Research report

Adverse childhood experiences and the risk of depressive disorders in adulthood

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Abstract

Background: Research examining the association between childhood abuse and depressive disorders has frequently assessed abuse categorically, thus not permitting discernment of the cumulative impact of multiple types of abuse. As previous research has documented that adverse childhood experiences (ACEs) are highly interrelated, we examined the association between the number of such experiences (ACE score) and the risk of depressive disorders. *Methods*: Retrospective cohort study of 9460 adult health maintenance organization members in a primary care clinic in San Diego, CA who completed a survey addressing a variety of health-related concerns, which included standardized assessments of lifetime and recent depressive disorders, childhood abuse and household dysfunction. *Results*: Lifetime prevalence of depressive disorders was 23%. Childhood emotional abuse increased risk for lifetime depressive disorders, with adjusted odds ratios (ORs) of 2.7 [95% confidence interval (CI), 2.3–3.2] in women and 2.5 (95% CI, 1.9–3.2) in men. We found a strong, dose–response relationship between the ACE score and the probability of lifetime and recent depressive disorders (*P* < 0.0001). This relationship was attenuated slightly when a history of growing up with a mentally ill household member was included in the model, but remained significant (*P* < 0.001). *Conclusions*: The number of ACEs has a graded relationship to both lifetime and recent depressive disorders. These results suggest that exposure to ACEs is associated with increased risk of depressive disorders up to decades after their occurrence. Early recognition of childhood abuse and appropriate intervention may thus play an important role in the prevention of depressive disorders throughout the life span.
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Research has documented an increased prevalence of psychiatric disorders among individuals experiencing childhood abuse and trauma relative to their age peers (Briere et al., 1997; Silverman et al., 1996). In particular, childhood abuse has been associated with subsequent development of posttraumatic stress disorder (PTSD) (Widom, 1999), borderline personality disorder (Herman et al., 1989), dissociative symptoms

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(Chu et al., 1999), and depression (Sansone et al., 2001).

Childhood physical abuse (Goldberg, 1994; Kaufman, 1991), sexual abuse, (Goldberg, 1994; Kinard, 1995) and psychological or emotional abuse (Ferguson and Dacey, 1997; Kaufman, 1991) have each been associated with an increased prevalence of depressive disorders. However, the effects of each of these types of abuse have generally been examined categorically, and in ways not permitting assessment of the cumulative impact of multiple types of abuse or assessment of a dose–response relationship between the number of types of abuse and the prevalence of depressive disorders.

Because abuse, domestic violence, and other forms of household dysfunction, which we term adverse childhood experiences (ACEs), are interrelated (Anda et al., 1999; Felitti et al., 1998) and have repeatedly demonstrated a strong graded relationship to a variety of health problems (Anda et al., 2001; Dube et al., 2001), we assessed the relationship of each of these ACEs to the lifetime risk of depressive disorders. Using a cumulative stressor model, we then examined the relationship between the total number of adverse childhood experiences (ACEs) and the prevalence of depressive disorders.

1. Methods

The data were collected as part of the ACE Study, a collaboration between Kaiser Permanente (San Diego, CA) and the Centers for Disease Control and Prevention (CDC, Atlanta). The study was approved by the institutional review boards of Kaiser Permanente and the Office of Protection from Research Risks at the National Institutes of Health. Potential participants received letters that accompanied the ACE study questionnaire informing them that their participation was voluntary, their answers would be held in strictest confidence, and would never become part of their medical records.

1.1. Study population and data collection

The study population consisted of adult members of the Kaiser Health Plan who received a standardized medical and biopsychosocial examination at Kaiser's Health Appraisal Center in San Diego, CA. In any 4-year period, 81% of all adult members received the examination, and more than 50,000 members are examined annually. The primary purpose of the examination is to conduct a complete health assessment rather than provide symptom- or illness-based care.

The ACE Study consisted of two survey waves. Wave I was conducted among 13,494 consecutive members visiting Kaiser's Health Appraisal Center between August 1995 and March 1996, with a response rate of 70% ($n = 9508$). Because the full questionnaire used to screen for depressive disorders was contained in Wave I only, this analysis is restricted to Wave I data. The details of the study have been published elsewhere (Felitti et al., 1998).

