Alcoholism and Income: The Role of Indirect Effects

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SEVERAL STUDIES HAVE SHOWN THAT ALCOHOL ABUSE and dependence impose large costs on society and that lost productivity constitutes a substantial portion of these costs (see Rice et al. 1990). However, the effects of alcohol abuse and dependence on one aspect of productivity, income, can be underestimated unless the impact of indirect effects is considered. This aspect can be overlooked because many studies analyze the effect of an individual's alcoholism on income when controlling for other personal characteristics such as education and marital status (for an early study, see Berry and Boland [1977]). Yet it is the effect of alcoholism on these other factors that may have the greatest negative effect on an individual's income. That is, had an individual not become an alcoholic, he or she might have been financially successful; instead the person lives modestly, sometimes in debt, because his or her alcoholism has interfered with educational attainment, establishment of a successful marriage, and other factors that would have increased the likelihood of success. This simplistic vignette suggests that the effects of alcoholism on income operate via indirect avenues.

The full impact of alcoholism on income incorporates both direct and indirect effects. Indirect effects occur via pathways like education and marital status. The direct effect is observed when controlling for these pathways. The total effect is the sum of the two. Many studies of the im-

pact of alcoholism estimate only the direct effect: the effect of alcoholism on earnings when factors possibly affected by alcoholism, such as education, are controlled for. Controlling for these factors allows the researcher to focus on the direct effects, but leads potentially to underestimates of the full impact because the indirect effects are not considered.

Since the necessary data on dimensions of alcoholism during the course of individuals' lives were not heretofore available, the indirect effects of the costs of alcoholism were once difficult to study. However, the data from the National Institute of Mental Health (NIMH) Epidemiologic Catchment Area (ECA) survey permit examination of the direct and indirect effects in a large population-based sample. The ECA is particularly suited to our study because it contains lifetime indicators of alcoholism symptoms. Measures of early onset of alcoholism, combined with information on labor market outcomes and parental background, allow study of the effects of alcoholism on education and marital status as well as on income. Because alcoholism can be a chronic, lifetime disorder, and because we hypothesize that the effects of alcoholism may be cumulative over time as well as contemporaneous, the life-cycle information contained in the ECA sample is essential to our study. The ECA data can thus help disentangle the direct and indirect effects of alcoholism on earnings.

The focus on indirect effects is important because a finding that they are significant in reducing income would imply that even if alcoholism itself could be "cured," negative effects on earnings that stem, for example, from reduced educational attainment, would still persist. This in turn would buttress arguments in support of more early intervention and focus attention not only on the adverse effects of current symptoms, but also on the mechanisms by which the indirect effects occur. When only the direct effects of alcoholism are examined, the full impact of the condition on earnings is underestimated, which in turn, understates the "costs" of alcoholism. This potential bias is important because estimates of the "costs" of alcoholism are used to support increased expenditures in the area of research, prevention, and treatment in the alcoholism field (Mullahy and Sindelar 1990).

In the next section, we discuss in detail our data set and sampling methods. We then consider the econometric specification of the models that describe the direct and indirect effects of alcoholism on income, followed by a presentation of the empirical results. We conclude with a discussion of the findings and of unresolved issues.

Data and Sampling Criteria

The empirical analysis conducted in this study is based on data from Wave I of the New Haven site of the NIMH ECA survey of noninstitutionalized individuals 18 years old and older. (For details of the ECA survey, see Eaton and Kessler [1985], Reiger et al. [1984], and Robins et al. [1981]). The survey was designed to assess the distribution of mental disorders, including alcoholism, in a community setting. The ECA data set is particularly well suited for studying alcoholism because it combines, in a large population-based sample, measures of alcoholism with data on labor force participation and income, as well as current socioeconomic and demographic characteristics. Moreover, the ECA data set contains information on father's occupation and education, which allows the researcher to control, to some extent, for family background. Of the five survey sites we only use data from the New Haven site because of its suitability for our data requirements; it has better data on labor force participation, and it allows us access to the Wave II data on father's education and occupation.

