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Combined role of childhood maltreatment, family history, and gender in the risk for alcohol dependence

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Abstract

Background—Studies of the relationship between childhood maltreatment and alcohol dependence have not controlled comprehensively for potential confounding by co-occurring maltreatments and other childhood trauma, or determined whether parental history of alcohol disorders operates synergistically with gender and maltreatment to produce alcohol dependence. We addressed these issues using national data.

Method—Face-to-face surveys of 27 712 adult participants in a national survey.

Results—Childhood physical, emotional and sexual abuse, and physical neglect were associated with alcohol dependence (p<0.001), controlling for demographics, co-occurring maltreatments and other childhood trauma. Attributable proportions (APs) due to interaction between each maltreatment and parental history revealed significant synergistic relationships for physical abuse in the entire sample, and for sexual abuse and emotional neglect in women (APs, 0.21, 0.31, 0.26 respectively), indicating that the odds of alcohol dependence given both parental history and these maltreatments were significantly higher than the additive effect of each alone (p<0.05).

Conclusions—Childhood maltreatments independently increased the risk of alcohol dependence. Importantly, results suggest a synergistic role of parental alcoholism: the effect of physical abuse on alcohol dependence may depend on parental history, while the effects of sexual abuse and emotional neglect may depend on parental history among women. Findings underscore the importance of early identification and prevention, particularly among those with a family history, and could guide genetic research and intervention development, e.g. programs to reduce the burden of childhood maltreatment may benefit from addressing the negative long-term effects

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Supplementary material

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Declaration of Interest

None.

of maltreatments, including potential alcohol problems, across a broad range of childhood environments.

Keywords

Alcohol dependence; alcohol use disorder; childhood adverse events; childhood maltreatment; epidemiology

Introduction

Alcohol dependence is characterized by maladaptive patterns of alcohol consumption manifested by symptoms leading to clinically significant impairment or distress (APA, 1994). In the USA, the lifetime prevalence of alcohol dependence is high (12.5%) (Hasin *et al.* 2007), and represents a significant public health burden (Rehm *et al.* 2009) requiring effective prevention and treatment, for which factors indicating high-risk groups must be identified and clarified.

Childhood maltreatment is one such factor. Prior epidemiological studies (Kessler *et al.* 1997; Anda *et al.* 2006; Dube *et al.* 2006; McLaughlin *et al.* 2010) suggest that any of the five types of childhood maltreatment [sexual abuse, physical abuse, emotional abuse, emotional neglect and physical neglect (Butchart *et al.* 2006)] are associated with alcohol dependence. However, no study has provided nationally representative information on the relationship between all five childhood maltreatments and adult alcohol dependence (Kessler *et al.* 1997; Sher *et al.* 1997; Anda *et al.* 2006; Dube *et al.* 2006; McLaughlin *et al.* 2010). Subsequently, several issues may have led to inaccuracies in our understanding of the role of childhood maltreatments in the risk for alcohol dependence.

One issue is that maltreatments commonly co-occur (Gilbert *et al.* 2009*b*). Thus, studying each type of maltreatment separately could lead to undetected confounding by the others. Understanding the independent association of each specific type of maltreatment with alcohol dependence requires adjustment for co-occuring maltreatments. Previous reports on maltreatment and alcohol dependence adjusted for one or a few other childhood adverse experiences (Kessler *et al.* 1997), but none controlled for them all, leaving the specific relationship of each type of childhood maltreatment to alcohol dependence unknown. A large sample and complete assessment of all five types of childhood maltreatment are needed for this type of statistical control.

A second issue is that apparent effects attributed to childhood maltreatment may actually have been due to other adverse childhood experiences not involving direct maltreatment of the child. These include parental divorce, incarceration, suicide or death, domestic violence, or involvement with the child welfare system. All are potentially traumatic and may give rise, on their own, to later psychopathology. These experiences may be associated with being maltreated and developing later alcohol dependence, making them potential confounders of the relationship between childhood maltreatment and alcohol dependence (Thompson *et al.* 2008; Gilbert *et al.* 2009*b*). To understand the direct role of maltreatment, other types of adverse childhood experiences should also be controlled.

A third issue is the role of family history, which can indicate inherited vulnerability. Alcohol dependence is highly heritable (Gelernter & Kranzler, 2009). Recent studies in selected samples suggest that among individuals who experience childhood maltreatment, genetic susceptibility increases the risk of various substance phenotypes or their early antecedents (Kaufman *et al.* 2007; Agrawal *et al.* 2009; Brody *et al.* 2009*a*, *b*; Caspi *et al.* 2010; Enoch, 2011). The family history study design is often used as an initial method of exploring genetic issues, for example, in the general population. If at least some individuals in the

population require both family history of alcoholism and childhood maltreatment to develop alcohol dependence, then the relationship between these two risk factors will be synergistic (i.e. the joint effect of maltreatment and family history will be greater than the sum of their individual effects) (Rothman *et al.* 1980). However, whether such a synergistic mechanism exists in the general population is unknown. While the field awaits data from large general population samples to examine this question using molecular genetic variants, synergy can be initially examined using epidemiological information on parental history.

A fourth issue is the relationship between gender and the likelihood of synergy between childhood maltreatment and inherited risk (as represented by parental history) for alcohol dependence. A recent review identified studies suggesting such gender differences (Enoch, 2011), but findings were inconsistent. Systematic exploration of this question in a large sample offers the possibility of resolving the inconsistencies.

Understanding these issues requires well-defined measures of all five childhood maltreatments, other adverse childhood experiences, parental history and alcohol dependence in a large, representative sample. We address the issues using data from the National Epidemiological Survey on Alcohol and Related Conditions (NESARC), sponsored by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). Specifically, we examined:

1. The association between sexual abuse, physical abuse, emotional abuse, physical neglect and emotional neglect and adult lifetime DSM-IV alcohol dependence, controlling for relevant demographic characteristics.
2. The specific relationship between each maltreatment and alcohol dependence, additionally controlling for the presence of any other maltreatments.
3. Whether the relationship between each maltreatment and alcohol dependence remains significant controlling for other adverse childhood experiences that do not involve direct maltreatment.
4. Whether parental history of alcohol dependence and each childhood maltreatment have synergistic effects on the risk for alcohol dependence.
5. Whether synergistic effects of each childhood maltreatment and parental history on the risk for alcohol dependence vary by gender.

