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Childhood adversities and adult psychopathology in the National Comorbidity Survey Replication (NCS-R) II: Associations with persistence of DSM-IV disorders

Katie A. McLaughlin, Ph.D., **Jennifer Greif Green, Ph.D.**, **Michael J. Gruber, M.S.**, **Nancy A. Sampson, B.A.**, **Alan M. Zaslavsky, Ph.D.**, and **Ronald C. Kessler, Ph.D.**
Department of Health Care Policy, Harvard Medical School

Abstract

Context—Although significant associations of childhood adversities (CAs) with adult mental disorders have been widely documented, associations of CAs with onset and persistence of disorders have not been distinguished. This distinction is of considerable importance for both conceptual and practical purposes.

Objective—To examine the multivariate associations of 12 retrospectively reported CAs with persistence of adult DSM-IV disorders in the National Comorbidity Survey Replication (NCS-R).

Design—Cross-sectional community survey

Setting/Participants—Nationally representative sample of 5,692 adults in the US household population.

Intervention—None

Main Outcome Measures—Recency of episodes was assessed separately for each of 20 lifetime DSM-IV mood, anxiety, disruptive behavior, and substance disorders among respondents with a lifetime history of these disorders using the WHO Composite International Diagnostic Interview (CIDI). Predictors of persistence were examined using backward recurrence survival models to predict time-since-most-recent-episode controlling for age-of-onset and time-since-onset.

Results—CAs involving maladaptive family functioning (MFF) (parental mental illness, substance disorder, criminal behavior, family violence, abuse, neglect) but not other CAs were significantly but modestly related to persistence of mood, substance, and anxiety disorders. Number of MFF CAs had statistically significant, but again substantively modest, sub-additive associations with the same outcomes. Exposure to multiple other CAs was significantly associated with persistence of mood and anxiety disorders. Associations remained statistically significant throughout the life course, although the substantive size of associations indicated by simulations showing time to most recent episode would increase by only 1.6% (from a mean of 8.3 years to a mean of 8.4 years) in the absence of CAs.

Conclusions—The overall statistically significant associations of CAs with adult DSM-IV/CIDI disorders are due largely to component associations with onsets rather than persistence, indirectly

Corresponding author: RC Kessler, Department of Health Care Policy, Harvard Medical School, 180 Longwood Avenue, Boston, MA 02115. Tel. (617) 432-3587, Fax (617) 432-3588, kessler@hcp.med.harvard.edu.

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suggesting that the greatest focus of public health attention on CAs should be aimed at primary prevention rather than secondary prevention.

Significant associations between retrospectively reported childhood adversities (CAs) and a wide variety of adult mental disorders have been documented in numerous community epidemiological surveys.[1-4] These associations are substantial, with over 30% of adult mental disorders estimated to be directly related to CAs.[5, 6] Previous studies have suggested that the associations of CAs with adult disorders are due to increased stress sensitivity that persists into adulthood, making individuals with a history of CAs especially vulnerable to episode onsets of mental disorders triggered by adult stressors.[7-9] If this is the case, we would expect that CAs would be associated with disorder persistence, as the majority of episode onsets in adulthood are recurrences rather than first onsets of mental disorders.[10-12] However, previous epidemiological studies of the associations between CAs and adult psychopathology have largely focused on prevalent disorders[1, 13-15] or on lifetime disorders.[15-17] No attempt was made in these studies to distinguish associations of CAs with first onset versus persistence of disorders. It would be useful to make this distinction in order to advance our understanding of the associations of CAs with adult mental disorders and to evaluate the intervention implications of these associations. A companion paper to this one[6] takes a first step in doing this by analyzing data from the National Comorbidity survey Replication (NCS-R)[18] and showing that a number of CAs are, in fact, associated with first onsets of a wide range of DSM-IV disorders throughout the life course. The current report takes the next logical step in this line of investigation by examining associations of CAs with persistence of the same DSM-IV disorders in the NCS-R.

Although a handful of previous studies have examined the associations of CAs with illness course, the results have been inconsistent. Some of these studies found significant associations of CAs with illness course,[10, 11, 19, 20] while other did not.[3, 21] A limitation of these studies is that they used relatively primitive methods to measure and analyze these associations and generally focused on a single mental health outcome. We address the first limitation in two ways. First, we use a novel statistical approach to examine the separate and joint associations of CAs with disorder persistence[6] to address the fact that CAs are highly co-occurring[22-24] and that multivariate associations of co-occurring CAs are generally nonadditive.[25] Second, we use an innovative approach to measure illness course based on a special class of survival models known as *backward recurrence models*.[26, 27] These models allow us to study the associations of CAs with illness course more sensitively than in previous retrospective studies. We address the second limitation by examining associations of CAs with persistence of a wide range of DSM-IV disorders.

