Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: Findings from the...; Dube, Shanta R; Anda, Robert F; Felitti, Vincent J; Chapman, Daniel P; <AUNAM
JAMA   12-26-2001

Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: Findings from the...

Findings From the **Adverse Childhood Experiences Study**
HEADNOTE

Context Suicide is a leading cause of death in the United States, but identifying persons at risk is difficult. Thus, the US surgeon general has made suicide prevention a national priority. An expanding body of research suggests that **childhood** trauma and **adverse experiences** can lead to a variety of negative health outcomes, including attempted suicide among adolescents and adults.

Objective To examine the relationship between the risk of suicide attempts and **adverse childhood experiences** and the number of such **experiences** (**adverse childhood experiences** [ACE] score).
HEADNOTE
Design, Setting, and Participants A retrospective cohort **study** of 17337 adult health maintenance organization members (54% female; mean [SD] age, 57 [15.3] years) who attended a primary care clinic in San Diego, Calif, within a 3-year period (1995-1997) and completed a survey about **childhood** abuse and household dysfunction, suicide attempts (including age at first attempt), and multiple other healthrelated issues.

Main Outcome Measure Self-reported suicide attempts, compared by number of **adverse childhood experiences**, including emotional, physical, and sexual abuse; household substance abuse, mental illness, and incarceration; and parental domestic violence, separation, or divorce.
HEADNOTE
Results The lifetime prevalence of having at least 1 suicide attempt was 3.8%. **Adverse childhood experiences** in any category increased the risk of attempted suicide 2to 5-fold. The ACE score had a strong, graded relationship to attempted suicide during **childhood**/adolescence and adulthood (P<.001). Compared with persons with no such **experiences** (prevalence of attempted suicide, 1.1 %), the

adjusted odds ratio of ever attempting suicide among persons with 7 or more **experiences** (35.2%) was 31.1 (95% confidence interval, 20.6-47.1). Adjustment for illicit drug use, depressed affect, and selfreported alcoholism reduced the strength of the relationship between the ACE score and suicide attempts, suggesting partial mediation of the **adverse childhood experience**-- suicide attempt relationship by these factors. The population-attributable risk fractions for 1 or more **experiences** were 67%, 64%, and 80% for lifetime, adult, and **childhood**/ adolescent suicide attempts, respectively.

HEADNOTE

Conclusions A powerful graded relationship exists between **adverse childhood experiences** and risk of attempted suicide throughout the life span. Alcoholism, depressed affect, and illicit drug use, which are strongly associated with such **experiences**, appear to partially mediate this relationship. Because estimates of the attributable risk fraction caused by these **experiences** were large, prevention of these **experiences** and the treatment of persons affected by them may lead to progress in suicide prevention.

SUICIDE WAS THE EIGHTH LEADing cause of death in the United States in 1998.(1) Particularly high rates have been reported among young persons and older adults.1-7 Each year, more than 30000 people in the United States commit suicide, but recognition of persons who are at high risk for suicide is difficult, making efforts to prevent its occurrence problematic.1,8-10 The US surgeon general brought attention to this complex public health issue by recommending that the investigation and prevention of suicide be a national priority.11

An expanding body of research suggests that **childhood** trauma and **adverse experiences** can lead to a variety of negative health outcomes, including substance abuse, depressive disorders, and attempted suicide among adolescents and adults.12-14 **Childhood** sexual and physical abuse have been strongly associated with suicide attempts.15-21 A recent **study** of Norwegian drug addicts showed that a high proportion of them attempted suicide, and an even higher proportion of drug addicts who had experienced **childhood adversity** had attempted suicide.22 In another **study**, low-income women who had a history of alcohol problems and had experienced **childhood** abuse and neglect were at increased risk for suicide attempts.13

There is little information about the relationship between multiple **childhood** traumas and the risk of suicide attempts. In fact, **childhood** stressors such as abuse, witnessing domestic violence, and other forms of household dysfunction are highly interrelated23,24 and have a graded relationship to numerous health and social problems.23-28 We examined the relationship of 8 **adverse childhood experiences** (**childhood** abuse [emotional, physical, and sexual], witnessing domestic violence, parental separation or divorce, and living with substanceabusing, mentally ill, or criminal household members) to the lifetime risk

of suicide attempts. We then determined whether the relationship between the total number of such **experiences** (the **adverse childhood experiences** [ACE] score) and risk of suicide attempts was cumulative and graded. We tested for evidence that self-reported alcoholism, depressed affect, and illicit drug use mediate this relationship and examined the relationship between the number of **adverse childhood experiences** and suicide attempts during **childhood**/ adolescence and adulthood. Finally, we estimated the attributable risk fraction for suicide attempts that may result from these **experiences**.

