

Are Smokers with Alcohol Disorders Less Likely to Quit?

ABSTRACT

Objectives. This study examined the likelihood of smoking cessation in smokers with a prior history of alcoholism.

Methods. Data came from an epidemiologic study of 1007 young adults, randomly selected from those insured in a large health maintenance organization (HMO) in southeast Michigan. Cox proportional hazards models with time-dependent covariates were used to estimate the hazards ratios of quitting in smokers with current and past alcoholism, with smokers with no history of alcoholism as a reference. Sex, race, and education were controlled.

Results. Smokers with active alcoholism in the preceding year were 60% less likely to quit than were smokers with no history of alcoholism. In contrast, smokers whose alcoholism had remitted were at least as likely to quit as smokers with no history of alcoholism. Compared with persistent alcoholism, remission of alcoholism was associated with more than a threefold increase in the likelihood of subsequent smoking cessation.

Conclusions. The findings suggest that discontinuation of alcoholism might increase the potential for successful smoking cessation. (*Am J Public Health*. 1996;86:985-990)

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Introduction

Clinical and epidemiological studies have reported a strong relationship between smoking and drinking.¹⁻⁷ Despite the consistent evidence that the use of alcohol and the use of tobacco are correlated, there is little information from general population studies on how changes in one behavior are related to changes in the other. Clinical studies have suggested a relationship between recovery from alcoholism and smoking cessation.^{8,9} In a population-based study, Carmelli et al.,⁴ examined the relationship between smoking and drinking over time. They reported that smoking cessation was followed by increased consumption of alcohol. The relationship between change in alcohol consumption and subsequent smoking behavior was not examined. In another population-based survey, the lifetime association between alcohol abuse or dependence and quitting or cutting down on smoking was investigated.¹⁰ The authors suggested that lifetime history of alcohol abuse or dependence might be associated with a reduced lifetime rate of quitting smoking. In women, the results were not statistically significant, and in men the negative association between alcoholism and smoking cessation or cutting down was of borderline significance. The analysis did not take into account the temporal order between the onset of alcohol disorder and smoking cessation and did not examine whether smokers whose alcoholism had remitted differed from smokers with active alcoholism with respect to the likelihood of quitting smoking or cutting down.¹⁰

In this study, we examine the potential for smoking cessation in smokers with a prior history of alcohol use disorder. The following questions were addressed:

(1) Is history of alcohol abuse or dependence associated with a decreased likelihood of smoking cessation? (2) Do smokers whose alcohol abuse or dependence has remitted differ from those whose alcohol abuse or dependence has persisted, with respect to the likelihood of subsequent smoking cessation? The relationship between history of alcohol abuse or dependence and smoking cessation was investigated in an epidemiologic study of young adults and was estimated in a multiple survival analytic model that took into account the time of change in alcohol abuse or dependence in relation to smoking cessation.

Methods

A random sample of 1200 was selected from all 21- to 30-year-old members of a 400 000-member health maintenance organization (HMO) in southeast Michigan. The HMO serves the tri-county area of Wayne, Oakland, and Macomb, which contains 91% of the 4.3 million of the Detroit primary metropolitan statistical area. A total of 1007 respondents, 84%

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This paper was accepted January 26, 1996.

of the sample, were interviewed at their homes in 1989. Twenty-two percent of the respondents lived in the city of Detroit at the time of the interview, while the remaining respondents resided in other parts of the tri-county area. The median age of the respondents was 26 years; 61.7% were female; 80.7% were White; 45% were married; and 29.3% were college graduates. Follow-up interviews at the respondent's homes were conducted in 1992, 3.5 years after baseline, with 979 (97%) of the sample.

The National Institute of Mental Health (NIMH) Diagnostic Interview Schedule-Revised (DIS-III-R),¹¹ which covers diagnoses outlined in the revised third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R),¹² was used to gather information on the history of substance use disorders. Data on the precision and accuracy of the previous version of the DIS have been reported elsewhere.¹³⁻¹⁵ The history of lifetime disorders was ascertained at baseline, and the interval history, covering the 3.5 years since baseline, was ascertained at follow-up. In addition to the history of DSM-III-R substance use disorders, the DIS inquires about age at the onset of daily smoking and age at last cigarette, as well as onset and offset of alcohol abuse or disorder.