Assessment of alcohol abuse and dependence, or "alcoholism," as we have loosely termed it, in the ECA is achieved through a professionally designed survey instrument, the Diagnostic Interview Schedule (DIS). Diagnosis by this instrument allows assessment of alcoholism for the general population. Use of a general population mitigates the potential for the self-selection problem whereby only individuals who seek treatment can be determined to suffer from alcoholism. Also, although the responses to the DIS are self-reported and thus suffer from the attendant problems, the self-reporting biases are likely to be less than were an individual asked to reply to the question, "Are you an alcoholic?" Another strength of these data is that, in addition to diagnosing current alcoholism, a lifetime diagnosis is assessed, which allows analysis of life-cycle phenomena. Lifetime diagnosis, however, may suffer from recall bias, and the algorithm for diagnosis is such that, for the lifetime case, the symptoms do not have to occur contemporaneously.

Between 1980 and 1981, Wave I of the New Haven survey was completed, yielding 5,034 observations, a 77.6 percent completion rate. The New Haven standard metropolitan statistical area (SMSA) was (approximately) the catchment area sampled. This area comprises 13 towns with a total adult population of 420,000. Two coordinated groups were sampled: (1) all adults (18+), and (2) individuals 65 and over. From the

5,034 observations in Wave I, we initially limit our attention to males aged 22 to 64 for most of our analysis, but use a higher truncation of age 25 to analyze educational attainment in order to restrict the focus to individuals who were more likely to have completed their education. The upper truncation of 64 years is selected in order generally to exclude retirees and thus avoid the possibly confounding relation between high earning power (wealth) and a relatively high probability of being retired. Given the oversampling of the elderly at the New Haven site, this restriction reduced our sample size considerably.

For the income regressions only, we further restrict our sample to males aged 30 to 59. In previous analyses (Mullahy and Sindelar 1993), we tested to determine whether individuals in all age groups could be pooled in income regressions and found significant differences among the older, younger, and middle-aged groups. We investigated this issue on the grounds that the impact of alcoholism on income might differ at younger and older ages. For example, in youth, alcoholism might increase the propensity to work part time while attending school or to drop out of school and work. In either case, alcoholism would be associated with an increased income. The same may be true at older ages when alcoholic persons may be less able to retire early because they have not accumulated sufficient pensions and wealth to do so. We focus here on the middle-aged group because this is the age group of males who are most committed to the labor market.

This study of the relation between alcoholism and income is confined to males only. (For more on gender differences and alcohol, see Mullahy and Sindelar [1991].) We do this not only because males have a much greater propensity to suffer from alcoholism than females, but also because they participate in the labor force at a greater rate than females. In addition, there is a large body of accumulated knowledge regarding the specification of income and earnings models for males. Because information on parental education and occupation is important in our analysis, we exclude observations for which these data are missing. Because these data on parental characteristics come from Wave II, and because there is some attrition between the waves, the requirement that parental data be available reduces the estimation sample size even further. Note that a comparison between Wave I and Wave II of the means and standard deviations of their variables indicates that very similar responses exist across the waves, despite the attrition. As a result of imposing these selection criteria, we are left with a sample of 561 observations for the analysis of

income, and a smaller sample of observations as a basis for analyzing educational outcomes and marital status. For both education and marital status, we use the information from Wave II on father's education and occupation, which reduces the sample size. For estimates of educational attainment, we use the subsample of individuals aged 25 to 64 to increase the probability that individuals had completed their education (Mullahy and Sindelar 1989).

Table 1 describes the dependent and independent variables; the sample descriptive statistics are displayed in table 2. Although these tables are largely self-explanatory, it is appropriate to discuss some specific issues that arise in the variable definitions.