METHODS

The **Adverse Childhood Experiences** (ACE) **Study** is a collaboration between **Kaiser** Permanente's Health Appraisal Center (HAC) in San Diego, Calif, the Centers for Disease Control and Prevention, and Emory University, Atlanta, Ga. The overall objective is to assess the impact of numerous **adverse childhood experiences** on a variety of health behaviors and outcomes and health care use.23 The ACE **Study** was approved by the institutional review boards of **Kaiser** Permanente, Emory University, and the Office of Protection from Research Risks, National Institutes of Health. Potential participants were sent letters that accompanied the ACE **Study** questionnaire and told them that their participation was voluntary and that their answers would be held in strictest confidence, never becoming a part of their medical record.

Recent publications from the ACE **Study** have shown a strong, graded relationship between the number of **adverse childhood experiences**, multiple risk factors for leading causes of death in the United States,23 and priority health and social problems such as smoking,24 sexually transmitted diseases,25 unintended pregnancies,26 male involvement in teen pregnancy,27 and alcohol problems.28

Study Population

The **study** population was drawn from the HAC, which provides complete and standardized medical, psychosocial, and preventive health evaluations to adult members of **Kaiser** Health Plan in San Diego County. In any 4-year period, 81% of the adult membership obtains this service, and more than 50 000 members are evaluated yearly; thus, data from the HAC represent the **experiences** and health status of a majority of adult **Kaiser** members in San Diego. Their visit to the HAC is primarily for complete health assessments rather than symptom-- based or illness-based care.

Persons evaluated at the HAC complete a standardized questionnaire, which includes detailed health histories and health-related behaviors, a medical review of systems, and psychosocial evaluations. This information was abstracted and is included in the ACE **Study** database.

ACE **Study** Design and Questionnaire

The baseline data collection was divided into 2 survey waves according to the

method we described earlier.23 Two weeks after the HAC evaluation, each person was mailed an ACE **Study** questionnaire, which included detailed information about **adverse childhood experiences** (eg, abuse and neglect) and family and household dysfunction (eg, domestic violence and substance abuse by parents or other household members) and questions about healthrelated behaviors from adolescence to adulthood. Prior publications from the ACE **Study** included respondents to wave 1 (9508 of 13 494; 70% response), conducted between August 1995 and March 1996.(23,24,26,29) Wave 2 was conducted between June and October 1997; 8667 of 13 330 persons (65%) responded. Wave 2 added detailed questions about health topics that analysis of wave 1 had shown to be important.23,26 The response rate for both survey waves combined was 68% (18175 of 26824).

Assessment of Representativeness, and Response or Reporting Bias

In wave 1, the HAC questionnaire data were abstracted for respondents and nonrespondents to the ACE **Study** questionnaire, enabling a detailed assessment of the representativeness of respondents in terms of demographic characteristics and health-related issues. Results of this analysis have been published elsewhere.29 Briefly, nonrespondents tended to be younger, less educated, or from racial or ethnic minority groups. After demographic differences were controlled for, health behaviors such as smoking and alcohol or drug abuse and health conditions such as heart disease, hypertension, obesity, and chronic lung disease did not differ between respondents and nonrespondents. Thus, there was no evidence that the general health of respondents and nonrespondents differed.

In addition, questions from the HAC allowed assessment of the strength of the relationship between **childhood** sexual abuse and health behaviors, diseases, and psychosocial problems; the strength of these relationships was virtually identical for respondents and nonrespondents.29 Thus, there was no evidence that respondents to the ACE **Study** questionnaire were biased toward attributing their health problems to **childhood experiences** such as sexual abuse.

Exclusions From the **Study** Cohort

We excluded 754 respondents who coincidentally underwent examinations during both survey waves. The unduplicated total number of respondents was 17421. After exclusion of 17 respondents with missing information about race and 67 with missing information about educational level, the final **study** sample included 95% of the respondents (17337 of 18175; wave 1=8708, wave 2=8629).

Definitions of **Adverse Childhood Experiences**

All questions about **adverse childhood experiences** pertained to the respondents' first 18 years of life. For questions adapted from the Conflict Tactics Scale (CTS),30 the response categories were as follows: never, once or twice, sometimes, often, or very often.

Emotional Abuse. Emotional abuse was determined from answers to 2 questions from the CTS: (1) "How often did a parent, stepparent, or adult living in your home swear at you, insult you, or put you down?" and (2) "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?" Responses of "often" or "very often" to either item defined emotional abuse during **childhood**.

Physical Abuse. A 2-part question from the CTS was used to describe **childhood** physical abuse: "Sometimes parents or other adults hurt children. How often did a parent, stepparent, or adult living in your home (1) push, grab, slap, or throw something at you or (2) hit you so hard that you had marks or were injured?" A respondent was defined as being physically abused if the response was "often" or "very often" to the first part or "sometimes," "often," or "very often" to the second part.

Sexual Abuse. Four questions from Wyatt31 were adapted to define contact sexual abuse during **childhood**: "Some people, while they are growing up in their first 18 years of life, had a sexual **experience** with an adult or someone at least 5 years older than themselves. These **experiences** may have involved a relative, family friend, or stranger. During the first 18 years of life, did an adult, relative, family friend, or stranger ever (1) touch or fondle your body in a sexual way, (2) have you touch their body in a sexual way, (3) attempt to have any type of sexual intercourse with you (oral, anal, or vaginal), or (4) actually have any type of sexual intercourse with you (oral, anal, or vaginal)?" A "yes" response to any of the 4 questions classified a respondent as having experienced contact sexual abuse during **childhood**.

