

The Lifetime Risk of Suicide in Alcoholism

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• **Current estimates of the lifetime risk of suicide in alcoholism (11% to 15%) are shown statistically to be untenable. Examination of the mortality from suicide in all published follow-up studies of alcoholics containing the requisite data permits calculation of a much smaller lifetime suicide risk: about 2% in untreated and 2.21% in outpatient-treated probands. Studies of alcoholics identified from hospital admissions yield a lifetime risk of about 3.4% for the United States, the United Kingdom, and other English-speaking countries. It is higher in the Scandinavian and European countries with high suicide rates, but not in those with low national suicide rates. The population at risk is shown to be about half of that commonly estimated, and consists of seriously affected alcoholics. While the annual incidence of suicide in the United States is about 1.3% currently, only that quarter of the population identifiably psychiatrically ill is at significant risk. Despite the seemingly miniscule lifetime risk of 2% to 3.4%, the likelihood of suicide in conservatively diagnosed alcoholism is between 60 and 120 times that of the non-psychiatrically ill. Such alcoholism contributes about 25% of the suicides.**

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It is well to examine received wisdom from time to time, to see if old beliefs are still tenable. Closer approximations to truth may help to avoid perpetuation of error. It is commonly held that the lifetime risk of suicide in alcoholism is 11% to 15%.¹⁻⁴ The data offered in support of these figures are of poor quality and inadequate to sustain their credibility. A different approach to the question yields a different and lower estimate.

EARLIER ESTIMATES

Lemere¹ asked his alcoholic patients to recall the manner of death of their deceased alcoholic ancestors over two generations. Based on 500 deaths reported, 11% were by suicide. There are a number of obvious potential biases in such a study, including the uncertainty of diagnosis, the possibility of selective recall affecting the completeness of the family history, and the selecting for severity by starting with affected probands. While Lemere's estimate has been thought to represent a rough approximation of the lifetime risk of suicide in alcoholism, as will be seen, it is likely to be far from the mark.

An informational brochure distributed by the National Council on Alcoholism (NCA)² states: "The lifetime risk for suicide is 1% in the general population, 15% in those with alcoholism." This statement, referenced incorrectly, is attributed to Frances et al³ (R. J. Frances, MD, oral communication, July 14, 1988). The authors are quoted incompletely. Their reference in support of the 15% lifetime risk for suicide in alcoholics is to a secondary source, Beck et al.⁵ Those authors, in turn, rely on Rushing,⁶ whose sole source was a limited literature review by Kessel and Grossman,⁷ accompanying a report of their 1- to 12-year and 4- to 5-year follow-up studies of two slightly overlapping cohorts of alcohol addicts. The literature reviewed consisted of three follow-up studies. Two, those of Gabriel⁸ and Dahlgren,⁹ were reported in terms of proportion of suicides to all deaths. In Gabriel's study, this was given as 21%; in Dahlgren's, 20%. The other follow-up study, by Norvig and Nielsen,¹⁰ and the review by Kessel and Grossman were presented in terms of proportion of suicides to all cases (leaving out 46 women, 21% of the sample). The figures quoted were 8%, 7%, and 8%, respectively. Frances et al somehow averaged these five disparately derived figures (R. J. Frances, MD, oral communication, July 14, 1988) to arrive at a "lifetime risk" of 15%. There is undoubtedly danger in relying on secondary (not to say quaternary) sources of data.

Miles⁴ plotted the proportion of deaths by suicide against the proportion dead in 12 follow-up studies of alcoholics,⁷⁻¹⁸ in Lemere's¹ study, and in a report of cause of death in 103 persons previously treated in alcoholism counseling clinics in Prague, Czechoslovakia.¹⁹ Data sources included the United States,^{11-13,18} the United Kingdom,^{7,16} Austria,⁸ Sweden,⁹ Denmark,¹⁰ Iceland,¹⁴ South Africa,¹⁶ and Canada,¹⁷ nations with widely differing suicide rates.

While the data points of the two reports with 100% of the sample deceased^{11,15} give the curve its semblance of coherence, they are incommensurate with the others. The limitations of Lemere's¹ findings have already been discussed. The other study¹⁹ is not a follow-up, but a tabulation of deaths occurring over a 0- to 10-year period (mean, 2.8 years) in persons identified as having received treatment at some time in the alcoholism clinics of Prague. This is not a population study to death, but an accumulation of deaths in a population of unstated size. Apart from the risk of bias from 20% of the death material having been lost, the short interval to death inflates the role of suicide, as these deaths tend to be overrepresented on short follow-up.^{9,17,20-22} Miles⁴ treated the curve drawn through these various sources of data as meaning a lifetime risk of 15% for suicide in alcoholics.

The above estimates can all be seen to be methodologically

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Table 1.—Proportions of Selected Diagnoses in Community Samples of Suicide*

| Source (Country), y | No. of Patients | % | | | |
|--|-----------------|--------------------|------------|---------------|----------------------------|
| | | Affective Disorder | Alcoholism | Schizophrenia | Substance Abuse/Dependency |
| Robins ²⁵ (United States), 1981, and Robins et al ²⁴ (United States), 1959 | 134 | 45 | 25 (30) | 2 | 25 |
| Dorpat and Ripley ²⁶ (United States), 1960 | 114 | 30 | 27 | 12 | 31 |
| Barracough et al ²⁷ (United Kingdom), 1974 | 100 | 70 | 15 | 3 | 19 |
| Beskow ²⁸ (Sweden), 1979† | 270 | 28 (45) | 31 | 3 | 37 |
| Hagnell and Forsman ²⁹ (Sweden), 1979 | 28 | 50 | 19 | 7 | 39 |
| Chynoweth et al ³⁰ (Australia), 1980 | 135 | 43 (55) | 20 | 4 | 22 (34) |
| Rich et al ²³ (United States), 1986‡ | 283 | 44 | 54 | 3 | 56 |

*Numbers in parentheses represent total numbers of suicides given this diagnosis either as a first or as a subsidiary diagnosis.

†This study was composed of male probands only.

‡Multiple diagnoses were made in this study.