Methods

Sample and procedures

Data for this study came from Waves 1 and 2 of NESARC (N=34 653). The Wave 1 (2001–2002) NESARC target population was the civilian noninstitutionalized population residing in households and group quarters, aged ≥18 years. Blacks, Hispanics, and ages 18–24 years were oversampled, with data adjusted for oversampling, household- and person-level non-response. The weighted data were then adjusted to represent the US civilian population based on the 2000 Census (Grant *et al.* 2004). For Wave 2 (2004–2005), all possible eligible respondents were re-interviewed (Grant *et al.* 2009; Hatzenbuehler *et al.* 2008). Excluding respondents ineligible for Wave 2 because they were deceased, deported, mentally or physically impaired or on active duty in the armed forces throughout the follow-up period, the Wave 2 response rate was 86.7%, with a cumulative response rate over the two surveys (i.e. the product of Waves 1 and 2 response rates) of 70.2%. All respondents were informed in writing about the nature of the survey and uses of the data, its voluntary aspect, and that federal laws protected confidentiality of the survey information. The research protocol, including informed consent procedures, was approved by the Census Bureau review board

and the U.S. Office of Management and Budget. The sample for the present study consisted of respondents who participated in both waves, as these were the participants for whom all variables were available. See Table 1 for sample characteristics.

Measures

The interview used to generate the data was the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM-IV Version (AUDADIS-IV). This structured diagnostic interview, designed for lay interviewers, generates DSM-IV diagnoses via computer diagnostic programs that implement the DSM-IV criteria for the disorders using AUDADIS-IV data.

Outcome: lifetime alcohol dependence—All respondents who consumed at least one alcoholic drink in their lifetime were assessed for alcohol dependence. Lifetime alcohol dependence was classified if respondents reported at least three of seven DSM-IV alcohol dependence criteria (APA, 1994) within a 12- month period in at least one of four time-frames including: (1) prior to the past year at Wave 1; (2) in the past year at Wave 1; (3) since Wave 1 but prior to the past year at Wave 2; (4) in the past year at Wave 2. AUDADIS alcohol dependence diagnoses have good to excellent reliability (kappa=0.63–0.75) in clinical and epidemiological studies in the USA and internationally (Grant *et al*. 1995; Chatterji *et al*. 1997; Pull *et al*. 1997; Ustun *et al*. 1997; Hasin *et al*. 2006, 2007) and good validity as evidenced by various strategies including clinician re-appraisals (Pull *et al*. 1997; Canino *et al*. 1999). We focused on alcohol dependence because this diagnosis is more reliable and valid than alcohol abuse (Hasin *et al*. 2006).

Predictors: childhood maltreatments—The Wave 2 AUDADIS included items on the frequency of experiencing the five maltreatments (sexual abuse, physical abuse, emotional abuse, physical neglect and emotional neglect) before age 18 years at the hands of a parent or other adult in the respondent's home. Response options for each item were: never (0), almost never (1), sometimes (2), somewhat often (3) and very often (4). The items and their underlying typology were drawn from widely used scales with good psychometric properties developed and validated against child welfare, family, and clinician reports [the Conflict Tactics Scale (Straus *et al*. 1998; Straus & Douglas, 2004), Childhood Trauma Questionnaire (Bernstein *et al*. 1994, 1997; Thombs *et al*. 2007) and Wyatt (1985)] and combined into five scales representing the five maltreatment types. The NESARC test–retest reliability (ICCs=0.79–0.88) and internal consistency (Cronbach's alphas=0.78–0.90) of these scales is excellent (Ruan *et al*. 2008).

We dichotomized the maltreatment scales for two reasons: their skewed distributions, and the need to summarize them in an easily interpretable manner. The scales were classified as positive as follows. (1) *Sexual abuse*: respondents reported ever experiencing sexual bodily contact with their caregiver. (2) *Physical abuse*: caregivers ever injured respondents, or often used physical force against them. (3) *Emotional abuse*: caregivers verbally abused or threatened respondents at least fairly often, or respondents feared their caregiver would injure them at least sometimes. (4) *Physical neglect*: respondents at least sometimes were made to do age-inappropriate chores, left unsupervised before age 10, not given adequate medical treatment, or went without basic necessities or food while their caregiver did not. (5) *Emotional neglect*: reverse scoring of items asking if someone in the respondents' family wanted them to be a success, made them feel important, believed in them, was supportive or if the family was close-knit. Emotional neglect was classified as positive if at least two items were scored never or almost never.

Other covariates

Demographics: Gender, race/ethnicity (white, Hispanic, black, Asian, Native American), Wave 1 age (continuous), and education (any college *v.* others) were included, given their association with maltreatment (Hussey *et al.* 2006; Gilbert *et al.* 2009*a*, *b*) and alcohol use disorders (Hasin *et al.* 2007).

Other adverse childhood experiences: Respondents were asked if they experienced any of the following prior to age 18: a caregiver was incarcerated, attempted or completed suicide; respondent lived in a foster home or institution; respondent's parents divorced or died; respondent saw serious fights at home. To avoid model collinearity due to correlation between items, a binary variable was created to indicate any of these experiences.

Parental alcohol disorders: Respondents were asked if relatives experienced alcohol dependence as defined by readily observable manifestations of alcohol disorder symptoms, an approach designed to address sensitivity issues in family history data collection (Andreasen *et al.* 1977; Zimmerman *et al.* 1988; Slutske *et al.* 1996). To improve validity, respondents were asked about each family member separately. We classified respondents as positive for parental history of alcoholism if they reported that their biological mother or father had alcohol problems. Validity (Hasin *et al.* 1997) and reliability (Dawson & Grant, 1998; Grant *et al.* 2003) of AUDADIS parental history of alcohol use disorder measures is excellent.

Statistical analysis

All analyses were conducted with SUDAAN (SUDAAN, 2002), which adjusts for characteristics of complex sample surveys such as the NESARC. The outcome variable was lifetime alcohol dependence *versus* no lifetime alcohol use disorder. We excluded respondents with only DSM-IV alcohol abuse because relative to dependence, the reliability and validity of alcohol abuse is lower and more variable (Hasin *et al.* 2006), and hence its meaning unclear. In addition, since this study addresses the relationship of maltreatment prior to age 18 to alcohol dependence, we excluded respondents whose first episode of alcohol dependence occurred before age 18 (n=522) to eliminate questions about time order of maltreatment and alcohol dependence onset.

To determine the association of the five maltreatments with alcohol dependence (Aim 1), odds ratios (ORs) and 95% confidence intervals (CIs) were derived from five logistic regression models, each one assessing a specific childhood maltreatment (sexual abuse, physical abuse, emotional abuse, physical neglect and emotional neglect) as predictors of adult lifetime DSM-IV alcohol dependence. All models adjusted for demographic characteristics (age, gender, race/ethnicity and education). To determine these associations controlling for the other direct maltreatments (Aim 2), an 'any other maltreatment' covariate was added to the five logistic regression models. To additionally control for the effects of other adverse childhood experiences (Aim 3), the covariate indicating whether respondents experienced any adverse childhood experience other than maltreatment was added to the five models described for Aim 2.