Battered Mother. We used 4 questions from the CTS to define **childhood** exposure to a battered mother. "Sometimes physical blows occur between parents. How often did your father (or stepfather) or mother's boyfriend do any of these things to your mother (or stepmother)? (1) Push, grab, slap, or throw something at her, (2) kick, bite, hit her with a fist, or hit her with something hard, (3) repeatedly hit her over at least a few minutes, or (4) threaten her with a knife or gun, or use a knife or gun to hurt her." A response of "sometimes," "often," or "very often" to either the first or second question or any response other than "never" to either the third or the fourth question defined a respondent as having had a battered mother.

Household Substance Abuse. Two questions asked whether respondents, during their **childhood**, lived with a problem drinker or alcoholic32 or with anyone who used street drugs. An affirmative response to either of these questions indicated **childhood** exposure to substance abuse in the household.

Mental Illness in Household. A "yes" response to the question "Was anyone in your household mentally ill or depressed?" defined this **adverse childhood experience**.

Parental Separation or Divorce. This **experience** was defined as a "yes" response to the question "Were your parents ever separated or divorced?"

Incarcerated Household Members. This **experience** was defined as having had **childhood** exposure to a household member who was incarcerated.

Definition of Reported Risk Factors for Suicide Attempts

Depressed Affect. Depressed affect was defined as a "yes" response to this question, which was included in both ACE **Study** survey waves: "Have you had or do you now have depression or feel down in the dumps?" We compared the measure of depressed affect to a validated screening tool developed by the Rand Corporation for lifetime prevalence of major depression or dysthymia.[33] The tool was available for the ACE **Study** survey wave 1 only. In this comparison (2 x 2 table), lifetime depressed affect was significantly associated with the validated measure[33] (chi^{2}_{1}= 1476; $P < .001$); the sensitivity, specificity, and positive predictive value for lifetime depressed affect were 83%, 60%, and 87%, respectively.

Self-reported Alcoholic. A "yes" response to the question "Have you ever considered yourself to be an alcoholic?" defined self-reported alcoholism.[32] Assessment of the methodological **studies** indicates that for the general population, self-reports of alcohol use are fairly accurate.[34] Furthermore, assuring respondents of the confidentiality of their responses, which was part of the ACE **Study** protocol, and providing responses in a private setting (mail survey in the home for the ACE **Study**) also enhance the accuracy of selfreported alcohol abuse.[34,35]

Ever Used Illicit Drugs. A "yes" response to the question "Have you ever used street drugs? " defined illicit drug use.

Definition of a Lifetime Suicide Attempt

Attempted suicide was defined as a "yes" response to the question "Have you ever attempted to commit suicide?" According to data available from wave 2 only, for persons who had attempted suicide, the mean number of suicide attempts was 1.6 (SD, 0.91); the range was 1 to 4 times, and 75th and 95th percentiles were 2 and 4, respectively. For persons who had attempted suicide, the mean number of attempts did not differ between men and women or according to the ACE score.

Assessing the Relationship of **Adverse Childhood Experiences** to Child, Adolescent, and Adult Suicide Attempts

Questions about age at suicide attempt were added to the wave 2 questionnaire (n=8629). **Childhood**/adolescent suicide attempts were defined as the subject's being 18 years or younger at the time of the attempt. Adult suicide attempts were defined as those that occurred when the subject was 19 years or older. These outcomes were assessed from wave 2 only. The mean ages for **childhood**/adolescent and adult suicide attempts were 15.1 (SD, 2.1) and 28.4 (SD, 10.6) years, respectively.

Statistical Analysis

All analyses were conducted with the SAS System, Version 6.12 (SAS Institute Inc, Cary, NC). Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were obtained from logistic regression models that estimated the likelihood of ever attempting suicide by each of the 8 categories of **adverse childhood experiences**. The number of **experiences** was summed for each respondent (ACE score range, 0-8). Because of small sample sizes, ACE scores of 7 or 8 were combined into 1 category (>=7). Thus, analyses were conducted with the summed score as 7 dichotomous variables (yes/ no), with 0 **experiences** as the referent. Covariates in all models were included on a priori reasoning rather than by using stepwise selection and included age (continuous variable), sex, race, and education (high school diploma, some college education, or college graduate vs less than high school education). We had no a priori hypotheses about interaction between demographic variables and the **adverse childhood experiences** to examine. Using SAS regression diagnostics, we found no evidence of collinearity. Persons with incomplete information about an **adverse childhood experience** were considered not to have had that **experience**. To assess the potential effect of this assumption, we repeated our analysis ofter excluding any respondent who had missing information on any **adverse childhood experience** and found no substantial difference in the results.