First, the DIS is used to assess alcohol abuse and dependence, and it is designed to be consistent with the American Psychiatric Association's (1980) DSM–III criteria for diagnoses of mental disorders. Whereas the DIS establishes symptoms for a large number of disorders, we focus on

TABLE 1
Variable Definitions

Variable	Definition
INCOME	Personal income/$1,000
NOWMARRY	Dummy: 1 if individual is now married, 0 if else
DISRUPT	Dummy: 1 if individual is currently divorced or separated, 0 if else
EDUC	Years of completed schooling
LNEDUC	Natural log of EDUC
ALCYOUNG	Dummy: 1 if ever met DSM–III(R) criteria for alcohol abuse and dependence, and had earliest symptoms beyond age 22, 0 if else
AGE	Age in years
QAGE	AGE squared
WHITE	Dummy: 1 if white, 0 if race nonwhite
EGPH	Dummy: 1 if self-reported physical health is excellent or good, 0 if self-reported physical health is fair or poor
OTHERINC	Other family members' income, measured as the greater of zero or household income minus personal income (in thousands)
EDFATH	Years of schooling of individual's father or head of household
WCFATH	Dummy: 1 if individual's father or head of household worked in white-collar job, 0 if else

TABLE 2
Sample Descriptive Statistics

Variable	Mean	S.D.	Minimum	Maximum
INCOME	19.38	12.61	0.5	60.0
NOWMARRY	0.68	—[a]	0.0	1.0
DISRUPT	0.11	—	0.0	1.0
EDUC	13.46	2.93	2.0	17.0
ALCYOUNG	.14	—	0.0	1.0
ALCLE18	0.08	—	0.0	1.0
ALC1922	0.06	—	0.0	1.0
AGE	39.68	12.70	22.0	64.0
QAGE	1736.4	1090.40	484.0	4096.0
WHITE	0.86	—	0.0	1.0
EGPH	0.88	—	0.0	1.0
OTHERINC	5.58	8.84	0.0	58.5
EDFATH[b]	10.70	8.84	0.0	17.0
WCFATH[b]	0.25	0.43	0.0	1.0

[a] Standard deviations not reported for dummy variables.
[b] The means refer to the 897 males aged 22–64, except for these two variables (EDFATH and WCFATH), which are calculated on a sample size of 621. The smaller sample size occurs because these variables come from Wave II and there was some attrition between the waves.

alcohol abuse and dependence. We use as our "alcoholism" variable the category of alcohol abuse and dependence combined; we do not examine the effects of abuse and dependence separately.

The DSM–III criteria were used in formulating the diagnosis of alcoholism for the ECA data. However, the DSM–III(R) criteria represented a fundamental change in the definition that, for our purposes, offered an improvement; it eliminated from the diagnostic criteria symptoms related, for example, to trouble at school or work that is due to alcohol. The advantage to us is that the DSM–III(R) criteria are more likely to be determined independently from estimates of income and education. Thus, we recalculated the diagnosis of alcohol abuse and dependence, dropping the job- and school-related questions. Although we anticipated that this modification could be important, in fact the diagnosis of alcohol abuse and dependence (grouped together as "alcoholism") was not changed for any individual.

We create a measure of alcoholism that helps to capture the life-cycle aspect of the symptoms of alcoholism. We formulate a measure of alcoholism that indicates early onset. ALCYOUNG indicates, for those who meet the criteria for alcoholism sometime during the lifetime, whether the individual had his first symptoms at or by age 22. We use this binary indicator because the occurrence of symptoms before age 22 is unlikely to be plagued by the reverse causalities — for example, alcoholism reducing income, and low productivity and earnings causing alcoholism — that could enter into an analysis of income and alcoholism.