Methods

Sample

The NCS-R is a face-to-face household survey of 9,282 English-speaking respondents ages 18 and older carried out between February 2001 and April 2003 in a nationally representative multi-stage clustered area probability sample of the US household population.[18] The response rate was 70.9%. Respondents were paid $50 for participation. Recruitment and consent procedures were approved by human subjects committees of Harvard Medical School and the University of Michigan. The survey was administered in two parts. Part I included a core diagnostic assessment (n = 9,282). Part II included questions about risk factors, consequences, and other correlates along with assessments of additional disorders. CAs were assessed in Part II, which was administered to all Part I respondents who met lifetime criteria for any Part I disorder plus a probability subsample of other Part I respondents (n = 5,692). The Part I sample was weighted to adjust for differential probabilities of selection and differences in intensity of recruitment effort among hard-to-recruit cases. The Part II sample, which is the focus of the

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current report, was additionally weighted for the under-sampling of Part I respondents without a Part I disorder. A final weight adjusted the Part II sample to match the 2000 census population on a cross-classification of a number of geographic and socio-demographic variables. All analyses reported in this paper employ these weights. The socio-demographic characteristics of Part II sample respondents are as follows: female (52%); 18-29 years-old (24%), 30-44 years-old (29%), 45-59 years-old (26%), 60+ years-old (21%); Non-Hispanic white (71%), Non-Hispanic black (12%), Hispanic (12%), and Other race/ethnicity (5%). More details about the NCS-R sample and design are reported elsewhere.[25]

Diagnostic Assessment

NCS-R diagnoses are based on Version 3.0 of the World Health Organization Composite International Diagnostic Interview (CIDI),[28] a fully-structured lay-administered interview that generates diagnoses according to both ICD-10 and DSM-IV criteria. DSM-IV criteria are used here. The 20 lifetime diagnoses include mood disorders [major depressive disorder, dysthymic disorder, bipolar disorder (BP-I, BP-II, and sub-threshold BPD, each treated in the analysis as a separate disorder)], anxiety disorders (panic disorder, agoraphobia without a history of panic disorder, generalized anxiety disorder, specific phobia, social phobia, post-traumatic stress disorder, separation anxiety disorder), disruptive behavior disorders (intermittent explosive disorder, attention-deficit/hyperactivity disorder, oppositional-defiant disorder, conduct disorder), and substance disorders (alcohol abuse, alcohol dependence with abuse, drug abuse, drug dependence with abuse). Diagnostic hierarchy rules and organic exclusion rules were used in making diagnoses. DSM-IV/CIDI prevalence estimates for each of these disorders in the total sample as well as in sub-samples defined by age, sex, and race-ethnicity are available at www.hcp.med.harvard.edu/ncs. As detailed elsewhere,[29] blinded clinical reappraisal interviews with a probability sub-sample of NCS-R respondents found generally good concordance between DSM-IV diagnoses based on the CIDI and those based on the Structured Clinical Interview for DSM-IV.[30] The CIDI assessed age-of-onset (AOO) of disorders retrospectively using a special question sequence documented experimentally to improve accuracy of AOO reporting compared to conventional methods.[31] A more detailed description of this question sequence is presented in a companion paper.[6] Recency was assessed by asking respondents if they had an episode of the disorder in the 12-months before interview and, if not, asking their age at the time of their most recent episode. Time-since-onset (TSO) was calculated by subtracting AOO from age at interview.

Childhood Adversities

Twelve dichotomously measured CAs were assessed in the NCS-R. These include three types of interpersonal loss (parental death, parental divorce, and other loss of contact with parents), four types of parental maladjustment (psychopathology, substance abuse, criminality, and violence), three types of maltreatment (physical abuse, sexual abuse, neglect), and two other CAs (serious respondent physical illness, family economic adversity). The measures used to assess these CAs are described in a companion paper,[6] where we also show that factor analysis found seven of these 12 CAs (the four indicators of parental maladjustment and the three indicators of maltreatment) to be strongly interrelated. We refer to this cluster of CAs as the maladaptive family functioning (MFF) cluster.

Persistence of disorders

Persistence of disorders, the proportion of time since onset a person with a history of disorder is in episode, is a joint function of episode duration and recurrence risk among people with a history of past episodes. It is possible for longitudinal studies to calculate persistence directly by recording complete information about duration of incident episodes, time to recurrence after offset of incident episodes, duration of second episodes, time to recurrence of third episodes

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after offset of second episodes, and so on, although this it is very difficult logistically even in long-term multi-wave prospective studies.[32-34] It is impossible to obtain this kind of direct assessment of persistence using retrospective assessments in a cross-sectional survey such as the NCS-R, but persistence can be estimated indirectly from the ratio of current prevalence to lifetime prevalence. This ratio is only an approximation of persistence because differential mortality and recall failure can lead the ratio to differ from true mean persistence.

Analysis Methods

Given that persistence can be indirectly estimated as the ratio of current to lifetime prevalence, the associations of CAs with persistence can be estimated approximately by using information about CAs to predict current prevalence among lifetime cases. However, that approach would use only part of the information about recency of disorders available in the CIDI. In addition to assessing current prevalence among lifetime cases, the CIDI obtains information from other lifetime cases about age at offset of the most recent episode. This information can be used to study associations of CAs with disorder persistence using a special class of survival models known as *backward recurrence models*.[26, 27] These models use a person-year survival approach[35] to predict current prevalence among lifetime cases and time since termination of most recent episode among lifetime cases who are not in episode at the time of interview. In the current application, we use a discrete-time person-year survival approach in which the dependent variable in each person-year is coded 1 for respondents with a most recent episode in that year and 0 for respondents with a most recent episode in a more distant year.

As in conventional survival analysis, person-years prior to the most recent episode are censored. The number of person-years in the data file for a given disorder for a particular respondent equals one of the two following values: (1) Respondents who had at least one episode at an age later than their AOO are represented with one more person-year than the number of years since the respondent's most recent episode. For example, a respondent with an episode in the year of interview is represented by only one person-year, which is coded 1 on the outcome, while a respondent with a most recent episode y years before the interview is represented by y+1 person-years, only the last of which is coded 1. (2) Respondents with no episode subsequent to AOO are represented by a number of person-years equal to TSO (beginning with the year of interview and ending the year after AOO), each coded 0.