The ACE Study questionnaire was mailed to each member 2 weeks after their examination and collected information on ACEs, including abuse (emotional, physical, or sexual), or household dysfunction (parental separation or divorce, having a battered mother or a substance abusing, criminal or mentally ill household member), as well as health-related behaviors from adolescence to adulthood.

1.2. Assessment of representatives and response or reporting bias

Standardized health examination data were abstracted for both respondents and nonrespondents to the ACE Study questionnaire enabling a detailed assessment of possible bias in terms of demographic characteristics and health-related issues. Although nonrespondents tended to be younger, less educated, and more likely to be members of racial and ethnic minority groups, the prevalence of both psychosocial and health problems was remarkably similar between respondents and nonrespondents after controlling for demographic differences (Edwards et al., 2001).

1.3. Exclusions from the study cohort

We excluded 34 respondents with missing information about race and 14 with missing educational attainment. Thus, the final study cohort included 98% of the respondents (9460/9508).

1.3.1. Definitions of adverse childhood experiences

All questions about ACEs pertained to the respondent's first 18 years of life. Questions used to define emotional and physical abuse, and growing up with a battered mother were adapted from the Conflict Tactics Scale (CTS) (Straus, 1979) with the response categories of *never*, *once or twice*, *sometimes*, *often*, or *very often*.

1.3.2. Emotional abuse

Participants were defined as being emotionally abused during childhood if they responded *often* or *very often* to either of the following two questions: "How often did a parent, stepparent, or adult living in your home swear at you, insult you, or put you down?" and "How often did a parent, stepparent, or adult living in your home act in a way that made you afraid that you might be physically hurt?"

1.3.3. Physical abuse

Two items were adapted from the Conflict Tactics Scale (CTS) (Straus, 1979). Respondents who indicated that they had been pushed, grabbed, shoved, slapped, or had something thrown at them "often" or "very often," or who indicated they had been hit so hard that they had marks or were injured "once" or more were considered victims of physical abuse.

1.3.4. Sexual abuse

Assessed by four categorical questions adapted from Wyatt (1985), that covered fondling, attempted intercourse, and intercourse. An affirmative answer to any of the four items resulted in classification as sexually abused.

1.3.5. Battered mother

Four items adapted from CTS were used to determine whether respondents were exposed to family violence. Answers indicating that the respondent had witnessed their mother "sometimes" or more being pushed, grabbed, slapped or seen something thrown at her, or who witnessed more serious violence (kicking, biting, hit with a fist or something hard, repeatedly hit over at least a few minutes, threatened with a knife or gun, or used a knife or gun to hurt her) once or more were considered exposed to a battered mother.

1.3.6. Household substance abuse

Two questions were used to determine whether respondents during their childhood, lived with a problem drinker or alcoholic (Schoenborn, 1995) or anyone who used street drugs.

1.3.7. Parental separation or divorce

This adverse experience was defined as an affirmative response to the question "Were your parents ever separated or divorced?"

1.3.8. Criminal household member

The respondent was defined as having childhood exposure to a criminal household member if anyone in the household had gone to prison during the respondent's childhood.

1.4. Mental illness in household

A respondent was defined as being exposed to mental illness if anyone in the household was depressed or mentally ill or had attempted suicide during the respondent's childhood. Because exposure to mental illness during childhood can exert an effect on the risk of depressive disorders during adulthood through both experiential and potential genetic influences, we treated this ACE as a separate type of exposure which was *not* included in the ACE score. Rather, we controlled for the effect of this ACE separately in our analysis of the association between the ACE score and the risk of depressive disorders.

1.5. The ACE score

The total number of ACEs (excluding mental illness in the household) experienced by respondents became their ACE score, which was used to assess the cumulative effect of multiple ACEs.

1.6. Personal history of depressive disorders

We used a screening instrument for depressive disorders (major depression and dysthymia) developed for the Medical Outcomes Study (Burnam et al., 1988). This instrument used data from primary care and mental health subsamples of the Los Angeles Epidemiological Catchment Area Study (Burnam et

al., 1987) and the Psychiatric Screening Questionnaires for Primary Care Patients (Hough et al., 1983).

