay in my neighborhood no matter what”; and 4) “I’d like to get out of my neighborhood” (reverse coded). This scale also showed good internal consistency (*Cronbach’s alpha* = 0.84). The scores of the four neighborhood bonding items were summed (range: 4-16) then dichotomized (1=high level of bonding [total score ≥12]; 0=low level of bonding [total score <12]).

Confounding variables. The following potential confounders were selected *a priori* for adjustment in study analyses and were measured at the grade 9 interview (administered in 1990) unless otherwise specified: parent report of highest level of education completed (1=some high school or less, 2=high school grad or GED, 3=some college or trade/business school, 4=college grad), parent report of annual household income in 1990 (1=under \$9,999, 2=\$10,000 - \$19,999, 3=\$20,000 - \$29,999, 4=\$30,000 - \$39,999, 5=\$40,000 or more), parent report of marital status (1=married, 0=not married), participant’s race/ethnicity (Caucasian, African American, Native American, Asian American; based on most commonly reported race from school records and multiple self-reports from the SSDP longitudinal study), and participant’s report of family history of depression (1=yes, 0=no; based on the interview question “Has anyone in your family had any of the following illnesses or conditions? Depression?” asked at age 33 interview). Race/ethnicity was included as a confounder in this study as a proxy for exposure to racial discrimination, which may lead to increased alcohol use as a coping strategy (31).

Statistical Analyses

Because the depression outcome was characterized as an ordinal categorical variable (0, 1, or 2 or more times meeting diagnostic criteria for MDD across the age 30, 33, and 39 study

waves), ordinal logistic (also known as cumulative probability) regression was used to evaluate the three aims of this project. Odds ratios estimated describe the proportional change in the odds of a one-unit increase in the outcome of interest (e.g., one MDD diagnosis compared to none, two or more MDD diagnoses compared to one) among those who lived with an adult who misused alcohol during childhood relative to those who did not live with an adult who misused alcohol during childhood. For our primary aim, the model included our binary exposure and all confounding variables as covariates (Model 1). For our second aim, the model included all variables in Model 1 as well as the continuous child maltreatment variable (Model 2). We evaluated the extent to which the odds ratio associated with the exposure was attenuated in Model 2 compared to the corresponding odds ratio in Model 1 (unadjusted for child maltreatment) as an indication of whether child maltreatment explained, at least in part, the association between exposure to adult alcohol misuse during childhood and severity/chronicity of MDD diagnoses during the subjects' thirties. For our third aim, we ran three models that separately examined moderation of our exposure-outcome association by school bonding, neighborhood bonding, and sex. Moderation was assessed by Wald's tests for the interaction terms between our exposure variable and each potential moderator.

Among the 783 children who participated in the grade 9 interview, 94% completed the interview at age 24, 90% completed the interview at ages 30 and 33, and 85% of the grade 9 sample completed the interview at age 39. Although participant retention was fairly high, particularly considering the length of follow-up, missingness could still lead to important biases. To help account for missingness, we used multiple imputation by chained equations (32). The imputation model included our exposure, outcome and all confounding variables, along with 6 additional auxiliary variables: child report of alcohol use in grade 9 (yes/no); child report of

marijuana use in grade 9 (yes/no); DSM-IV-based diagnosis of alcohol dependence or abuse at ages 30, 33, and 39 (yes/no); and subject's annual income at age 33 (continuous). The imputation model also specified relevant interactions (e.g., exposure-x-moderators). Twenty datasets were imputed. Regression models were run within each of the twenty datasets and parameter estimates and their standard errors were combined across the datasets using Rubin's rules that account for uncertainty both between and within imputations (33). All statistical analyses were conducted in R version 4.0.3 (34) and the *mice* package was used for multiple imputation (35). Statistical significance was evaluated at an $\alpha=0.05$ level.

