

# Adverse Childhood Experiences and Smoking During Adolescence and Adulthood

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**T**HE DRAMATIC RATE OF DECLINE in the prevalence of cigarette smoking among US adults that took place over the past 30 years has slowed and nearly come to a halt.<sup>1,2</sup> Furthermore, past declines in smoking among US adolescents have actually reversed during the 1990s,<sup>1,3</sup> and about two thirds of US adults who have ever smoked regularly have tried smoking by the age of 18 years.<sup>4</sup> These recent disturbing trends in smoking have occurred amidst efforts to reduce access to cigarettes and counter the effects of tobacco marketing, parent and sibling smoking, and peer pressure to smoke.<sup>4-9</sup> Some of this reversal may also be due to exorbitant advertising and promotion expenditures,<sup>10</sup> especially for brands that appeal to youth,<sup>11</sup> and increasing exposure to tobacco in the media.<sup>12</sup> However, we have an incomplete understanding of the reasons for this reversal. Further insight into the basic underlying factors that lead to smoking during adolescence and adulthood, be they depression,<sup>13-16</sup> anxiety,<sup>17</sup> or social and developmental<sup>18</sup> impairments, are needed.

We used data from the Adverse Childhood Experiences (ACE) Study<sup>19</sup> to estimate the strength of the relationship between adverse childhood experi-

**Context** In recent years, smoking among adolescents has increased and the decline of adult smoking has slowed to nearly a halt; new insights into tobacco dependency are needed to correct this situation. Long-term use of nicotine has been linked with self-medicating efforts to cope with negative emotional, neurobiological, and social effects of adverse childhood experiences.

**Objective** To assess the relationship between adverse childhood experiences and 5 smoking behaviors.

**Design** The ACE Study, a retrospective cohort survey including smoking and exposure to 8 categories of adverse childhood experiences (emotional, physical, and sexual abuse; a battered mother; parental separation or divorce; and growing up with a substance-abusing, mentally ill, or incarcerated household member), conducted from August to November 1995 and January to March 1996.

**Setting** A primary care clinic for adult members of a large health maintenance organization in San Diego, Calif.

**Participants** A total of 9215 adults (4958 women and 4257 men with mean [SD] ages of 55.3 [15.7] and 58.1 [14.5] years, respectively) who responded to a survey questionnaire, which was mailed to all patients 1 week after a clinic visit.

**Main Outcome Measures** Smoking initiation by age 14 years or after age 18 years, and status as ever, current, or heavy smoker.

**Results** At least 1 of 8 categories of adverse childhood experiences was reported by 63% of respondents. After adjusting for age, sex, race, and education, each category showed an increased risk for each smoking behavior, and these risks were comparable for each category of adverse childhood experiences. Compared with those reporting no adverse childhood experiences, persons reporting 5 or more categories had substantially higher risks of early smoking initiation (odds ratio [OR], 5.4; 95% confidence interval [CI], 4.1-7.1), ever smoking (OR, 3.1; 95% CI, 2.6-3.8), current smoking (OR, 2.1; 95% CI, 1.6-2.7), and heavy smoking (OR, 2.8; 95% CI, 1.9-4.2). Each relationship between smoking behavior and the number of adverse childhood experiences was strong and graded ( $P < .001$ ). For any given number of adverse childhood experiences, recent problems with depressed affect were more common among smokers than among nonsmokers.

**Conclusions** Smoking was strongly associated with adverse childhood experiences. Primary prevention of adverse childhood experiences and improved treatment of exposed children could reduce smoking among both adolescents and adults.

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ences and 5 smoking behaviors: early smoking initiation, smoking initiation as an adult, ever smoking, current smoking, and heavy smoking. The adverse childhood experiences included the following: emotional, physical, and sexual abuse; a battered mother; parental separation or divorce; and growing up with substance-abusing, mentally ill, or in-

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carcerated household members. We included these childhood exposures because they can have a detrimental effect on a child's emotional and social development and behavior,<sup>20,21</sup> are common,<sup>19,22-24</sup> frequently co-occur,<sup>19</sup> and represent health or social problems of national importance.