Definitions

Smoking was defined as ever having smoked daily for 1 month or more. *Smoking cessation* was defined as having smoked last at least 1 year before the time of the last interview. Because most relapses occur within the first year after quitting, the definition captures successful quitting. *Time of quitting* was defined as the year when the last cigarette was smoked. *Alcohol abuse or disorder* was defined according to DSM-III-R criteria for psychoactive substance use disorder. The DSM-III-R definition reflects current consensus in the field of addiction on the cardinal features of substance use disorder. At the core of the category is the construct of dependence, defined as a cognitive, behavioral, and physiological cluster that characterizes compulsive use of all substances. *Alcohol dependence* is defined as the presence of three or more dependence symptoms from a list of nine symptoms. If dependence criteria are not met, *alcohol abuse* is defined as continued use of alcohol despite the knowledge of health, psychological, or social problems caused by the substance or the recurrent use of alcohol in situations in which its use

is hazardous. *Remission* is defined as having no symptoms of alcohol disorder for 1 year or more.

Statistical Analysis

The analysis of smoking cessation was performed on the *combined* data from the baseline and follow-up interviews of the subset of young adults who had smoked daily for a month or more at any time in their life. Baseline interviews covered lifetime history, including age of onset and offset of alcohol use disorder and smoking cessation, up to the time of the interview. Follow-up interviews covered the 3.5-year interval since the baseline interview. Combining follow-up data with baseline data provided lifetime information on smoking and drinking behaviors up to age 33, the upper age limit at follow-up. Discrete Cox-proportional hazards models for censored survival data were used to estimate the hazards ratios of quitting smoking associated with prior status of alcohol use disorder, which was defined as a time-dependent covariate.¹⁶⁻¹⁹ The censored subjects were smokers who had continued to smoke during the year preceding the last interview. Because the period during which cessation could have occurred started when daily smoking began, time to quitting was defined as the number of years since the onset of daily smoking until the year when the last cigarette was smoked or the year of censoring.

Two Cox proportional hazards models were calculated. The first model calculated the hazards ratio of quitting in smokers with a prior history of alcohol abuse or dependence, as compared with smokers with no prior history of alcohol abuse or dependence. History of alcohol abuse or dependence was coded as a time-dependent covariate, which takes into account the age at onset of alcohol abuse or dependence relative to the time of quitting tobacco. Sex, race, and education were included as fixed covariates. In the second model, which also controlled for sex, race, and education, two hazards ratios were calculated, using smokers with no prior history of alcohol abuse or dependence as a reference: (1) the hazards ratio of quitting in smokers whose alcohol abuse or dependence had remitted prior to quitting tobacco and (2) the hazards ratio of quitting in smokers whose alcohol abuse or dependence symptoms were active during the preceding year, compared with smokers with no prior history of alcohol abuse or dependence. In this model as well, alcohol abuse or

dependence status was coded as a time-dependent covariate. In separate analyses, interactions between the key independent variables were tested. No significant interactions were detected. The advantage of the discrete Cox-proportional hazards models with time-dependent covariates is that they permit us to take into account the status of alcohol disorder in relation to the time of smoking cessation.

We estimated the cumulative incidence curves of smoking cessation according to smokers' status of alcohol abuse or dependence in the year preceding the time of smoking cessation. These curves differ from the standard Kaplan-Meier survival curves in that the grouping variable, alcohol abuse or dependence, is treated as a time-dependent covariate, as opposed to a fixed covariate. That is, a smoker's status of alcohol abuse or dependence is not "fixed" at the time that daily smoking began, but can change from "no alcohol abuse or dependence" to "onset of alcohol abuse or dependence" and then to "remitted" at any year since daily smoking began until the year of smoking cessation or censoring. The estimation procedure for the curves allows group membership to change over time.

In an additional analysis, using the same statistical approach, we estimated the reverse relationship, that is, the relationship between smoking status and subsequent remission of alcohol abuse or dependence.

Results

Sociodemographic Factors in Smoking

Table 1 presents the prevalence proportions of smoking, defined as having ever smoked daily for a month or more, by sex, race, and education. Sex differences in smoking were slight and not significant. Whites were significantly more likely to have ever smoked than Blacks. A graded relationship was found between level of education and smoking, with persons who completed college showing a sharply lower lifetime prevalence of smoking, compared with persons with lower education.