The screening instrument (Burnam et al., 1988) includes the following two questions from the Diagnostic Interview Schedule (DIS) of the National Institute of Mental Health (Robins et al., 1981): (1) "In the past year, have you had 2 weeks or more during which you felt sad, blue, or depressed, or lost pleasure in things that you usually cared about or enjoyed?" and (2) "Have you had 2 years or more in your life when you felt depressed or sad most days, even if you felt okay sometimes? (If yes) Have you felt depressed or sad much of the time in the past year?"

The instrument also included six questions from the Center for Epidemiologic Studies Depression Scale (CES-D) (Roberts and Vernon, 1983). The CES-D items ask how often in the past week the respondent had experienced the following: (1) "I felt depressed." (2) "My sleep was restless." (3) "I enjoyed life." (4) "I had crying spells." (5) "I felt sad." (6) "I felt that people dislike me." The response scale for these questions was less than 1, 1–2, 3–4, and 5–7 days. Using the prediction equation developed for this screener, we used the cutoff point of 0.009 to define a lifetime history of depression disorder and the cutoff point of 0.06 for recent depressive disorders occurring during the past year (see Burnam et al., 1988, for further details).

1.7. Statistical analysis

We used the Statistical Analysis System (SAS) for all analyses. Persons with incomplete information about an ACE were considered not to have had that experience. This would likely result in conservative estimates of the relationship between ACEs and health outcomes because persons who had potentially been exposed to an experience would be misclassified as unexposed. This type of misclassification would bias our results towards the null. However, to assess this potential effect, we repeated our analyses after excluding all respondents with missing information on any of the ACEs.

Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) from logistic regression models were used to assess the associations between each category of ACE and the risk of depressive disorders. The number of ACEs was summed for each respondent (range: 0–7); analyses were repeated with five dichotomous variables (yes/no) with 0 ACEs as the referent. To test for observed trends in the ORs from the models using five dichotomous variables, the summed score was entered as an ordinal variable (0, 1, 2, 3, 4, or ≥ 5). We also modeled the relationship of the ACE score to depressive disorders with and without controlling for exposure to mental illness in the household.

Attributable risk fractions (ARFs) were calculated using adjusted ORs from logistic regression models based upon ≥ 1 ACE with 0 ACEs as the referent. This analysis was done because a substantial increase in the risk of depressive disorders was seen for persons reporting at least 1 ACE. We used Levin's formula for these calculations, $ARF = P_1(RR-1)/1 + P_1(RR-1)$, where P_1 is the prevalence of an ACE score ≥ 1 and $RR = OR$ of depressive disorders for an ACE score ≥ 1. The ARF is an estimate of the proportion of the health problem (e.g., depressive disorders) that would not have occurred if no persons had been exposed to the risk factor being assessed (ACEs) (Haddix et al., 1996).

2. Results

Of the 9460 respondents, 54% were women. The mean age of respondents was 56.6 years. Seventy-five percent were white; 42% were college graduates and only 7% had not graduated from high school. The prevalence of a lifetime history of depressive disorders was greater among women than men (28.9% vs. 19.4%), as was the prevalence of recent depressive disorders (15.7% vs. 8.4%). Approximately one in five women reported the presence of a mentally ill household member while they were growing up, with a slightly lower prevalence reported among men (15.0%). Among both men and women, the prevalence of each of the ACEs ranged from over 3% reporting a criminal household member to about 30% indicating they had been physically abused while growing up. Notably, 20.8% of women and 14.0% of men reported they had experienced three or more ACEs while growing up, excluding mental illness in the household.