## METHODS

### Study Population

This portion of the ACE Study is a retrospective cohort study analysis designed to assess the effect of specific adverse childhood experiences on adult health behaviors associated with the leading causes of morbidity and mortality in the United States.<sup>19</sup> The study is being conducted among adult members of the Kaiser Permanente health maintenance organization in San Diego, Calif. Each year, more than 45 000 adult members undergo a standardized biopsychosocial medical examination at a primary care clinic; 81% of Kaiser Permanente members in San Diego, aged 25 years or older, who were continuously enrolled between 1992 and 1995, have been evaluated at this clinic.

All 13 494 Kaiser Health Plan members who completed standardized medical evaluations at the clinic in August through November 1995 or January through March 1996 were eligible to participate in the ACE Study. Members examined during December 1995 were not included because survey response rates are lower during this holiday period.<sup>25</sup> One week after the clinic visit, these members were mailed a study questionnaire about health behaviors and adverse childhood experiences. Questions from several disciplines were used in the study questionnaire.<sup>22,23,26-28</sup> Questionnaires were returned by 9508 people (70.5%). Response rates did not differ by sex, education, cigarette smoking behavior, or history of childhood sexual abuse as recorded in the clinic's medical record; however, respondents were slightly older (56.7 years vs 49.3 years) and more likely to be white (84% vs 75%) than were nonrespondents.

We excluded 51 respondents with missing information about race, 34 with

missing information about educational attainment, and 208 with incomplete information about smoking behaviors. Thus, the final study cohort included 97% of the respondents (9215/9508).

The ACE Study was approved by the institutional review boards of the Southern California Permanente Medical Group, Emory University, and the Office of Protection From Research Risks, National Institutes of Health.

### Definitions of Adverse Childhood Experiences

All questions about adverse childhood experiences pertained to the respondents' first 18 years of life. For questions from the Conflict Tactics Scale (CTS),<sup>26</sup> the response categories were as follows: never, once or twice, sometimes, often, or very often.

**Verbal Abuse.** Verbal abuse was determined from answers to the following 2 questions from the CTS<sup>26</sup>: (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 threaten to hit you or throw something at you, but didn't do it?" Responses of "often" or "very often" to either item defined verbal abuse during childhood.

**Physical Abuse.** Two questions from the CTS were used to describe childhood physical abuse<sup>26</sup>: "Sometimes parents or other adults hurt children. While you were growing up, that is, in your first 18 years of life, 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?" Potential responses included never, once or twice, sometimes, often, or very often. A respondent was defined as being physically abused if the response was either "often" or "very often" to the first question or "sometimes," "often," or "very often" to the second.

**Sexual Abuse.** Four questions from Wyatt<sup>27</sup> 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 1 of the 4 questions defined a respondent as having experienced contact sexual abuse during childhood.

**Battered Mother.** We used 4 questions from the CTS<sup>26</sup> to define childhood exposure to a battered mother. The questions were preceded by the following question: "Sometimes physical blows occur between parents. While you were growing up in your first 18 years of life, 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 at least 1 of the first 2 questions or any response other than "never" to at least 1 of the third and fourth questions defined a respondent as having had a battered mother.

**Household Substance Abuse.** Two questions asked whether the respondent, during his or her childhood, lived with a problem drinker or alcoholic<sup>24</sup> or anyone who used street drugs. An affirmative response to either question indicated childhood exposure to substance abuse in the household.

**Mental Illness in Household.** A respondent who said that during his or her childhood, anyone was depressed or mentally ill or that anyone in the household had attempted suicide was considered to have been exposed to mental illness in the household.

