

A 60-year follow-up of alcoholic men

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ABSTRACT

Aims To study the course of male alcohol abuse from age 20 to age 70–80 years.

Design A prospective multi-disciplinary follow-up of two community cohorts of adolescent males from 1940 until the present.

Setting and participants Two hundred and sixty-eight former Harvard undergraduates (college sample) and 456 non-delinquent, socially disadvantaged Boston adolescents (core city sample).

Measurements Since adolescence these cohorts have been followed by repeated interview, questionnaires and physical examination. The college cohort has been followed until age 80 and the younger core city cohort until age 70. DSM-III criteria were used to ascertain alcohol abuse and alcohol dependence. At some point during their lives, 54 (20%) of the college men and 140 (31%) of the core city men met criteria for alcohol abuse. Outcome categories were mortality, continued alcohol abuse and stable remission.

Findings and conclusions These socially divergent cohorts resembled each other in four respects. First, by age 70 chronic alcohol dependence was rare; this was due both to death and to stable abstinence. By age 70, 54% of the 72 successfully followed alcohol-dependent core city men had died, 32% were abstinent, 1% were controlled drinkers and only 12% were known to be still abusing alcohol. By age 70, 58% of the 19 successfully followed college alcohol-dependent men had died, 21% were abstinent, 10.5% were controlled drinkers and only 10.5% were known to be still abusing alcohol. Secondly, in both samples alcohol abuse could persist for decades without remission, death or progression to dependence. Thirdly, among both samples prior alcohol dependence and AA attendance were the two best predictors of sustained abstinence. Fourthly, few life-time symptoms of alcohol abuse were the best predictor of sustained return to controlled-drinking.

KEYWORDS Alcohol dependence, Alcoholics Anonymous, mortality, recovery.

INTRODUCTION

We know far more about the natural history of most cancers than we do of alcoholism. As a result, there are still many unanswered questions regarding the clinical course of alcoholism. To the extent that the natural history of alcoholism can be reflected by a 60-year study confined to American white males, this paper will address four of the most important of these unanswered questions. The first question is: if alcohol abuse persists over

the life course, does it progress inexorably, as investigators such as E. M. Jellinek (1960) believed? Or, analogous to individuals with moderate obesity, do some individuals continue to abuse alcohol over a life-time without obvious progression. Secondly, why does the prevalence of alcohol abuse decline sharply with age? (Robins & Regier 1991). Is the explanation for this decline stable abstinence, or 'burnout'? Is it due to a return to asymptomatic drinking? Or is the explanation high mortality, or due perhaps to poor case finding among the alcoholic elderly?

The third question is how long must abstinence or return-to-controlled-drinking persist before an individual's recovery from alcoholism can be considered secure? In cancer, remission must usually endure for 5 years before relapse is considered unlikely. In alcohol treatment studies, however, investigators often speak of 'recovery' after the alcohol abuser has been symptom-free for 6 months or 1 year. Is this realistic? The fourth question is if, over the life course, alcoholics die young—why?

This report builds on an age 47 follow-back study (Vaillant 1983) of two contrasting community samples of prospectively followed adolescents: 456 underprivileged inner-city schoolboys (core-city) and 268 Harvard University (college) sophomores. Several years later Vaillant (1996) reported a further prospective follow-up of these same men—the core-city men at age 60 and the college men at age 70. In this current report, the core-city men are followed until age 70 and the college men until 80. Further follow-up has been particularly useful to document all-cause mortality, to verify or invalidate prior self-reports of return-to-controlled drinking, and to document sustained alcohol abuse without progression.

SUBJECTS AND METHODS

A prospective cohort study of two socially contrasting samples of alcoholic men has been conducted since 1940.

Study participants

The core city sample (mean date of birth 1929 ± 2) included 456 males studied first from early adolescence until age 31 as a non-delinquent community control group for the Gluecks' well-known studies of institutionalized juvenile delinquents (Glueck & Glueck 1950). Residing in high-crime inner-city Boston neighborhoods, 90% of these men came from working-class or welfare families; 61% of their parents were foreign-born. Their mean IQ was 95 ± 12 ; only 48% graduated from high school. The sample included no African-Americans.

At the time of the original study the men, their parents and their teachers were interviewed individually. Over 90% of the surviving participants were reinterviewed at ages 25 and 31 (Glueck & Glueck 1968). At these interviews alcohol abuse or its absence was specifically recorded. When they reached age 47, a 2-hour semi-structured interview with a detailed 23-item section on life-time problem drinking was used to reinterview 87% of the surviving men (Vaillant 1995). Records of criminal history and psychiatric hospitalization were obtained for more than 95% of the men. Since age 47 the core city men have received questionnaires every 2 years and physical examinations every 5 years.