The 20 disorder-specific person-year files were stacked into a consolidated data file, each file containing a yes-no outcome variable for the most recent episode of the focal disorder. Logistic regression analysis was used to estimate the associations of CAs with this outcome variable with 19 dummy control variables to distinguish among the 20 disorders and nonlinear controls for person-year (i.e., time-since-interview), AOO, TSO, gender, race-ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Other), and lifetime history of other disorders as of AOO of the focal disorder. The same range of bivariate and multivariate models was examined as in our analysis of the associations of CA with disorder onset.[6] The initial model coefficients were constrained to be the same for all 20 disorders. The most complex model, which included predictors for both type and number of CAs and differentiated MFF from other CAs, was then used to estimate coefficients in sub-samples defined by life course stage and class of disorders.

Backward recurrence models, although to our knowledge never before used to study persistence of mental disorders, have been used extensively by demographers to predict such demographic transitions as probability of having an additional child or of changing marital status as a function of respondent age at first making a related transition (e.g., age at first child-birth or age at first marrying), current age, and number of years since most recent transition (e.g., years since last having a child or years in current marital status).[36, 37] Empirical comparison of predictor coefficients in such models with the coefficients in prospective time-to-next-event survival models (i.e., models that use the more detailed information needed to

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study transitions prospectively by recording the age of each of the respondent's children and the time between births of each child or the respondent's age at each marital transition, including marriages, separations, and divorces, and time-in-state for each of these transitions) shows that recurrence model coefficients are generally good approximations to the survival coefficients obtained in prospective analyses.[38]

We assessed the overall associations of all CAs combined with disorder persistence by simulating, based on the most complex model, the extent to which the most recent episode would have been pushed backwards in time if none of the CAs had occurred and the ORs in the model were due to causal effects of the CAs. This simulation, which was carried out using a SAS macro written explicitly for this purpose, generated individual-level predicted probabilities of recurrence at each person-year twice from the coefficients in the model: the first time using all the coefficients in the model and the second time assuming that the coefficients associated with the CAs were all zero. The ratio of the mean time-to-most-recent-episode estimates in the two specifications was used to calculate the effects of CAs on time since most recent episode recurrence.

The coefficients and standard errors in the backward recurrence survival models were exponentiated for ease of interpretation and are reported here in the form of odds-ratios (ORs) and 95% confidence intervals (CIs). Statistical significance was consistently evaluated using . 05-level two-sided tests. As the NCS-R data are both clustered and weighted, the design-based Taylor series method[39] implemented in the SUDAAN software system[40] was used to estimate standard errors and to evaluate the statistical significance of coefficients.

Results

The associations of CAs with persistence of DSM-IV/CIDI disorders

Two-thirds of the CAs are significantly associated with greater persistence of disorders in bivariate backward recurrence models that examine one CA at a time and that pool across the 20 DSM-IV/CIDI disorders. (Table 1) These ORs are all weak in substantive terms (1.1-1.3), indicating that persistence in a given year is only modestly higher among people with than without a history of CAs. Furthermore, most significant bivariate ORs become insignificant in a multivariate model that includes all CAs. The two CAs that remain significant in the multivariate additive model (physical abuse and sexual abuse) have weak ORs (1.1-1.2). In addition, only a weak dose-response relationship exists between number of CAs and disorder persistence in the multivariate model of number of CAs, with ORs of 1.3-1.4 for respondents who experienced a high number of CAs (compared to respondents who experienced no CAs). We can nonetheless reject the hypothesis that the two significant ORs occurred by chance in the set of 12 ($\chi^2_{12} = 63.1$, $p < .001$) as well as the hypothesis that the 12 ORs do not differ significantly among themselves ($\chi^2_{11} = 41.6$, $p < .001$). The latter result means that we would have under-estimated the associations of CAs with persistence by using a simple 0-12 summary count measure.

The most complex model we considered, a multivariate interactive model, includes separate predictors for type of CA (i.e., one predictor for each of the 12 CAs) and number of CAs (i.e., separate predictors for respondents who were exposed to exactly one, exactly two, exactly three…etc. CAs) and distinguishes between MFF CAs and other CAs. This model shows that type ($\chi^2_7 = 31.1$, $p < .001$) but not number ($\chi^2_6 = 6.0$, $p = .43$) of MFF CAs is significantly associated with disorder persistence, while neither type ($\chi^2_5 = 4.6$, $p = .47$) nor number ($\chi^2_5 = 3.2$, $p = .36$) of non-MFF CAs is associated with persistence. The significant MFF CAs include parental mental illness, physical abuse, sexual abuse, and neglect, each of which has a modestly elevated OR (1.2-1.2). The ORs associated with number of MFF CAs become increasingly smaller and less than 1.0 in this model as number increases, documenting significant sub-

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additive interactions among the MFF CAs (i.e., that the joint effects of multiple MFF CAs are significantly less than the product of the ORs associated with the individual CAs in the cluster).