**Parental Separation or Divorce.** This was defined as a "yes" response to the

**Table 1.** Selected Characteristics of the Study Population and Prevalence of Adverse Childhood Experiences (ACEs): Kaiser Permanente, San Diego, Calif, 1995-1996

Characteristic	Women, % (n = 4958)	Men, % (n = 4257)
History of parental smoking	67.8	68.8
Early smoking initiation	6.0	13.4
Current smoking status		
Never smoked	59.8	40.5
Former smoker	31.5	50.3
Current smoker	8.8	9.0
ACEs		
Emotional abuse	13.9	7.2
Physical abuse	28.6	31.7
Sexual abuse	24.4	14.9
Battered mother	13.2	11.0
Household substance abuse	27.8	22.0
Mental illness in household	20.8	14.9
Parental separation or divorce	22.9	21.1
Incarcerated household member	3.4	3.3
ACEs, No.		
0	36.4	38.5
1	23.8	28.1
2	15.1	16.4
3	10.2	8.5
4	7.0	4.9
≥5	7.5	3.7

question, "Were your parents ever separated or divorced?"

**Incarcerated Household Members.** If anyone in the household had gone to prison during the respondent's childhood, this was defined as having childhood exposure to a household member who was incarcerated.

### Definition of Smoking Behaviors

We used the following standardized definitions for smoking behaviors<sup>28,29</sup>: *early smoking initiation* as regularly smoking cigarettes by 14 years of age; *ever smoked* as having smoked at least 100 cigarettes; smoking at the time of the survey as *current smokers*; and *heavy smoking* as currently smoking 20 or more cigarettes per day. We also assessed smoking initiation at age 19 years or older to assess adult smoking initiation to provide a subgroup of persons among

whom we were certain that all adverse childhood experiences antedated smoking initiation. Respondents who reported that either parent smoked during the respondent's childhood were considered to have a history of parental smoking.

Because we hypothesized that the relationship between current smoking and adverse childhood experiences may be a result of the use of nicotine to "self-medicate" affective disorders with the psychoactive actions of nicotine,<sup>30</sup> we assessed the relationship between adverse childhood experiences, current smoking, and depression during the past year. We used a question from the Diagnostic Interview Schedule<sup>31</sup> to assess recent problems with depressed affect: "Have you felt depressed or sad much of the time in the past year?"

### Statistical Analyses

Persons with incomplete information about an adverse childhood experience were considered not to have had that experience. This would likely result in conservative estimates of the relationships between adverse childhood experiences as persons who had potentially been exposed to an experience would always be misclassified as unexposed; this type of misclassification would bias our results toward the null.<sup>32</sup> However, to assess this potential effect, we repeated our analyses after excluding any respondent with missing information on any one of the adverse childhood experiences.

Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were obtained from logistic regression models that assessed the associations between each category of adverse childhood experience and smoking behaviors. The number of adverse childhood experiences was summed for each respondent (range, 0-8); analyses were repeated with the summed score as an ordinal variable (0, 1, 2, 3, 4, or ≥5) or as 5 dichotomous variables (yes/no) with 0 experiences as the referent. Covariates in all models included age, sex, race (other vs white), and education (high school diploma, some col-

lege, or college graduate vs less than high school).

To assess whether the relationship between the adverse childhood experiences and smoking behaviors was explained primarily by either the genetic or role-modeling influences of parental smoking or substance abuse (alcohol or illicit drugs) in household members, we repeated separate logistic models stratified by the presence or absence of a history of parental smoking and the presence or absence of substance abuse in the household.

## RESULTS

### Characteristics of Study Population

The study population included 4958 women and 4257 men. The mean (SD) age was 55.3 (15.7) years for women and 58.1 (14.5) years for men. Seventy-seven percent of women and 81% of men were white; 37% of women and 48% of men were college graduates; and another 33% of women and 30% of men had some college education.

Nearly 70% of respondents reported a history of parental smoking (TABLE 1). Early smoking initiation was more common among men; the prevalence of current smoking was similar for women and men (Table 1). Because our study population is better educated and older than the general population and the prevalence of smoking tends to be lower in these groups, we adjusted for differences in the demographics of our study population (educational attainment, age, sex, and race) and the population of California using the 1995 census. The adjusted prevalence of current smoking was 14.4% in the study sample, which is similar to the estimate of 15.5% for the prevalence of current smoking for all California residents in 1995<sup>33</sup>; thus, the apparently low prevalence of smoking in the study population can be accounted for by its demographic characteristics.