The college sample (mean date of birth 1921 ± 2) included 268 Harvard University sophomores selected for a study of 'normal' development conducted from 1938 to 1944 (Heath 1945). Selection criteria were no known physical or mental illness and a freshman grade average above C. Although half the sample worked during college to help pay tuition and/or were on scholarship, most of their parents were upper- or middle-class, and most grandparents were born in the United States. Their estimated mean IQ was 130; 76% attended graduate school; and their 1976 mean income was three times that of the core city men. Up to age 47, the college sample was studied in roughly the same fashion as the core city sample, except that since age 21 the college men also received biennial questionnaires. After age 47 years the college sample, like the core city sample, have received questionnaires every 2 years and physical examinations every 5 years (Vaillant 1996).

Data collection

Presence or absence of alcohol abuse before age 47 years

For both samples, 2-hour interviews at age 47 ± 3 years were performed by clinicians, most with 2 or more years of experience in alcohol clinics. The men's interviews c. age 31 and their life-time psychiatric and arrest records (core city men) and biennial questionnaires (college men) were also reviewed. These records added to the participants' self-reports and further documented alcohol-related problems. Based on all the available data, clinicians rated the men on both a categorical and a dimensional scale of alcohol abuse.

Diagnostic and Statistical Manual, 3rd edn (DSM-III)

American Psychiatric Association 1980: this manual divides men with problem drinking into two arbitrary categories: alcohol abuse and alcohol dependence (tolerance or withdrawal symptoms from alcohol *in addition* to symptoms of alcohol abuse). Diagnosis was made by consensus of two clinicians. Evidence for convergent validity of diagnosis is discussed elsewhere (Vaillant *et al.* 1991; Vaillant 1995).

The Problem Drinking Scale (Vaillant 1995): this scale viewed problem drinking as a continuum. It employed an equally weighted 16-point scale (similar to the Michigan Alcoholism Screening Test (Selzer 1971); it combines the emphasis of the DSM-III on physiological dependence and the emphasis of sociologists (Cahalan 1970) on social deviance. The scale assigned points for social, legal, medical and employment problems caused by alcohol abuse and points for blackouts, 'going on the wagon', seeking treatment, admitting to problems with control and

withdrawal symptoms. DSM-III 'alcohol abusers' received a mean problem score of 5 ± 2 and those with 'alcohol dependence' a mean problem score of 9 ± 4 on the problem drinking scale.

Originally all men ever meeting the criteria for DSM-III alcohol abuse ($n = 153$ core city and $n = 56$ college) were included. However, for this paper men with borderline problem drinking scores (3 or 4) and who abused alcohol for less than 5 years and who returned to social drinking for the rest of their lives (13 core city and two college men) were reclassified as social drinkers. Thus, the total number of alcohol abusers in this report is 8% less than previous reports.

Presence or absence of alcohol abuse after age 47

From age 47 years until the present, both groups were followed-up by biennial questionnaires and by reports of complete independent physical examinations (including complete blood counts and routine blood chemistries every 5 years) (Vaillant 1979). Besides gathering information regarding health, work relationships and quantity and frequency of alcohol use, the biennial questionnaires inquired about alcohol problems. The men were asked five questions about whether (1) they, (2) their friends, (3) their family or (4) their physicians had been concerned about their drinking, and (5) whether and for how long they had stopped drinking. Any man, not classified previously as an alcohol abuser, who reported two or more of the four alcohol-related problems (e.g. wife, doctor or participant concerned, etc.) on the biennial questionnaire for two consecutive questionnaires, or who through interview and telephone contact acknowledged alcohol abuse or whose physical exam serendipitously revealed evidence of alcohol abuse was reclassified an alcohol abuser.

Age at onset of alcohol abuse (from age 15–60)

The age that each participant first met criteria for DSM-III alcohol abuse was estimated from all available data.

- *Smoking*: pack/years of cigarette smoking were estimated by review of all information for all men up to age 60 years (Vaillant *et al.* 1991).
- *Body mass index* (weight in kg/height in m^2): was calculated for all men at 50.
- *Cause of death*: complete physical examinations were sought for all subjects every 5 years. Death certificates have been obtained. Mortality and death certificates for non-responders and dropouts were ascertained through the National Death Index. Data from physical examinations and death certificates were used to determine major cause of death.

Outcome definitions

Yearly alcohol outcome status

This was estimated from age 20–70 years. This estimate was based upon all available information including the questionnaires administered every 2 years, physical examinations obtained every 5 years, occasional interviews and death certificates. Outcome status was categorized as follows: 'abstinent': less than one drink (0.5 ounces of ethanol) a month for a year. 'Return-to-controlled-drinking': a former alcohol abuser consuming more than one drink a month for at least a year but with no reported problems. 'Continued alcohol abuse': clear past history of sustained alcohol abuse and one or more acknowledged problems caused by drinking in the past 3 years. 'Lost': survival but inadequate information. Due to missing questionnaires for some men during some periods information was missing. If data was missing for 3 years the yearly status was rated as 'unknown'. Otherwise, in the absence of contradictory questionnaire or interview data was considered also valid for the preceding and subsequent year. Over the 60 years of observation (on average) data on alcohol abuse were obtained at 20–40 points in time.