Table 2.—Age at Death by Suicide Among Alcoholics

| Source (Country), y | No. of Patients | No. of Suicides (%) | | | | |
|---|-----------------|---------------------|----------------|----------------|----------------|----------------|
| | | 20-29 y | 30-39 y | 40-49 y | 50-59 y | 60+ y |
| Gabriel ⁸ (Austria), 1935 | 30 | 1 (3) | 5 (17) | 16 (54) | 7 (24) | 1 (3) |
| Robins et al ²⁴ (United States), 1959 | 33 | 2 (6) | 8 (24) | 12 (36) | 8 (24) | 3 (9) |
| Merčič and Brežinová ¹⁰ (Czechoslovakia), 1960 | 28 | 1 (4) | 6 (21) | 11 (39) | 7 (25) | 3 (11) |
| Ciampi and Eisert ³⁶ (Switzerland), 1969 | 98 | 0 (0) | 6 (6) | 39 (40) | 31 (32) | 22 (22) |
| Murphy et al ³³ (United States), 1979 | 50 | 1 (2) | 8 (16) | 17 (34) | 20 (40) | 4 (8) |
| Combs-Orme et al ³⁷ (United States), 1983 | 9 | 3 (33) | 0 (0) | 3 (33) | 3 (33) | 0 (0) |
| Total | 248 | 8 (3) | 33 (13) | 98 (40) | 76 (30) | 33 (13) |

flawed, leaving open the question of the lifetime risk of suicide in alcoholism. An examination of suicide statistics from another vantage point suggests that these studies overestimate the risk by a factor of three or more.

WHY PREVIOUS CALCULATIONS ARE OVERESTIMATES

One way to examine the credibility of the above figures is to consider the impact of, for example, a 15% lifetime risk of suicide on the US suicide statistics. First, we need to know the number of suicides in the population and the proportion of suicides that are alcoholics. We also need to know the mean duration of abusive drinking that precedes suicide, that is, the years at risk.

All of the published retrospective community studies of suicide that we have been able to find are presented in Table 1. Excepting the most recent report, that of Rich et al,²³ the mean proportional contribution of alcoholics is 25%,²⁴⁻³⁰ with a range of 15% to 31%. The lowest figure, that from the United Kingdom,²⁷ was conducted in an area with a heavy concentration of older, retired persons, where the rate of depression could be expected to be high and alcoholism low. The second highest (31%), from Sweden,²⁸ consists of men only. Thus, it is undiluted by the lower suicide rate of females. The study

finding the highest proportion of alcoholics, 54%, is from the United States²³ and is also the largest sampling. The diagnosis of alcoholism was based on *DSM-III*²¹ criteria for alcohol abuse, which are markedly overinclusive²² as will be shown. Unlike earlier studies, multiple diagnoses were made without a hierarchy of precedence. This will magnify the apparent contribution of each disorder.

Being unaware of any databased estimate of years of alcoholism preceding suicide, we calculated the mean duration from onset of excessive drinking to suicide on the basis of the 67 male and 9 female active alcoholic suicides on whom we had the requisite information from two studies.^{25,33} That figure was 19.8 years (mean) for men and 12.3 years for women. Combining the data gives a duration of risk of 18.9, essentially 19 years, with 95% probability limits of 18.7 and 21.0 years. The NCA² claims there were an estimated 10.5 million alcoholics in the United States in 1985.³⁴

To be sure, 76 cases is not a large number on which to base the estimated duration of 19 years. Of other investigators, only Rich et al³⁵ have supplied data on this point. From their San Diego, Calif, study they had 22 "pure alcoholics," with duration of alcoholism preceding suicide in 11. Mean (\pm SD) information on duration of alcohol abuse for these 11 was 29.3 \pm 17.3 years.³⁵ When alcohol and other drug abuse were

found together, the duration of alcohol abuse was more than halved: 12.4 ± 9.9 years in 27 subjects with the necessary data of 37 with the dual diagnosis. These authors present other evidence as well that alcohol and other drug abuse combined sharply lowers the length of the career to suicide. Small sample sizes and large SDs leave wide latitude for comparison.

The mean age at death by suicide in the two samples from which our own estimate of drinking duration to death was derived was 45.37 years. The figure from the six published studies we found in which age at suicide of alcoholics is given is 48.5 years^{7,19,26,33,36,37} (Table 2). Since onset of alcoholism is most often in the 20s, the figure of 19 years' mean duration of active alcoholism eventuating in suicide cannot be far off. This is the lifetime for which suicide risk is to be calculated. As all of the pertinent data are presented in Tables 3 through 7, recalculation for any alternative lifetime is easily done.

Suicide is a late phenomenon in the course of alcoholism. Abusive drinking has been established for many years. Among 76 suicides with pertinent information from two studies,^{26,30} only 11% had less than 10 years of excessive drinking. Thus, suicide risk is not evenly distributed over the course of the illness. Although onset of alcoholism tends to be in the 20s (range, 15 to 56 years), few suicides occur in the 20s and 30s. The incidence peaks in the middle to late 40s (Table 2). Unlike depressive males, in whom suicide risk continues to rise through the senium, few alcoholics die by suicide after the age of 60 years; the majority die much younger. Both age and duration of inebriety make a contribution.

There were 28 620 officially identified suicides in the United States in 1985.³⁸ From the range of outcomes in Table 1,

| Source (Country), y | No. of Patients | Follow-up, y | Person-Years | No. of Suicides |
|--|-----------------|--------------|--------------|-----------------|
| Untreated* | | | | |
| Pell and D'Alonzo ⁶² (United States), 1973 | 848 | 5 | 4240 | 2 |
| Helgason ¹⁴ (Iceland), 1964 | 241 | 42† | 10 122 | 12 |
| Total | 1089 | ... | 14362 | 14 |
| Outpatient-treated‡ | | | | |
| Choi ⁵⁵ (United States), 1975 | 863 | 1.5 | 1294 | 2 |
| Hyman ⁶³ (United States), 1976§ | 48 | 15 | 720 | 2 |
| Martin et al ⁶⁴ (United States), 1985 | 67 | 12 | 804 | 4 |
| Schmidt and deLint ¹⁷ (Canada), 1972 | 6478 | 7.5 | 48 585 | 51 |
| Total | 7456 | ... | 50703 | 59 |

*Lifetime risk was calculated as follows: 14 suicides/14362 person-years $\times 100 = 0.097\%$ annual rate. $0.097\% \times 19$ years = 1.84% lifetime risk.