Because we have previously reported the graded relationship of **adverse childhood experiences** to 3 known risk factors for suicide, ie, selfreported alcoholism, illicit drug use, and depressed affect,[23,28] we used logistic models with and without controlling for these variables to assess them potential mediating role in the relationship between the ACE score and suicide attempts.
IMAGE TABLE
Table 1.

Attributable risk fractions (ARFs) were calculated by using adjusted ORs from logistic regression models based upon having had at least 1 **adverse childhood experience**, with 0 as the referent. This analysis was done because a substantial increase in the risk of attempted suicide was seen for persons reporting at least 1 **experience**. We used Levin's formula for these calculations: $ARF = P_1 (RR - 1) / 1 + P_1 (RR - 1)$,[36] where P_1 is the prevalence of an ACE score of at least 1 and RR is the OR of attempted suicide for an ACE score of at least 1.[36] The ARF is an estimate of the proportion of the health problem (eg, attempted suicide) that would not have occurred if no persons had been exposed to the risk factor being assessed.[36]

RESULTS

Characteristics of the **Study** Population

The **study** population included 9367 (54%) women and 7970 (46%) men. The mean age was 56 (SD, 15.2) years. Seventy-five percent of participants were white, 39% were college graduates, 36% had some college education, and 18%

were high school graduates. Only 7% had not graduated from high school.

Adverse Childhood Experiences

The prevalence of each **experience** and of the ACE scores is shown in TABLE 1. Sixty-four percent of respondents reported at least 1 of the 8 categories. We found no substantial difference in prevalence of **adverse childhood experiences** between waves 1 and 2, with the adjusted mean ACE score for both waves equaling 1.5.

Known Risk Factors for Suicide

The prevalence of self-reported alcoholism, illicit drug use, and depressed affect was 6.5%, 16.5%, and 28.4%, respectively. Self-reported alcoholism and illicit drug use were higher among men than women (8.9% vs 4.1% and 17.9% vs 15.3%, respectively), while depressed affect was higher among women than men (35.2% vs 20.4%). The prevalence we obtained for self-reported alcoholism (6.5%) and depressed affect (28.4%) is similar to previously reported data on alcohol dependence and depressive symptoms.[37-39] Because illicit drug use is inversely associated with age (a secular trend), we adjusted the prevalence of ever using illicit drugs to the age distribution of the US population by using 2000 census population figures (using the direct method).[40] The adjusted prevalence is substantially higher, 25.5%. Thus, the apparent low estimate (16.5%) of illicit drug use may largely be an artifact of the age structure of the **study** population.

Demographic Characteristics of Suicide Attempts

The lifetime prevalence of having at least 1 suicide attempt was 3.8% and was approximately 3 times higher for women than for men (5.4% vs 1.9%). The ageadjusted prevalence of attempted suicide decreased with increasing educational level: no high school (5.5%), high school graduate (4.7%), some college (4.2%), and college graduate (2.8%).

The risk of suicide attempt was increased 2- to 5-fold ($P<.001$) by any **adverse childhood experience**, regardless of the category (TABLE 2). Because we found no substantial differences in these risk estimates between men and women, we present the data for men and women combined (Table 2). Estimates of the OR for each of the 8 **adverse childhood experiences** were statistically significant ($P<.01$) and ranged from 1.9 (95% CI, 1.6-2.2) for parental separation or divorce to 5.0 (95% CI, 4.2-5.9) for emotional abuse (Table 2).

We used separate logistic regression models to assess the association of the ACE score, self-reported alcoholism, depressed affect, and illicit drug use to attempting suicide, with each of these exposures treated as an individual dependent variable (TABLE 3). In these individual models, we found a significant graded relationship between the ACE score and ever attempting suicide. Self-reported alcoholism, depressed affect, and illicit drug use were associated with ever attempting suicide, with a 3- to 5-fold increased risk ($P<.001$). When we simultaneously entered the

ACE score, self-reported alcoholism, depressed affect, and illicit drug use in a single (full) logistic model (Table 3), the graded relationship between the ACE score and the lifetime risk of attempted suicide remained. However, there was a slight reduction in the strength of the OR for each ACE score in the full model, suggesting a mediating role for these factors. Adding alcoholism, depressed affect, and illicit drug use to the model with the ACE score improved the fit of the model significantly $\chi^2_3 = 225.83$; P<.001).

The associations of the ACE score to **childhood**/adolescent or adult suicide attempts are presented in TABLE 4. The likelihood of **childhood**/adolescent and adult suicide attempts increased as ACE score increased. An ACE score of at least 7 increased the likelihood of **childhood**/ adolescent suicide attempts 51-fold and adult suicide attempts 30-fold (P<.001). For **childhood**/adolescent and adult suicide attempts, the addition of the known risk factors (potential mediators) improved the fit of the models ($\chi^2_3 = 235.0$, P<.001 and $\chi^2_3 = 90.8$, P<.001, respectively; data not shown).