With the exception of physical abuse, women were more likely than men to report each category of adverse childhood experience (Table 1). Sixty-three percent of women and men reported at least 1 category of adverse childhood experience.

**Table 2.** Prevalence of Reporting of Additional Categories of Adverse Childhood Experiences (ACEs) Among Respondents Who Reported Exposure to a First Category of ACE

First Category of ACE	No. Reporting First Category	% Reporting Additional Categories of ACEs								Any 1 Additional Category	Any 2 Additional Categories
		Emotional Abuse	Physical Abuse	Sexual Abuse	Battered Mother	Substance Abuse	Mental Illness	Separation or Divorce	Household Member Incarcerated		
Childhood abuse											
Emotional abuse	998	...	81	44	38	50	48	39	9	97	84
Physical abuse	2784	29	...	32	25	36	29	29	6	75	51
Sexual abuse	1840	24	48	...	22	39	31	34	6	88	75
Household exposures											
Battered mother	1120	34	62	36	...	58	36	50	10	94	79
Substance abuse	2313	22	43	31	28	...	32	39	8	80	66
Mental illness	1668	29	48	34	24	48	...	37	8	83	61
Parental separation or divorce	2034	19	38	30	27	44	30	...	8	78	54
Incarcerated household member	311	28	51	37	36	61	41	52	...	93	76
Median (range)		28 (19-34)	48 (38-81)	34 (30-44)	27 (22-38)	48 (36-61)	32 (29-48)	39 (29-52)	8 (6-10)	85.5 (75-97)	70.5 (51-84)

### The Interrelatedness of Adverse Childhood Experiences

If a respondent was exposed to one of the adverse childhood experiences, the probability of exposure to any other category of adverse childhood experience was increased substantially (TABLE 2). The median probability of exposure to any additional category given exposure to a first was 85.5%; for any 2 additional categories, the median probability was 70.5%.

### Associations Between Adverse Childhood Experiences and Smoking Behaviors

The strengths of the relationships between each of the categories of adverse childhood experiences with smoking initiation and current smoking behavior were comparable (TABLE 3). All categories of adverse childhood experiences were also significantly associated with ever smoking and heavy smoking ( $P < .05$ ; data not shown).

The relationship between the frequency of exposure to emotional abuse, physical abuse, and maternal battery and early smoking initiation and current smoking using the questions about the least severe forms of abuse or violence from the CTS<sup>26</sup> showed a positive graded relationship between the frequency of exposure to these forms of violence and the prevalence of these behaviors ( $P < .001$ ; data not shown).

**Table 3.** Association Between Categories of Adverse Childhood Experiences (ACEs) and the Likelihood of Selected Smoking Behaviors: Kaiser Permanente, San Diego, Calif, 1995-1996\*

Category of ACE	Early Smoking Initiation		Current Smoking	
	Prevalence, %	OR (95% CI)	Prevalence, %	OR (95% CI)
Verbal abuse				
No	8.6	1.0 (referent)	8.2	1.0 (referent)
Yes	16.1	2.3 (1.9-2.8)	14.4	1.6 (1.3-2.0)
Physical abuse				
No	7.4	1.0 (referent)	8.0	1.0 (referent)
Yes	14.2	2.0 (1.7-2.3)	11.1	1.3 (1.1-1.5)
Sexual abuse				
No	8.4	1.0 (referent)	8.2	1.0 (referent)
Yes	13.5	2.0 (1.7-2.3)	11.7	1.4 (1.2-1.6)
Battered mother				
No	8.9	1.0 (referent)	8.2	1.0 (referent)
Yes	13.6	1.7 (1.4-2.0)	14.4	1.6 (1.3-2.0)
Household substance abuse				
No	7.9	1.0 (referent)	7.4	1.0 (referent)
Yes	14.1	1.9 (1.6-2.2)	13.4	1.5 (1.3-1.8)
Mentally ill household member				
No	8.6	1.0 (referent)	8.3	1.0 (referent)
Yes	13.4	1.7 (1.4-2.0)	11.5	1.3 (1.1-1.5)
Parental separation or divorce				
No	8.0	1.0 (referent)	7.9	1.0 (referent)
Yes	14.2	1.8 (1.5-2.1)	12.4	1.3 (1.1-1.6)
Incarcerated household member				
No	9.1	1.0 (referent)	8.7	1.0 (referent)
Yes	18.0	2.1 (1.6-2.9)	14.8	1.3 (1.0-1.9)