Table 1 summarizes the associations between each of the seven ACEs and the lifetime history and recent

Table 1

Adverse childhood experiences and the prevalence and risk (adjusted odds ratio) of a lifetime history of depressive disorders or of recent depressive disorders

Adverse childhood experience (ACE)	Women reporting ACE (n)	Men reporting ACE (n)	Lifetime prevalence		Recent prevalence	
			Women adjusted odds ratio	Men adjusted odds ratio	Women adjusted odds ratio	Men adjusted odds ratio
Emotional abuse	709	319	2.7 (2.3−3.2)	2.5 (1.9−3.2)	3.1 (2.6−3.8)	3.3 (2.4−4.4)
Physical abuse	1456	1394	2.1 (1.8−2.4)	1.6 (1.4−1.9)	2.3 (2.0−2.7)	1.8 (1.4−2.2)
Sexual abuse	1246	650	1.8 (1.5−2.0)	1.6 (1.3−2.0)	2.0 (1.7−2.3)	1.6 (1.2−2.1)
Battered mother	676	478	2.1 (1.8−2.5)	1.5 (1.2−1.9)	2.2 (1.8−2.7)	1.5 (1.1−2.1)
Household substance abuse	1413	965	1.7 (1.5−2.0)	1.3 (1.1−1.5)	1.8 (1.5−2.1)	1.3 (1.1−1.6)
Parental separation or divorce	1174	929	1.4 (1.2−1.6)	1.1 (1.0−1.4)	1.4 (1.2−2.7)	1.0 (0.9−1.3)
Criminal household member	177	141	1.7 (1.2−2.3)	1.5 (1.1−2.1)	1.6 (1.1−2.2)	0.9 (0.5−1.6)

prevalence of depressive disorders for women and men. Among women, adjusted odds ratios reveal significant associations between each ACE and both a lifetime history of depressive disorders and recent depressive disorders. Notably, women reporting childhood emotional abuse were 2.7 and 3.1 times as likely as those not reporting emotional abuse to have a lifetime history of depressive disorders or recent depressive disorders, respectively. Most of the individual ACEs were also significantly associated with a recent and lifetime history of depressive disorders among men, with the exception of growing up with a criminal household member and parental separation or divorce. As was observed among women, childhood emotional abuse posed the greatest risk of any of the ACEs for both a lifetime history of depressive disorders and recent depressive disorders (adjusted odds ratios: 2.5 and 3.3, respectively) among men.

The cumulative effects of ACEs on the probability of a lifetime history of depressive disorders and current depressive disorders are summarized for women and for men in Tables 2 and 3, respectively. As the presence of a mentally ill household member could potentially be confounded with genetic influences on the etiology of depressive disorders, we analyzed the effect of this ACE in separate logistic models, as well as in a single model in which both the ACE score and a childhood history of having a mentally ill household

Table 2

Relationship of the ACE score and a history of growing up with a mentally ill household member to a lifetime history of depressive disorders and recent depressive disorders among women

ACE score		(N)	Lifetime history of depressive disorders			Recent depressive disorders		
			%	Separate models[a] adjusted odds ratio	Single model[a] adjusted odds ratio	%	Separate models[a] adjusted odds ratio	Single model[a] adjusted odds ratio
0		(1984)	18.5	1.0 (referent)	1.0 (referent)	8.3	1.0 (referent)	1.0 (referent)
1		(1289)	25.8	1.4 (1.2−1.6)	1.3 (1.1−1.5)	13.5	1.6 (1.2−2.0)	1.4 (1.1−1.8)
2		(742)	32.7	1.8 (1.5−2.2)	1.6 (1.3−2.0)	18.7	2.1 (1.7−2.7)	1.8 (1.4−2.4)
3		(503)	44.7	3.0 (2.4−3.7)	2.5 (2.0−3.1)	24.1	2.9 (2.2−3.8)	2.3 (1.7−3.0)
4		(322)	47.5	3.0 (2.3−3.9)	2.4 (1.9−3.2)	29.8	3.6 (2.7−4.8)	2.7 (2.0−3.7)
≥ 5		(236)	61.0	5.0 (3.7−6.7)	3.7 (2.7−5.0)	44.1	6.4 (4.7−8.7)	4.4 (3.2−6.1)
Mentally ill household member	No	(4018)	24.3	1.0 (referent)	1.0 (referent)	12.0	1.0 (referent)	1.0 (referent)
	Yes	(1058)	46.1	2.5 (2.1−2.8)	1.8 (1.5−2.1)	29.9	2.9 (2.4−3.4)	2.0 (1.7−2.5)

[a] Separate logistic models were run for ACE score and a history of growing up with a mentally ill household member; the single model included both the ACE score and a history of mental illness in the household. X^2 for the difference in the log likelihood ratios for the single model with the ACE score vs. the single model for a lifetime history of depressive disorders was 65 (1 degree of freedom; $P<0.0001$). Similarly, the X^2 for the difference in the log likelihood ratios for recent depressive disorders was 48 (1 degree of freedom; $P<0.0001$).

member were entered simultaneously. This approach is conservative as it likely overcontrolled for genetic influences while simultaneously disregarding experiential influences; thus, the single model likely underestimates the strength of the associations.