The causal inference literature indicates that synergy is most closely represented by interaction effects on the additive risk scale, which can be assessed with attributable proportions due to interaction (APs) (Rothman *et al.* 1980; Darroch, 1997). Therefore, to assess for synergy between parental history of alcohol dependence and each childhood maltreatment (Aim 4), APs and 95% CIs were obtained for each maltreatment according to the method of Andersson *et al.* (2005) which has been used extensively in previous analyses of additive interactions with binary outcomes (e.g. Wicks *et al.* 2010; Zhang *et al.* 2010).

APs were calculated using the formula ($OR_{11} - OR_{10} - OR_{01}+1$)/ OR_{11} (Rothman *et al.* 1980; Kalilani & Atashili, 2006) which tests whether the joint effect of the maltreatment and parental history (OR_{11}) differs from the sum of the effect of the maltreatment in the absence of parental history (OR_{10}) and the effect of parental history in the absence of the maltreatment (OR_{01}). An AP of 0 indicates no effect modification (i.e. that $OR_{11}=OR_{10}+OR_{01}$), while an AP greater than 0 indicates synergy (i.e. that $OR_{11}>OR_{10}+OR_{01}$). Significant APs are those whose 95% CIs do not include 0. Analyses adjusted for demographics and other adverse childhood experiences.

Similarly, to determine whether the role of parental history of alcohol use disorders in the relationship of each type of childhood maltreatment to alcohol dependence varies by gender (Aim 5), we stratified the sample by gender and then repeated the Aim 4 analyses described above within the male and female subsets of the sample. Separate APs and 95% CIs for men and women indicated whether the joint effects of each maltreatment and parental history differed from the sum of the independent effects of these factors. Analyses were adjusted for demographics and other adverse childhood experiences.

Results

Lifetime prevalence of alcohol dependence was 17.1% (S.E.=0.5), including cases diagnosed at Waves 1 and/ or 2. Physical neglect was the most prevalent maltreatment (15.8%, S.E.=0.4), followed by physical abuse (14.9%, S.E.=0.3), emotional abuse (12.0%, S.E.=0.3), sexual abuse (10.1%, S.E.=0.3) and emotional neglect (7.9%, S.E.=0.2).

Associations between the five maltreatments and alcohol dependence (Table 2)

All five maltreatments were significant predictors ($p<0.001$) of adult lifetime DSM-IV alcohol dependence, adjusting for demographics. The magnitude of the ORs ranged from 1.45 (emotional neglect) to 2.29 (emotional abuse). Additionally controlling for any other childhood maltreatment yielded associations with alcohol dependence of similar significance ($p<0.001$), and somewhat lower magnitude for sexual abuse, physical abuse, emotional abuse, and physical neglect. ORs ranged from 1.46 (physical neglect) to 1.84 (sexual abuse). Additionally controlling for other adverse childhood experiences did not further change the significance or magnitude of associations for sexual abuse, physical abuse, emotional abuse and physical neglect ($p<0.001$).

Parental history of alcohol disorders as an effect modifier

Significant departures from additivity in the odds for alcohol dependence were found in the relationship of parental history and sexual abuse, physical abuse and emotional neglect, controlling for demographics and other adverse experiences ($p<0.05$). As shown in Table 3, among individuals with a parental history of alcoholism and history of maltreatment, the proportion of alcohol dependence attributable to the interaction between the maltreatments and parental history was 0.27 (95% CI 0.12–0.42) for sexual abuse, 0.21 (95% CI 0.03–0.39) for physical abuse and 0.22 (95% CI 0.03–0.42) for emotional neglect. The ORs for these associations are shown in Table 3. The APs did not differ significantly from 0 for the other childhood maltreatments, suggesting that their role was independent of parental history of alcoholism.

Gender-specific differences in the role of parental history as an effect modifier

Gender-stratified analyses of the proportion of alcohol dependence attributable to the interaction between the maltreatments and parental history indicated two significant gender-specific effects, both in women. These included significant departures from additivity for sexual abuse and parental history (AP 0.31, 95% CI 0.15–0.48), and emotional neglect and

parental history (AP 0.26, 95% CI 0.04–0.47). Thus, the synergistic effect of parental history of alcohol use disorders with two of the childhood maltreatments – sexual abuse and emotional neglect – on the odds for alcohol dependence appears to vary by gender.

Discussion

In a large, nationally representative dataset, childhood sexual abuse, physical abuse, emotional abuse and physical neglect significantly increased the lifetime odds of adult alcohol dependence, independent of demographic characteristics, co-occurring childhood maltreatments and other traumatic childhood events. Furthermore, in a synergistic manner, parental history increased the odds of alcohol dependence associated with physical abuse in the whole sample, and the odds associated with sexual abuse and emotional neglect among women. These results suggest a role of genetic vulnerability and gender in the mechanism underlying the maltreatment–alcohol dependence relationship. Findings support the hypothesis that individuals with a history of childhood maltreatment are at a significantly elevated risk of adult alcohol dependence, and that this risk may further depend on genetic vulnerability.

This study adds to a growing literature on important long-term negative consequences of childhood maltreatment, and suggests key roles for childhood sexual abuse, physical abuse, emotional abuse and physical neglect in the development of adult alcohol dependence in the general population. Findings confirm and extend previous reports of a childhood maltreatment– alcohol dependence relationship from studies with more limited samples and/or measures (Kessler *et al*. 1997; Sher *et al*. 1997; Anda *et al*. 2006; Dube *et al*. 2006; McLaughlin *et al*. 2010). Of particular importance, the increased risk of adult alcohol dependence conferred by sexual abuse, physical abuse, emotional abuse or physical neglect cannot be explained by other childhood trauma. Thus, children who experience these maltreatments are at risk of adult psychopathology, regardless of the presence or absence of other maltreatments, domestic violence, parental divorce, incarceration, suicide or death, or spending time in foster homes or institutions. Program development to reduce the burden of childhood maltreatment may therefore benefit from considering the negative effects of maltreatments across a broad range of childhood environments. Further, despite moderate tetrachoric correlations between maltreatments (range 0.38–0.82, mean 0.55, median 0.53), four of the five maltreatments remained significant after controlling for co-occurring maltreatments. This suggests that the interrelationships between childhood maltreatments may be especially important in understanding the risk of developing future psychiatric disorders, and could be considered in future work.