Disaggregation by type of disorder

Disaggregation of the final model by type of disorder reveals differential associations of CAs with persistence of mood, anxiety, disruptive behavior, and substance disorders. (Table 2) Type of MFF CA is significantly associated with persistence of mood, anxiety, and substance disorders (χ^2_7 = 19.8-52.8, p = .006-<.001), but not disruptive behavior disorders (χ^2_7 = 8.5, p = .29). All MFF CAs other than parental criminality are associated with mood, anxiety, or substance disorders, with significant ORs in the range 1.2-1.9. Only two of these ORs vary significantly across the three types of disorders: (i) a higher OR of parental substance disorders with respondent substance disorders (1.5) than the other disorders (1.0-1.1); and (ii) a higher OR of physical abuse with mood disorders (1.9) than the other disorders (1.1-1.3). Type of Non-MFF CA is associated with persistence of disruptive behavior disorders (χ^2_5 = 12.9, p = .025), but not mood, anxiety, or substance disorders (χ^2_5 = 1.0-6.0, p = .31-.96), although none of the individual CAs is significantly associated with disruptive behavior disorders. A test of the joint associations of the 21 type and number of CA variables with disorder persistence across the four disorder classes is significant (χ^2_{63} = 95.7, p = .005), indicating differential associations by disorder type.

The ORs for number of MMF CAs are significantly related to persistence of mood and substance disorders (χ^2_6 = 20.4-29.5, p = .002 - <.001), but not anxiety or disruptive behavior disorders (χ^2_7 = 3.2-7.8, p = .25-.78). As in the aggregate model, the ORs associated with number of CAs are negative, indicating sub-additive interactions. The ORs for number of Non-MFF CAs, in comparison, are significantly related to persistence of mood disorders (χ^2_3 = 13.5, p = .004), but not any of the other types of disorders (χ^2_3 = 0.6-3.5, p = .33-.90), and are greater than 1.0. This means that even though none of the non-MFF CAs, when occurring alone, is significantly related to persistence of mood disorders, persistence is significantly higher among respondents who experienced a number of these CAs than respondents who experienced none.

In terms of overall strength of associations, simulations suggest that mean duration between time of interview and time of most recent episode would have increased by 4.9% for mood disorders, 0.6% for anxiety disorders, 2.1% for substance disorders, and would be largely unaffected for disruptive behavior disorders if none of the CAs had occurred and the ORs were due to causal effects of CAs.

Disaggregation by age at interview

Disaggregation of the final model by respondent age at interview shows that the significant associations described above are more pronounced in mid-life (ages 30-44 and 45-59) than either earlier (ages 18-29) or later (ages 60+) ages. (Table 3) It is only in the 30-44 and 45-59 year age groups that we find significantly elevated ORs associated with type of MFF CA (χ^2_7 = 14.3-33.3, p = .045-<.001) and significantly decreasing ORs associated with number of MFF CAs (χ^2_6 = 12.9-15.6, p = .045-.020). As one might expect, the significant ORs associated with type are somewhat larger among respondents in the significant age range (1.2-1.4) than in the total sample (1.2). Type of Non-MFF CA is not related to disorder persistence in any age group (χ^2_5 = 2.5-10.6, p = .78-.06), whereas number of Non-MFF CAs is significantly and positively related to persistence in the 30-44, 45-59, and 60+ age groups (χ^2_{2-3} = 6.8-238.4, p = .030-<.001). Simulations suggest that mean duration between time of interview and time of most recent episode would have increased by 1.3% among respondents in the age range 18-29, 2.6% among those ages 30-44, 1.9% among those ages 45-59, and 1.3% among those ages 60 + if none of the CAs had occurred and the ORs were due to causal effects of CAs .

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Disaggregation by the cross-classification of age at interview and type of disorder

Further disaggregation of the final model by the cross-classification of respondent age at interview and type of disorder shows further variation. (Detailed results are available on request.) The significantly elevated ORs associated with type of MFF CAs extend into the 60 + age range for mood and substance disorders and the significantly decreasing ORs associated with number of MFF CAs appear as early as in the 18-29 age range for mood and substance disorders and extend into the 60+ age range for anxiety and substance disorders. MFF CAs are more consistently significant (15% of ORs) than non-MFF CAs (2.5% of ORs), although no single MFF CA stands out as most consistently significant. Each MFF CA is significant in at least one subsample and none is significant in more than four of the 16 sub-samples created by cross-classifying the four types of disorders with the four age ranges considered here. Number of non-MFF CAs predicts greater persistence of anxiety disorders in 3 of 4 life course sub-samples. The hypothesis can be rejected that all MFF CAs have the same OR in most subsamples.

Simulated aggregate associations of CAs with time-since most recent episode

We evaluated the overall importance of CAs for disorder persistence using the simulation method described above in the Analysis Methods section. This simulation estimated the extent to which most recent episodes might have been pushed backwards in time (i.e., time since most recent episode increased) in the absence of CAs. (Table 4) The mean observed time since the most recent episode under the model is 8.3 years. This mean includes respondents who were in episode at the time of interview, who were coded as having a time of 0 years since their most recent episode. This mean increases only very slightly, to 8.4 years, in the simulated data that restricts the ORs associated with CAs to 1.0. This change represents a 1.6% increase in the mean duration of time since most recent episode associated with the absence of CA effects, documenting that even though the associations of CAs with persistence are significant in a statistical sense, the overall substantive importance of CAs is quite modest. Simulations suggest that mean duration between the time of interview and time of most recent episode would have increased by no more than 12.5% (for mood disorders among respondents in the age range 30-44) in the absence of CA effects across sub-samples defined by the cross-classification of disorder and age at interview.