'Final alcohol outcome status' reflects the men's alcohol status at age 70. In the case of death or institutionalization, outcome status was based on the last 3 years of community residence prior to death or chronic care.

Statistical analysis

The significance of differences between groups was determined by the χ^2 test for categorical predictors or Student's *t*-test for continuous predictors. All tests were two-tailed, with *P*-value of < 0.05 considered significant.

RESULTS

Attrition

Prior to age 45 years, eight (3%) of the 268 men from the college sample could not be classified for presence or absence of alcohol abuse due to non-participation or death in World War II. Prior to age 65, of the remaining 260 men, 54 were classified as alcoholics (32 as alcohol-abusing, 22 as alcohol-dependent) and 206 as not alcohol abusers. Prior to age 45 34 (8%) of the 456 core city men could not be classified due to early death, non-participation or difficulty in locating. Prior to age 65, of the remaining 422 men, 140 were classified as alcoholic (68 as alcohol-abusing, 72 as alcohol-dependent) and 282 as not alcohol abusers.

Since age 47 years, the alcohol-abusing subjects in both samples were less likely to return questionnaires

than non-abusers, but not significantly. In an average mailing, 50–70% of participants returned questionnaires. (Non-responders for two consecutive questionnaires were interviewed by telephone or in person.) Every 5 years physical examinations were obtained for about 95% of participating members. Survival of withdrawals and chronically non-responding subjects was confirmed through credit agencies and departments of motor vehicles; death was confirmed through the National Death Index. By age 70, 65 (46%) of the 140 core-city alcoholics and 19 (35%) of the 54 college alcoholics were dead. By age 80, 37 or 69% of the 54 college alcoholics were dead.

Outcome status of alcohol abusers

Table 1 illustrates that by age 70 years, 54 (20%) of the 268 college men had met DSM-III criteria for alcohol

abuse; 48 could be followed until death (Table 1) or age 70. By age 70 years, 140 (31%) of the 456 core city men had met DSM-III criteria for alcohol abuse and 126 could be followed until death or age 70. The average age of onset of alcohol abuse was a decade later for the college men (mean = 40.5 ± 10.6 years) than it was for the core city men (mean = 29.2 years ± 9.5 years).

Table 2 summarizes the outcome status for the 174 alcoholics from both cohorts followed successfully until death or age 70. Yearly alcohol status (based on at least one report in the last 3 years) was missing for 7% of the 8700 (50 × 174) man/years of observation for the 174 alcohol abusers followed successfully from age 20 to age 70.

Although the numbers are small for the college men, severity (see Table 3) and probably alcohol dependence predicted the likelihood of stable abstinence. None of the

Table 1 Outcome status at time of death or for surviving alcoholics at age 70.

	<i>Alcoholic men</i>							
	<i>College cohort</i>				<i>Core city cohort</i>			
	<i>In community at age 70</i> n = 31		<i>Dead at age 70</i> n = 23		<i>In community at age 70</i> n = 75		<i>Dead at age 70</i> n = 65	
	n	%	n	%	n	n	%	
Stable abstinence (3 + years)	4	13	5	22	38	50	19	29
Return-to-controlled-drinking	5	16	2	9	4	5	8	12
Chronic alcohol abuse	20	65	12	52	25	33	32 ^a	51
Drop/lost/died young	2	6	4	17	9	12	5	8
Total 100	31	100	23	100	75	100	65	100

^aOne man abusing alcohol when institutionalized but still alive.

Table 2 Differences in outcome status among alcohol abusers and the alcohol-dependent.

	<i>Core city cohort</i>				<i>College cohort</i>			
	<i>DSM-III Alcohol abusers</i> n = 54		<i>DSM-III Alcohol dependence</i> n = 72		<i>DSM-III Alcohol abuser</i> n = 29		<i>DSM-III Alcohol dependence</i> n = 19	
	n	%	n	%	n	%	n	%
Stable abstinence (3 + years)	18	33	39	53*	0	0	9	47***
Return-to-controlled-drinking	9	17	3	4	5	10	2	11
Chronic alcohol abuse	27	50	30	43	24	86	8	42***
Total	54	100	72	100	29	100	19	100
Dead by age 70 ^a	20 ^b	37	39 ^b	54	8 ^c	28	11 ^c	58
Problem drinking score age 47	5.5 ± 1.7		10.5 ± 3.5		4.6 ± 1.3		8.7 ± 2.3***	

* $P < 0.05$. χ^2 *** $P < 0.001$.

^aFor both cohorts numbers of dead are smaller than Table 1 because drops and early deaths are excluded.

^bIn contrast, only 83 (29%) of the 282 non-alcoholic core city men had died by age 70 (twice as many as the non-alcoholic college men at age 70).

^cIn contrast, only 31 (15%) of the 204 non-alcoholic college men had died by age 70, and 64 (31%) had died by 80. This death rate was half that expected for white Americans in their birth cohort.