Of note, since the literature suggests that the associations between childhood maltreatment and adult psychiatric and substance-related outcomes may vary by gender (Widom *et al*. 1995, 2007, 2008; Wilson & Widom, 2009), we stratified the maltreatment–alcohol dependence associations by gender in a sensitivity analysis (results provided in online Supplementary Table S1). The direction and significance of the sexual abuse, physical abuse, emotional abuse and physical neglect associations did not vary by gender. However, for emotional neglect, there was a positive significant association among women (OR 1.26, 95% CI 1.03– 1.55). This suggests that the role of childhood emotional neglect in the risk of adult alcohol dependence may vary by gender, which should be explored further in future work.

Despite the evidence for the role of sexual abuse, physical abuse, emotional abuse and physical neglect in the development of adult alcohol dependence, not all individuals who experience these maltreatments develop alcohol dependence. This suggests that maltreatment is just one among a set of risk factors for alcohol dependence. Identification of

the risk factors which work in conjunction with maltreatment to produce alcohol dependence (i.e. effect modifiers) is critical for two primary reasons. First, investigation of the mechanisms underlying the childhood maltreatment-alcohol dependence association will contribute important scientific knowledge about alcohol dependence etiology. Second, information about the conditions under which maltreatment increases the risk for alcohol dependence could facilitate the development and implementation of more effective interventions by tailoring them towards maltreated children with the greatest risk of alcohol dependence, building in specific components designed to prevent behaviors that often precede alcohol dependence such as very early onset of drinking or heavy drinking.

Given previous promising but limited evidence that genetic vulnerability, gender and early life stress operate synergistically to produce alcohol dependence (Enoch, 2011), we investigated the relationship between the five maltreatments and parental history of alcohol problems and gender, finding three key synergistic relationships. First, the joint effect of parental history and physical abuse was significantly greater than the sum of the independent effects of these two risk factors, suggesting that parental history and physical abuse may operate synergistically to produce alcohol dependence in the general population. Second, we found a significant synergistic relationship between parental history and sexual abuse which appears to depend on female gender. Third, results revealed a significant synergistic relationship between parental history and emotional neglect in women, but not in men. Thus, there may be different underlying alcohol dependence mechanisms in the general population that function in the presence of parental history and female gender but differ by whether childhood sexual abuse or emotional neglect was experienced. Results support and enhance our understanding of the hypothesis that the effect of parental history on complex disorders may depend on childhood maltreatment and gender. Given the importance of genetic factors in the development of alcohol dependence (Gelernter & Kranzler, 2009), these results suggest directions for future investigations involving more genetically informative samples.

This study underscores the potential long-term detrimental impact of childhood maltreatments, and suggests the need for preventative strategies. For example, school administrations could increase the number of programs designed to teach children knowledge and skills believed to be protective against abuse (Wurtele *et al.* 1992; Daro & McCurdy, 1994). In the event that the maltreatment has already occurred, treatment and prevention of adverse consequences is needed. At present, such strategies focus on shortterm effects of maltreatment (Macmillan *et al.* 2009). However, the link between childhood maltreatment and adult psychopathology suggests the need to intervene in a manner that also prevents long-term consequences, including alcohol dependence. Psychological and information processing theories may help inform the development of such interventions. According to these theories, schemas [i.e. stable and enduring cognitive structures which determine how we process information and behavior, and react to situations (Padesky, 1994)] develop throughout childhood during normal cognitive development. Individuals who experience childhood maltreatment can develop maladaptive schemas (Lumley & Harkness, 2007) which are thought to underlie psychopathology including alcohol dependence (Wright *et al.* 1993). Cognitive therapies target and modify these maladaptive schemas. These are effective in improving current mental health problems among sexually abused children (Macmillan *et al.* 2009), and are also effective in treating substance use disorders (Wright *et al.* 1993; Marques & Formigoni, 2001; McHugh *et al.* 2010). This suggests that cognitive restructuring techniques could be incorporated into interventions for maltreated children to treat existing psychiatric problems and prevent the development of later alcohol use disorders.

Some study limitations are noted. (1) Respondents reporting early onset alcohol dependence (<18 years) were excluded to eliminate reverse causation as an explanation of the findings.

Adding these cases did not substantially impact the impact the significance (all associations $p<0.001$) or magnitude (range of increase in ORs: 0.02–0.10) of associations. (2) We excluded cases of alcohol abuse as uninformative. Sensitivity analyses indicated that this was an appropriate strategy. Including respondents with alcohol abuse in the reference group produced essentially no change in the associations. Adding respondents with alcohol abuse to the case group (those with alcohol dependence) did not change the significance of associations, but led to slight decreases in the magnitude of ORs (range −0.16 to −0.34), which supports our decision to exclude cases of alcohol abuse as they would partially mask the maltreatment-dependence associations. (3) Due to model restrictions, interaction analyses did not adjust for co-occurring maltreatments. However, since co-occurring maltreatments did not explain the main effects of sexual abuse, physical abuse, emotional abuse and physical neglect on alcohol dependence, they are unlikely to explain the interaction effects. (4) Retrospective reports of childhood maltreatment play an important role in research (Rutter *et al.* 2001), but are vulnerable to recall bias. However, sibling verification of adult reports of childhood maltreatment (Bifulco *et al.* 1997) and good retrospective recall of maltreatment in prospective studies (Robins *et al.* 1985; Johnson *et al.* 1999; Nelson *et al.* 2010) support the validity of such measures. Moreover, requiring official records to verify maltreatment is unfeasible in a study this size, and could produce false negatives for moderate maltreatments that are never officially reported. Further, adult reports of childhood maltreatment could be biased if *Childhood maltreatments and risk for alcohol dependence* 1053 respondents with current alcohol dependence report maltreatment differently from those with no current alcohol dependence diagnosis. This could happen if mood-congruent recall bias (Bower, 1981) affected reporting of childhood maltreatments, since those with current alcohol dependence are more likely to have depressed mood than others (Schuckit *et al.* 1997; Hasin *et al.* 2007). A sensitivity analysis indicated that such misclassification is unlikely because excluding respondents with current alcohol dependence and analyzing only those with past-only alcohol dependence did not change the main results for sexual abuse, physical abuse, emotional abuse, and physical neglect, which all remained significant predictors of alcohol dependence controlling for demographics, cooccurring maltreatments and other adverse childhood experiences ($p<0.001$). Moreover, even if those with lifetime alcohol dependence are more likely to recall and report maltreatment than those without lifetime alcohol dependence, this bias (away from the null) would likely be cancelled out by the bias from the false negatives (towards the null). (5) We did not reanalyze our data using preliminary proxies for alcohol use disorder as it will be defined in DSM-5, in part because the new criteria have not been finalized and in part because of the complexities involved in such an extension of the present study. The relationships we report should be investigated after DSM-5 is finalized to determine if they remain the same using the new criteria. (6) Since we were interested in understanding the specific maltreatment types, we chose to address maltreatments as five binary variables rather than with a summary score of all maltreatment items. Our operational definitions of the five childhood maltreatments were derived from the World Health Organization's conceptual definitions of childhood maltreatment, and where possible aligned with definitions utilized in secondary analyses of data from the Adverse Childhood Experiences (ACE) Study. Slight differences in our maltreatment definitions and those used in the ACE study (e.g. our threshold for physical abuse was slightly higher and we included an additional emotional abuse item) did not impact the significance of results.