†Actual follow-up period was 47 years. Probands were 13 to 15 years old at intake. Subtracting 5 years from the observation period ensures that the entire population is within the age of risk of alcoholism.

‡Lifetime risk was calculated as follows: 59 suicides/50703 person-years $\times 100 = 0.116\%$ annual rate. $0.116\% \times 19$ years = 2.21% lifetime risk.

§This study was composed of male probands only.

Table 4.—Annual and Lifetime Risk of Suicide for Alcoholics Identified by Inpatient Treatment*

| Source (Country), y | No. of Patients | Follow-up, y | Person-Years | No. of Suicides | Contemporaneous Suicide Rate, % |
|---|-----------------|--------------|---------------|-----------------|---------------------------------|
| US studies | | | | | |
| Prout et al, ⁶⁴ 1950† | 85 | 4.5‡ | 382 | 1 | 17.2 ⁴² |
| Selzer and Holloway, ¹² 1957 | 86 | 6 | 516 | 1 | 10.0 ⁴² |
| Hastings, ¹¹ 1958 | 23 | 8‡ | 184 | 1 | 11.5 ⁴² |
| Tashiro and Lipscomb, ¹³ 1963 | 1692 | 3‡ | 5076 | 6 | 10.0 ⁴³ |
| Pokorny et al, ⁶⁵ 1968† | 101 | 2 | 202 | 0 | 16.3 ⁴³ |
| Shuckit and Winokur, ⁶⁶ 1972 | 45 | 3 | 136 | 0 | 6.6 ⁴³ |
| Shuckit and Gunderson, ⁶⁷ 1974† | 4755 | 3.5 | 16 642 | 16 | 15.8 ⁴⁴ |
| Costello and Schneider, ⁶⁸ 1974 | 400 | 6‡ | 2400 | 3 | 10.7 ⁴⁴ |
| Polich et al, ⁶⁹ 1980† | 781 | 4 | 3124 | 13 | 18.9 ⁴⁴ |
| Combs-Orme et al, ³⁷ 1983 | 1289 | 7.5‡ | 9668 | 10 | 13.3 ⁴⁴ |
| Smith et al, ⁵⁸ 1983§ | 100 | 11.5‡ | 1150 | 2 | 4.3 ⁴⁴ |
| Studies from countries with rates similar to the United States | | | | | |
| Davies et al ⁷⁰ (United Kingdom), 1956 | 50 | 2 | 100 | 1 | 10.2 ⁴² |
| Kessel and Grossman ⁷ (United Kingdom), 1961 | 218 | 6‡ | 1308 | 11 | 11.2 ⁴³ |
| Rathod et al ⁷¹ (United Kingdom), 1966† | 105 | 2 | 210 | 2 | 13.8 ⁴³ |
| Dubourg ⁷² (United Kingdom), 1969† | 76 | 1.75 | 133 | 1 | 12.7 ⁴³ |
| Nicholls et al ²⁰ (United Kingdom), 1974 | 865 | 12.5 | 10 812 | 46 | 11.2 ⁴³ |
| deLint and Levinson ⁵⁴ (Canada), 1975 | 143 | 5 | 715 | 3 | 11.9 ⁴⁴ |
| Thorarinsson ⁷³ (Iceland), 1979† | 2863 | 13‡ | 37 219 | 45 | 15.7 ⁴³ |
| Total | 13 677 | ... | 89 977 | 162 | ... |

*Lifetime risk was calculated as follows: 162 suicides/89 977 person-years $\times 100 = 0.180\%$ annual rate. $0.180\% \times 19$ years = 3.42% lifetime risk.

†The data and suicide rate for this study apply to men only.

‡Number represents mean duration of follow-up.

§The data and suicide rate for this study apply to women only.

Table 5.—Annual and Lifetime Risk of Suicide in Less-Than-Inpatient, Little-Treated Alcoholics*

| Source (Country), y | No. of Patients | Follow-up, y | Person-Years | No. of Suicides | Contemporaneous Suicide Rate, % |
|---|-----------------|--------------|---------------|-----------------|---------------------------------|
| Dahlgren ⁷⁵ (Sweden), 1951† | 10 588 | 4.5‡ | 47 646 | 63 | 22.3 ⁴⁷ |
| Öjesjö ⁷⁸ (Sweden), 1981† | 96 | 15 | 1440 | 3 | 28.7 ⁴³ |
| Fremming ⁵² (Denmark), 1951 | 61 | 36 | 2196 | 2 | 14.3 ⁴² |
| Total | 10 745 | ... | 48 282 | 68 | ... |

*Lifetime risk was calculated as follows: 68 suicides/48 282 person-years × 100 = 0.141% annual rate. 0.141% × 19 years = 2.68% lifetime risk.

†The data and suicide rate for this study apply to men only.

‡Number represents mean duration of follow-up.

Table 6.—Annual and Lifetime Risk of Suicide in Inpatient-Treated Alcoholics*

| Source (Country), y | No. of Patients | Follow-up, y | Person-Years | No. of Suicides | Contemporaneous Suicide Rate, % |
|--|-----------------|--------------|---------------|-----------------|---------------------------------|
| Gabriel ⁶ (Austria), 1935 | 1109 | 7† | 7763 | 30 | 38.3 ⁴² |
| Ellerman ⁷⁸ (Denmark), 1948‡ | 159 | 5† | 795 | 1 | 25.4 ⁴² |
| Nørvig and Nielsen ¹⁰ (Denmark), 1956‡ | 181 | 4 | 724 | 15 | 32.4 ⁴² |
| Wieser and Kunad ⁵¹ (West Germany), 1965 | 153 | 10† | 1530 | 13 | 19.2 ⁴³ |
| Ciampi and Eisert ³⁶ (Switzerland), 1969 | 1386 | 30 | 41 580 | 98 | 23.9 ⁴² |
| Gillis ¹⁶ (South Africa), 1969 | 802 | 3.5† | 2807 | 11 | 16.8 ⁴⁵ |
| Salum ²² (Sweden), 1972‡ | 1005 | 7.5† | 7538 | 33 | 27.6 ⁴³ |
| Lindellus et al ⁵³ (Sweden), 1974 | 257 | 7.5† | 1918 | 10 | 21.1 ⁴³ |
| Medhus ⁷⁹ (Sweden), 1975§ | 83 | 9 | 747 | 4 | 13.2 ⁴⁴ |
| Dahlgren and Myrhed ⁸⁰ (Sweden), 1977 | 200 | 9† | 1800 | 4 | 22.3 ⁴⁴ |
| Berglund ⁸¹ (Sweden), 1984 | 1312 | 20.5† | 26 896 | 88 | 22.3 ⁴³ |
| Total | 5845 | ... | 94 098 | 307 | ... |

*Lifetime risk was calculated as follows: 307 suicides/94 098 person years × 100 = 0.326% annual rate. 0.326% × 19 years = 6.20% lifetime risk.