29 college men meeting only criteria for alcohol abuse ever achieved 3 or more years of abstinence. This is in contrast to the fact that almost half of the 19 college men classified as dependent achieved 3 years or more of abstinence. Admittedly, only four of the nine stably abstinent college men survived until age 70. The alcohol-dependent core city men were also somewhat more likely to become abstinent than the alcohol abusers. By age 70, 54% of the 72 followed alcohol-dependent core city men had died, 32% were abstinent, 1% were controlled drinkers and only 12% were known to be still abusing alcohol. By age 70, 58% of the 19 successfully followed college alcohol-dependent men had died, 21% were abstinent, 10.5% were controlled drinkers and only 10.5% were known to be still abusing alcohol.

Surprisingly, in both samples alcohol abuse could persist for decades without remission, death or progression to dependence. Thus, among the 29 college alcohol abusers 13 survived until age 80. Seven (53%) of these

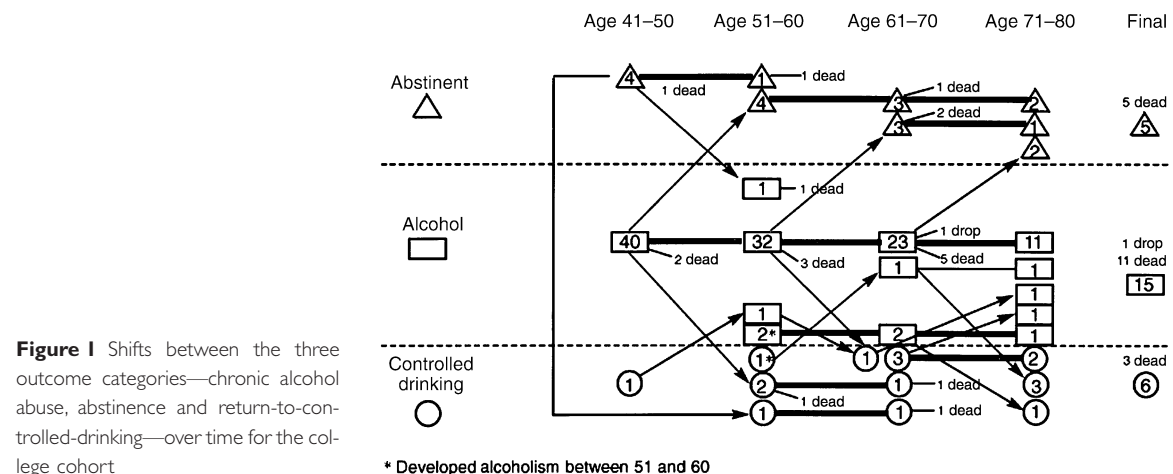
survivors were still continuing to abuse alcohol (for a mean of 32 ± 4 years) but without evidence of worsening symptomatology (i.e. morning drinking, job loss, detoxification). Among the 22 college alcohol-dependent men, only one man was still alive at 80 and still abusing alcohol.

A second predictive factor was length of follow-up. This is illustrated in Figs 1 and 2, which illustrate the shifts in the men's outcome status on a decade-by-decade basis. The longer the men survived the more likely was stable abstinence, but because abstinence undoubtedly facilitated survival this observation may not convey causality. As can be seen in Fig. 2, between age 60 and 70 the proportion of actively alcohol-abusing core city men continued to fall. Return to controlled drinking rarely persisted for much more than a decade without relapse or evolution into abstinence. For example, in Fig. 2, 20 (54%) of the 37 men abstinent at 50 were still abstinent at 70. In contrast, only four (19%) of the 21 men

Table 3 Characteristics of alcoholics at age 70 classed as abstinent, controlled and active alcoholics.

	College cohort			Core city cohort		
	Abstinent n = 9	Controlled n = 7	Active n = 32	Abstinent n = 57	Controlled n = 12	Active n = 44
Years of abstinence	15 ± 11	4 ± 6	1 ± 2***	16.4 ± 10.8	2.7 ± 2.1	1.0 ± 2.1***
Years of controlled drinking	0 ± 0	9.2 ± 5.3	3.2 ± 4.8	4.2 ± 8.0	13.6 ± 8.1	2.0 ± 3.7***
Years of active alcoholism	20 ± 11	17 ± 11	23 ± 10	18 ± 9	14 ± 6	22 ± 10***
Age first alcoholic	34 ± 9	42 ± 6	42 ± 10	28 ± 9	32 ± 9	31 ± 11
Problem drinking score	9 ± 3.0	5 ± 2.	6 ± 2***	9.7 ± 3.8	7.5 ± 4.2	8.3 ± 3.3*
Years of status unknown	0.2 ± 0.7	2.1 ± 3.0	2.5 ± 4.0	2.8 ± 4.4	5.7 ± 5.0	6.9 ± 6.9***
Pack-years of smoking	49 ± 27	44 ± 30	31 ± 23	60 ± 32	63 ± 34	60 ± 35
Body mass index	24 ± 3	23 ± 3	26 ± 3*	27 ± 4	29 ± 6	26 ± 4*
Years of education	18.7 ± 2.0	17 ± 1.7	17.7 ± 1.9	10.2 ± 2.4	9.5 ± 2.1	10 ± 2.4
No. of alcoholic relatives	2.3 ± 1.2	2.7 ± 0.8	2.3 ± 1.1	2.8 ± 1.0	2.6 ± 1.0	2.7 ± 1.1
AA meetings	137 ± 155	14 ± 24	2 ± 9***	143 ± 327	0 ± 0	8 ± 30***

*P < 0.05; **P < 0.01; ***P < 0.001; Student's t-test.