\*Each logistic regression analysis adjusted for sex, age, race, and education. OR indicates odds ratio; CI, confidence interval.

We performed a separate analysis in which we used a more conservative definition of sexual abuse (abuse that occurred by 14 years of age or younger) and excluded respondents whose age of initiation was earlier than the age at which

the sexual abuse first occurred. In this analysis, the prevalence of early smoking initiation was 25.1% for persons who had been sexually abused and 8.7% for those who had not (adjusted OR, 3.9; 95% CI, 3.2-4.7); the prevalence of cur-

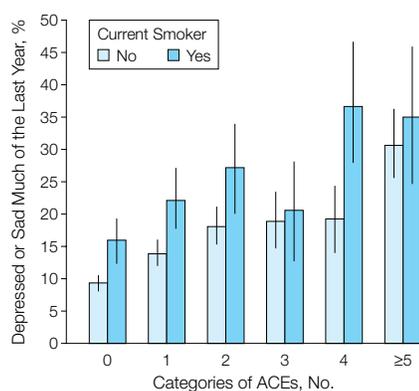
**Table 4.** Association Between Number of Categories of Adverse Childhood Experiences (ACEs) and the Prevalence and Risk of Selected

Categories of ACEs, No.	Early Smoking Initiation		Initiated Smoking After Age 18 y		Ever Smoked	
	Prevalence, %	OR (95% CI)	Prevalence, %	OR (95% CI)†	Prevalence, %	OR (95% CI)
0	5.5	1.0 (referent)	24.4	1.0 (referent)	42.4	1.0 (referent)
1	8.7	1.6 (1.3-2.0)	27.8	1.2 (1.0-1.3)	49.0	1.4 (1.2-1.5)
2	11.5	2.2 (1.7-2.7)	30.0	1.3 (1.1-1.6)	52.0	1.7 (1.5-1.9)
3	12.8	2.7 (2.1-3.4)	32.8	1.6 (1.3-2.0)	54.5	2.0 (1.7-2.4)
4	15.4	3.5 (2.6-4.6)	33.7	1.7 (1.3-2.2)	57.3	2.5 (2.0-3.0)
≥5	21.1	5.4 (4.1-7.1)	31.4	1.6 (1.2-2.2)	60.4	3.1 (2.6-3.8)

\*Logistic regression analyses include sex, age, race, and education; *P* value for the linear trend <.001 for all smoking behaviors. OR indicates odds ratio; CI, confidence interval.

†Persons who began smoking by 18 years of age were excluded from this analysis.

‡Defined as smoking at least 1 pack of cigarettes per day (20 cigarettes per pack); lighter smokers were excluded from this analysis.

**Figure.** Relationship Between Depressed Affect in the Past Year and Current Smoking by Number of Adverse Childhood Experiences (ACEs)

Percentages adjusted for age, sex, race, and education; vertical bars represent 95% confidence intervals.

rent smoking for those respondents who had been sexually abused was 14.4% and 8.2% for those who had not (adjusted OR, 2.7; 95% CI, 2.2-3.3).