Several issues concerning the disorder measures should be noted. First, the data on disorders are not self-reported in the sense of individuals being asked directly, for example, "Do you suffer from alcoholism?"; rather, an indirect method (the DIS), using a battery of diagnostic questions for each disorder, is applied to ascertain the diagnoses of both current and past disorders. Nonetheless, the input information for the DIS is provided by the respondent. Accordingly, the responses to these questions may involve some recall and self-report bias. Note, however, that the reliability and validity of the DIS-based diagnoses for alcoholism and other disorders have been analyzed in the ECA data set (see Robins et al. [1981]; Helzer et al. [1985a,b]; Anthony et al. [1985]; and Shrout, Spitzer, and Fleiss [1987]), revealing that alcoholism has one of the better chance-corrected degrees of agreement between the DIS disorder and diagnoses by psychiatrists. Second, severity is not measured. Further, onset of the first symptom does not necessarily correspond to onset of the disorder itself; however, it may be somewhat predictive of who will develop the disorder early, thus serving the required purpose.

The education and income variables are created using interval midpoints. That is, we use the midpoints of the categories to create a continuous variable. For education, 17 years was used to fill in the open-ended upper interval: "grad school." Income is more accurately described as individual income, and consists of both labor income and other income "brought into" the household by the individual. For this measure, 500 was used to fill in the bottom interval, "less than $1,000," and 60,000 was used to fill in the upper open-ended interval of "over $50,000." Other family members' income indicates all family income that was not "brought in" by the individual under observation, which means that it incorporates other family members' earnings as well as capital income that is not specifically attributable to the individual under observation.

Empirical Approach and Results

Statistical Methods

We take two approaches in investigating the role of indirect effects. The first is to estimate a model of income as a function of alcoholism using only a small set of relevant exogenous variables; then we add to the regression those variables that we hypothesize are also relevant but are the possible pathways of the indirect effect. A decline in the magnitude and significance of alcoholism with the addition of the second set of variables would indicate that part of the effect of alcoholism in the first case is being captured by these variables. These variables, we hypothesize, are also likely to be affected by alcoholism. The second set of variables includes educational attainment, marital status, physical health, and income from other family members.

The second approach is to estimate directly whether some of these potentially endogenous variables are significantly associated with alcoholism. We focus on education and marital status. A finding that marital status and education are significantly related to alcoholism also would support the idea that alcoholism has indirect as well as direct effects. The first method gives us a quantitative estimate of the role of indirect effects; the second method focuses more on the mechanisms of the indirect effects.

In all of the estimations we maintain, for the purposes of this study, that alcoholism is an exogenous explanatory variable, that is, we use it as an independent variable assuming that it is determined apart from the issues we are studying. Although what we are really measuring is an association, our approach in essence assumes that alcoholism has a causal role in, for instance, educational attainment. For example, an interpretation of a negative and significant association of alcoholism symptoms prior to age 22 with education would be that onset of alcoholism results in lower educational attainment. We use this as the maintained hypothesis. We realize, however, that causality could at least in part run in the reverse direction, that is, failure at school could cause problem drinking, or that both less education and problems with drinking could be caused by a third factor.

Results

Income.   We estimate income as a function of the labor market variables that are typically used in similar regressions (see Mincer [1974] for

a classic empirical study of this genre). We use a logarithmic transformation of the income variable because the distribution of income over a population is skewed and the log-transformation makes the distribution conform more closely to a normal distribution. Our set of exogenous variables used in column 1 of table 3 is a parsimonious set because we believe that few variables are truly exogenous to the income–alcohol relationship. In addition to the alcohol indicator, our estimation uses the following variables: age, age squared, and a race indicator (white). These are defined in table 1. The means, standard deviations, and the maximums and minimums are presented in table 2. In our specification, the

TABLE 3
Personal Income Estimated for Individuals[a]