Compared to women reporting no ACEs, those who reported five or more ACEs had a fivefold increased risk for a lifetime history of depressive disorders and a greater than sixfold increased risk for recent depressive disorders in the separate logistic models. This relationship was attenuated somewhat in the single logistic models in which the ACE score and childhood history of having a mentally ill household member were entered simultaneously, but remained statistically significant for both women and men (Tables 2 and 3) ($P < 0.0001$). Despite these attenuations, in this model, women reporting five or more ACEs had adjusted odd ratios of 3.7 and 4.4 for lifetime and recent depressive disorders, respectively.

Cumulative exposure to ACEs generally assumed a stronger dose–response relationship with depressive disorders among women than men. However, the presence of ACEs was also associated with strong and significantly increased risks of both lifetime and current depressive disorders in men. Among men, ACEs assumed cumulative effects on lifetime history of depressive disorders in separate models (adjusted odds ratios = 1.4 for one ACE, 1.8 for two ACEs, and 2.4 for five or more ACEs) (Table 3). Our estimate of the attributable risk fraction (ARF) for lifetime depressive disorders was 35% (women, 38%; men, 29%) and 40% for recent depressive disorders (women, 46%; men, 29%).

3. Discussion

This investigation represents a departure from previous studies characteristically restricted to examination of the association between single forms of abuse and depressive disorders. Our results indicate that the majority of respondents reported at least one ACE and approximately one-third of adults experienced at least two ACEs during their childhood. This finding, and prior publications from the ACE Study (Anda et al., 1999; Dube et al., 2002; Felitti et al., 1998), suggest that detection of one ACE should alert the clinician to assess the patient for a history of exposure to other forms of abuse or household dysfunction. Moreover, a strong graded relationship was generally evident between the number of ACEs and recent and lifetime depressive disorders among men and women. These findings suggest that experiencing multiple forms of abuse or household dysfunction during childhood may pose particularly deleterious consequences on adult mental health.

Table 3
Relationship of the ACE score and a history of growing up with a mentally ill household member to a lifetime history of depressive disorders and recent depressive disorders among men

ACE score		(N)	Lifetime history of depressive disorders			Recent depressive disorders		
			%	Separate models[a] adjusted odds ratio	Single model[a] adjusted odds ratio	%	Separate models[a] adjusted odds ratio	Single model[a] adjusted odds ratio
0		(1823)	13.8	1.0 (referent)	1.0 (referent)	5.5	1.0 (referent)	1.0 (referent)
1		(1256)	19.0	1.4 (1.1–1.7)	1.3 (1.1–1.6)	8.2	1.4 (1.1–1.9)	1.4 (1.1–1.8)
2		(693)	24.4	1.8 (1.4–2.2)	1.6 (1.3–2.0)	10.8	1.8 (1.3–2.5)	1.6 (1.2–2.2)
3		(340)	26.5	1.9 (1.4–2.5)	1.5 (1.1–2.1)	11.2	1.8 (1.2–2.7)	1.4 (1.0–2.2)
4		(176)	36.9	2.9 (2.0–4.0)	2.3 (1.6–3.3)	18.7	3.2 (2.0–4.9)	2.5 (1.6–3.9)
≥ 5		(96)	35.4	2.4 (1.5–3.7)	1.7 (1.1–2.8)	17.7	2.6 (1.5–4.6)	1.8 (1.1–3.3)
Mentally ill household member	No	(3726)	16.7	1.0 (referent)	1.0 (referent)	6.8	1.0 (referent)	1.0 (referent)
	Yes	(658)	34.6	2.4 (2.0–2.9)	2.1 (1.7–2.5)	17.0	2.5 (1.9–3.1)	2.1 (1.6–2.8)

[a] Separate logistic models were run for ACE score and a history of growing up with a mentally ill household member; the single model included both the ACE score and a history of mental illness in the household. X^2 for the difference in the log likelihood ratios for the single model with the ACE score vs. the single model for a lifetime history of depressive disorders was 46 (1 degree of freedom; $P<0.0001$). Similarly, the X^2 for the difference in the log likelihood ratios for recent depressive disorders was 33 (1 degree of freedom; $P<0.0001$).