†Number represents mean duration of follow-up.

‡The data and suicide rate for this study apply to men only.

§The data and suicide rate for this study apply to women only.

Table 7.—Annual and Lifetime Risk of Suicide in Outpatient- and Inpatient-Treated Alcoholics for Low Suicide Rate Countries

| Source (Country), y | No. of Patients | Follow-up, y | Person-Years | No. of Suicides | Contemporaneous Suicide Rate, % |
|---|-----------------|--------------|---------------|-----------------|---------------------------------|
| Outpatient-treated* van Dijk and van Dijk-Koffeman ⁸² (Netherlands), 1973† | 200 | 4 | 800 | 1 | 7.9 ⁴³ |
| Inpatient-treated‡ Sundby ²¹ (Norway), 1967† | 1693 | 29.5§ | 34 951 | 65 | 8.7 ⁴² |
| Bratfos ⁸³ (Norway), 1974† | 478 | 10 | 4780 | 1 | 11.1 ⁴⁷ |
| Haver ⁸⁴ (Norway), 1986¶ | 55 | 6.5 | 358 | 2 | 6 ⁴⁴ |
| Vallance ⁸⁵ (Scotland), 1965† | 68 | 2 | 136 | 2 | 10.5 ⁴³ |
| Beaubrun ⁸⁰ (Trinidad), 1967 | 45 | 7 | 315 | 3 | 1.6 ⁴⁵ |
| Total | 2557 | ... | 40 540 | 73 | ... |

*Lifetime risk was calculated as follows: 1 suicide/800 person-years × 100 = 0.125% annual rate. 0.125% × 19 years = 2.38% lifetime risk.

†The data and suicide rate for this study apply to men only.

‡Lifetime risk was calculated as follows: 73 suicides/40 540 person-years × 100 = 0.180% annual rate. 0.180% × 19 years = 3.42% lifetime risk.

§Number represents mean duration of follow-up.

||Number represents author's calculation.

¶The data and suicide rate for this study apply to women only.

between 15%²⁷ and 54%²⁸ could have been alcoholics, accounting for 4293 to 15 455 of the suicides. Consider these the outer limits of the problem we are working with. Over a 19-year period, the drinking lifetime we calculated as ending in suicide, assuming the same proportions each year, there would have been between 81 567 and 293 645 suicidal deaths of alcoholics. This represents between 0.77% and 2.79% of the NCA estimated number of alcoholics, and is far below the 11% to 15% previously estimated lifetime risk. The prevalence of alcoholism is thought to have increased, but so has the incidence and prevalence of major depressive disorder.²⁹ There is little reason to assume a major change in the participation of alcoholism in this rate. In fact, among the 204 consecutive suicides described by Rich et al³⁵ studied in 1981 and 1982, there were 22 pure alcohol abusers and 37 abusers of both alcohol and other drugs, representing 29% of the suicides. The currently assumed lifetime risk of suicide in alcoholics is far too large.

To look at it another way, if the 54% of suicides considered to be alcoholics under the maximum estimate (15 455) were 15% (Miles⁴ estimate) of the alcoholics dying in 1985, and the same 15% rate had prevailed for the 19-year lifetime of those alcoholics, the number of alcoholics at risk would have been only 1 957 633 ($[15\ 455 \times 19]/0.15$). Assuming the lowest estimate (4293 alcoholic suicides in 20 years) would project an absurdly low alcoholic population at risk of 543 780 persons. At least one of our assumptions must be faulty. The number of alcoholics at risk in the population may be greatly overestimated, or the mean duration of excessive drinking leading to suicide may be greatly underestimated. More likely, only a proportion of all persons loosely identified as alcoholics are seriously at risk.

The recurrent question of whether national suicide figures are reliable or gross underestimates is not germane. Retrospective suicide studies²⁸⁻³⁰ are all based on officially identified suicides, so the base is the same as the official statistics for the region studied. Only if there were a very large differential bias against recognizing the deaths of alcoholics as suicide would ascertainment be a critical variable. There is no a priori reason to assume this to be the case. Two studies, a Scottish one⁴⁰ and an English one,⁴¹ bear on the question of whether missed cases differ from those identified. According to those studies, they do not.

FOLLOW-UP STUDIES AS DATABASE

Having shown that current estimates of lifetime risk of suicide in alcoholics are impossibly high, we may now attempt to derive more realistic figures. There is a rather large follow-up literature on alcoholics. We have identified 46 studies, from 14 countries and published in four languages, that report both suicide and total mortality in a population of stated size over a specified time period. One third of them are from the United States. Both sample size and length of follow-up vary widely. We will use the data contained in these studies to calculate statistically sound lifetime risk estimates. One of the problems in such an undertaking is the fact that the majority of follow-up periods are relatively short: less than 10 years. Suicides, by definition premature deaths, tend to account for a disproportionate share of deaths early in the follow-up period, and become progressively diluted with other mortality as time goes on. Short follow-up periods yield widely varying results, sometimes quite high ratios of suicides to all deaths. The representativeness of the studies may not altogether be taken for granted. A very high or very low mortality may influence the probability that a series or its mortality will be reported. The longer the follow-up time, the lower the derived figure, and the more reliable the result is likely to be.

There is also the question of comparability of studies from the standpoint of how alcoholism was diagnosed. About 90% of

the material is based on hospital admission for, or discharge following inpatient treatment of, alcoholism. A careful review of diagnostic methods where these are given leads us to feel justified in taking hospital admission for treatment to be adequate evidence of a degree of severity of drinking and attendant problems to warrant confidence in the diagnosis. Pertinent characteristics of the studies of nonadmitted probands are presented where they come under consideration.