Study strengths are also noted. This was the first investigation to differentiate between the risk of alcohol dependence conferred by physical and emotional neglect, and assess the associations between adult lifetime DSM-IV alcohol dependence and five maltreatments (sexual abuse, physical abuse, emotional abuse, physical neglect and emotional neglect) using a nationally representative dataset large enough to identify the unique effect of these maltreatments controlling for demographics, co-occurring maltreatments and other traumatic

childhood events. We also provided information on circumstances under which sexual abuse, physical abuse and emotional neglect may result in alcohol dependence. Thus, the present findings contribute a significant advance in our understanding of the associations of childhood abuse and neglect with adult alcohol dependence.

In summary, sexual abuse, physical abuse, emotional abuse and physical neglect independently increased the risk of alcohol dependence, underscoring the importance of early identification and prevention. Importantly, the effect of physical abuse on alcohol dependence may depend on genetic vulnerability as suggested by the effect of parental history of alcoholism, while the effects of sexual abuse and emotional neglect may depend on this vulnerability within women. Findings could guide genetic studies and intervention development. Finally, future studies should consider whether observed relationships are unique to alcohol dependence or common to a broad range of adult psychopathology.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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References

Agrawal A, Sartor CE, Lynskey MT, Grant JD, Pergadia ML, Grucza R, Bucholz KK, Nelson EC, Madden PA, Martin NG, Heath AC. Evidence for an interaction between age at first drink and genetic influences on DSM-IV alcohol dependence symptoms. Alcoholism: Clinical & Experimental Research. 2009; 33:2047–2056.

APA. Diagnostic and Statistical Manual of Mental Disorders. Washington, D.C: American Psychiatric Association; 1994.

Anda RF, Felitti VJ, Bremner JD, Walker JD, Whitfield C, Perry BD, Dube SR, Giles WH. The enduring effects of abuse and related adverse experiences in childhood. A convergence of evidence from neurobiology and epidemiology. European Archives of Psychiatry and Clinical Neuroscience. 2006; 256:174–186. [PubMed: 16311898]

Andersson T, Alfredsson L, Kallberg H, Zdravkovic S, Ahlbom A. Calculating measures of biological interaction. European Journal of Epidemiology. 2005; 20:575–579. [PubMed: 16119429]

Andreasen NC, Endicott J, Spitzer RL, Winokur G. The family history method using diagnostic criteria. Reliability and validity. Archives of General Psychiatry. 1977; 34:1229–1235. [PubMed: 911222]

Bernstein DP, Ahluvalia T, Pogge D, Handelsman L. Validity of the Childhood Trauma Questionnaire in an adolescent psychiatric population. Journal of the American Acadamy of Child and Adolescent Psychiatry. 1997; 36:340–348.

Bernstein DP, Fink L, Handelsman L, Foote J, Lovejoy M, Wenzel K, Sapareto E, Ruggiero J. Initial reliability and validity of a new retrospective measure of child abuse and neglect. American Journal of Psychiatry. 1994; 151:1132–1136. [PubMed: 8037246]

Bifulco A, Brown GW, Lillie A, Jarvis J. Memories of childhood neglect and abuse: corroboration in a series of sisters. Journal of Child Psychology and Psychiatry. 1997; 38:365–374. [PubMed: 9232482]

Bower GH. Mood and memory. American Psychologist. 1981; 36:129–148. [PubMed: 7224324]

Brody GH, Beach SR, Philibert RA, Chen YF, Lei MK, Murry VM, Brown AC. Parenting moderates a genetic vulnerability factor in longitudinal increases in youths' substance use. Journal of Consulting and Clinical Psychology. 2009a; 77:1–11. [PubMed: 19170449]

Brody GH, Beach SR, Philibert RA, Chen YF, Murry VM. Prevention effects moderate the association of 5-HTTLPR and youth risk behavior initiation: generenvironment hypotheses tested via a randomized prevention design. Child Development. 2009b; 80:645–661. [PubMed: 19489894]

Butchart, A.; Harvey, AP.; Mian, M.; Furniss, T. Preventing Child Maltreatment: A Guide to Taking Action and Generating Evidence. World Health Organization; 2006.

Canino G, Bravo M, Ramirez R, Febo VE, Rubio-Stipec M, Fernandez RL, Hasin D. The Spanish Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability and concordance with clinical diagnoses in a Hispanic population. Journal of Studies on Alcohol. 1999; 60:790–799. [PubMed: 10606491]

Caspi A, Hariri AR, Holmes A, Uher R, Moffitt TE. Genetic sensitivity to the environment: the case of the serotonin transporter gene and its implications for studying complex diseases and traits. American Journal of Psychiatry. 2010; 167:509–527. [PubMed: 20231323]

Chatterji S, Saunders JB, Vrasti R, Grant BF, Hasin D, Mager D. Reliability of the alcohol and drug modules of the Alcohol Use Disorder and Associated Disabilities Interview Schedule – Alcohol/Drug-Revised (AUDADIS-ADR): an international comparison. Drug and Alcohol Dependence. 1997; 47:171–185. [PubMed: 9306043]

Daro D, McCurdy K. Preventing child abuse and neglect: programmatic interventions. Child Welfare. 1994; 73:405–430. [PubMed: 7924561]

Darroch J. Biologic synergism and parallelism. American Journal of Epidemiology. 1997; 145:661–668. [PubMed: 9098184]

Dawson DA, Grant BF. Family history of alcoholism and gender: their combined effects on DSM-IV alcohol dependence and major depression. Journal of Studies on Alcohol. 1998; 59:97–106. [PubMed: 9498321]

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; 38:444, e1–10. [PubMed: 16549308]

Enoch MA. The role of early life stress as a predictor for alcohol and drug dependence. Psychopharmacology (Berlin). 2011; 214:17–31. [PubMed: 20596857]

Gelernter J, Kranzler HR. Genetics of alcohol dependence. Human Genetics. 2009; 126:91–99. [PubMed: 19533172]

Gilbert R, Kemp A, Thoburn J, Sidebotham P, Radford L, Glaser D, Macmillan HL. Recognising and responding to child maltreatment. Lancet. 2009a; 373:167–180. [PubMed: 19056119]

Gilbert R, Widom CS, Browne K, Fergusson D, Webb E, Janson S. Burden and consequences of child maltreatment in high-income countries. Lancet. 2009b; 373:68–81. [PubMed: 19056114]