Results

Frequency of responses to each child maltreatment item are shown in Table 1. Distribution of study sample characteristics by childhood exposure of adult alcohol misuse as averaged across the twenty imputed datasets are shown in Table 2. The percentage of the study sample who reported living with an adult who misused alcohol at grade 9 was 28.8%. In bivariate analyses, those who reported living with an adult who misused alcohol compared to those who did not were significantly more likely to: be female, Caucasian, Native American, and to have lived in a household with lower annual income, family history of depression, unmarried parents, lower combined parental education attainment, as well as to have lower school and neighborhood bonding, higher child maltreatment scores, and have at least one report of MDD during their thirties (Table 2). Similar prevalence estimates of sample characteristics by exposure status were observed using the non-imputed data.

Odds ratios from multivariable ordinal logistic regression models are shown in Table 3. Results from models adjusting for confounding variables (Model 1) showed that living with an

adult who misuses alcohol during childhood was associated with 63% higher odds for a one-unit increase in reported MDD during study follow-up (OR = 1.63; 95% CI: 1.05, 2.52). To aid in interpretation, the model-predicted prevalence estimates of reporting 0, 1, and 2 or more MDD diagnoses among those who lived with adult alcohol misuse during childhood were 84%, 11%, and 5%, respectively, compared to 89%, 8%, and 3%, among those who did not live with adult alcohol misuse during childhood. When child maltreatment was included in the model (Table 3, Model 2), there was a 49% reduction in the odds ratio compared to results from Model 1 and the association was no longer statistically significant (OR= 1.32; 95% CI: 0.84, 2.07).

We next examined moderation of the association of living with an adult who misuses alcohol during childhood and MDD diagnosis severity/chronicity by school bonding, neighborhood bonding, and sex in separate models. None of the three exposure-x-moderator interaction terms were statistically significant (sex interaction $p=0.84$; school bonding interaction $p=0.20$; neighborhood bonding interaction $p=0.86$).

Discussion

In this prospective cohort study following individuals from grade 9 (~15 years old) to age 39, we found that children who reported living with an adult who misused alcohol during childhood were significantly more likely to meet diagnostic criteria for MDD during their thirties. We also observed that this association was explained, at least in part, by child maltreatment. We did not find evidence of significant moderation by sex, school bonding, or neighborhood bonding.

Our findings linking childhood exposure of adult alcohol misuse and MDD diagnosis in adulthood are consistent with previous epidemiological studies (3, 4). This study builds on these

earlier studies by suggesting that the mental health consequences of living with adult alcohol misuse during childhood may extend further into adulthood than has been previously shown. If adults are impacted into their late 30s—when many will be partnered, raising children, and become more fully established in careers—this has important implications for later life problems, family functioning, and perhaps intergenerational impacts (25, 36, 37, 38). Further, our results are consistent with the SDM framework, which stresses the crucial role of bonding to socializing units, such as families, for health outcomes including mental health in adulthood. According to the SDM, alcohol misuse by a child’s parents or other important adults provides opportunities for unhealthy bonding and conveys health-risking beliefs and values; this may also hinder the formation of prosocial bonds within the family that promote positive development. Healthy bonding opportunities in other settings such as schools and neighborhoods may be particularly important for children living with adult alcohol misuse in the family, where such opportunities may be limited.

Our findings that child maltreatment—including abuse and neglect—partially explained the association are consistent with previous research (18, 19), and provide evidence that child maltreatment may be an important mechanism through which living with adult alcohol misuse during childhood influences long-term mental health status. Parental alcohol misuse has been shown to be associated with child maltreatment in multiple studies (39, 40), and other research suggests parental alcohol misuse affects parenting capacities, relationships and attachments with children, and creates a familial environment characterized by fear, uncertainty, and conflict (20). This could confer risk on later-life depression as child maltreatment is a key determinant of emotional dysregulation across the lifespan (41), and emotional dysregulation is in turn associated with psychiatric disorders such as depression (42). In this study, participants

retrospectively reported at age 24 their experience of child maltreatment occurring before age 18. Evidence suggests that there may be sensitive periods during development that could be particularly harmful to a child if they experience maltreatment. For example, one study found that experiencing child maltreatment during middle childhood (ages 6-10) was particularly harmful and led to worse mental health outcomes compared to other developmental periods (43). Thus, future research should consider the role of child maltreatment across different developmental periods in the association between living with adult alcohol misuse during childhood and severity/chronicity of MDD in adulthood.