Comment

The study is limited because it is based on retrospective reports of CAs and lifetime disorders, because we evaluated a non-exhaustive set of CAs that did not consider timing, sequencing, persistence, or severity, and because we assessed disorder persistence indirectly from information about recency of last episode rather than by reconstructing or prospectively assessing a complete history of episodes. Results of backwards recurrence models might be biased, especially if the disorders under study are associated with early mortality,[41] in which case we would expect the associations of CAs with persistence to be underestimated.[42] A preferable approach might be to assess CAs in childhood and to follow respondents prospectively into adulthood with low attrition to chart the persistence and severity of their disorders over time. Several long-term prospective general population studies of this sort exist that could be used to evaluate the generalizability of the results reported here,[13, 43-45] although it is important to note that attrition bias in these studies (i.e., decreasing response rates with time that might be more pronounced for original respondents with more persistent mental disorders) can lead to errors in estimates that in some cases could be as great as those due to recall bias in retrospective studies. The ideal approach, in light of these limitations of both retrospective and prospective studies, is to compare results from the two kinds of studies and to have the most faith in results that are consistent across the two.

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Additional study limitations are that our list of CAs, although larger than in most previous studies, is not exhaustive and failed to consider timing, sequencing, severity, or duration of individual CAs. In addition, the analysis of joint CA effects focused only on broad patterns of interactions among dichotomous CA measures and did not include fine-grained evaluation of targeted interactions. Future analyses need to examine targeted interactions against the backdrop of the broader patterns found in the current report. Future research is also needed to examine disorder persistence in childhood and adolescence. We were unable to do this because the NCS-R included only respondents over the age of 18.

Within the context of these limitations, our findings extend the previous literature on the associations of CAs with disorder course in several important ways. First, we find clear evidence that CAs predict disorder persistence significantly, albeit with small effect sizes, and that these significant associations can be detected throughout the life course, including among the elderly. Second, we find that CAs associated with maladaptive family functioning (MFF) are stronger predictors of persistence than are other CAs. A similar specification was found in our analysis of the association between CAs and first onset of mental disorders[6] as well as in previous research on the associations of CAs with prevalent cases of adult disorders.[46, 47] Third, we find that the effects of CAs on persistence are larger for mood and substance use disorders than for anxiety disorders. Fourth, we find that the joint effects of co-occurring MFF CAs on persistence are sub-additive while the effects of other CAs are largely confined to people who experienced multiple other CAs. Consistent with recent work,[25] these results show clearly that the simple summary count measures of CAs used in much of the previous literature on multivariate CA effects[41, 48, 49] are inadequate to capture the true effects of multiple CAs. Moreover, these findings suggest that the dozens of previous studies that have examined associations between specific CAs and specific mental and physical health outcomes[50-53] have most likely overestimated these associations by failing to account for co-occurring CAs and comorbid outcomes.

Perhaps the most important finding of the study comes from our simulations, which found that even though the associations of CAs with persistence are significant in a statistical sense, they are small in substantive terms. The largest effect size is 5% for mood disorders. To translate this into substantive terms, a 5% increase in time since most recent episode occurrence means that a person with a history of depression who has not had an episode for the past 20 years would be expected to have had a most recent episode 21 years ago rather than 20 years ago were it not for a history of CAs. Effects of CAs on anxiety and substance disorders are even smaller. These results indirectly suggest that the public health implications of CAs are greater for primary prevention than for secondary prevention, as the associations of CAs with disorder onset are much stronger than the associations with persistence.[6]

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Table 1

Bivariate and multivariate associations (odds ratios) between childhood adversities (CAs) and the persistence of DSM-IV/CIDI disorders (N=10,915)[a]

	Bivariate[b]		Multivariate (Additive)[c]		Multivariate (Number of CAs)[d]		Multivariate (Interactive)[e]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Maladaptive family functioning								
Parent Mental Illness	1.2*	(1.0-1.4)	1.1	(1.0-1.3)	-	-	1.1	(1.0-1.2)
Parent Substance	1.1*	(1.0-1.2)	1.0	(0.9-1.1)	-	-	1.0	(0.9-1.2)
Parent Criminal	1.0	(0.9-1.1)	0.9	(0.8-1.0)	-	-	0.9	(0.8-1.1)
Family Violence	1.2*	(1.1-1.3)	1.0	(1.0-1.1)	-	-	1.0	(0.9-1.1)
Physical Abuse	1.3*	(1.2-1.4)	1.2*	(1.1-1.3)	-	-	1.2*	(1.0-1.3)
Sexual Abuse	1.2*	(1.1-1.4)	1.1*	(1.0-1.3)	-	-	1.2	(1.0-1.3)
Neglect	1.2*	(1.1-1.4)	1.1	(1.0-1.2)	-	-	1.1	(0.9-1.3)
χ^2_7				44.8*				23.9*
χ^2_6								23.0*
II. Other childhood adversities								
Parent Died	1.0	(0.9-1.1)	1.0	(0.9-1.1)	-	-	1.0	(0.9-1.2)
Parent Divorce	1.1*	(1.0-1.2)	1.1	(1.0-1.2)	-	-	1.0	(0.9-1.2)
Other Parent Loss	1.0	(1.0-1.2)	1.0	(0.9-1.1)	-	-	1.0	(0.8-1.1)
Serious physical Illness	1.0	(0.9-1.2)	1.0	(0.9-1.1)	-	-	1.0	(0.9-1.1)
Family economic Adversity	1.1*	(1.0-1.2)	1.1	(1.0-1.2)	-	-	1.1	(0.9-1.2)
χ^2_5				5.1				4.1
χ^2_{12}				63.1*				32.8*
χ^2_{11}								41.6*
III. Number of childhood adversities								
0	-	-	-	-	-	-	-	-
1	-	-	-	-	1.0	(0.9-1.1)	-	-
2	-	-	-	-	1.2*	(1.1-1.3)	1.1	(1.0-1.2)