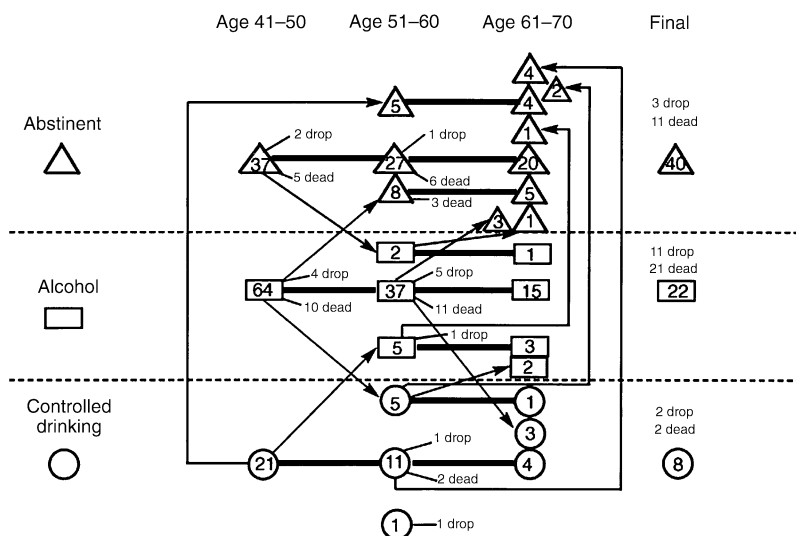


Figure 2 Shifts between the three outcome categories—chronic alcohol abuse, abstinence and return-to-controlled-drinking—over time for the core city cohort

reporting controlled drinking at 50 reported continuing to drink in a controlled fashion at 70.

Table 3 contrasts the alcohol-abusing men who 'remitted' (i.e. achieved 3 years or more of abstinence or controlled drinking) by age 70 with those who had not remitted. Again, as the presence or absence of alcohol abuse reflects a continuum and not a true categorical distinction, there were borderline cases among the three categorical outcomes—abstinent, return-to-controlled drinking and chronic abuse. Admittedly, in a longitudinal study of this kind information is of varying reliability, and over 40 years, as illustrated in Figs 1 and 2 and in Table 3, many men spent a year or more in each category. Nevertheless, Table 3 demonstrates clear differences between the grouped outcomes at 70. Collectively, for those categorized as 'abstinent' or 'controlled' the average number of years of remission from adult alcohol abuse was 10 times longer, than for those categorized as 'active alcoholics'. Risk factors for alcohol abuse did not predict remission. On average, not only had the remitted alcoholics abused alcohol for at least two decades, but the severity of their alcoholism and their genetic vulnerability had been at least as great as that of their non-remitting counterparts; nor did limited education, a risk factor for alcohol abuse, predict remission. Although the per capita cigarette consumption of the alcoholics was almost twice that of the non-alcoholics, the severity of cigarette abuse among alcoholics was not associated statistically with outcome.

For both cohorts, regular AA attendance was associated strongly with relapse prevention. Of the nine alcohol-dependent college men who achieved stable abstinence, five (56%) attended Alcoholics Anonymous for 30–2000 meetings. Two other alcohol-dependent college men attended about 50 meetings but relapsed. Of the 39 alcohol-dependent core city men with stable

abstinence at least 14 (36%) attended AA for 50–2000 meetings. Four men who did not achieve abstinence attended about 50 AA meetings; of these three relapsed, and one returned to controlled drinking. The core city men with less than 30 AA visits experienced a problem drinking score of 8.7 ± 3.0 . Men who attended more than 29 AA visits (mean = 400 meetings) had a mean problem drinking score of 12.0 ± 4.2 ($F = 13.8, P < 0.001$).

Duration of abstinence required for stable remission

The association between length of abstinence and probability of relapse was examined for the 10 college and 46 core city alcohol abusers who reported at least 2 years of abstinence and who subsequently survived for at least 8 years more. Eventual relapse to alcohol abuse occurred in 23 (41%) of these 56 men. Twenty relapses occurred before year 7; only three relapses occurred after year 7. The mean length of recorded abstinence among the 33 men not reporting relapse was 18 years (range, 9–33 years). In short, analogous to cancer patients, a follow-up of 5 years rather than of 1 or 2 years would appear necessary to determine stable recovery. As illustrated by Figs 1 and 2, return-to-controlled-drinking was less stable and usually evolved into relapse or abstinence.