	Column				
Variable	1	2	3	4	5
ALCYOUNG	−.246*	−.238*	−.169	−.152	−.155
	(2.06)	(2.02)	(1.54)	(1.42)	(1.46)
AGE	.107*	.087*	.108**	.099**	.092*
	(2.50)	(2.10)	(2.79)	(2.61)	(2.47)
QAGE	−.001*	−.001*	−.001**	−.001*	−.001*
	(2.44)	(2.10)	(2.61)	(2.38)	(2.26)
WHITE	.574**	.534**	.335**	.296**	.266**
	(4.83)	(4.57)	(3.03)	(2.78)	(2.47)
NOWMARRY		.466**	.516**	.513**	.551**
		(4.32)	(5.16)	(5.35)	(6.02)
DISRUPT		.204	.224	.252	.254*
		(1.34)	(1.62)	(1.88)	(2.30)
EDUC			.079**	.070**	.072**
			(7.24)	(6.62)	(7.03)
EGPH				.428**	.430**
				(2.84)	(4.41)
OTHERINC					−.017**
					(4.23)
INTERCEPT	.149	.287	−1.240	−1.324	−1.102
	(.166)	(.327)	(1.48)	(1.63)	(1.356)
No. of observations	555	555	555	555	555
R^2	.09	.13	.21	.21	.24

[a] Ordinary least squares; natural loss of income.
* $p < .05$. ** $p < .01$.

age-squared term is used because in income equations age often has such nonlinear effects. Column 1 of table 3 contains only those variables that we maintain to be exogenous.

In columns 2–5 we add four variables that we suspect may be transmitting indirect effects of alcoholism to income. First, in column 2, we add our set of indicators of marital status (NOWMARRY and DISRUPT). Sequentially, in columns 3–5, we add educational attainment, physical health, and income derived from other family members. The hypothesis is that alcoholism will appear to have a larger and more significant effect in the first column, compared with the second and third, because in the first case alcoholism captures not only the direct effect but also whatever indirect effects might otherwise operate through those variables possibly correlated with alcoholism.

The results support the hypotheses of indirect effects. When only the first set of variables is included (column 1), alcoholism has a negative and significant coefficient. This corresponds to the standard intuition that alcoholism depresses income. However, when the variables that may be affected by alcoholism are added (marital status, education, physical health, and income brought into the household by other family members), the coefficient estimate on alcoholism becomes insignificant at standard levels, and the magnitude is substantially reduced. Furthermore, the coefficient on alcoholism in column 5 is significantly different from that in column 1.

By adding these variables sequentially, we learn that each additional entry affects the coefficient on alcoholism in the same direction, that is, their inclusion reduces the magnitude of the effect. That education and marital status are affected by alcoholism is consistent with these results. When these (and other family members' income and physical health) are excluded from the regression, the coefficient on alcoholism picks up the full effect, but when education and marital status are added, they too acquire some of the adverse effects of alcoholism. Other family members' income and physical health could play similar roles because they may be correlated with alcoholism in a variety of ways. The number, age, and hours worked of other family members living with the alcoholic could, for example, be affected by the individual's alcoholism. Physical health is likely to be adversely affected by heavy consumption of alcohol.

It thus seems that alcoholism affects income through the routes of education and marital status and also through other family members' income and physical health. We henceforth focus primarily on education

and marital status because these have previously been shown to be important variables in income regressions (Mincer 1974), they are potential pathways for alcoholism to affect income, and they are of independent interest. We explore their roles further by estimating models of educational attainment and marital status as a function of alcoholism.

Education. Perhaps the single most important determinant of labor market success, and hence income — educational attainment — may be affected by alcoholism. However, should the effects of alcoholism be present, they would almost always be realized relatively early in the life cycle. Accordingly, we focus our analysis on how early onset of alcoholism affects educational attainment. Because most (although not all) individuals complete schooling by their mid-twenties, we have restricted our sample to individuals aged 25 to 64.

We estimate by ordinary least squares (OLS) a reduced-form specification of years of completed schooling; as in the case of income, we use the log-transformation of education. Note that we use the logarithmic transformation of education for the same reasons we use the log-transformation of income: a skewed distribution. Consistent with our primary focus on the potential adverse effects of early onset of alcoholism, we include the dummy variable indicating onset of alcoholism prior to age 22 (ALC-YOUNG). We also list among the explanatory variables father's educational attainment, a measure of father's occupation to control for family background and other factors, and AGE and its square to control for cohort effects. The potential cohort effect is that individuals of the older cohort tend to have lower levels of educational achievement, even when controlling for other factors.