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	Bivariate[b]		Multivariate (Additive)[c]		Multivariate (Number of CAs)[d]		Multivariate (Interactive)[e]	
	OR	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
3	-	-	-	-	1.1*	(1.0-1.3)	1.0	(0.8-1.3)
4	-	-	-	-	1.3*	(1.1-1.6)	1.1	(0.8-1.6)
5	-	-	-	-	1.4*	(1.2-1.7)	1.1	(0.7-1.8)
6	-	-	-	-	1.3*	(1.2-1.5)	1.0	(0.6-1.7)
7	-	-	-	-	1.3*	(1.0-1.5)	0.9	(0.5-1.8)
χ^2_7					46.6*		$\chi^2_6 = 9.8$	

*Significant at the .05 level, two-sided test.

[a] A separate backward recurrence person-year file was created for respondents with a lifetime history of each of the 20 disorders. These 20 files were then stacked. The models were estimated using this stacked dataset in a backward recurrence discrete-time survival framework with person-year the unit of analysis to predict recency of the outcome disorder, thereby forcing the slopes to be constant across the 20 disorders. Each model controlled for person-year (number of years since interview), age-of-onset, time-since-onset, sex, 19 dummy variables for the outcome disorder category (i.e., for the 20 disorders in the stacked dataset), and controls for the prior (to the age of onset of the focal disorder) onset of comorbid disorders. The 5,692 respondents had a total of 11,047 lifetime disorder onsets, of which 132 started in the year of interview and 9,301 of the remaining 10,915 had most recent occurrences at a later age than age of onset, ranging from 80 for Bipolar I disorder to 1,140 for Specific Phobia. There were a total of 71,783 person-years across all disorders without onsets. Data on the prevalence of individual CAs and the distribution of number of CAs separately in person-years with and without most recent episodes are available on request. For person-years with most recent episodes, these prevalence estimates range from a low of 9.1% (physical illness) to a high of 29.1% (family violence).

[b] Models were estimated with one CA at a time in addition to the controls noted in the previous footnote.

[c] The model was estimated with all 12 CAs in addition to the controls noted in the first footnote.

[d] The model was estimated with dummy predictors for number of CAs without any information about the types of CAs. The same controls used in earlier models were included as well.

[e] The model was estimated with dummy predictors for number of CAs as well as the types of CAs. The same controls used in earlier models were included as well.

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Table 2

Multivariate associations (odds ratios) between childhood adversities (CAs) and the persistence of DSM-IV/CIDI classes of disorders based on a simple interactive model (N=10,915)[a]

	Mood		Anxiety		Substance		Disruptive Behavior[b]		All	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Maladaptive family functioning										
Parent Mental Illness	1.3*	(1.0-1.6)	1.1	(1.0-1.3)	1.2	(0.9-1.5)	1.2	(0.9-1.7)	1.2*	(1.0-1.3)
Parent Substance	1.1	(0.9-1.4)	1.0	(0.8-1.2)	1.5*	(1.1-2.0)	1.0	(0.7-1.4)	1.1	(0.9-1.2)
Parent Criminal	1.1	(0.8-1.5)	1.0	(0.8-1.2)	1.1	(0.8-1.5)	0.9	(0.6-1.3)	1.0	(0.8-1.1)
Family Violence	1.3*	(1.0-1.7)	1.0	(0.8-1.2)	1.4*	(1.1-1.7)	1.1	(0.8-1.6)	1.1	(1.0-1.2)
Physical Abuse	1.9*	(1.5-2.4)	1.1	(1.0-1.4)	1.3*	(1.1-1.7)	1.0	(0.8-1.4)	1.2*	(1.1-1.4)
Sexual Abuse	1.3*	(1.0-1.6)	1.2	(1.0-1.4)	1.6*	(1.2-2.1)	1.2	(0.9-1.7)	1.2*	(1.0-1.4)
Neglect	1.2	(0.9-1.6)	1.4*	(1.0-1.9)	1.1	(0.8-1.5)	1.1	(0.8-1.4)	1.2*	(1.0-1.4)
χ^2_7		52.8*		19.8*		28.0*		8.5		31.1*
χ^2_6		28.5*		18.6*		9.9		6.2		23.0*
II. Other childhood adversities										
Parent Died	1.1	(0.9-1.4)	1.1	(0.9-1.3)	1.0	(0.8-1.2)	0.9	(0.7-1.2)	1.0	(0.9-1.1)
Parent Divorce	1.1	(0.9-1.3)	1.1	(0.9-1.2)	1.0	(0.8-1.2)	1.1	(1.0-1.3)	1.0	(0.9-1.1)
Other Parent Loss	1.0	(0.7-1.4)	0.9	(0.7-1.2)	0.8*	(0.6-1.0)	0.9	(0.7-1.2)	0.9	(0.8-1.0)
Serious physical Illness	1.0	(0.7-1.4)	1.0	(0.8-1.2)	0.8	(0.6-1.1)	1.3	(0.9-1.9)	1.0	(0.8-1.1)
Family economic Adversity	1.0	(0.8-1.4)	1.1	(0.8-1.4)	0.9	(0.7-1.2)	1.0	(0.8-1.3)	1.0	(0.9-1.2)
χ^2_5		1.0		1.6		6.0		12.9*		4.6
χ^2_{12}		57.7*		21.9*		33.4*		24.9*		43.3*
χ^2_{11}		44.9*		20.6*		35.1*		23.9*		41.6*
III. Number of maladaptive family functioning CAs										
0-1	-	-	-	-	-	-	-	-	-	-
2	0.7*	(0.5-0.9)	1.0	(0.7-1.3)	0.8	(0.6-1.2)	1.1	(0.8-1.7)	0.9	(0.8-1.2)
3	0.5*	(0.3-0.7)	1.0	(0.7-1.5)	0.7	(0.4-1.2)	1.4	(0.8-2.7)	0.9	(0.7-1.2)