Because the strength of the relationships between each of the adverse childhood experiences and the smoking behaviors were comparable, we used a simple additive approach to categorize the number of adverse childhood experiences. We found strong graded relationships between the number of categories of adverse childhood experiences and each smoking behavior ( $P < .001$ ) (TABLE 4). The relationship between the number of categories of adverse childhood experiences and smoking behaviors in logistic models that were stratified by either a history of parental smoking or household sub-

stance abuse were similar in each stratum (data not shown). When we repeated the analyses in Table 4 after excluding any person with missing information about an adverse childhood experience, we found similar, strong, graded relationships between adverse childhood experiences and each smoking behavior (data not shown).

The mean age of initiation among ever smokers for those with no adverse childhood experiences was 20.9 years, whereas for those with all 8 experiences, the mean age was 17.3 years. The relationship between age at initiation and number of adverse childhood experiences was inverse and strongly graded (from 0 through 8 categories, ages were 20.9, 19.3, 19.0, 19.4, 18.6, 18.5, 17.4, 17.5, and 17.3 years, respectively;  $P < .001$ ; multiple linear regression).

We assessed the possibility that changing trends in social forces and knowledge about the risks of smoking may have affected the relationship between adverse childhood experiences and smoking behaviors. To do this, we performed 2 birth cohort analyses. The first analysis divided the subjects into those born during 1902 and 1939 and those born between 1940 and 1979. We chose these cohorts because those born during World War II or later were unlikely to have been influenced by rationing of cigarettes by the armed forces and also lived with increasingly intense pressures not to smoke or to quit. The second birth cohort analysis divided the subjects into those born between 1902 and 1959 and 1960 and 1976; the younger birth cohort grew up

after the surgeon general's warning against smoking and also faced intense social pressures not to smoke. In both analyses, in the younger birth cohorts the associations between adverse childhood experiences and each smoking behavior tended to be stronger (data not shown).

The percentage of persons who reported feeling depressed or sad much of the time in the past year increased as the number of adverse childhood experiences increased. Furthermore, for any given number of adverse childhood experiences, the percentage of respondents reporting problems with depressed affect was always higher among smokers than among nonsmokers (FIGURE).

## COMMENT

To our knowledge, this is the first study to assess the relationship between a full range of common and interrelated adverse childhood experiences and smoking behaviors. Few studies have assessed the association between childhood abuse and smoking among adults<sup>34-36</sup> or adolescents.<sup>37-39</sup> Some studies have found associations of childhood abuse with substance and alcohol abuse but only marginal associations with cigarette smoking.<sup>37,38</sup> We found that the relationship between the number of categories of adverse childhood experiences and each of the smoking behaviors is strong and cumulative.

The associations that we report were similar when we stratified our analyses by a history of parental smoking and household substance abuse. Thus, the relationship between adverse child-

Smoking Behaviors, Kaiser Permanente, San Diego, Calif, 1995-1996\*

Current Smoker		Heavy Smoker	
Prevalence, %	OR (95% CI)	Prevalence, %	OR (95% CI)‡
6.2	1.0 (referent)	2.5	1.0 (referent)
8.2	1.3 (1.0-1.5)	2.9	1.1 (0.8-1.5)
8.8	1.3 (1.0-1.6)	3.3	1.2 (0.8-1.7)
13.0	1.9 (1.5-2.4)	6.0	2.3 (1.6-3.3)
16.0	2.2 (1.7-3.0)	7.9	3.0 (2.0-4.4)
16.0	2.1 (1.6-2.7)	7.9	2.8 (1.9-4.2)

hood experiences and smoking behaviors does not appear to be mediated primarily by genetic influences<sup>40-43</sup> from, or modeling of smoking by, parents who were smokers, alcoholics, or illicit drug abusers. However, there may be unmeasured genetic components to the relationships between adverse childhood experiences and smoking.<sup>43</sup>

Some of the exposures we studied, such as to household substance abuse, seem to play a causal role in the occurrence of other exposures. Our data indicate that if a person reports one of these adverse childhood experiences, there is an 85% chance of experiencing a second, and a 70% chance of experiencing a third. In light of these data, the historical tendency to focus on the effects of single types of adverse childhood experience such as childhood sexual abuse and the small number of studies that assessed the impact of more than 1 type of abuse may be limiting.<sup>44-49</sup> This tendency leads to underestimation of the full exposure burden and hence to underestimating the importance of adverse childhood experiences to important health and social outcomes. Nonetheless, future analyses of the ACE Study data are planned and data from other studies will be important to understand the relationship of specific adverse childhood experiences to health outcomes.