The results are reported in column 1 of table 4. In what we consider to be an important finding in understanding the lifetime effects of alcoholism, we discover that the onset of alcoholism by age 22 has a significant negative coefficient in regressions of educational attainment. This suggests that onset of alcoholism by age 22 is related to a 5 percent reduction in educational attainment when controlling for other relevant factors. Combining results from column 5 of table 3 and column 1 of table 4 produces an indirect effect of alcoholism on income via education of almost 5 percent, which is over a third of the direct effect of about 15 percent, as shown in table 3 column 1. Note, however, that this effect ignores other indirect effects of alcoholism on, for instance, marital status.

Parental and household characteristics as proxied by EDFATH and

TABLE 4

Education and Marital Status Estimated as a Function of Alcoholism
and Other Covariates

	Ordinary least squares	Maximum likelihood multinomial logit	
	LNEDUC	NOWMARRY	DISRUPT
ALCYOUNG	−.050*	1.285*	.842*
	(2.22)	(2.49)	(2.00)
AGE	−.012	.819**	.387**
	(1.92)	(5.59)	(3.96)
AGESQ	.0001	−.009**	−.004**
	(1.49)	(5.34)	(3.54)
WHITE	.121*	−1.141*	.441
	(3.84)	(2.45)	(1.07)
EDFATH	.017**	−.030	−.082*
	(5.90)	(.56)	(1.95)
WCFATH	.070**	.472	.371
	(3.82)	(1.12)	(1.14)
INTERCEPT	2.60**	−16.019**	−6.588**
	(20.25)	(5.23)	(3.21)
No. of observations	561	561	561
R^2	.23		
Loglikelihood		−406.04	

$* p < .05. ** p < .01.$

WCFATH have important effects on the educational attainment of
the offspring; both estimated coefficients have the expected positive
signs and are statistically significant. We also find in this specification
significant age effects that presumably are picking up cohort effects of
educational attainment. In addition, race is a statistically significant de-
terminant of educational attainment.

Because we find the negative impact of early onset of alcoholism on
education to be an important and interesting finding, we explore it fur-
ther. In particular, we investigate onset prior to age 18 because this onset
would occur prior to many of the educational choices of individuals. We
also examine onset between ages 19 and 22 inclusive. We include both
of these variables in the same specification of the education regression
that we estimate in table 4, but replace ALCYOUNG with these two on-

set variables. We find that onset prior to age 18 has a negative and significant ($p < .01$) effect on educational attainment. Onset prior to age 18 tends to reduce educational attainment by 11 percent. Onset between ages 19 and 22 has an insignificant effect on education. These findings are consistent with the notion that onset before age 18 is important because it affects these relatively early educational outcomes.

Marital Status. There are many routes through which an individual's propensity to marry, divorce, and/or separate might be related to alcoholism. First, early onset of alcoholism might affect the probability of marriage. We are agnostic regarding the *direction* of the effects of alcoholism on marriage propensity (see Layne and Whitehead [1985] for a related study). Although a person who exhibits early symptoms of alcoholism may be considered a less desirable partner, this person may have lowered his or her standards for what constitutes a good marriage mate. Thus, early onset of alcoholism could either increase or decrease the probability of marriage; the stability of the match would presumably be reduced in either event, however, thus suggesting ensuing disruption. Alcoholism may influence not only the propensity to marry, but also the age of marriage, thus affecting estimates of the probability of marriage given the age distribution of our sample. Finally, conditional on marrying, alcoholism may increase the probability of divorce or separation.

Using multinomial logit analysis, we estimate the probability of currently being married (NOWMARRY) and also of being in a disrupted marriage (DISRUPT), compared with being never married. (We put widowers in the NOWMARRY category on the assumption that disruption of a marriage caused by death of a spouse is unlikely to be systematically correlated with alcoholism.) The multinomial logit estimation procedure permits analysis of the effect of independent variables on a set of mutually exclusive categorical outcomes: the marital status variables. This procedure estimates the effects of the included variables on, in our study, the probability of being married and also the probability of being in a disrupted marriage, relative to never marrying. Thus, the estimated coefficients indicate how the included variables affect the probability of being married or divorced relative to never marrying.