We did not find evidence of moderation by sex, which is consistent with prior literature suggesting that the relationship between substance abuse in the home during childhood and poor mental health in adulthood, as well as other ACEs, do not differ by sex (4, 5). However, one prior study found that poor mental health among children that experienced adult alcohol misuse in the home differed according to whether it was the mother or father who misused alcohol (44). Thus, when considering potential sex differences, there may be specific mother vs. father and daughter vs. son combinations that are particularly impactful. This study could not consider this particular question because of a lack of specificity in our measure of living with an adult who misuses alcohol, but this may be an area of future research.

Also, we did not find evidence of moderation by either school bonding or neighborhood bonding in our analyses. This may be in part due to limited power to detect interactions in this study. With regard to school bonding, although the interaction did not reach statistical significance at $p < 0.05$, stratified point estimates were consistent with our hypothesis (OR=2.08; 95% CI: 1.11, 3.89 for those with low levels of school bonding compared to OR=1.25; 95% CI: 0.69, 2.27 for those with higher levels of school bonding). Although these stratified results

should be interpreted with caution, the direction of findings aligns with prior epidemiological studies that suggest perceived positive school environments during childhood reduce the risk of poor mental health outcomes in adulthood (20, 17). To better specify prevention implications, future well-powered studies should seek to identify important modifiable factors that could protect against deleterious effects of childhood exposure to adult alcohol misuse.

There were limitations of this study. First, findings may not be generalizable to other populations given our sample included higher risk youth originally from one urban region in the Pacific Northwest. However, prevalence of living with adult alcohol misuse during childhood and child maltreatment in our sample was similar to national studies (9, 45). Secondly, childhood exposure to living with an adult who misuses alcohol was measured only at one time point and may not capture this exposure at other important developmental periods, particularly earlier in childhood, or cumulatively over time. Thirdly, as mentioned earlier, it was not possible to determine the relationship of the adult who misused alcohol (e.g., a parent, sibling, grandparent), which would allow for further insight into the association. Fourthly, we could not definitively establish temporality of adult alcohol misuse and child maltreatment. It is possible that child maltreatment led to adult alcohol misuse. Yet, prior longitudinal studies have found that adult substance use is a risk factor for children experiencing maltreatment, suggesting it would be more likely that adult alcohol misuse leads to child maltreatment rather than vice versa (36, 46). Lastly, assessment of child maltreatment relied on retrospective self-report which may introduce measurement error and threaten internal validity of the study. However, prior studies have found retrospective reporting of these items to be valid (26, 47). Despite these limitations, the longitudinal study design into the 30s and novel examination of mechanisms and protective

factors are important strengths that contribute to a better understanding of the link between childhood exposure to adult alcohol misuse and poor mental health in adulthood.

Our study suggests that living with adult alcohol misuse during childhood may be associated with a greater chronicity/severity of MDD in the 30s, with child maltreatment substantially explaining this association. These results highlight the already appreciated importance of interventions that reach families with alcohol misuse in the home in order to mitigate long-term mental health and other behavioral health challenges into later adulthood (48). Further, continued research should seek to uncover modifiable environmental factors, such as providing opportunities for positive bonding in schools and neighborhoods, that could potentially increase resilience and otherwise mitigate the negative impacts of exposure to adult alcohol misuse on mental health in adulthood.