To test for a trend (graded relationship) between the ACE score and the risk of suicide attempts, we entered ACE score as an ordinal variable into logistic models, with adjustment for the demographic covariates, for the 3 outcomes: suicide attempts during **childhood**/adolescence, attempts during adulthood, and lifetime suicide attempts. The 3 ordinal ORs are, respectively, 1.7 (95% CI, 1.5-1.8), 1.5 (95% CI, 1.4-1.6), and 1.6 (95% CI, 1.5-1.6). These results suggest that for every increase in the ACE score, the risk of suicide attempts increases by about 60%. Thus, we found strong statistical evidence of a trend; the precision in the estimate of the trend for increasing OR as the ACE score increases is high.

Attributable Risk Fraction

Because the risks for attempted suicide increased substantially beginning with an ACE score of 1, we used an ACE score of at least 1 (prevalence = 64%) to calculate ARFs. The estimated ARFs for lifetime, **childhood**/adolescent, and adult suicide attempts were 67%, 80%, and 64%, respectively.

COMMENT

We found that each of the 8 **adverse childhood experiences** increased the risk of ever attempting suicide from 2- to 5-fold. Because these **experiences** are strongly interrelated and rarely occur in isolation,[23,24,41] it is important to simultaneously consider the impact of multiple **experiences**. As the number of such **experiences** increased, the risk of ever attempting suicide, as well as attempted suicide during either **childhood**/ adolescence or adulthood, increased dramatically. Moreover, because **adverse childhood experiences** were common and strongly associated with attempted suicide, the estimated population attributable fractions were large-ranging from 64% to 80%.

To assess **adverse childhood experiences** as risk factors for suicide attempts during different life stages, we examined the association between the ACE score

and suicide attempts separately for **childhood**/adolescence and adulthood. The extraordinarily strong and graded association we report between the burden of **adverse childhood experiences** and the likelihood of **childhood**/ adolescent suicide attempts may be due to the temporal proximity of these **experiences** to the attempts and a more limited capacity of young people to cope with these stressors. These findings are supported by **studies** on abused children and adolescents at high risk for suicidal behaviors.[16,42] The immediacy of the stress and the pain of physical, emotional, or sexual abuse or witnessing domestic violence are **experiences** not easily escaped by children and adolescents, which may make suicide appear to be the only solution.

In our analysis of suicide attempts during adulthood, we can establish a temporal relationship between the exposure (**adverse childhood experiences**) and outcome, which is important because some reports suggested that determining the temporal sequence of events makes causal inferences about putative risk factors for suicide difficult.[43] Furthermore, the relationship between **adverse childhood experiences** and suicide attempts among adults demonstrates how these **childhood** exposures have a long-term impact on the risk for suicide attempt.

Multiple factors reportedly increase the risk of suicide.[44-49] Substance abuse has repeatedly been associated with suicidal behaviors, and depression has as well.[1,50-62] Moreover, previous reports from the ACE **Study** have demonstrated strong, graded relationships between the number of **adverse childhood experiences** and the risk of alcohol or illicit substance abuse and depressive disorders.[23,24,28] Although a temporal relationship between the onset of substance abuse or depressive disorders and lifetime suicide attempts in the ACE **Study** cohort is uncertain, our analysis of the potential mediating effects of these known risk factors provides evidence that for some persons, **adverse childhood experiences** play a role in the development of substance abuse or depression. In turn, these problems may partially mediate the relationship between these **experiences** and suicide attempts.

Our estimates of the ARFs are of an order of magnitude that is rarely observed in epidemiology and public health data. The current analysis suggests that approximately two thirds (67%) of suicide attempts are attributable to the types of abusive or traumatic **childhood experiences** that we **studied**. Although preventing, treating, and understanding the effects of **adverse childhood experiences** is difficult, progress in this area may substantially reduce the burden of suicide attempts.

Information from the neurosciences supports the biological plausibility of our findings. Children who experienced traumatic events are more likely to have problems with emotional and behavioral self-regulation later in life and more likely to mutilate themselves and attempt to commit or commit suicide.[14] Furthermore, the biological processes that occur when children are exposed to stressful events such as recurrent abuse or witnessing domestic violence can disrupt early development of the central nervous system, which may **adversely** affect brain functioning later in life.[63]

A potential weakness of **studies** with retrospective reporting of **childhood experiences** is that respondents may have difficulty recalling certain events. For example, longitudinal follow-up of adults whose **childhood** abuse was documented has shown that their retrospective reports of **childhood** abuse are likely to underestimate actual occurrence.[64,65] Difficulty recalling **childhood** events likely results in misclassification (classifying persons truly exposed to **adverse childhood experiences** as unexposed) that would bias our results toward the null. Thus, this potential weakness probably resulted in underestimates of the true relationships between these **experiences** and suicide attempts.[66] It is also possible that persons who report suicide attempts may have a more negative view of themselves and their past than persons not reporting suicide attempts, thus increasing the likelihood that the former may report a history of **adverse childhood experiences**. Furthermore, it is possible that other unmeasured or unknown factors could have affected the strength of our estimates (either upward or downward) of association between **adverse childhood experiences** and suicide attempts.