Progression of symptoms

One of the most surprising findings was that alcohol abusers—if after one or two decades they did not remit or become alcohol-dependent—could continue to abuse alcohol for decades more without clear progression to dependence. Many of the surviving chronic college alcohol abusers spent the decades from 50 to 70 years alternating between repeated brief periods of controlled drinking and periods of alcohol abuse without evidence of

Table 4 The effect of alcohol abuse on mortality.

	Alcoholic dead				No alcohol abuse dead			
	Core city ^a n = 65 ^c		College ^b n = 37 ^d		Core city ^a n = 83		College ^b n = 64	
Unnatural death + alcoholic cirrhosis	16***	25%	8**	22%	2	2%	5	8%
Lung cancer + COPD	18*	28%	5**	13%	20	24%	2	3%
Arteriosclerotic heart disease	17	26%	14***	38%	30	36%	12	19%
Other deaths	14	21%	10	27%	31	37%	45	70%
Total deaths	65 ^c	100%	37 ^d	100%	83 ^e	100%	64 ^f	100%

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$. Fisher's exact test was the statistic used. Comparisons of the likelihood of death from each cause between all alcoholics and non-alcoholics (living or dead) in each cohort.

^aMortality assessed at age 70.

^bMortality assessed at age 80.

^cSince mortality was known for all the alcoholics in Table 1 and 65 or 46% of the 140 core city alcoholics were dead by 70.

^d37 or 69% of the 54 college alcoholics were dead by 80.

^e83 reflects the 29% of the 282 core city non-alcoholics who were dead by 70.

^f64 reflects the 31% of the 206 college non-alcoholics who were dead by 80.

progression to dependence. They reported continued alcohol-related problems with their health, self-esteem and families. Yet, despite decades of observation with two exceptions, these alcohol-abusing men's sustained patterns of alcohol abuse did not progress to job loss, morning drinking or need for detoxification.

On the other hand, alcohol-dependent men could neither sustain prolonged periods of return-to-controlled-drinking status nor of intermittent alcohol abuse without returning to morning drinking and need for detoxification. For the alcohol-dependent men in both cohorts abstinence appeared the more durable solution.

Mortality

At age 80, mortality for the 206 non-alcoholic college men was only 31% ($n = 64$). This contrasts with a 69% ($n = 37$) mortality observed for the 54 alcoholic college men—more than two times as great. Among the college men, however, the non-alcoholics smoked 14 ± 20 pack-years, the alcohol abusers 27 ± 20 pack-years and the alcohol-dependent 50 ± 28 pack-years. In contrast, the 46% mortality of the 140 alcohol-abusing core city men by age 70 was only one-and-a-half times greater than the 29% of the 282 non-alcohol abusing core city men dead at 70. This was largely as a function of greater cigarette consumption and obesity among the non-alcoholic core city men. (The 29% mortality for non-alcoholic core city men at age 70 was about as great as the 31% mortality for the non-alcoholic college men at 80.) In other words, alcohol abuse and the accompanying heavy smoking greatly reduced the superior relative mortality granted the college sample (presumably from its higher SES).

Table 4 also contrasts cause-specific mortality among the alcoholic and their non-alcoholic counterparts. Due

to the heavy smoking among alcohol abusers—deaths from Chronic obstruction pulmonary disease (COPD), lung cancer and heart disease were more common in absolute, if not proportionately, among the alcohol abusers than among the social drinkers. Equally important, deaths from suicide, cirrhosis and accident were many times more common among alcohol abusers. In these small samples, alcohol abuse did not increase significantly the overall death rate from other causes (principally cancers, excluding lung and stroke); but, proportionately, the alcoholics were only about half as likely to die from these 'natural' causes.

CONCLUSIONS

There are several limitations to this study. First, categorizing the careers of alcoholics into three mutually exclusive arbitrary outcomes—abstinence, controlled drinking and alcohol abuse—ignores the fact that many of the men over the 50 years could have met criteria briefly for all three outcomes (see Figures and Table 3).

Secondly, these two contrasting cohorts of white American males born between 1917 and 1932 are small and are hardly representative of the general population. Thus, the paper's conclusions are suggestive but may not be applicable to other populations. [Controlling for birth cohort and gender, however, the life-time rate of alcohol abuse for the two cohorts was roughly the same as observed for male United States population samples (Robins & Regier 1991).]