Drinking Behaviors Associated with Smoking

The lifetime prevalence proportions of a range of drinking behaviors in smokers and nonsmokers appear in Table 2. Odds ratios (OR) and 95% confidence intervals (CI) are included as measures of

TABLE 1—Lifetime Smoking among 1007 Young Adults, by Sex, Race, and Education

	% Smokers
Sex	
Male (n = 388)	39.4
Female (n = 619)	43.8
Race^a	
White (n = 813)	44.3
Black (n = 194)	33.0
Education^b	
< high school (n = 26)	69.2
High school (n = 184)	59.8
13–15 y (n = 413)	49.6
16+ y (n = 384)	23.7

Note. The numbers on which the percentages are based appear in parentheses.

^aRace differences in smoking: $\chi^2 = 8.19$; $P = .004$.

^bDifferences in smoking across education levels: $\chi^2 = 99.42$ (3df); $P < .0001$.

the associations between individual drinking behaviors and smoking. Whereas having ever drunk at least once a month for a period of 6 months or more was very common, and was reported by 84% of the sample, smokers were significantly more likely to have reported it than nonsmokers. The lifetime prevalence of alcohol abuse or dependence was significantly higher in smokers than nonsmokers, 38.0% vs 16.3%, respectively. Smoking was also observed to be associated with unusually heavy drinking: smokers were far more likely than nonsmokers to report having four or more drinks daily for 2 weeks and seven or more drinks daily for 2 weeks.

Smoking Cessation and History of Alcohol Disorder

Of 424 persons who have ever smoked daily for a month or more, 145 had quit and did not smoke for 1 year or more before the last interview. Estimated in a Cox-proportional hazards model, with alcohol abuse or dependence as a time-dependent covariate, and sex, race, and education as fixed covariates, the hazards ratio for quitting in smokers with a history of alcohol abuse or dependence vs those with no history of alcohol disorder was 0.68 (95% CI = 0.46, 1.01). (Results not shown.) In addition, smoking cessation did not vary significantly by sex or race, but smokers with less than college education were less likely than college-educated smokers to quit (hazards ratio [HR] = 0.37, 95% CI = 0.26, 0.52). (Maximum

TABLE 2—Drinking Behaviors in Smokers and Nonsmokers: Lifetime Associations

	Smokers (n = 424), %	Nonsmokers (n = 583), %	OR (95% CI)	P
Drank ≥ 1 drink per month for ≥ 6 mo	91.3	78.6	2.8 (1.9, 4.2)	<.0001
Alcohol abuse/dependence ≥ 4 drinks daily/2 wk	38.0	16.3	3.1 (2.3, 4.2)	<.0001
≥ 7 drinks daily/2 wk	13.9	4.8	3.2 (2.0, 5.1)	<.0001
	10.1	2.6	4.3 (2.3, 7.8)	<.0001

Note. OR = odds ratio; CI = confidence interval.

TABLE 3—Hazards Ratios for Smoking Cessation in 424 Young Adults, by History of Alcohol Abuse or Dependence, Sex, Race, and Education

	Hazards Ratio for Quitting	95% CI	P
History of alcohol abuse or dependence			
Continuing	.40	.23, .70	.001
Remitted	1.46	.87, 2.46	.150
Never	1.00
Sex			
Female	.90	.63, 1.28	.555
Male	1.00
Race			
White	.81	.49, 1.31	.385
Black	1.00
Education			
< college	.36	.25, .52	.0001
College	1.00

Note. CI = confidence interval. Maximum likelihood $\chi^2 = 44.49$ (5df); $P = .0001$.

likelihood chi-square for the model = 31.14 (4df); $P = .0001$.) The finding that smokers with a preexisting history of alcohol abuse and dependence were slightly less likely to quit provides only a gross picture of the way in which alcohol disorder might influence the potential for smoking cessation, as it does not distinguish between smokers whose alcohol disorder was in remittance and smokers whose alcohol disorder persisted during the preceding year. The second step in this analysis examined this distinction.

Smoking Cessation and History of Alcohol Disorder: Separating Remitted from Persistent Alcohol Use Disorder

Of the 161 smokers with a history of alcohol abuse or dependence (38% of all smokers), 98 had been classified as remitted on the basis of having no symptoms 1 or more years before the time of the last interview. (This is the total number of remitted cases; the age of remittance of

alcohol abuse or dependence in relation to smoking cessation was not taken into account. The analysis below focuses on remittance of alcohol abuse or dependence in relation to the time of smoking cessation.) Whereas only a minority of those who had remitted (21%) abstained from alcohol, most of those who had not abstained, 86%, had no episodes of heavy drinking for 1 or more years preceding the last interview. Table 3 presents the results of an expanded Cox-proportional hazards model in which alcohol abuse or dependence was classified as remitted or persistent according to the time of the last symptom in relation to smoking cessation. Smokers with remission of alcohol disorder had a greater likelihood of subsequent smoking cessation than smokers with no history of alcohol abuse or dependence. The hazards ratio of quitting in smokers whose alcohol abuse or dependence had remitted was not significantly different from the reference group of smokers with