References

1. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication [published correction appears in *Arch Gen Psychiatry*. 2005 Jul;62(7):768. Merikangas, Kathleen R [added]]. *Arch Gen Psychiatry*. 2005;62(6):593-602. doi:10.1001/archpsyc.62.6.593.
2. Saveanu RV, Nemeroff CB. Etiology of depression: genetic and environmental factors. *Psychiatr Clin North Am*. 2012;35(1):51-71. doi:10.1016/j.psc.2011.12.001.
3. Mwachofi A, Imai S, Bell RA. Adverse childhood experiences and mental health in adulthood: Evidence from North Carolina. *J Affect Disord*. 2020;267:251-257. doi:10.1016/j.jad.2020.02.021.
4. Reinherz HZ, Paradis AD, Giaconia RM, Stashwick CK, Fitzmaurice G. Childhood and adolescent predictors of major depression in the transition to adulthood. *Am J Psychiatry*. 2003;160(12):2141-2147. doi:10.1176/appi.ajp.160.12.2141.
5. Lee RD, Chen J. Adverse childhood experiences, mental health, and excessive alcohol use: Examination of race/ethnicity and sex differences. *Child Abuse Negl*. 2017;69:40-48. doi:10.1016/j.chiabu.2017.04.004.
6. Omkarappa DB, Rentala S. Anxiety, depression, self-esteem among children of alcoholic and nonalcoholic parents. *J Family Med Prim Care*. 2019;8(2):604-609. doi:10.4103/jfmpc.jfmpc_282_18.
7. Hughes K, Lowey H, Quigg Z, Bellis MA. Relationships between adverse childhood experiences and adult mental well-being: results from an English national household survey. *BMC Public Health*. 2016;16:222. Published 2016 Mar 3. doi:10.1186/s12889-016-2906-3.
8. Bethell CD, Carle A, Hudziak J, et al. Methods to Assess Adverse Childhood Experiences of Children and Families: Toward Approaches to Promote Child Well-being in Policy and Practice. *Acad Pediatr*. 2017;17(7S):S51-S69. doi:10.1016/j.acap.2017.04.161.
9. Lipari RN, Van Horn SL. Children Living with Parents Who Have a Substance Use Disorder. In: *The CBHSQ Report*. Rockville (MD): Substance Abuse and Mental Health Services Administration (US); August 24, 2017.1-7.
10. Jones TM, Hill KG, Epstein M, Lee JO, Hawkins JD, Catalano RF. Understanding the interplay of individual and social-developmental factors in the progression of substance use and mental health from childhood to adulthood. *Dev Psychopathol*. 2016;28(3):721-741. doi:10.1017/S0954579416000274.
11. Guttmanova K, Hill KG, Bailey JA, Hartigan L, Small CM, Hawkins JD. Parental Alcohol Use, Parenting, and Child On-Time Development. *Infant Child Dev*. 2017;26(5):e2013. doi:10.1002/icd.2013.
12. Solis JM, Shadur JM, Burns AR, Hussong AM. Understanding the diverse needs of children whose parents abuse substances. *Curr Drug Abuse Rev*. 2012;5(2):135-147. doi:10.2174/1874473711205020135.
13. Chassin L, Pitts SC, DeLucia C, Todd M. A longitudinal study of children of alcoholics: predicting young adult substance use disorders, anxiety, and depression. *J Abnorm Psychol*. 1999;108(1):106-119. doi:10.1037//0021-843x.108.1.106.