Another problem is that suicide rates vary widely by nationality and culture. Most European and Scandinavian countries that have produced follow-up studies of alcoholics have much higher suicide rates than the United States, the United Kingdom, Canada, and Iceland.⁴²⁻⁴⁵ Although approaching the US suicide rate today,²⁸ both Scotland (when considered separately from England and Wales)⁴⁶ and Norway⁴⁷ have long recorded substantially lower rates. That of the Netherlands remains low. Owing to these differences in suicide rates, it will be appropriate to consider the countries with high, medium, and low suicide rates as separate groups.

THE TREATED AND THE UNTREATED

Most published follow-up studies of alcoholics begin with consecutive hospital admissions or discharges. It is safe to say that alcoholics admitted for treatment are not representative of all alcoholics. Although perhaps an extreme view, Clark and Midanik^{48(p50)} opine that "The number of people with alcohol problems who ever seek any treatment for their problem related to alcohol is minuscule." In the Epidemiologic Catchment Area (ECA) study,⁴⁹ more than 16 000 persons aged 18 years and older were studied in five cities across the United States. Alcohol abuse (*DSM-III* criteria) was found in 13% of the population. Eighteen percent of the alcohol abusers had a history of hospitalization for any mental health reason (L. McEvoy, MA, written communication, April 11, 1988).

Not only do the great majority of alcoholics escape treatment, those who do so are likely to be less severely affected than those who do not. A larger minority of alcoholic suicides has had inpatient treatment^{24,25,33,50} than is found in these surveys of living persons. Of the 33 alcoholic and probable alcoholic suicides described by Robins in 1981,²⁵ 27% had had psychiatric treatment as either inpatients or outpatients. In the series of 50 alcoholic suicides followed up by Murphy et al³³ 15 years later, 32% had had inpatient psychiatric treatment. While access to treatment is undoubtedly greater today, it appears likely that alcoholics offered outpatient treatment may be less severely afflicted than those admitted to inpatient care. Having no treatment characterizes both relative youth and lesser problems. Therefore, different risk figures should be generated by samples of alcoholics having greater or lesser contact with physicians. All of the follow-up studies of alcoholics we were able to find in which both total mortality and that by suicide are given forms the database.

Before we undertake the calculations, three issues must be clarified. The first of these is that the outcome will pertain chiefly to men, who, in any case, contribute 80% to 90% of alcoholic suicides. A review of the 15 follow-up studies including both sexes that give mortality data separately by sex^{6,12-14,16,17,36,37,51-57} shows that the inclusion of women has little impact on the numbers (table available from G.E.M. on request). While representing 16% of the alcoholic probands in these studies, they contributed only 8% of the suicides. Across all studies under consideration, women account for 6% of the probands and 5% of the suicides. Thus, we conclude that their representation in various studies will not materially affect the outcome. Secondly, blacks are included in several US studies^{37,55,58,59} and one from Trinidad.⁶⁰ While blacks have substantially lower suicide rates than whites, the numbers are so small in the aggregate of studies as to have little effect on the

figures. The third point is that at the level of inpatient treatment there is no justification or need to distinguish types or durations of programs.⁶¹

SUICIDE RISK BY TREATMENT HISTORY

The number of probands in a follow-up study multiplied by the length of the follow-up in years gives the number of person-years at risk of suicide for that particular study. (There is a more precise way of performing this calculation, but the requisite data are rarely included in the reports.) The number of suicides within the follow-up period divided by the person-years at risk times 100 gives the annual percentage of probands dead by suicide. This figure, multiplied by 19 years—the calculated mean duration of alcoholism leading to suicide—yields an approximate lifetime risk for suicide. We will consider first those studies in which treatment did not play a part in accession. Next, we look at follow-up studies from outpatient treatment. Finally, we calculate risk for probands identified from inpatient admissions. While it is unlikely to be the case that no patient identified at a lower level of attention went on to a higher level, internal evidence in the various studies suggests that few had done so within the follow-up period. Account is taken of follow-up studies, in which the length of intake was a substantial proportion of the entire study duration, by calculating a *mean* follow-up duration.

Table 3 shows the above calculations for studies of (presumably) untreated and outpatient-treated alcoholics. Only two follow-up studies of untreated alcoholics were found. The US study is of an industrial population⁶² uncertainly diagnosed by company physicians. The other is from a longitudinal survey of the entire population of Iceland.¹⁴ The calculated annual rate of 0.097% yields a lifetime risk of 1.84%. Two small US studies,^{59,63} a medium one,⁶⁵ and a large Canadian study¹⁷ of alcoholics treated in outpatient settings yielded an annual suicide rate of 0.116% and a lifetime rate of 2.21% by the same method.

The majority of follow-up studies of alcoholics have identified their probands from psychiatric hospital admissions or discharges. They vary widely in duration, with short follow-up periods being most numerous. Cumulated figures are given in Table 4 for the 11 US studies,^{11-19,55,58,64-69} 5 from the United Kingdom,^{6,20,70-72} and 1 each from Canada⁵⁴ and Iceland.⁷³ The contemporaneous national suicide rate for both sexes or for men or women alone as indicated is given in the last column of Table 4 for the midpoint year of the follow-up. The rates are quite comparable across studies and countries. A yearly suicide rate of 0.180% is found. The lifetime risk of suicide among alcoholics who have been hospitalized is calculated to be 3.42% (0.180 × 19 years) for the combined studies. These figures are very substantially lower than those currently quoted.^{12,4} There is roughly a 20% increment in risk progressing from untreated to outpatient-treated alcoholics and a more than 50% increment from these to alcoholics having inpatient treatment.

SCANDINAVIAN AND EUROPEAN RISK ESTIMATES

Most of the Scandinavian and European countries have substantially higher suicide rates than those just considered. While alcoholism rates are not uniform across these countries, Beskow's⁶⁸ data for males and Hagnell and Rorsman's⁶⁹ for both sexes (Table 1) suggest that the contribution of alcoholism to the suicide rate in Sweden is not materially different from that in the United States. We will assume the same for the other countries included. There is not a sufficient database from that part of the world to justify separate calculations for untreated and outpatient-treated popula-

tions. Dahlgren's very large follow-up study of Swedish men known to the Temperance Board of the province of Malmöhus (Table 5) includes "not only institutional cases, but all the individuals who have come before a Temperance Board, warned, superintended or treated in an institution."^{75(p258)} By no means have all alcoholics admitted for treatment been reported to the Temperance Board, and only a minority of those reported are hospitalized. Thus, this is a rather mixed group, resembling outpatients more than inpatients. Öjesjö's⁷⁶ report from the longitudinal population study of Lundby, Sweden,⁷⁷ and Fremming's⁵² study of the population on the Danish island of Bornholm are from more general population surveys. Little if any treatment was afforded these alcoholic probands. The annual suicide rate for these three studies (Table 5) comes to 0.141%. Assuming our 19 years at risk holds for Europe and Scandinavia, the lifetime rate is 2.68%, modestly higher than that for countries with intermediate suicide rates. The population is a mixed one. It may cautiously be considered to represent nonhospitalized Scandinavian/European alcoholics.