We did not examine the relationship between **childhood** exposure to suicidal behaviors among household members and personal suicide attempts because it was impossible to separate genetic vs environmental (experiential) contributions to the risk of suicide attempts. Additionally, the ACE survey could not include subjects who completed suicides, so our results reflect solely suicide attempts.
IMAGE TABLE
Table 2.
IMAGE TABLE
Table 3
IMAGE TABLE
Table 4.

Our data cannot provide certainty about the temporal relationship between **adverse childhood experiences** and lifetime or **childhood**/adolescent suicide attempts, because both the exposure and outcome were reported as occurring when subjects were 18 years or younger. Nonetheless, the powerful association observed between the ACE score and attempted suicide during **childhood**/adolescence merits serious consideration.

Other population-based **studies** have found prevalences of attempted suicide similar to those we report. The prevalence of lifetime suicide attempts in the present **study** was 3.8%, which is within the range reported by Moscicki et al[67] (1. MAW and the National Comorbidity Survey (4.6%).[67,68] In our cohort, women were 3 times as likely as men to report attempted suicide (5.4% vs 1.9%), which is consistent with known gender differences in suicide attempts.[69]

The prevalence of **childhood** exposures we report is nearly identical to that reported in surveys of the general population. We found that 16% of the men and 25% of the women met the case definition for contact sexual abuse; a national telephone survey of adults in 1990 conducted by Finkelhor et al[70] and using similar

criteria estimated that 16% of men and 27% of women had been sexually abused. As for physical abuse, 30% of the men from our **study** had experienced it as boys, which closely parallels the finding (31%) in a populationbased **study** of Ontario men that used questions from the same scales.71 The similarity of the estimates from the ACE **Study** to those of population-based **studies** suggests that our findings would be applicable in other settings.

In conclusion, we found that **adverse childhood experiences** dramatically increase the risk of attempting suicide. The unusually high estimates we obtained for the ARFs suggest that such **experiences** largely influence suicide attempts throughout the life span. Thus, recognition that **adverse childhood experiences** are common and frequently take place as multiple events may be the first step in preventing their occurrence; identifying and treating persons who have been affected by such **experiences** may have substantial value in our evolving efforts to prevent suicide.

REFERENCE
REFERENCES
REFERENCE
1. Department of Health and Human Services. Healthy People 2010. Washington, DC: US Government Printing Office; 1991.

2. Boxer PA, Burnett C, Swanson N. Suicide and occupation. J Occup Environ Med. 1995;37:442-452.

3. Sentell JW, Lacroix M, Sentell JV, Finstuen K. Predictive patterns of suicidal behavior. Mil Med. 1997; 162:168-171.

4. Committee on Adolescents, American Academy of Pediatrics. Suicide and suicide attempts in adolescents. Pediatrics. 2000;105:871-874.

5. Ohberg A, Lonnqvist J, Sarna S, Vuori E. Violent methods associated with high suicide mortality among the young. J Am Acad Child Adolesc Psychiatry. 1996; 35:144-153.

6. Bharucha AJ, Satlin A. Late-life suicide: a review. Harv Rev Psychiatry. 1997;5:55-65.

7. Rockett IR, Smith GS. Homicide, suicide, motor vehide crash, and fall mortality. Am J Public Health. 1989; 79:1396-1400.

8. Kaplan HI, Sadock BJ. Psychiatric emergencies. In: Kaplan HI, Sadock BJ, eds. Concise Textbook of Clinical Psychiatry. Baltimore, Md: Williams & Wilkins; 1996:361-373.
REFERENCE
9. Harwitz D, Ravizza L. Suicide and depression. Emerg Med Clin North Am. 2000;18:263-271.

10. Hughes DH. Suicide and violence assessment in psychiatry. Gen Hosp

Psychiatry. 1996;18:416-421. 11. US Public Health Service. The Surgeon General's Call to Action to Prevent Suicide. Washington, DC: US Dept of Health and Human Services; 1999.

12. Brodsky BS, Malone KM, Ellis SP, Dulit RA, Mann JJ. Characteristics of borderline personality disorder asssociated with suicidal behavior. Am J Psychiatry. 1997; 154:1715-1719.

13. Kingree JB, Thompson MP, Kaslow NJ. Risk factors for suicide attempts among low-income women with a history of alcohol problems. Addict Behav. 1999; 24:583-587.

14. van der Kolk BA, Perry JC, Herman JL. **Childhood** origins of self-destructive behavior. Am J Psychiatry. 1991;148:1665-1671.

15. Beautrais AL, Joyce PR, Mulder RT. Risk factors for serious suicide attempts among youths aged 13 through 24 years. J Am Acad Child Adolesc Psychiatry. 1996;35:1174-1182.

16. Brown J, Cohen P, Johnson JG, Smailes EM. **Childhood** abuse and neglect. J Am Acad Child Adolesc Psychiatry. 1999;38:1490-1496.
REFERENCE
17. Dinwiddie S, Heath AC, Dunne MP, et al. Early sexual abuse and lifetime psychopathology: a co-twincontrol **study**. Psychol Med. 2000;30:41 -52.