14. Substance Abuse and Mental Health Services Administration. (2020). Key substance use and mental health indicators in the United States: Results from the 2019 National Survey on Drug Use and Health (HHS Publication No. PEP20-07-01-001, NSDUH Series H-55). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from <https://www.samhsa.gov/data/>
15. Catalano RF, Hawkins JD. The social development model: A theory of antisocial behavior. In: Hawkins JD, eds. *Cambridge criminology series. Delinquency and crime: Current theories*. New York City, NY: Cambridge University Press, 1996:149-197.
16. Kaslow NJ, Brown RT, Mee LL. Cognitive and behavioral correlates of childhood depression. In: Reynolds WM, Johnston HF, eds. *Handbook of depression in children and adolescents*. Boston, MA: Springer, 1994:97-121.
17. Mason WA, Hawkins JD, Kosterman R, Catalano RF. Alcohol Use Disorders and Depression: Protective Factors in the Development of Unique Versus Comorbid Outcomes. *J Child Adolesc Subst Abuse*. 2010;19(4):309-323. doi:10.1080/1067828X.2010.502491.
18. Clemens V, Berthold O, Witt A, et al. Lifespan risks of growing up in a family with mental illness or substance abuse. *Scientific Reports*. 2020;10(1). doi:10.1038/s41598-020-72064-w.
19. Clemens V, Berthold O, Witt A, et al. Child maltreatment is mediating long-term consequences of household dysfunction in a population representative sample. *Eur Psychiatry*. 2019;58:10-18. doi:10.1016/j.eurpsy.2019.01.018.
20. Velleman R, Templeton LJ. Impact of parents substance misuse on children: an update. *BJPsych Advances*. 2016;22(2):108-117. doi:10.1192/apt.bp.114.014449.
21. Catalano RF, Mazza JJ, Harachi TW, Abbott RD, Haggerty KP, Fleming CB. Raising healthy children through enhancing social development in elementary school: Results after 1.5 years. *Journal of School Psychology*. 2003;41(2):143-164. doi:10.1016/s0022-4405(03)00031-1.
22. Popkin SJ, Acs G, Smith R. The Urban Institutes Program on Neighborhoods and Youth Development: Understanding How Place Matters for Kids. *PsycEXTRA Dataset*. 2009. doi:10.1037/e685552011-001.
23. Hawkins JD, Kosterman R, Catalano RF, Hill KG, Abbott RD. Effects of social development intervention in childhood 15 years later. *Arch Pediatr Adolesc Med*. 2008;162(12):1133-1141. doi:10.1001/archpedi.162.12.1133.
24. Eschenbeck H, Kohlmann C-W, Lohaus A. Gender Differences in Coping Strategies in Children and Adolescents. *Journal of Individual Differences*. 2007;28(1):18-26. doi:10.1027/1614-0001.28.1.18.
25. Catalano RF, Hawkins JD, Kosterman R, et al. Applying the Social Development Model in Middle Childhood to Promote Healthy Development: Effects from Primary School Through the 30s and Across Generations. *Journal of Developmental and Life-Course Criminology*. 2020;7(1):66-86. doi:10.1007/s40865-020-00152-6.
26. Robins LN, Helzer JE, Croughan J, Ratcliff KS. National Institute of Mental Health Diagnostic Interview Schedule: Its History, Characteristics, and Validity. *Arch Gen Psychiatry*. 1981;38(4):381-389. doi:10.1001/archpsyc.1981.01780290015001.
27. McGee R, Feehan M, Williams S, Partridge F, Silva PA, Kelly J. DSM-III disorders in a large sample of adolescents. *J Am Acad Child Adolesc Psychiatry*. 1990;29(4):611-619. doi:10.1097/00004583-199007000-00016
28. American Psychiatric Association, ed. Diagnostic and statistical manual of mental disorders DSM-4. Washington, DC: American Psychiatric Association; 1994.