Ten follow-up studies of inpatient-treated alcoholics were found from Austria,⁷ Denmark,^{9,78} Sweden,^{22,53,79-81} Switzerland,³⁶ and West Germany⁵¹ (Table 6). To these is added a study from South Africa (whites),¹⁶ which also has a high suicide rate.⁴⁴ By the procedure described above, the annual suicide rate of alcoholics is 0.326%, with a lifetime risk of 6.20%, nearly double that for countries with intermediate suicide rates. These studies span about 50 years, an undeniably long time, but it is not simply current suicide rates that dictate their inclusion. The appropriate published⁴²⁻⁴⁵ national suicide rate (men, women, or both) for each study at the midpoint of its follow-up (Table 6) shows their comparability. Only South Africa appears to be on the low side. Medhus'⁷⁹ study is of women only. The rate is more than double that for countries further west.

van Dijk and van Dijk-Koffeman⁸² have published the only follow-up study from a low-suicide-rate country based on an outpatient population of alcoholics. Small as this sample is—200 men followed up after 4 years—it yields a satisfactory result (Table 7). The annual rate of suicide was 0.125% and the lifetime rate was 2.38%.

Countries with relatively low suicide rates that have produced follow-up studies of hospitalized alcoholics include Norway,^{21,83,84} Scotland,⁸⁵ and Trinidad.⁶⁰ Inpatient-treated alcoholics in these countries exhibited an annual suicide rate of 0.180% and a lifetime risk of 3.42% (Table 7). This is the same as that calculated from studies in countries with intermediate suicide rates. Perhaps there is a lower limit to lifetime risk of suicide in alcoholics who have been hospitalized, regardless of the population's suicide rate. Alternatively, hospital admission may be less easily achieved in these relatively poor countries, thus selecting for greater severity. In any event, the result in this instance rests very heavily on a single large study,²¹ albeit a careful one.

It must not be assumed that the above estimates of lifetime risk for suicide in alcoholism can be relied on unquestioningly. The database is large and quite extended both temporally and geographically. We do not know with certainty that our assumptions about either the commensurability of studies or the applicability of our calculated lifetime of alcoholics who commit suicide are sound.

In general, the calculations (Tables 3 through 7) show a satisfyingly logical progression. Rather than a single suicide risk for all alcoholics everywhere, these figures reflect both a progressive risk with increasing evidence of psychopathologic factors and a differential rate for countries with high vs medium and low suicide rates. It is clear that earlier risk estimates are both conceptually unsound and mathematically untenable. The present calculations do work within the framework of our

knowledge. Until a better method is devised or better data are accumulated, they may serve as a closer approximation to fact.

ALCOHOLICS AT RISK

It may now be possible to approximate the population of alcohol abusers at risk for suicide. Those community studies that employed conservative diagnostic criteria for alcoholism²⁴⁻³⁰ (Table 1) found that, on average, 25% of the suicides were contributed by alcoholics. For the year 1985,³⁸ 25% of the 28 620 officially identified suicides equals 7155 such deaths. We found that roughly one third of our 50 alcoholic suicides had a history of inpatient treatment.³³ Taking one third of the 7155 alcoholic suicides ($0.33 \times 7155 = 2361$) and dividing by the calculated annual rate of suicide for previously hospitalized alcoholics from Table 4 (0.180%) yields a base of 1 311 167 hospital-treated alcoholics. The remaining two thirds of the alcoholic suicides ($0.67 \times 7155 = 4794$) divided by the annual suicide rate for nonadmitted alcoholics calculated for untreated plus outpatient-treated subjects from Table 3 (0.112%) gives a base of 4 272 899 nonadmitted alcoholics. The total, 5 584 066, would be roughly the number of alcoholics in the population at some risk of suicide. This figure is hardly more than half as large as the NCA estimate² of the prevalence of alcoholism.

PROBLEMS WITH RECENT PREVALENCE ESTIMATES

The NCA prevalence estimate of 10.5 million alcoholics in the United States² was calculated by Williams et al²⁴ based on a 1979 National Institute of Alcohol Abuse and Alcoholism survey reported by Clark and Midanik.⁴⁸ "Alcoholics were defined as drinkers who, during the prior year, had experienced one or more symptoms of alcohol dependence . . . either at least one symptom of alcohol withdrawal or at least one symptom of loss of control plus one other symptom of dependency excluding withdrawal."^{734(p82)} As pointed out by Fillmore and Midanik,³⁶ this method will produce an overestimate of the prevalence of the disorder. The rate was highest in men 18 to 20 years of age and next highest in the 21- to 34-year age group.

The ECA study,⁴⁹ conducted between 1980 and 1982,⁸⁷ was a large, multisite epidemiological study of the prevalence of psychiatric disorders in the general population. Between 10.7% and 15.9% (mean, 13.5%) of the population aged 18 years and older surveyed in five ECA sites were judged to be suffering from alcohol abuse/dependency disorders according to *DSM-III*⁸¹ criteria.^{86(p17)} The US population 18 years and above was 162 790 845 in 1980.⁸⁸ The ECA prevalence figure of 13.5% produces an estimate of 21 977 000 alcoholics, more than double that of the NCA!¹²

There are three aspects to the *DSM-III* criteria for a diagnosis of alcohol abuse pertinent to the ECA figure, as pointed out by Helzer and Burnam.³² First, only two symptoms are required for the diagnosis, one of these being a period of overindulgence and the other some adverse consequence. Second, a duration of only 1 month of a symptom suffices. The third and most important issue is that *the two symptoms are not required to be concurrent*. One criterion symptom can occur at one time and the other, months or years later (or earlier). In contrast to most other diagnostic criteria included in *DSM-III*, the syndrome concept is abandoned in regard to alcohol abuse. Given these considerations, a good case can be made that the ECA study, and to a lesser extent the NCA, are estimating the prevalence of alcohol abuse, a substantially broader population than that defined by more restrictive, syndromic definitions of alcoholism.^{90,91} For the same reason, the number of alcohol abusers identified by Rich et al²³ among

their suicides must be considerably greater than would be identified using more conservative criteria.