18. Farber EW, Herbert SE, Reviere SL. **Childhood** abuse and suicidality in obstetrics patients in a hospitalbased urban prenatal clinic. Gen Hosp Psychiatry. 1996; 18:56-60.

19. Lipschitz DS, Winegar RK, Nicolaou AL, Hartnick E, Wolfson M, Southwick SM. Perceived abuse and neglect as risk factors for suicidal behavior in adolescent inpatients. J New Ment Dis. 1999;187:32-39.

20. Yoder KA. Comparing suicide attempters, suicide ideators, and nonsuicidal homeless and runaway adolescents. Suicide Life Threat Behav. 1999; 29:25-36.

21. Renaud J, Brent DA, Birmaher B, Chiappetta L, Bridge J. Suicide in adolescents with disruptive disorders. J Am Acad Child Adolesc Psychiatry. 1999;38:846-851.
22. Rossow I, Lauritzen G. Shattered **childhood**: a key
REFERENCE
issue in suicidal behavior among drug addicts? Addiction. 2001;96:227-240.

23. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of **childhood** abuse and household dysfunction to many of the leading causes of death in adults. Am J Prev Med. 1998;14:245-258.

24. Anda RF, Croft JB, Felitti VJ, et al. **Adverse childhood experiences** and smoking during adolescence and adulthood. JAMA. 1999;282:1652-1658.

25. Hillis SD, Anda RF, Felitti VJ, Nordenberg D, Marchbanks P, **Adverse childhood experiences** and sexually transmitted diseases in men and women: a retrospective **study**. Pediatrics. 2000;106:El 11.

26. Dietz PM, Spitz AM, Anda RF, et al. Unintended pregnancy among adult women exposed to abuse or household dysfunction during their **childhood**. JAMA. 1999;282:1359-1364.

27. Anda RF, Felitti VJ, Chapman DP, et al. Abused boys, battered mothers, and male involvement in teen pregnancy. Pediatrics. 2001;107:E19.

28. Dube SR, Anda RF, Felitti VJ, Edwards VJ, Croft JB. **Adverse childhood experiences** and personal alcohol abuse as an adult. Addict Behav. In press.

29. Edwards VJ, Anda RF, Nordenberg DF, et al. Bias assessment for child abuse survey. Child Abuse Negl. 2001;25:307-312.

30. Straus M, Gelles RJ. Physical Violence in American Families. New Brunswick, NJ: Transaction Press; 1990. 31. Wyatt GE. The sexual abuse of Afro-American and white American women in **childhood**. Child Abuse Negl. 1985;9:507-519.

32. Schoenborn CA. Exposure to Alcoholism in the Family: United States, 1988. Hyattsville, Md: National Center for Health Statistics; 1995. Publication Pl-Ic q Qr - 1 Ron
REFERENCE
33: Burnam MA, Wells KB, Leake B, Landsverk J. Development of a brief screening instrument for detecting depressive disorders. Med Care. 1988;26:775-789.

34. Ninth Special Report to the US Congress on Alcohol and Health. Rockville, Md: US Dept of Health and Human Services; 1997.

35. Clark W. Some comments on methods. In: Clark WB, Hilton ME, eds. Alcohol in America: Drinking Practices and Problems. Albany: State University of New York Press; 1991:19-25.

36. Haddix AC, Teutsch SM, Shaeffer PA, Dunet DO. Prevention Effectiveness. New York, NY: Oxford University Press; 1996.

37. Helzer JE, Burnam A, McEvoy LT. Alcohol abuse and dependence. In: Robins LN, Regier DA, eds. Psychiatric Disorders in America. New York, NY: Free Press; 1991:81-115.

38. Nagel R, Lynch D, Tamburrino M. Validity of the medical outcomes **study** depression screener in family practice training centers and community settings. Fam Med. 1998;30:362-365.

39. Zung WW, Broadhead WE, Roth ME. Prevalence of depressive symptoms in

primary care. J Fam Pract. 1993;37:337-344.

40. Klein RJ, Schoenborn CA. Age Adjustment Using the 2000 Projected U.S. Population. Hyattsville Md: National Center for Health Statistics; 2001. Publication PHS 2001-1237.
REFERENCE
41. Finkelhor D. Improving research, policy, and practice to understand child sexual abuse. JAMA. 1998; 280:1855-1862.

42. Kaplan SJ, Pelcovitz D, Salzinger S, et al. Adolescent physical abuse and risk for suicidal behaviors. J Interpersonal Violence. 1999;14:976-988.

43. Wagner BM. Family risk factors for child and adolescent suicidal behavior. Psychol Bull. 1997; 121:246298.

44. Roy A, Segal NL, Centerwall BS, Robinette CD. Suicide in twins. Arch Gen Psychiatry. 1991;48:29-32. 45. Statham DJ, Heath AC, Madden PA, et al. Suicidal behaviour. Psychol Med. 1998;28:839-855. 46. Turecki G, Briere R, Dewar K, et al. Prediction of level of serotonin 2A receptor binding by serotonin
REFERENCE
receptor 2A genetic variation in postmortem brain samples from subjects who did or did not commit suicide. Am J Psychiatry. 1999;156:1456-1458.