29. Newman DL, Moffitt TE, Caspi A, Magdol L, Silva PA, Stanton WR. Psychiatric disorder in a birth cohort of young adults: prevalence, comorbidity, clinical significance, and new case incidence from ages 11 to 21. *J Consult Clin Psychol*. 1996;64(3):552-562.
30. Reinherz HZ, Giaconia RM, Hauf AM, Wasserman MS, Paradis AD. General and specific childhood risk factors for depression and drug disorders by early adulthood. *J Am Acad Child Adolesc Psychiatry*. 2000;39(2):223-231. doi:10.1097/00004583-200002000-00023.
31. Gilbert PA, Zemore SE. Discrimination and drinking: A systematic review of the evidence. *Soc Sci Med*. 2016;161:178-194. doi:10.1016/j.socscimed.2016.06.009
32. Graham JW. Missing data analysis: making it work in the real world. *Annu Rev Psychol*. 2009;60:549-576. doi:10.1146/annurev.psych.58.110405.085530.
33. Rubin DB. Multiple imputation for nonresponse in surveys. New York: Wiley, 1987.
34. R Core Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
35. Stef van Buuren, Karin Groothuis-Oudshoorn (2011). mice: Multivariate Imputation by Chained Equations in R. *Journal of Statistical Software*, 45(3), 1-67. URL <https://www.jstatsoft.org/v45/i03/>.
36. Bramlett MD, Mosher WD. Cohabitation, marriage, divorce, and remarriage in the United States. *Vital Health Stat 23*. 2002;(22):1-93.
37. Martinez GM, Daniels K, Febo-Vazquez I. Fertility of Men and Women Aged 15-44 in the United States: National Survey of Family Growth, 2011-2015. *Natl Health Stat Report*. 2018;(113):1-17.
38. Hill KG, Bailey JA, Steeger CM, et al. Outcomes of Childhood Preventive Intervention Across 2 Generations: A Nonrandomized Controlled Trial. *JAMA Pediatr*. 2020;174(8):764-771. doi:10.1001/jamapediatrics.2020.1310
39. Brown J, Cohen P, Johnson JG, Salzinger S. A longitudinal analysis of risk factors for child maltreatment: findings of a 17-year prospective study of officially recorded and self-reported child abuse and neglect. *Child Abuse Negl*. 1998;22(11):1065-1078. doi:10.1016/s0145-2134(98)00087-8.
40. Dube SR, Anda RF, Felitti VJ, Croft JB, Edwards VJ, Giles WH. Growing up with parental alcohol abuse: exposure to childhood abuse, neglect, and household dysfunction. *Child Abuse Negl*. 2001;25(12):1627-1640. doi:10.1016/s0145-2134(01)00293-9
41. Thompson KL, Hannan SM, Miron LR. Fight, flight, and freeze: Threat sensitivity and emotion dysregulation in survivors of chronic childhood maltreatment. *Personality and Individual Differences*. 2014;69:28-32. doi:10.1016/j.paid.2014.05.005.
42. Bradley B, DeFife JA, Guarnaccia C, et al. Emotion dysregulation and negative affect: association with psychiatric symptoms. *J Clin Psychiatry*. 2011;72(5):685-691. doi:10.4088/JCP.10m06409blu.
43. Dunn EC, Nishimi K, Gomez SH, Powers A, Bradley B. Developmental timing of trauma exposure and emotion dysregulation in adulthood: Are there sensitive periods when trauma is most harmful?. *J Affect Disord*. 2018;227:869-877. doi:10.1016/j.jad.2017.10.045.
44. Balsa AI, Homer JF, French MT. The health effects of parental problem drinking on adult children. *J Ment Health Policy Econ*. 2009;12(2):55-66.
45. Hussey JM, Chang JJ, Kotch JB. Child maltreatment in the United States: prevalence, risk factors, and adolescent health consequences. *Pediatrics*. 2006;118(3):933-942. doi:10.1542/peds.2005-2452.

46. Laslett AM, Room R, Dietze P, Ferris J. Alcohol's involvement in recurrent child abuse and neglect cases. *Addiction*. 2012;107(10):1786-1793. doi:10.1111/j.1360-0443.2012.03917.x.
47. Hardt J, Rutter M. Validity of adult retrospective reports of adverse childhood experiences: review of the evidence. *J Child Psychol Psychiatry*. 2004;45(2):260-273. doi:10.1111/j.1469-7610.2004.00218.x.
48. Hildebrandt UC, Graham JC, Grant TM. Predictors and moderators of improved social-emotional functioning in mothers with substance use disorders and their young children enrolled in a relationship-based case management program. *Infant Ment Health J*. 2020;41(5):677-696. doi:10.1002/imhj.21872.