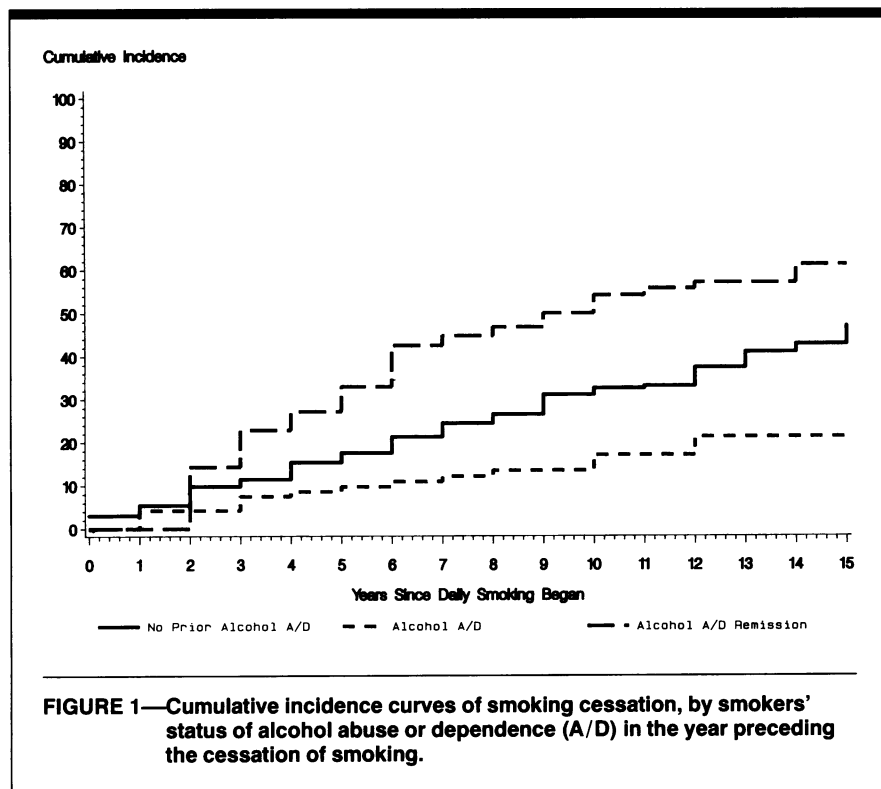


FIGURE 1—Cumulative incidence curves of smoking cessation, by smokers' status of alcohol abuse or dependence (A/D) in the year preceding the cessation of smoking.