47. Hollis C. Depression, family environment, and adolescent suicidal behavior. J Am Acad Child Adolesc Psychiatry. 1996;35:622-630.

48. Neeleman J, Halpern D, Leon D, Lewis G. Tolerance of suicide, religion and suicide rates. Psychol Med. 1997;27:1165-1171.

49. Sundqvist-Stensman UB. Suicides in close connection with psychiatric care. Acta Psychiatr Scand. 1987;76:15-20.

50. Alexopoulos GS, Bruce ML, Hull J, Sirey JA, Kakuma T. Clinical determinants of suicidal ideation and behavior in geriatric depression. Arch Gen Psychiatry. 1999;56:1048-1053.
REFERENCE
51. Callahan CM, Hendrie HC, Nienaber NA, Tierney WM. Suicidal ideation among older primary care patients. J Am Geriatr Soc. 1996;44:1205-1209. 52. Rao U, Weissman MM, Martin JA, Hammond RW. **Childhood** depression and risk of suicide. J Am Acad Child Adolesc Psychiatry. 1993;32:21-27.

53. Fombonne E. Suicidal behaviours in vulnerable adolescents. Br J Psychiatry. 1998;173:154-159.

54. Garrison CZ, McKeown RE, Valois RF, Vincent ML. Aggression, substance use, and suicidal behaviors in high school students. Am J Public Health. 1993;83: 179-184.

55. Grant BF, Hasin DS. Suicidal ideation among the United States drinking population. J Stud Alcohol. 1999;60:422-429.

56. Oyefeso A, Ghodse H, Clancy C, Corkery JM. Suicide among drug addicts in the U.K. BrJ Psychiatry. 1999;175:277-282.

57. Pages KP, Russo JE, Roy-Byrne PP, Ries RK, Cowley DS. Determinants of suicidal ideation. J Clin Psychiatry. 1997;58:510-515.

58. Rivara FP, Mueller BA, Somes G, et al. Alcohol and illicit drug abuse and the risk of violent death in the home. JAMA. 1997;278:569-575.

59. Brent DA, Perper JA, Allman CJ. Alcohol, firearms, and suicide among youth. JAMA. 1987;257: 3369-3372.
REFERENCE
60. Borges G, Walters EE, Kessler RC. Associations of substance use, abuse, and dependence with subsequent suicidal behavior. Am J Epidemiol. 2000;151:781-789.
61. Blair-West GW, Mellsop GW, Eyeson-Annan ML. Down-rating lifetime suicide risk in major depression. Acta Psychiatr Scand. 1997;95:259-263.

62. Blair-West GW, Cantor CH, Mellsop GW, et al. Lifetime suicide risk in major depression: sex and age determinants. J Affect Disord. 1999;55:171-178. 63. Perry BD, Pollard R. Homeostasis, stress, trauma, and adaptations neurodevelopmental view of **childhood** trauma. Child Adolesc Psychiatr Clin North Am. 1998;7:33-51.

64. Femina DD, Yeager CA, Lewis DO. Child abuse. Child Abuse Negl. 1990;14:227-231.

65. Williams LM. Recovered memories of abuse in women with documented child sexual victimization histories. J Trauma Stress. 1995;8:649-673.

66. Rothman KJ. Modern Epidemiology. Boston, Mass: Little Brown; 1986.

67. Moscicki EK. Identification of suicide risk factors using epidemiologic **studies**. Psychiatr Clin North Am. 1997;20:499-517.

68. Kessler RC, Borges G, Walters EE. Prevalence and risk factors for lifetime suicide attempts in the National Comorbidity Survey. Arch Gen Psychiatry. 1999; 56:617-626.
REFERENCE
69. Moscicki EK. Gender differences in completed and attempted suicides. Ann Epidemiol. 1994;152:152-158. 70. Finkelhor D, Hotaling G, Lewis IA, Smith C. Sexual abuse in a national survey of adult men and women. Child Abuse Negl. 1990;14:19-28.

71. MacMillan HL, Fleming JE, Trocme N, et al. Prevalence of child physical and sexual abuse in the community. JAMA. 1997;278:131-135.
AUTHOR_AFFILIATION

Author Affiliations are listed at the end of this article.

Corresponding Author and Reprints: Shanta R. Dube, MPH, Centers for Disease Control and Prevention,
AUTHOR_AFFILIATION
National Center for Chronic Disease Prevention and Health Promotion, Division of Adult and Community Health, 4770 Buford Hwy NE, MS K-45, Atlanta, GA 30341-3717 (e-mail: skd7@cdc.gov).
AUTHOR_AFFILIATION
Author Affiliations: National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Ga (Ms Dube and Drs Anda, Chapman, Williamson, and Giles); and the Department of Preventive Medicine, Southern California Permanente Medical Group (**Kaiser** Permanente), San Diego (Dr Felitti).