Grant BF, Dawson DA, Stinson FS, Chou PS, Kay W, Pickering R. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADISIV): reliability of alcohol consumption, tobacco use, family history of depression and psychiatric diagnostic modules in a general population sample. Drug and Alcohol Dependence. 2003; 71:7–16. [PubMed: 12821201]

Grant BF, Goldstein RB, Chou SP, Huang B, Stinson FS, Dawson DA, Saha TD, Smith SM, Pulay AJ, Pickering RP, Ruan WJ, Compton WM. Sociodemographic and psychopathologic predictors of first incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. Molecular Psychiatry. 2009; 14:1051–1066. [PubMed: 18427559]

Grant BF, Harford TC, Dawson DA, Chou PS, Pickering RP. The Alcohol Use Disorder and Associated Disabilities Interview schedule (AUDADIS): reliability of alcohol and drug modules in a general population sample. Drug and Alcohol Dependence. 1995; 39:37–44. [PubMed: 7587973]

Grant BF, Stinson FS, Dawson DA, Chou SP, Ruan WJ, Pickering RP. Co-occurrence of 12-month alcohol and drug use disorders and personality disorders in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Archives of General Psychiatry. 2004; 61:361–368. [PubMed: 15066894]

Hasin D, Hatzenbuehler ML, Keyes K, Ogburn E. Substance use disorders: Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) and International Classification of Diseases, tenth edition (ICD-10). Addiction. 2006; 101 (Suppl 1):59–75. [PubMed: 16930162]

Hasin D, Van Rossem R, McCloud S, Endicott J. Alcohol dependence and abuse diagnoses: validity in community sample heavy drinkers. Alcoholism: Clinical & Experimental Research. 1997; 21:213–219.

Hasin DS, Stinson FS, Ogburn E, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Archives of General Psychiatry. 2007; 64:830–842. [PubMed: 17606817]

Hatzenbuehler ML, Keyes KM, Narrow WE, Grant BF, Hasin DS. Racial/ethnic disparities in service utilization for individuals with co-occurring mental health and substance use disorders in the general population: results from the national epidemiologic survey on alcohol and related conditions. Journal of Clinical Psychiatry. 2008; 69:1112–1121. [PubMed: 18517286]

Hussey JM, Chang JJ, Kotch JB. Child maltreatment in the United States: prevalence, risk factors, and adolescent health consequences. Pediatrics. 2006; 118:933–942. [PubMed: 16950983]

Johnson JG, Cohen P, Brown J, Smailes EM, Bernstein DP. Childhood maltreatment increases risk for personality disorders during early adulthood. Arcives of General Psychiatry. 1999; 56:600–606.

Kalilani L, Atashili J. Measuring additive interaction using odds ratios. Epidemiologic Perspectives & Innovations. 2006; 3:5. [PubMed: 16620385]

Kaufman J, Yang BZ, Douglas-Palumberi H, Crouse-Artus M, Lipschitz D, Krystal JH, Gelernter J. Genetic and environmental predictors of early alcohol use. Biological Psychiatry. 2007; 61:1228–1234. [PubMed: 17123474]

Kessler RC, Davis CG, Kendler KS. Childhood adversity and adult psychiatric disorder in the US National Comorbidity Survey. Psychological Medicine. 1997; 27:1101–1119. [PubMed: 9300515]

Lumley M, Harkness K. Specificity in the relations among childhood adversity, early maladaptive schemas, and symptom profiles in adolescent depression. Cognitive Therapy and Research. 2007; 31:639–657.

Macmillan HL, Wathen CN, Barlow J, Fergusson DM, Leventhal JM, Taussig HN. Interventions to prevent child maltreatment and associated impairment. Lancet. 2009; 373:250–266. [PubMed: 19056113]

Marques AC, Formigoni ML. Comparison of individual and group cognitive-behavioral therapy for alcohol and/or drug-dependent patients. Addiction. 2001; 96:835–846. [PubMed: 11399215]

McHugh RK, Hearon BA, Otto MW. Cognitive behavioral therapy for substance use disorders. Psychiatric Clinics of North America. 2010; 33:511–525. [PubMed: 20599130]

McLaughlin KA, Green JG, Gruber MJ, Sampson NA, Zaslavsky AM, Kessler RC. Childhood adversities and adult psychopathology in the National Comorbidity Survey Replication (NCS-R) III: associations with functional impairment related to DSM-IV disorders. Psychological Medicine. 2010; 40:847–859. [PubMed: 19732483]

Nelson EC, Lynskey MT, Heath AC, Madden PA, Martin NG. A family study of adult twins with and without a history of childhood abuse: stability of retrospective reports of maltreatment and associated family measures. Twin Research and Human Genetics. 2010; 13:121–130. [PubMed: 20397742]

Padesky C. Schema change processes in cognitive therapy. Clinical Psychology & Psychotherapy. 1994; 1:267–278.

Pull CB, Saunders JB, Mavreas V, Cottler LB, Grant BF, Hasin DS, Blaine J, Mager D, Ustun BT. Concordance between ICD-10 alcohol and drug use disorder criteria and diagnoses as measured by the AUDADIS-ADR, CIDI and SCAN: results of a crossnational study. Drug and Alcohol Dependence. 1997; 47:207–216. [PubMed: 9306046]

Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. Lancet. 2009; 373:2223–2233. [PubMed: 19560604]

Robins LN, Schoenberg SP, Holmes SJ, Ratcliff KS, Benham A, Works J. Early home environment and retrospective recall: a test for concordance between siblings with and without psychiatric disorders. American Journal of Orthopsychiatry. 1985; 55:27–41. [PubMed: 3970148]

Rothman KJ, Greenland S, Walker AM. Concepts of interaction. American Journal of Epidemiology. 1980; 112:467–470. [PubMed: 7424895]

Ruan WJ, Goldstein RB, Chou SP, Smith SM, Saha TD, Pickering RP, Dawson DA, Huang B, Stinson FS, Grant BF. The alcohol use disorder and associated disabilities interview schedule-IV (AUDADIS-IV): reliability of new psychiatric diagnostic modules and risk factors in a general population sample. Drug and Alcohol Dependence. 2008; 92:27–36. [PubMed: 17706375]

Rutter M, Pickles A, Murray R, Eaves L. Testing hypotheses on specific environmental causal effects on behavior. Psychological Bulletin. 2001; 127:291–324. [PubMed: 11393298]

Schuckit MA, Tipp JE, Bergman M, Reich W, Hesselbrock VM, Smith TL. Comparison of induced and independent major depressive disorders in 2,945 alcoholics. American Journal of Psychiatry. 1997; 154:948–957. [PubMed: 9210745]