Table 1. Prevalence^a of child maltreatment indicators by subtype from the Retrospective Child Nurturance and Abuse Questionnaire^b.	
Child Maltreatment Indicator	Total N (%)
Physical Abuse	
I got hit so hard by my mother or father (or other primary caregiver) that I had to see a doctor or go to the hospital.	
Never True	643 (92.5)
Rarely True	28 (4.0)
Sometimes True	14 (2.0)
Often True	7 (1.0)
Always True	3 (0.4)
My mother or father (or other primary caregiver) hit me so hard that it left me with bruises or marks.	
Never True	538 (77.3)
Rarely True	78 (11.2)
Sometimes True	56 (8.0)
Often True	20 (2.9)
Always True	4 (0.6)
I was punished with a belt, a board, a cord, or some other hard object.	
Never True	324 (46.4)
Rarely True	125 (17.9)
Sometimes True	160 (22.9)
Often True	60 (8.6)
Always True	30 (4.3)
I believe that I was physically abused.	
Never True	589 (84.5)
Rarely True	35 (5.0)
Sometimes True	40 (5.7)
Often True	16 (2.3)
Always True	17 (2.4)
I got hit or beaten so badly that it was noticed by someone like a teacher, neighbor, or doctor.	
Never True	649 (93.0)
Rarely True	23 (3.3)
Sometimes True	16 (2.3)
Often True	4 (0.6)
Always True	6 (0.9)
Emotional Abuse	
My mother or father (or other primary caregiver) called me things like "stupid" or "lazy" or "ugly".	
Never True	357 (50.6)
Rarely True	155 (22.0)
Sometimes True	140 (19.9)
Often True	43 (6.1)
Always True	10 (1.4)
My mother or father (or other primary caregiver) said hurtful or insulting things to me.	
Never True	366 (52.4)

Rarely True	152 (21.7)
Sometimes True	130 (18.6)
Often True	41 (5.9)
Always True	10 (1.4)
I believe that I was emotionally abused.	
Never True	490 (70.1)
Rarely True	67 (9.6)
Sometimes True	79 (11.3)
Often True	40 (5.7)
Always True	23 (3.3)
Sexual Abuse	
My mother or father (or other primary caregiver) tried to touch me in a sexual way, or tried to make me touch them.	
Never True	567 (82.1)
Rarely True	52 (7.5)
Sometimes True	42 (6.1)
Often True	20 (2.9)
Always True	10 (1.4)
My mother or father (or other primary caregiver) threatened to hurt me or tell lies about me unless I did something sexual with them.	
Never True	648 (93.5)
Rarely True	17 (2.5)
Sometimes True	17 (2.5)
Often True	10 (1.4)
Always True	1 (0.1)
My mother or father (or other primary caregiver) tried to make me do sexual things or watch sexual things.	
Never True	592 (85.9)
Rarely True	39 (5.7)
Sometimes True	39 (5.7)
Often True	16 (2.3)
Always True	3 (0.4)
My mother or father (or other primary caregiver) molested me.	
Never True	578 (84.0)
Rarely True	44 (6.4)
Sometimes True	27 (3.9)
Often True	10 (1.5)
Always True	29 (4.2)
I believe that I was sexually abused.	
Never True	588 (85.2)
Rarely True	33 (4.8)
Sometimes True	22 (3.2)
Often True	11 (1.6)
Always True	36 (5.2)
Physical Neglect	
There was someone to take me to the doctor if I needed it.	
Never True	7 (1.0)
Rarely True	11 (1.6)
Sometimes True	28 (4.0)
Often True	95 (13.5)

Always True	562 (79.9)
I had to wear dirty clothes.	
Never True	608 (87.1)
Rarely True	46 (6.6)
Sometimes True	33 (4.7)
Often True	5 (0.7)
Always True	6 (0.9)
I knew that there was someone to take care of me and protect me.	
Never True	13 (1.8)
Rarely True	27 (3.8)
Sometimes True	46 (6.5)
Often True	115 (16.3)
Always True	503 (71.4)
I didn't have enough to eat.	
Never True	606 (87.1)
Rarely True	41 (5.9)
Sometimes True	37 (5.3)
Often True	8 (1.1)
Always True	4 (0.6)
Emotional Neglect	
I felt that I was loved.	
Never True	6 (0.9)
Rarely True	20 (2.8)
Sometimes True	76 (10.8)
Often True	143 (20.3)
Always True	458 (65.1)
I thought that my parents wished I had never been born.	
Never True	599 (85.9)
Rarely True	45 (6.5)
Sometimes True	38 (5.5)
Often True	12 (1.7)
Always True	3 (0.4)
There was someone in my family who helped me feel that I was important or special.	
Never True	27 (3.8)
Rarely True	23 (3.3)
Sometimes True	105 (15.0)
Often True	211 (30.1)
Always True	336 (47.9)
I felt that my mother or father (or other primary caregiver) hated me.	
Never True	520 (74.3)
Rarely True	70 (10.0)
Sometimes True	62 (8.9)
Often True	28 (4.0)
Always True	20 (2.9)
People in my family looked out for one another.	
Never True	24 (3.4)
Rarely True	35 (5.0)
Sometimes True	95 (13.5)
Often True	221 (31.5)