The lifetime prevalence of depressive disorders in this study (women, 28.9%; men, 19.4%) is similar to that obtained in other studies conducted in clinical populations (Nagel et al., 1998; Zung et al., 1993). However, it must be acknowledged that respondents reporting depressive symptoms cannot be presumed to be suffering from major depression. Nevertheless, previous research has documented the negative effect of depressive symptoms on quality of life (Pyne et al., 1997) and activities of daily living (Alexopoulos et al., 1996).

Consistent with previous research (Weissman et al., 1991; Zung et al., 1993), we found a greater prevalence of depressive disorders among women than men. These findings are paralleled by a greater reported prevalence of ACEs—with the exception of physical abuse—among women than men. While potentially mediated by a number of variables unexamined here, our data suggest the increased prevalence of depressive disorders among women may be at least partially attributable to the higher prevalence of ACEs and their stronger association with depressive disorders in women.

A slight reduction in the effect of ACEs on depressive symptoms was observed among respondents who reported the presence of a mentally ill household member, relative to those who did not. Yet, even after controlling for this factor, ACEs remained strongly associated with the development of depressive disorders across the life span. However, the mentally ill household members inquired about were not necessarily suffering from depression and may not have been blood relatives. Thus, conclusions about the role of genetics in the development of depression throughout the life span cannot be drawn from these data.

While permitting examination of a wide variety of childhood experiences and subsequent behavioral and health outcomes, the ACE Study has several potential limitations. The duration of each ACE was not assessed. Moreover, these data cannot definitively establish the temporal relationship between ACEs and lifetime depressive disorders, as it is conceivable that the onset of a depressive disorder may have preceded exposure to ACEs. However, the finding of strong, positive associations between ACEs and depressive disorders occurring during the past year would appear to obviate this concern, although the

possibility of a mood state bias altering recall of childhood events must be acknowledged. Nonetheless, as there is only a modest attenuation of the cumulative effect of ACEs on recent onset relative to lifetime depressive disorders, these data strongly suggest that ACEs exert deleterious consequences threatening mental health throughout adulthood.

As the median age of respondents was 57 years, the positive association of the ACE score with recent depressive symptoms suggests the consequences of ACEs persist for several decades after their occurrence. This observation thus extends previous findings of increased depressive symptomatology among abused children (Stern et al., 1995) and suggests that the depressogenic potential of child abuse extends far into adulthood. Further research identifying characteristics distinguishing adults who experienced childhood abuse and do not manifest increased adulthood depressive symptomatology from those who do is needed.

Of all the individual ACEs, emotional abuse exhibited the strongest relationship to both measures of depressive symptoms among both men and women. The increased risk evident for emotional abuse was statistically significant in comparison with most of the other ACEs. These findings corroborate previous investigations documenting the deleterious consequences of emotional (Roy, 1999) or psychological (Ferguson and Dacey, 1997) abuse on mental health. Our results suggest that emotional abuse is characteristically combined with other forms of abuse, thereby potentiating its impact. Succinctly stated, "names do hurt" and assessment for childhood emotional abuse may provide an important benchmark for other forms of abuse and a heightened risk for depressive symptoms in adulthood.

Adverse childhood experiences have a strong, graded relationship to the risk of lifetime and current depressive disorders that extends into adulthood. Because ACEs are interrelated (Anda et al., 1999; Felitti et al., 1998), it is important to consider abuse and household dysfunction as a set of experiences that affect the risk of depressive disorders. Moreover, ACEs are common and account for a considerable proportion of depressive disorders—as evidenced by the estimates of the population attributable risk. Prevention of ACEs and early treatment of persons affected by them will likely

substantially decrease the serious burden of depressive disorders.

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