Sher KJ, Gershuny BS, Peterson L, Raskin G. The role of childhood stressors in the intergenerational transmission of alcohol use disorders. Journal of Studies on Alcohol. 1997; 58:414–427. [PubMed: 9203123]

Slutske WS, Heath AC, Madden PA, Bucholz KK, Dinwiddie SH, Dunne MP, Statham DJ, Martin NG. Reliability and reporting biases for perceived parental history of alcohol-related problems: agreement between twins and differences between discordant pairs. Journal of Studies on Alcohol. 1996; 57:387–395. [PubMed: 8776680]

Straus MA, Douglas EM. A short form of the Revised Conflict Tactics Scales, and typologies for severity and mutuality. Violence and Victims. 2004; 19:507–520. [PubMed: 15844722]

Straus MA, Hamby SL, Finkelhor D, Moore DW, Runyan D. Identification of child maltreatment with the Parent-Child Conflict Tactics Scales: development and psychometric data for a national sample of American parents. Child Abuse & Neglect. 1998; 22:249–270. [PubMed: 9589178]

SUDAAN. Software for Survey Data Analysis (SUDAAN). Research Triangle Institute; Research Triangle Park, NC: 2002.

Thombs BD, Lewis C, Bernstein DP, Medrano MA, Hatch JP. An evaluation of the measurement equivalence of the Childhood Trauma Questionnaire – Short Form across gender and race in a sample of drug abusing adults. Journal of Psychosomatic Research. 2007; 63:391–398. [PubMed: 17905047]

Thompson RG Jr, Lizardi D, Keyes KM, Hasin DS. Childhood or adolescent parental divorce/separation, parental history of alcohol problems, and offspring lifetime alcohol dependence. Drug and Alcohol Dependence. 2008; 98:264–269. [PubMed: 18757141]

Ustun B, Compton W, Mager D, Babor T, Baiyewu O, Chatterji S, Cottler L, Gogus A, Mavreas V, Peters L, Pull C, Saunders J, Smeets R, Stipec MR, Vrasti R, Hasin D, Room R, Van den Brink W, Regier D, Blaine J, Grant BF, Sartorius N. WHO Study on the reliability and validity of the alcohol and drug use disorder instruments: overview of methods and results. Drug and Alcohol Dependence. 1997; 47:161–169. [PubMed: 9306042]

Wicks S, Hjern A, Dalman C. Social risk or genetic liability for psychosis ? A study of children born in Sweden and reared by adoptive parents. American Journal of Psychiatry. 2010; 167:1240–1246. [PubMed: 20686186]

Widom CS, Czaja SJ, Dutton MA. Childhood victimization and lifetime revictimization. Child Abuse & Neglect. 2008; 32:785–796. [PubMed: 18760474]

Widom CS, Ireland T, Glynn PJ. Alcohol abuse in abused and neglected children followed-up: are they at increased risk ? Journal of Studies on Alcohol. 1995; 56:207–217. [PubMed: 7760568]

Widom CS, White HR, Czaja SJ, Marmorstein NR. Long-term effects of child abuse and neglect on alcohol use and excessive drinking in middle adulthood. Journal of Studies on Alcohol and Drugs. 2007; 68:317–326. [PubMed: 17446970]

Wilson HW, Widom CS. A prospective examination of the path from child abuse and neglect to illicit drug use in middle adulthood: the potential mediating role of four risk factors. Journal of Youth and Adolescence. 2009; 38:340–354. [PubMed: 19636749]

Wright FD, Beck AT, Newman CF, Liese BS. Cognitive therapy of substance abuse: theoretical rationale. NIDA Research Monographs. 1993; 137:123–46.

Wurtele SK, Kast LC, Melzer AM. Sexual abuse prevention education for young children: a comparison of teachers and parents as instructors. Child Abuse Negl. 1992; 16:865–876. [PubMed: 1486515]

Wyatt GE. The sexual abuse of Afro-American and white-American women in childhood. Child Abuse & Neglect. 1985; 9:507–519. [PubMed: 4084830]

Zhang J, Xiao S, Zhou L. Mental disorders and suicide among young rural Chinese: a case-control psychological autopsy study. American Journal of Psychiatry. 2010; 167:773–781. [PubMed: 20395398]

Zimmerman M, Coryell W, Pfohl B, Stangl D. The reliability of the family history method for psychiatric diagnoses. Archives of General Psychiatry. 1988; 45:320–322. [PubMed: 3281625]

Table 1

Weighted prevalence of demographic characteristics and childhood experiences among the total sample and each of the five maltreatment subgroups

	Weighted prevalence (%) and standard error (S.E.) of each characteristic among:											
	Total sample (*N*=27712)		Sexual abuse (*N*=3043)		Physical abuse (*N*=4315)		Emotional abuse (*N*=3530)		Physical neglect (*N*=4646)		Emotional neglect (*N*=2404)	
Characteristic	**Weighted %**	**S.E.**	**Weighted %**	**S.E.**	**Weighted %**	**S.E.**	**Weighted %**	**S.E.**	**Weighted %**	**S.E.**	**Weighted %**	**S.E.**
Sex												
Male	43.1	0.4	21.9	1.0	45.7	1.0	41.1	1.1	43.4	1.0	35.5	1.4
Female	56.9	0.4	78.1	1.0	54.3	1.0	58.9	1.1	56.6	1.0	64.5	1.4
Race												
White	68.3	1.7	68.1	1.7	64.5	1.8	67.5	1.8	61.5	2.0	66.3	2.4
Black	12.0	0.7	14.3	1.1	14.5	1.0	12.8	1.0	12.2	0.8	9.7	1.1
Native American	2.0	0.2	3.6	0.6	3.5	0.4	3.6	0.5	3.1	0.5	2.9	0.5
Asian	5.0	0.6	2.2	0.5	4.3	0.7	3.7	0.6	5.5	0.7	3.8	0.7
Hispanic	12.6	1.3	11.7	1.3	13.2	1.3	12.5	1.4	17.7	1.9	17.3	2.0
Age, years												
18–29	31.7	0.4	31.6	1.0	29.4	1.0	32.6	1.0	30.2	1.0	25.2	1.1
30–39	29.6	0.4	36.2	1.1	36.7	0.9	34.4	1.0	31.3	0.8	31.3	1.1
40–49	21.0	0.3	21.6	0.9	22.7	0.8	22.8	0.8	22.4	0.8	24.7	1.2
≥50	17.7	0.4	10.6	0.6	11.2	0.6	10.1	0.6	16.1	0.7	18.8	1.0
Education:												
≤High school	45.1	0.7	43.3	1.3	44.4	1.0	44.3	1.2	51.2	1.0	57.6	1.6
>High school	54.9	0.7	56.7	1.3	55.6	1.0	55.7	1.2	48.8	1.0	42.4	1.6
No. of childhood maltreatments												
0	67.1	0.4	–	–	–	–	–	–	–	–	–	–
1	17.9	0.3	38.1	1.1	24.6	0.8	14.4	0.7	37.7	1.0	33.9	1.7
2	7.0	0.2	20.8	0.9	27.4	0.9	26.3	1.0	21.0	0.8	18.0	0.9
≥3	8.0	0.2	41.0	1.2	48.0	0.9	59.2	1.0	41.3	1.0	48.1	1.7
Any other adverse childhood experience[a]	39.8	0.5	61.9	1.1	63.5	1.0	68.5	1.1	63.8	0.9	59.9	1.4

[a]At least one of: caregiver was incarcerated, caregiver attempted or committed suicide, respondent lived in foster home or institution, respondent's parents divorced or died, respondent saw serious fights at home.