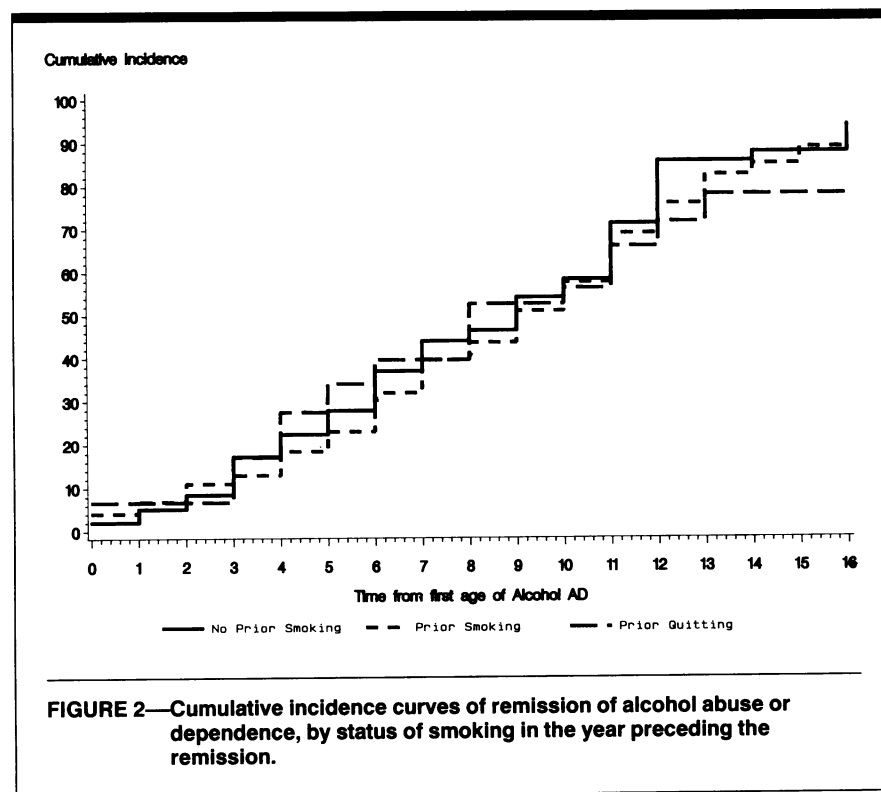


FIGURE 2—Cumulative incidence curves of remission of alcohol abuse or dependence, by status of smoking in the year preceding the remission.

To illustrate these results more clearly, we present in Figure 1 the cumulative incidence curves of smoking cessation by alcohol abuse or dependence status in the year preceding smoking cessation. Beginning at 3 years after smoking began and continuing up to the time of the last interview, the cumulative percentage of smoking cessation was highest if alcohol abuse or dependence had remitted in the preceding year (or earlier) and lowest if alcohol abuse or dependence symptoms continued and were active in the preceding year.

Additional Analysis: Remittance of Alcohol Abuse or Dependence following Smoking Cessation

In an additional discrete Cox-proportional hazards analysis with time-dependent covariates, we estimated the relationship between smoking cessation and subsequent remittance of alcohol abuse or dependence in the subset of 256 with lifetime alcohol disorder. With sex, race, and education controlled for, smoking cessation signaled a decrease in the likelihood of subsequent remission of alcohol abuse or dependence, with those with alcohol abuse or dependence but no history of smoking used as reference (HR = 0.55, 95% CI = 0.30, 1.01, P = 0.054). Furthermore, no significant difference in the likelihood of alcohol abuse or dependence remission was detected between alcoholics who had continued to smoke during the preceding year and those who had quit for 1 year or more (HR = 0.72, 95% CI = 0.40, 1.29, P = 0.27). These results are in sharp contrast with the observation that the remission of alcohol abuse and dependence was associated with an increased likelihood of subsequent smoking cessation.

Figure 2 presents the cumulative incidence curves of remission of alcohol abuse or dependence by smoking status in the preceding year. As can be seen, having quit smoking in the preceding year (or before) conferred no advantage on the likelihood of remission of alcohol abuse or dependence.

Discussion

The key findings of this study were as follows. (1) Smokers with active alcohol abuse or dependence in the preceding year were 60% less likely to quit, as compared with smokers with no history of alcohol abuse or dependence. (2) In contrast, smokers whose alcohol disorder

no prior history of alcohol disorder. In sharp contrast, smokers with symptoms of alcohol abuse or dependence in the preceding year were nearly 60% less likely to quit than smokers with no history of alcohol disorder (HR = 0.40, 95% CI =

0.23, 0.76). The hazards ratio of quitting in smokers whose alcohol abuse or dependence had remitted, as compared with smokers with continuing alcohol abuse or dependence was 3.62 (95% CI = 1.81, 7.24).

had remitted were at least as likely to quit as smokers with no history of alcohol abuse or dependence. (3) In comparison with persistent alcohol abuse or dependence, remission of alcohol abuse or dependence was associated with more than a threefold increase in the likelihood of subsequent smoking cessation. (4) Additional analysis that focused on the consequences of smoking cessation for change in alcohol abuse or dependence did not detect significant associations in the reverse direction.

Because most of the data were gathered retrospectively at baseline, the possibility of recall errors cannot be dismissed, even in this sample of young adults. It should, however, be emphasized that the plausibility that a correlated reporting bias might account for the results is considerably diminished by the finding that the relationship between change in alcoholism and change in smoking applied only in one direction. Other limitations should be noted. The sample consists of young adults, and thus the findings might not apply to older persons. While the age limitation restricts the generalizability of the findings, it provides the methodological advantage that the findings are less likely to be biased by selective mortality or by recall errors regarding historical information on smoking and drinking than if older adults were included. Continued follow-up of the respondents as they age will provide information on changes in the 4th decade of life.