While overgenerous diagnostic criteria yield high prevalence figures, the cross-sectional method of estimating prevalence contributes as well. Fillmore and Midanik^{36(p223)} comment as follows:

[T]here is a marked difference in demographic and drinking characteristics between alcoholics in treatment and problem drinkers in the general population, particularly among men. The ages of alcoholics in clinical populations normally range from 35 to 60, whereas those with serious drinking problems in the general population tend to be in their early 20s. Patients in treatment are characterized by symptoms that are relatively coherent and persistent over time but this has not been found in the general population, even among those most seriously affected.

In two longitudinal samples, Fillmore et al⁹² found a much higher remission rate from alcohol abuse in a 4-year follow-up study of men aged 21 to 29 years at intake than among men 40 to 49 years old at index examination. Their data indicate quite a high prevalence of abusive drinking among younger men that is likely to diminish markedly over time. Paradoxically, the likelihood of abandonment of this behavior was seen to be greater among the young men reporting higher levels of alcohol consumption and attendant problems. This finding is echoed by Vaillant and Milofsky.⁹³ In their long follow-up study, young male alcohol abusers who later achieved sustained abstinence were significantly more likely to have shown alcohol dependency than those who continued to drink ($\chi^2 = 10.76$ with Yates' correction, $P < .01$; our calculation).

In contrast to the rather high levels of chronicity of alcohol abuse in those who come to treatment, Helzer and Burnam³² found in the ECA follow-up study remission rates in the neighborhood of 50% for both blacks and whites and men and women identified as ever having met *DSM-III* criteria for alcoholism. Remission was defined as no alcohol problems in the past year. Lifetime prevalence rates of alcoholism were significantly higher in those under 45 years of age (both men and women) than in those older. Remissions accumulate linearly, starting at 36% in the youngest age group of males, and have doubled by age 65 years and older. The young who might be identified as alcoholic in a population survey withdraw increasingly from that category. Mostly, they do so without coming to professional attention.^{32,93}

Owing to the increasing proportion of addictive drinkers in each successive age group,³² one might think that symptoms of addiction would predict chronicity. However, addictive drinkers among the young are shown to have a substantially higher remission rate than do mere abusers of alcohol,^{32,93} so the core group that will contribute to suicide is not readily identifiable early. However, if half of the untreated (or minimally treated) alcoholics remit, then the lifetime risk of suicide in the remainder is not greatly different from that of treated alcoholics (untreated, $1.84\% \times 2 = 3.68\%$; lightly treated, $2.21\% \times 2 = 4.42\%$; hospital-treated, 3.42%).

These studies help us to understand why some of the numbers do not work. A period of alcohol abuse is a poor predictor of longitudinal course. Guze et al⁸⁴ have shown that 84% of a group of alcoholics diagnosed by conservative criteria^{90,91} would still be so diagnosed 6 to 12 years later by raters blind to the initial diagnosis. Thus, conservative diagnosis, requiring both a syndrome and a substantial number and variety of symptoms, better defines the population at risk of suicide. These or similar criteria were used to diagnose alcoholic suicides in our two studies.^{25,33,50}

COMORBIDITY AS A RISK FACTOR

Relatively little attention has been paid in the suicide literature to the question of comorbidity—other psychiatric disor-

ders complicating or complicated by alcoholism. Comorbidity with alcohol abuse is common. Helzer and Przybeck⁶⁵ report that 47% of alcohol abusers identified in the ECA study had a second diagnosis and that alcoholism was particularly likely to coexist with other diagnoses. The strongest associations were with other substance abuse (men, 19%; women, 31%) and antisocial personality disorder (men, 15%; women, 10%). Major depression was 1½ times more frequent in alcoholics than in nonalcoholics. It was found in 5% of the male and 19% of the female alcoholics. A number of authors have noted substantial rates of accompanying diagnoses in their alcoholic probands on admission to their follow-up studies. Prominent among those mentioned are psychopathic or antisocial personalities^{14,32,36,44,52,72,96} and, to a lesser extent, affective disorders.^{21,56,81,96,97} Antisocial personality tends to endure, but the affective state at the time of accession to a follow-up study is not necessarily the same as that at the time of suicide.

Psychological autopsy findings paint a rather different picture. Murphy et al³⁸ found only 11 (22%) of 50 alcoholic suicides not to have an additional diagnosis. The most common accompanying diagnosis was major depression meeting strict diagnostic criteria⁹⁰ found in 68% of the suicides. In all but three cases, the depression was antedated by alcoholism. It tended to have been episodic and to have contributed to hospital admissions. The tendency to depressive episodes may lead alcoholics both to a greater likelihood of hospital treatment and to a greater risk of suicide as well.

Beskow²⁶ reported finding a depressive syndrome in 45% of the 100 substance abusers in his study of 271 suicides in Swedish men. He further found the symptom of depression in 89%. Alcoholism was not separated from other substance abuse, which was rather infrequent in that study. Nor were other comorbid factors identified for the substance-abusing subpopulation. In the report of Rich et al,²³ it was not possible to tell to what extent depression complicated alcohol abuse and in what proportion the reverse. In their multiply diagnosed probands, depression coexisted with substance abuse in 59% and substance abuse with depression in 54%.⁹⁸ More recently, these authors³⁵ have drawn attention to the high rate of coexistence of alcohol abuse and other drug abuse as an emerging phenomenon of significance in suicide.

Owing to the retrospective nature of the investigations and the very low frequency with which informants knew the proband during his or her early years, it was never possible to make a confident diagnosis of antisocial personality disorder in our studies,^{24,25,33,50} even when more recent behavior or history strongly suggested it. Based on the literature reviewed, it would not be unreasonable to expect a comorbidity of 10% to 20% of antisocial personality disorder, which went undetected for the reasons stated.