Always True	327 (46.6)
People in my family felt close to each other.	
Never True	28 (4.0)
Rarely True	53 (7.5)
Sometimes True	151 (21.4)
Often True	255 (36.2)
Always True	217 (30.8)
My family was a source of strength and support.	
Never True	40 (5.7)
Rarely True	66 (9.3)
Sometimes True	130 (18.4)
Often True	197 (27.9)
Always True	273 (38.7)

^aPrevalence from the observed dataset and reflect participants who completed the item; missing values ranged from 9.8% to 12.1% across items.

^bRetrospective Child Nurturance and Abuse Questionnaire was administered at age 24 interview and participants reported how often each of the child maltreatment indicators happened before the age of 18.

Table 2. Prevalence^a of participant characteristics by childhood exposure of adult alcohol misuse.			
Characteristic^b	Total	Have you ever lived with an adult who in your judgment was an alcoholic or a problem drinker (while you were living with them)?	
		Yes	No
	N = 783 %	n = 226 %	n = 557 %
Female sex	49.0	55.1	46.6
Race/Ethnicity			
Caucasian	47.5	57.4	43.5
African American	25.2	22.4	26.3
Native American	5.2	10.1	3.3
Asian American	22.1	10.1	27.0
Annual parental income, \$			
< 9,999	14.1	18.2	12.5
10,000 – 19,999	20.5	24.3	19.0
20,000 – 29,999	19.5	17.0	20.5
30,000 – 39,999	17.3	15.9	17.9
40,000 or more	28.5	24.6	30.1
Family history of depression	38.9	54.8	32.5
Parents married	60.3	49.4	64.8
Highest level of parental education completed			
Some high school or less	15.1	15.6	14.8
High school grad or GED	21.7	24.4	20.7
Trade or business school or some college	37.1	39.4	36.2
College graduate	26.1	20.6	28.3
School bonding, high	61.0	54.5	63.6
Neighborhood bonding, high	67.2	58.6	70.7
Child maltreatment, mean	12.6	17.5	11.4
Number of MDD diagnoses during 30s			
0	78.1	67.9	82.2
1	14.0	17.9	12.4
≥2	7.9	14.2	5.4

Abbreviations: MDD, major depressive disorder

^a Estimates averaged across 20 imputed datasets

^bDifferences in covariates across exposure status were all statistically significant at an $\alpha=0.05$ level based on the chi-square test for categorical covariates and a t-test for the continuous child maltreatment covariate

Table 3. Odds ratios^a from ordinal logistic regression models for number of adult MDD diagnoses in one's thirties according to covariates.

Covariate	Model 1			Model 2		
	OR	95% CI	p-value	OR	95% CI	p-value
Living with an adult misusing alcohol	1.63	1.05, 2.52	0.030	1.32	0.84, 2.07	0.233
Race						
Caucasian (ref)	---	---	---	---	---	---
African American	1.84	1.14, 2.97	0.012	1.52	0.93, 2.50	0.092
Native American	1.84	0.86, 3.95	0.115	1.73	0.80, 3.74	0.164
Asian American	0.70	0.36, 1.39	0.311	0.64	0.32, 1.28	0.206
Parental income	0.92	0.77, 1.12	0.436	0.91	0.76, 1.10	0.345
Family history of depression	3.33	2.21, 5.01	<0.001	2.75	1.81, 4.17	<0.001
Parental education	0.80	0.63, 1.00	0.055	0.84	0.66, 1.06	0.138
Parental marriage status	0.89	0.55, 1.46	0.651	0.94	0.57, 1.55	0.807
Child maltreatment	---	---	---	1.04	1.02, 1.05	<0.001

Abbreviations: MDD, major depressive disorder; OR, odds ratio; CI, confidence interval