Drawn from a list of members of a large health maintenance organization (HMO), the sample represents the population of this age in the geographic area, excluding the extremes of the socioeconomic range. Available reports on HMO populations indicate that the members generally represent the population of the geographic area, except that they are slightly more educated and healthier.^{20,21} On indicators of general health and health behaviors, that is, ratings of self-assessed health, prevalence of cigarette smoking, and alcohol and cocaine use, our sample resembles the late 1980s US population of comparable age, as described in national reports.^{22,23}

To our knowledge, this is the first epidemiologic study to examine smoking cessation in smokers with alcoholism that takes into account the status of alcohol disorder in relation to the time when smoking cessation occurred. The findings indicate that the likelihood of quitting in smokers with a history of alcoholism

hinges on whether their alcoholism was active or had remitted. While the evidence suggests a temporal link in the persistence or discontinuity of smoking and alcohol abuse or dependence, the link appears to be one-sided. Specifically, the remission of alcohol abuse or dependence increased the chances of smoking cessation, but the reverse was not observed. Moreover, the findings on smoking cessation and subsequent change in alcohol abuse or dependence suggest the possibility of a small *decrease* in the likelihood of remission after the cessation of smoking. The findings warn against the notion that there might be a single rule governing changes in the use of multiple drugs over time.

It should be noted that the relationship between a history of alcoholism and smoking cessation was exposed in an analytic method that takes into account change in alcohol abuse or dependence in relation to the time when smoking cessation occurred. A previous report by Covey et al.,¹⁰ in which the status of alcoholism in relation to the time of smoking cessation was not taken into account, found only weak evidence for an association between alcoholism and smoking cessation.

Two behavioral sequences in smokers with a history of alcohol abuse or dependence were uncovered in this analysis. The first is the decreased likelihood of quitting tobacco in smokers whose alcohol abuse or dependence had continued, and the second is the increased likelihood of quitting tobacco in smokers whose alcohol abuse or dependence had remitted. The first observation suggests that alcohol abuse or dependence might inhibit smoking cessation. The second observation suggests that the remission of alcohol abuse or dependence (which in most cases was associated with discontinuation of heavy drinking if not complete abstinence) might enhance the chances of smoking cessation, or at least might place smokers with a past history of alcohol abuse or dependence at no disadvantage compared with smokers with no history of alcohol abuse or dependence. These observations are consistent with results from experimental studies that demonstrated that alcohol potentiates tobacco consumption.²⁴⁻²⁷ The experimental findings would predict that a reduction in the potentiation of smoking following the remission of alcohol abuse or dependence might facilitate smoking cessation, a prediction borne out in our findings. There are no analogous experiments on whether

or not smoking potentiates alcohol consumption²⁷; thus, the interpretation of our finding that smoking cessation had little effect on the remission of alcohol abuse or dependence is uninformed by experimental data.

Alternative explanations of the observed relationship between the status of alcohol abuse or dependence and subsequent smoking cessation might include the possibility that discontinuation of the compulsive use of one substance has a reinforcing effect on the motivation to discontinue the compulsive use of the other substance. However, the observed asymmetry in the discontinuation of smoking and alcohol disorder weakens the plausibility of this explanation.

Although our data are observational, describing the natural course of smoking cessation in the general population, the findings have implications for treatment programs for alcohol and tobacco. The evidence suggests that the continued use of alcohol at levels sufficient to produce the type of problems that characterize alcohol abuse or dependence are likely to diminish the potential for successful smoking cessation. The remission of alcohol problems might enhance the potential for successful smoking cessation, so that smokers whose alcohol disorder has remitted might be at no disadvantage relative to smokers who have never had an alcohol disorder. □

Acknowledgment

This research was supported by grant MH-48802 from the National Institute of Mental Health, Bethesda, Md (Dr Breslau).

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Conference on Psychosocial and Behavioral Factors in Women's Health to Be Held in September

The American Psychological Association will host a conference on "Behavioral Factors in Women's Health: Research, Prevention, Treatment, and Service Delivery in Clinical and Community Settings" at the Renaissance Hotel in Washington, DC, September 19 through 21, 1996. Continuing education workshops will be held on September 18, 1996.

Conference topics will include sociocultural influences on health; health promotion and disease prevention; psychosocial and emotional issues; health-care resource information trans-

fer; systems and structures for women's health care; and health services delivery.

Registration fees postmarked on or before August 1, 1996, are \$225 for attendees and presenters and \$95 for students. After this date, regular registration is \$275 and \$125 for students. For additional information and registration materials contact the Women's Health Conference, American Psychological Association, Women's Programs Office, 750 First St, NE, Washington, DC 20002-4242; tel (202) 336-6070; fax (202) 336-6117; e-mail whc.apa@email.apa.org.