We work with the same sample of 561 observations that was used in the education regressions, focusing on our measure of early onset of alcoholism (ALCYOUNG) to reduce the problems associated with reverse causality. In an attempt to isolate the direct effects of alcoholism on these marital status outcomes, the model is specified so that, for exam-

ple, we exclude EDUC and NONWAGE; that is, we eliminate the variables that could be associated with alcoholism in a causal way and estimate "reduced form" specifications. Included, however, are measures of father's education and occupation (EDFATH, WCFATH). These exogenous variables are used to control for some additional early life-cycle influences on the marital status outcomes such as family background and upbringing.

Columns 2 and 3 of table 4 display the results for the model of marital status. We find that ALCYOUNG has positive and statistically significant effects both on being married and on getting divorced. The positive coefficients on early onset of alcoholism indicate that alcoholism increases the probability of ever marrying, but also significantly increases the probability of subsequently divorcing. The net indirect effect of alcoholism on income via marital status is very complex to calculate for a variety of reasons, among them that it is a dynamic process: one is not "eligible" for divorce until one has been married. However, the series of coefficients on ALCYOUNG in table 3 are suggestive of a net negative effect of the marital status variables on income; going from column 2 to column 3, as the marital status variables are added, the coefficient on ALCYOUNG decreases. Although the decrease is insignificant, the direction suggests that the net effect of including marital status variables reduces the negative impact of alcoholism on income.

We find significant age effects on propensity to be currently married and also to have one's marriage disrupted relative to never marrying: both AGE and AGE squared effects are statistically significant. The coefficient for WHITE is negative and statistically significant for the probability of being currently married, but insignificant for the probability of being in a disrupted marriage. The parental background measures, EDFATH and WCFATH, are statistically insignificant in both cases.

Summary and Discussion

Our results suggest that there are important indirect effects of alcoholism on income for males. This finding is important because it indicates that studies of the costs of alcoholism that have controlled for education, marital status, and other alcohol-related variables will typically underes-

timate the full economic costs of alcoholism, and thereby also underestimate, for instance, the potential gains to early intervention. The negative indirect effects of alcoholism on income are attributable to the reduced educational attainment and increased marital disruption associated with this disorder.

Given the central role of education found in many labor market studies, the depressant effect of alcoholism on education is an important finding. Even if the early alcoholic recovers, there are likely to be lifetime adverse effects on labor market success that operate through reduced educational attainment. This implies that the social benefits of early intervention policies could be large.

The disruptive effect of current alcoholism on marriage is consistent with the extant literature. As marital status is often found to have important, although not always theoretically grounded, effects on earning power and labor market decisions, our results indicate the potential role for significant indirect effects of alcoholism on income as well. We find that early onset of alcoholism not only increases the chance of marrying significantly, but also significantly enhances the likelihood of marital disruption, holding all else constant. The net effect of early onset of alcoholism, however, appears to be reduction of earning power.

The interpretation of the depressant effect of alcoholism on education, marital stability, and income in this study, like others, is subject to challenge. Other interpretations and confounding factors cannot be eliminated. For example, alcoholism may be a symptom of deeper problems that could also result in reduced educational income. Elimination of alcoholism per se would not necessarily mean, therefore, that income would be of the same magnitude as that of otherwise similar individuals without alcoholism. Again, it should be stressed that the direction of causation cannot be fully determined: lower earnings may certainly be a factor in the development of alcoholism. Furthermore, some studies suggest that the alcohol consumption has a positive effect on earnings (Berger and Leigh, 1988).

In sum, we conclude that there are important indirect effects of alcoholism operating via education and marital status. Ignoring the role of indirect effects would typically produce underestimates of the costs of alcoholism to society. Recognition of these effects would give more weight in public policy discussion to alcoholism, particularly to prevention early in life.

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