Thirdly, compared to other recent studies of mortality among alcoholics (Rossow & Amundsen 1997; Dawson 2000a; Liskow *et al.* 2000; Neumark, Von Etten & Anthony 2000) the number of deaths in this report is rel-

atively small. Nevertheless, the findings are very similar to these larger studies and to eight other longitudinal studies of premature mortality in alcoholics reviewed elsewhere (Vaillant 1995, pp. 202, 207). In general, the increased death rate among alcoholics is two to three times the expected. Our data also conform to the findings of Ojesjo, Hagnell & Otterbeck (1998), who report on the only other prospective study of equal duration. Namely, among the alcoholics in both studies the magnitude of the increased mortality was twice as great before 60 as after 60. In all studies the increased death rate is almost completely a result of excess deaths from cirrhosis, unnatural causes, lung cancer (due to failed smoking cessation), oral pharyngeal cancers (Boffetta *et al.* 2001), infection and heart disease. The association of heart disease with alcohol abuse is in part an artifact of the fact that alcohol abuse interferes with smoking cessation (Difranza & Guerrero 1990; Vaillant *et al.* 1991; Dawson 2000b). However, as Poikolainen (1998) has noted, even controlling for smoking, alcohol abuse increases observed mortality from arteriosclerotic heart diseases. This is due to the contribution of alcohol abuse, especially binge drinking, to arrhythmias, cardiomyopathy and hypertension. In our sample 16% (17 core city alcoholics and 14 college alcoholics) of a total of 194 (140 plus 54) alcoholics died of arteriosclerotic heart disease. Among the 488 (282 plus 206) non-alcoholics only 42 (30 plus 12) or 9% died from this cause ($\chi^2 = 6.7$, $df = 1$, $P < 0.02$).

Fourthly, the outcomes are based upon self-report and physician-report without confirmation from significant others. Self-reports of sustained abstinence (mean duration, 19 years) and of continued alcohol abuse (mean duration 22 years) can probably be considered reliable, but the proportion of alcoholics who alleged to have returned-to-controlled-drinking may be inflated. As illustrated by other prolonged follow-up studies of alcohol abuse (Pendery *et al.* 1982; Edwards 1985; Miller *et al.* 1992), return-to-controlled drinking, as reported in short-term studies, is often a mirage. In 1977, at the end of the age 20–47 follow-up period, 21 of the core city men had been classified as having achieved stable abstinence of 3 years or more and 22 men had been classified as return-to-controlled-drinking for 3 years or more (Vaillant 1983). Continued follow-up until 1992 revealed that of the 21 core city men with 3 or more years of abstinence in 1977, 18 (86%) have continued to remain abstinent until age 60 or until death (Vaillant 1996). The mean length of known abstinence for these 18 men was 20 years (range 3–37 years). In contrast, over the next 15 years of the 22 men with 3 or more years of controlled drinking, seven relapsed to sustained alcohol abuse with a mean duration of alleged controlled drinking before relapse of 12 years (range 5–28 years). Three more men became stably abstinent, four more withdrew from the

study and three because of the brevity of their abuse were reclassified as non-alcoholic. Thus, in 1992 or at death only five of the 22 men were still believed to be drinking in a controlled fashion.

However, prolonged follow-up revealed that conclusions of Jellinek and Alcoholics Anonymous regarding the inexorable progression of alcohol abuse may be in error. Alcohol abuse, like cigarette abuse, is inexorably 'progressive' only in its initial stages. Some cigarette abusers progress to two packs in a few years, others maintain a pack-per-day habit for decades. Similarly, some alcohol abusers can remain 'out of control' of their alcohol consumption for a life-time without progressing to morning drinking, job loss or severe withdrawal. Admittedly, as is the case for two-packs-a-day smokers, alcoholics with the morning shakes rarely evolve into addicts with only minimum symptoms of abuse.

This report confirms the conclusion of Edwards *et al.* (1988); namely, the predictors of recovery are different from the predictors of onset of alcoholism. Variables as promising as alcoholic heredity, family disorganization, number and severity of alcohol problems and absence of alcohol clinic treatment fail to predict poor long-term outcome (Table 3). The predictors of recovery in these two cohorts have been reported in detail elsewhere (Vaillant 1988, 1995). Besides severity, the critical factors in recovery from alcohol dependence appeared to be finding a non-pharmacological substitute for alcohol, compulsory supervision (immediate negative consequences for relapse), new relationships and involvement in spiritual programs. Because, fortuitously, Alcoholics Anonymous combines all four of these factors, it is not surprising that Table 3 reveals that the men who achieved stable abstinence attended roughly 20 times as many AA meetings as men who did not.

Finally, prolonged follow-up reveals a fundamental paradox to predicting the life course of an alcoholic. Socially disadvantaged men, men with strong family histories of alcoholism and men with early onset of severe alcohol dependence were more likely than other men to become stably abstinent. In contrast, alcohol abusers with excellent social supports, high education, good health habits, and late onset of minimal alcohol abuse—epitomized by the college sample—were more likely to remain chronic alcohol abusers. For example, the relatively increased mortality among the socially advantaged college men has also been noted by others (Edwards *et al.* 1978; Rossow & Amundsen 1996). Nevertheless, the men who, when classified originally, met only minimal criteria for alcohol abuse included the men who achieved life-long stable lives through return to controlled drinking. In short, the most and the least severe alcoholics appeared to enjoy the best, long-term chance of remission.