Comorbidity plays an important, perhaps crucial, role in the suicide of alcoholics. Complicating depression is the leading factor. Other substance abuse is seen to be not only more frequent now than in the past but to shorten the career from onset of substance abuse to suicide, regardless of which comes first³⁵ (Table 4). When the less common contributors to suicide are considered, such as antisocial or other personality disorders and Briquet's hysteria,⁹⁰ alcoholism or other substance abuse is almost invariably present as well.^{24,25,50} Thus, we may say that *suicide in alcoholism is largely dependent on the supervention of a depressive episode, while in the personality disorders suicide is conditioned on substance abuse* (and possibly depression as well).

THE RELATIVE RISK OF SUICIDE IN ALCOHOLISM

Based on our calculations regarding *untreated* alcoholics, it could be said that the lifetime risk of suicide (about 2%) is only slightly higher than that in the general population (1.3%). It is

not much different for those having outpatient treatment only (about 2.21%). But we know that the greatest part of the general population is not at risk at all. Fewer than 5% (perhaps 1% to 3% of suicides) are not identifiably psychiatrically ill.²⁴⁻³⁰ Even the sometimes overinclusive *DSM-III* diagnoses of the ECA data do not identify above one third of the population aged 18 years and older as having a psychiatric illness in their lifetime. Excepting phobias, which have not been shown to contribute to suicide, less than 25% of the population was identified as affected,⁸⁷ while nearly all of the deaths by suicide will be in the psychiatrically ill population.

Allowing that 5% of suicides are not psychiatrically ill, that group would account for $0.05 \times 28\ 620$ suicides (for 1985), which equals 1431 suicides not accounted for by the psychiatrically ill. Seventy-five percent, by ECA estimate, comprise the "not psychiatrically ill." This percentage of the 1985 US population aged 18 years and over amounts to 132 million persons⁸⁸ (0.75×176 million). The annual suicide rate for this population is then 1431 nonpsychiatrically ill suicides/ $132\ 000\ 000 = 0.000108$, or 0.00108%. We estimate 25% of the 28 620 suicides to have been alcoholics: 7155 alcoholic suicides. If there are 10.5 million alcoholics (NCA estimate),⁸ their risk is $7155/10\ 500\ 000 = 0.00068$, or 0.068%. (Note that this is only a little less than half the annual rate we calculated for outpatient-treated alcoholics.) By this calculation, alcoholics are about 60 times ($0.00068/0.000108 = 62.7$) as likely to commit suicide as the nonill. If the base were our calculated 5 584 066 alcoholics seriously at risk, the ratio is $0.0013/0.000108 = 120$. Depending, then, on which prevalence estimate is used, alcoholics are seen to have 60 or 120 times the suicide risk of the non-psychiatrically ill population. These are clearly conservative estimates compared with our risk calculations for hospital-treated alcoholics. At 0.18% annual risk, that group would be at 166 times greater risk than the nonill population.

A 3.4% lifetime risk of suicide sounds small. However, alcoholics die of a wide variety of medical and surgical disorders as well as violence at twice or more the rate of the population at large.* This mortality dilutes the proportional contribution of suicide in a way not characteristic of the affective disorders or schizophrenia. It also steadily diminishes the population at risk for suicide.

The alcoholic who becomes truly abstinent is probably protected from suicide to a great extent, at least so far as the role of alcoholism itself is concerned. Unfortunately, only 1 study of the 46 reviewed addresses this question with adequate methodologic focus⁷, and it suggests that this is the case. Abstinence is not a perfect protector, however, as an occasional case shows.^{71,86} In our studies,^{24,25,33,50} every diagnosed alcoholic was a recently active abuser of alcohol with current problems from it. A small number had stopped drinking for a few days before their suicide. It appeared in each case that a severe depressive episode was the cause of not drinking, rather than a decision of abstinence.

ALCOHOLICS AT GREATEST RISK

Suicide risk is not uniform across all alcoholics or at all times in any of them. It is certainly higher in conservatively diagnosed alcoholics^{90,91} than in the broader group of *DSM-III* alcohol abusers. Risk varies curvilinearly with age (Table 2) and directly with duration and severity of alcohol abuse, the supervention of a depressive episode, social isolation, and loss of emotional support. A depressive episode occurring in the course of alcoholism is found in one half to three fourths of the alcoholic suicides,^{23,26,50} a frequency much higher than in alcoholics hospitalized for treatment.^{21,56,96,97} Depression must be

*References 13, 15-17, 20-22, 37, 51, 53, 54, 56, 58, 62, 63, 67, 69, 73, 79, 81, 82.

considered a substantial risk factor. Finally, it has been shown⁵⁰ and replicated^{38,88} that disruption of a major interpersonal relationship signals a period of heightened risk of suicide in the alcoholic.

SUMMARY

We have shown that current estimates of a 10% to 15% lifetime risk of suicide in alcoholism are incompatible with existing data. If one assumes, based on the evidence presented, that 25% of suicides are alcoholic, and that the mean duration of inebriety preceding suicide is about 20 years, then the NCA estimate of 10.5 million alcoholics produces a lifetime risk figure around 1.3%. Even doubling the assumed percentage of suicides due to alcoholism yields a remarkably low lifetime risk estimate. Follow-up studies of alcoholics permit calculation of annual and lifetime rates of suicide. Long follow-up studies yielded the most stable, and short follow-up studies the least stable results. Probands experiencing different levels of treatment—none, outpatient, or inpatient—generally showed progressively higher levels of risk corresponding to greater degrees of affliction. Risk, calculated on data from countries with intermediate suicide rates (United

States, Canada, England, and Wales) and those with high rates (most European countries), was likewise progressively higher than in those countries with historically low rates (Norway, Scotland, and Trinidad). Finally, a more realistic estimate of the prevalence of chronic alcoholism (as opposed to youthful excess) in the United States was derived. Our calculation suggests that the alcoholic population at risk for suicide is about 5.6 million, little more than half that proposed by the NCA. Differing levels of diagnostic stringency for alcohol abuse can account for this difference. While we compute a much lower lifetime risk of suicide than that currently held, the rate we derived for the United States and other Western countries with similar suicide rates, about 3.4%, is 60 to 120 or more times higher than that in the general population. Comorbidity, particularly the superposition of a depressive disorder, is relevant to risk in the individual alcoholic, as are psychosocial changes such as interpersonal losses and social isolation.

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