Sexual abuse that occurred by 14 years of age and antedated age of smoking initiation was associated with a 4-fold increase in smoking initiation. For adult smoking behaviors, including smoking initiation at age 19 years or older, current smoking, and heavy

smoking, we could be certain that the childhood experiences antedated the smoking behavior. Our data showing that the mean age at smoking initiation was inversely related to the number of adverse childhood experiences provide further support for a causal relationship between adverse childhood experiences and smoking initiation.

We now come to a crucial question posed by our findings: How might persons exposed to childhood adversity benefit from the use of nicotine? Nicotine has demonstrable psychoactive benefits in the regulation of affect<sup>50</sup>; therefore, persons exposed to adverse childhood experiences may benefit from using nicotine to regulate their mood.<sup>30,50,51</sup> For such persons, attempts to quit may remove nicotine as their pharmacological coping device for the negative emotional, neurobiological, and social effects of adverse childhood experiences. That is, nicotine appears to be a sufficiently effective psychoactive agent that unconscious selection of its recurrent use could occur in situations of chronic distress. This hypothesis is supported by our data showing a strong, graded relationship between past-year depression, and that for any given number of adverse childhood experiences, current smokers were always more likely to have problems with depression.

Experiments with animals have shown that experiences that would be considered adverse for human children are more likely to lead to self-administration of nicotine<sup>52</sup> and other drugs.<sup>53</sup> Since young children are dependent on their parents or other house-

hold members for their survival, the aversive stimuli they experience in abusive, violent, or dysfunctional households are as inescapable as those administered to animals in laboratory settings.

Because of the negative biological and emotional impact of adverse childhood experiences, children who experience them may be victims on 4 levels. First, they are victims of abuse, violence, and other dysfunction in their households. Second, because of resulting problems with affect, socialization, and self-esteem they may be more likely to fall prey to both peer pressure and the seductive marketing practices of the tobacco industry, which spent \$5.1 billion in tobacco promotion and advertising in 1996.<sup>10</sup> Third, many states have passed legislation that fines or criminalizes children for the purchase, possession, or use of tobacco.<sup>54</sup> The number of states with such legislation increased from 32 in 1995 to 41 in 1998; the current maximum state penalty for minors is a fine of up to \$1000, and it is possible for fines to minors to exceed the fines to retailers who sell tobacco to them (unpublished data, Centers for Disease Control and Prevention, Office on Smoking and Health, State Tobacco Activities Tracking and Evaluation System [STATE], 1998). Although some form of negative consequences for youth who purchase or possess tobacco might be useful, the effectiveness of current state sanctions is unproven and, in some cases, seem excessive. For youths whose smoking may be a consequence of adverse childhood experiences, they are victimized a third time by legislation that fines or criminalizes them for responding to cigarette advertising and, perhaps, finding that nicotine provides pharmacological relief from the effects of adverse childhood experiences. Finally, as adults they are likely to become victims of diseases caused by smoking.<sup>55</sup>

Because adverse childhood experiences are common and strongly associated with smoking initiation, preventing their occurrence<sup>56</sup> and early identification and treatment of children exposed to them may reduce smoking initiation among adolescents. Current

smokers who consciously or unconsciously use nicotine as a pharmacological tool to alleviate the long-term emotional and psycho-biological wounds of adverse childhood experiences may need special assistance to help them quit. Such assistance includes recognition of the use of nicotine to modulate problems with affect, treatment of the residua of these adverse childhood experiences, and the use of nicotine replacement therapy<sup>57</sup> or antidepressant medications.<sup>58</sup> These efforts could contribute substantially to the reestablishment of the historical downward trends in smoking initiation and smoking prevalence in the United States.

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