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REFERENCES

- American Psychiatric Association (APA) (1980) *Diagnostic and Statistical Manual of Mental Disorders*, 3rd edn. Washington, DC: APA Press.
- Boffetta, P., YeW., Adami, H. O., Mucci, L. A. & Nyren, O. (2001) Risk of cancers of the lung, head and neck in patients hospitalized for alcoholism in Sweden. *British Journal of Cancer*, **85**, 678–682.
- Cahalan, D. (1970) *Problem Drinkers: a National Survey*. San Francisco: Jossey-Bass.
- Dawson, D. A. (2000a) Alcohol consumption, alcohol dependence and all-cause mortality. *Alcoholism: Clinical and Experimental Research*, **24**, 72–81.
- Dawson, D. A. (2000b) Drinking as a risk factor for sustained smoking. *Drug and Alcohol Dependence*, **59**, 235–249.
- Difranza, J. & Guerrerera, M. (1990) Alcoholism and smoking. *Journal of Studies on Alcohol*, **51**, 130–135.
- Edwards, G. (1985) A later follow-up of a classic case series: D. L. Davies' 1962 report and its significance for the present. *Journal of Studies on Alcohol*, **46**, 181–190.
- Edwards, G., Brown, D., Oppenheimer, E., Sheehan, M., Taylor, C. & Duckitt, A. (1988) Long-term outcome for patients with drinking problems: the search for predictors. *British Journal of Addiction*, **83**, 917–927.
- Edwards, G., Kyle, E., Nicholls, P. & Taylor, C. (1978) Alcoholism and mortality: implications for epidemiology. *Journal of Studies on Alcohol*, **39**, 1607–1617.
- Glueck, S. & Glueck, E. (1950) *Unraveling Juvenile Delinquency*. New York: Commonwealth Fund.
- Glueck, S. & Glueck, E. (1968) *Delinquents and Nondelinquents in Perspective*. Cambridge, MA: Harvard University Press.
- Heath, C. W. (1945) *What People Are*. Cambridge, MA: Harvard University Press.
- Jellinek, E. M. (1960) *The Disease Concept of Alcoholism*. New Haven: Hillhouse Press.
- Liskow, B. J., Powell, B. J., Penick, E. C., Nickel, E. J., Wallace, D. D., Landon, J. F., Campbell, J. & Cantrell, P. J. (2000) Mortality in male alcoholics after ten to fourteen years. *Journal of Studies on Alcohol*, **46**, 853–861.
- Miller, W. R., Leckman, A. L., Delaney, H. D. & Tinkcom, M. (1992) Long-term follow-up of behavioral self-control training. *Journal of Studies on Alcohol*, **53**, 249–261.
- Neumark, Y. D., Van Etten, M. L. & Anthony, J. C. (2000) Alcohol dependence and death: survival analysis of the Baltimore ECA sample from 1981 to 1995. *Substance Use and Misuse*, **35**, 533–549.
- Ojesjo, L., Hagnell, O. & Otterback, L. (1998) Mortality in alcoholism among men in the Lundby Community Cohort, Sweden: a forty-year follow-up. *Journal of Studies on Alcohol*, **59**, 140–145.
- Pendery, M. L., Maltzman, I. M. & West, L. J. (1982) Controlled drinking by alcoholics? New findings and a reevaluation of a major affirmative study. *Science*, **217**, 169–175.
- Poikolainen, K. (1998) It can be bad for the heart, too—drinking patterns and coronary heart disease. *Addiction*, **93**, 1757–1759.
- Robins, L. N. & Regier, D. A. (1991) *Psychiatric Disorders in America*. New York: The Free Press.
- Rossow, I. & Amundsen, A. (1996) The disadvantage of being advantaged—on a social gradient in excess mortality among alcohol abusers. *Addiction*, **91**, 1821–1829.
- Rossow, I. & Amundsen, A. (1997) Alcohol abuse and mortality: a 40-year prospective study of Norwegian conscripts. *Social Science and Medicine*, **44**, 261–267.
- Selzer, M. L. (1971) The Michigan alcoholism screening test: the quest for a new diagnostic instrument. *American Journal of Psychiatry*, **127**, 1653–1658.
- Vaillant, G. E. (1979) Natural history of male psychological health: effects of mental health on physical health. *New England Journal of Medicine*, **301**, 1249–1254.
- Vaillant, G. E. (1983) *The Natural History of Alcoholism: Paths to Recovery*. Cambridge, MA: Harvard University Press.
- Vaillant, G. E. (1988) What can long-term follow-up teach us about relapse and prevention of relapse in addiction? *British Journal of Addiction*, **83**, 1147–1157.
- Vaillant, G. E. (1995) *The Natural History of Alcoholism Revisited*. Cambridge, MA: Harvard University Press.
- Vaillant, G. E. (1996) A long-term follow-up of male alcohol abuse. *Archives of General Psychiatry*, **53**, 243–249.
- Vaillant, G. E., Schnurr, P. P., Baron, J. A. & Gerber, P. D. (1991) A prospective study of the effects of cigarette smoking and alcohol abuse on mortality. *Journal of General Internal Medicine*, **6**, 299–304.