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	Mood		Anxiety		Substance		Disruptive Behavior[b]		All	
	OR	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
4	0.6	(0.3-1.1)	0.8	(0.4-1.6)	0.4*	(0.2-0.8)	1.2	(0.5-2.5)	0.8	(0.5-1.2)
5	0.2*	(0.1-0.5)	0.8	(0.4-1.8)	0.5	(0.2-1.1)	1.9	(0.7-5.2)	0.8	(0.4-1.4)
6	0.3*	(0.1-0.9)	0.7	(0.3-1.7)	0.2*	(0.1-0.6)	1.2	(0.3-5.1)	0.6	(0.3-1.0)
7	0.3	(0.1-2.1)	0.9	(0.2-3.5)	0.2*	(0.1-0.5)	2.1	(0.3-13.7)	0.7	(0.3-1.8)
χ^2_6		20.4*		3.2		29.5*		7.8		6.0
IV. Number of other CAs										
0-1	-		-	-	-	-	-	-	-	-
2	.9	(0.6-1.3)	1.0	(0.8-1.3)	1.4	(1.0-1.9)	1.0	(0.7-1.4)	1.0	(0.9-1.3)
3	1.6	(0.8-3.1)	1.1	(0.6-1.9)	1.3	(0.7-2.5)	1.0	(0.6-1.5)	1.2	(1.0-1.5)
4+	3.8*	(1.1-12.6)	1.5	(0.5-4.4)	2.0	(0.7-6.1)	1.4	(0.3-5.9)	1.5	(0.7-3.1)
χ^2_3		13.5*		0.7		3.5		0.6		3.2
χ^2_{21}		171.1*		66.1*		120.8*		94.6*		148.8*

*Significant at the .05 level, two-sided test.

[a]See the second footnote to Table 1 for a description of the dataset and overall modeling approach. The model used here was estimated with predictors for both types of adversities and number of adversities (distinguishing number of Maladaptive Family Functioning adversities from number of Other adversities) in addition to the controls used in the models described in Table 1. Note that no term was included in the model for having exactly 1 CA. This means that the coefficients for types of CAs can be interpreted as the associations of *pure* CAs (i.e., having one and only one particular type of CA compared to having none) with persistence, whereas the associations with number of CAs represent the extent to which the *incremental* associations of comorbid CAs (i.e., the added risk of having a particular type of CA or not among respondents who are otherwise equivalent in having a given number of other CAs controlling for the types of those other CAs) differ from the associations of pure CAs. Data on the prevalence of individual CAs and the distribution of number of CAs separately in person-years with and without most recent episodes are available on request. For person-years with most recent episodes, these prevalence estimates range from a low of 7.5% (physical illness associated with episodes of substance disorder) to a high of 34.6% (family violence associated with disruptive behavior disorders).

[b]Disruptive behavior disorders are restricted to those <= 44 years of age

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Table 3

Multivariate associations (odds ratios) between childhood adversities (CAs) and the persistence of DSM-IV/CIDI disorders by age at interview based on a simple interactive model (N=10,915)[a]

	Ages 18-29		Ages 30-44		Ages 45-59		Ages 60+	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Maladaptive family functioning								
Parent Mental Illness	1.2	(1.0-1.5)	1.2*	(1.0-1.5)	1.1	(0.9-1.3)	1.1	(0.8-1.4)
Parent Substance	1.0	(0.7-1.3)	1.2	(1.0-1.4)	1.2	(0.9-1.5)	0.9	(0.6-1.3)
Parent Criminal	0.9	(0.6-1.3)	1.0	(0.8-1.4)	0.9	(0.7-1.2)	1.0	(0.5-2.1)
Family Violence	1.0	(0.8-1.3)	1.4*	(1.2-1.6)	1.1	(0.8-1.4)	0.8	(0.4-1.6)
Physical Abuse	1.0	(0.7-1.4)	1.4*	(1.2-1.7)	1.3*	(1.0-1.7)	1.0	(0.7-1.6)
Sexual Abuse	1.1	(0.8-1.5)	1.4*	(1.1-1.7)	1.3*	(1.0-1.7)	0.7	(0.4-1.2)
Neglect	1.0	(0.7-1.3)	1.4*	(1.1-1.9)	1.1	(0.9-1.4)	0.8	(0.5-1.2)
χ^2_7		4.9		33.3*		14.3*		4.8
χ^2_6		4.0		14.9*		11.8		3.8
II. Other childhood adversities								
Parent Died	0.9	(0.7-1.1)	1.0	(0.8-1.3)	0.9	(0.8-1.1)	1.1	(0.8-1.6)
Parent Divorce	1.1	(0.9-1.3)	1.0	(0.9-1.1)	1.0	(0.8-1.3)	0.9	(0.6-1.3)
Other Parent Loss	1.0	(0.7-1.3)	0.8	(0.6-1.1)	1.1	(0.8-1.4)	0.6	(0.4-1.0)
Serious physical Illness	0.9	(0.6-1.4)	1.0	(0.6-1.4)	1.1	(0.9-1.4)	0.8	(0.6-1.1)
Family economic Adversity	1.1	(0.9-1.4)	0.9	(0.7-1.1)	1.0	(0.7-1.4)	1.1	(0.7-1.8)
χ^2_5		7.1		6.4		2.5		10.6
χ^2_{12}		10.8		43.0*		26.7*		19.0
χ^2_{11}		9.8		55.3*		22.6*		9.5
III. Number of maladaptive family functioning CAs								
0-1								
2	0.9	(0.6-1.4)	0.9	(0.7-1.1)	0.8	(0.6-1.2)	1.5	(0.7-2.9)
3	1.1	(0.6-2.0)	0.7*	(0.5-1.0)	0.7	(0.5-1.2)	1.3	(0.4-3.9)