Table 2

Alcohol dependence among individuals with a history of childhood maltreatments (N=27 712)

				Logistic regression results					
		Weighted prevalence of alcohol dependence (*N*=4371)		Controlling for demographics[a]		Controlling for demographics+any other maltreatment[b]		Controlling for demographics, any other maltreatment+ other adverse childhood experiences[c]	
Maltreatment (N)		**%**	**S.E**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Sexual abuse	Yes (3043)	24.1	1.1	2.28**	2.00–2.60	1.84**	1.59–2.12	1.79**	1.55–2.06
	No (24 669)	16.3	0.5	1.00	Ref.	1.00	Ref.	1.00	Ref.
Physical abuse	Yes (4315)	28.0	1.0	2.28**	2.05–2.54	1.79**	1.58–2.04	1.74**	1.53–1.98
	No (23 397)	15.2	0.5	1.00	Ref.	1.00	Ref.	1.00	Ref.
Emotional abuse	Yes (3530)	28.4	1.1	2.29**	2.06–2.55	1.68**	1.48–1.91	1.62**	1.42–1.84
	No (24 182)	15.5	0.5	1.00	Ref.	1.00	Ref.	1.00	Ref.
Physical neglect	Yes (4646)	23.8	1.0	1.90**	1.70–2.14	1.46**	1.29–1.66	1.40**	1.24–1.59
	No (23 066)	15.8	0.5	1.00	Ref.	1.00	Ref.	1.00	Ref.
Emotional neglect	Yes (2404)	18.9	1.1	1.45**	1.25–1.68	1.08	0.93–1.27	1.05	0.90–1.23
	No (25 308)	16.9	0.5	1.00	Ref.	1.00	Ref.	1.00	Ref.

S.E., Standard error; OR, odds ratio; CI, confidence interval.

[a] ORs controlling for demographics (age, gender, race/ethnicity, and education).

[b] ORs controlling for demographics (age, gender, race/ethnicity, and education) and any other childhood maltreatment.

[c] ORs controlling for demographics (age, gender, race/ethnicity, and education), any other childhood maltreatment and a binary variable measuring the presence of other adverse childhood experiences (caregiver was incarcerated, caregiver attempted or committed suicide, respondent lived in foster home or institution, respondent's parents divorced or died, respondent saw serious fights at home).

** $p<0.001$.

Table 3

Alcohol dependence and childhood maltreatments: parental history[a] as an effect modifier

	Adjusted[b] odds ratios and 95% confidence intervals[c]							
	Parental history only[d]		Maltreatment only[e]		Parental history and maltreatment[f]		AP (95% CI)[c]	
Maltreatment	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**AP**	**95% CI**
Sexual abuse								
Total sample	2.56	2.32–2.82	1.92	1.62–2.27	4.76	3.97–5.71	**0.27***	**0.12–0.42**
Men	2.14	1.90–2.40	0.64	0.49–0.83	1.38	1.08–1.76	−0.29	−0.66–0.07
Women	2.69	2.31–3.16	3.10	2.51–3.81	6.96	5.59–867	**0.31***	**0.15–0.48**
Physical abuse								
Total sample	2.66	2.29–3.10	1.88	1.58–2.23	4.48	3.61–5.56	**0.21***	**0.03–0.39**
Men	2.05	1.82–2.32	2.09	1.77–2.43	3.42	2.86–4.09	0.09	−0.09–0.26
Women	2.89	2.47–3.37	2.20	1.79–2.71	4.67	3.78–5.76	0.12	−0.80–0.33
Emotional abuse								
Total sample	2.36	2.15–2. 95	2.01	1.74–2.32	3.49	3.30–4.06	0.03	−0.12–0.19
Men	2.12	1.87–2.46	1.80	1.52–2.14	2.72	2.27–3.25	−0.08	−0.29–0.14
Women	2.86	3.32–2.39	2.34	1.88–2.91	4.62	3.72–5.72	0.09	−0.11–0.30
Physical neglect								
Total sample	2.66	2.39–2.97	1.72	1.48–1.99	3.71	3.15–4.36	0.09	−0.08–0.26
Men	2.16	1.915–2.45	1.60	1.35–1.90	2.44	1.99–2.98	−0.13	−0.39–0.12
Women	2.83	2.41–3.32	1.95	1.57–2.43	4.39	3.56–5.42	0.14	−0.06–0.34
Emotional neglect								
Total sample	2.59	2.34–2.85	1.09	0.89–1.34	3.46	2.76–4.33	**0.22***	**0.03–0.42**
Men	2.05	1.82–2.32	0.73	0.56–0.95	1.92	1.42–2.58	0.07	−0.25–0.39
Women	2.77	2.40–3.21	1.67	1.27–2.18	4.62	3.56–6.00	**0.26***	**0.04–0.47**

OR, Odds ratio; CI, confidence intervals; AP, attributable proportion.

[a]Biological mother or father had alcohol problems.

[b]ORs for three indicator variables (parental history and no maltreatment; no parental history and maltreatment; parental history and maltreatment) adjusting for demographics and a binary variable measuring the presence of other adverse childhood experiences (caregiver was incarcerated, caregiver attempted or committed suicide, respondent lived in foster home or institution, respondent's parents divorced or died, respondent saw serious fights at home).

[c] Analyses were conducted according to the method of Andersson *et al.* (2005).

[d] OR measuring the risk of alcohol dependence conferred by having a parental history of alcohol problems in the absence of the maltreatment.

[e] OR measuring the risk of alcohol dependence conferred by experiencing the specific maltreatment indicated in the row, in the absence having a parental history of alcohol problems.

[f] OR measuring the risk of alcohol dependence conferred by experiencing the maltreatment in the presence of a parental history of alcohol problems.

[*] Attributable proportion due to interaction is significant ($p<0.05$).