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	Ages 18-29		Ages 30-44		Ages 45-59		Ages 60+	
	OR	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
4	0.9	(0.4-1.9)	0.6*	(0.3-0.9)	0.9	(0.5-1.7)	1.4	(0.4-6.0)
5	1.4	(0.5-3.9)	0.5	(0.2-1.0)	0.5	(0.3-1.1)	2.0	(0.4-11.0)
6	1.3	(0.4-4.4)	0.3*	(0.1-0.6)	0.5	(0.1-1.6)	2.5	(0.3-19.6)
7	1.4	(0.3-7.2)	0.4	(0.1-1.1)	0.6	(0.2-2.2)		
χ^2_6		5.2		15.6*		12.9*		2.5
IV. Number of other CAs								
0-1								
2	1.0	(0.7-1.5)	1.2	(0.9-1.6)	1.0	(0.6-1.4)	1.1	(0.5-2.1)
3	1.2	(0.7-2.0)	1.4	(0.9-2.3)	1.0	(0.6-1.7)	3.8*	(1.4-10.3)
4+	1.1	(0.4-3.2)	0.0*	(0.0-0.0)	2.7*	(1.1-6.8)	-	-
χ^2_3		0.7		238.4*		27.3*		6.8*
χ^2_{21}		59.0*		419.7*		195.9*		57.3*

*Significant at the .05 level, two-sided test.

[a]See the second footnote to Table 1 for a description of the dataset and overall modeling approach. The model used here was estimated with predictors for both types of adversities and number of adversities (distinguishing number of Maladaptive Family Functioning adversities from number of Other adversities) in addition to the controls used in the models described in Table 1. See the second footnote in Table 2 for a description of the interpretation of the joint effects of type and number of CAs. Data on the prevalence of individual CAs and the distribution of number of CAs separately in person-years with and without most recent episodes are available on request. For person-years with most recent episodes, these prevalence estimates range from a low of 5.1% (parent criminality among respondents in the age range 60+) to a high of 33.8% (family violence among respondents in the age range 30-44).

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Table 4

Simulated effects of childhood adversities on proportional increase in mean duration between time of interview and time of most recent episode in sub-samples defined by the cross-classification of disorder type and respondent age at interview

	Overall			Ages 18-29			Ages 30-44			Ages 45-59			Ages 60+		
	$Mean_r$*	**$Mean_u$**	**Diff %**	**$Mean_r$**	**$Mean_u$**	**Diff %**	**$Mean_r$**	**$Mean_u$**	**Diff %**	**$Mean_r$**	**$Mean_u$**	**Diff %**	**$Mean_r$**	**$Mean_u$**	**Diff %**
Mood	3.8	3.7	4.9	1.4	1.3	6.2	2.6	2.3	12.5	6.0	5.8	4.0	11.8	11.3	5.1
Anxiety	10.9	10.8	0.6	2.0	2.0	-1.5	9.3	9.1	1.5	15.6	15.7	-0.6	32.2	32.0	3.7
Substance	7.4	7.3	2.1	1.8	1.8	2.2	6.9	6.6	3.3	11.3	11.0	2.7	15.2	13.7	10.7
Disruptive Behavior[a]	9.2	9.3	-1.2	4.7	4.8	-2.5	11.5	12.3	-6.5	-	-	-	-	-	-
Any	8.4	8.3	1.6	3.0	2.9	1.4	8.1	7.9	2.7	11.4	11.2	2.0	20.0	19.7	1.3

*Mean number of years in the restricted model, mean number of years in the unrestricted model, and the % difference. The *restricted* model is one in which the ORs associated with CAs were restricted to be 1.0, simulating a situation in which CAs were completely unrelated to duration between time of interview and time of more recent episode. The *unrestricted* model is one in which the empirically observed associations between CAs and the outcome were retained. If CAs are associated with more recent episodes, we would expect the estimated mean duration in the restricted models to be larger than in the unrestricted model; that is, for the amount of time since most recent episode to be longer in the absence of CAs. This is, in fact, the general pattern in the table, with differences between $Mean_r$ and $Mean_u$ being mostly positive.

[a]Disruptive behavior disorders are restricted to those <= 44 years of age at interview