

College medical and other records of former students from two universities were examined for characteristics predisposing to suicide and accidental death in a 17-51 year follow-up period. Similarities and contrasts in these two types of unnatural death were demonstrated in terms of familial, social, and psychological characteristics. The data were interpreted to signify anxiety in the future suicide and irresponsibility in the future accident decedent.

CHRONIC DISEASE IN FORMER COLLEGE STUDENTS

IX. CHARACTERISTICS IN YOUTH THAT PREDISPOSE TO SUICIDE AND ACCIDENTAL DEATH IN LATER LIFE

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Introduction

A REPORT on former students who entered Harvard University or the University of Pennsylvania from 1926 through 1950 identified a complex of host and environmental characteristics that distinguished eventual suicides from their classmates.¹ These characteristics included familial, physical, social, and psychological traits recorded during college years. Dominant among the distinguishing familial characteristics of eventual suicides was paternal deprivation through early loss or death of the father. Physically, the suicides tended to be of average stature (neither short nor tall), weighed less for their height, and were more prone to allergies. Socially, they were more apt to smoke cigarettes, less often joined in extracurricular activities or athletics, and more often became college dropouts. Self-assessed psychological traits revealed configurations of self-consciousness, anxiety, and mood swings.

Observations have now been updated and extended to earlier classes at Harvard, affording larger sample size and broader age range of subjects for study of events predisposing to suicide. Precursive characteristics are examined for their individual and collective effects on risk of self-destruction. Parallel analyses are made for former students reported to have died from accidental causes. Similarities and contrasts of the suicides and accident decedents are identified in terms of familial, social, and psychological precursive characteristics.

Methods

Observations relate to 50,000 men, 37,500 subjected to case-taking at Harvard from 1916 through 1950, and 13,500 examined at Pennsylvania from 1931 through 1940. Their mean age at college case-taking had been 18 (± 2) years. Routine case-taking and other college records provide starting data for

the 35-year period beginning in 1916. Names of living and deceased alumni, kept current by the schools, sustain follow-up activities and lead to identification of suicides and accidental deaths, end-point data of the study. Nearly 5,000 of the former students have died in the 17 to 51 years between the time of college record and 1967, whereas surviving members of their classes now range in age from 30 to 70 years.

College case-taking included medical, social, and psychological histories together with comprehensive physical examinations. At Harvard, case-taking forms and systems of examination changed at intervals; at Pennsylvania, forms and procedures remained unchanged during the period of record. Some items of interest, particularly sociopsychological traits, were recorded only during certain years or only at one school, limiting somewhat the uniformity of information. Subjects were omitted from computations where data were missing from college records.

End-point data were based on notification of death from university alumni offices and identification of causes of death from official certificates. In addition to decedents specifically designated as suicides, those whose certificates reported *self-inflicted* injuries or poisonings not ascribed to accidental circumstances also were considered as suicides. Accidental deaths were defined as those from unexpected injuries of physical or chemical nature, i.e., from trauma due to abnormal energy exchanges.

The present report includes only the first 381 suicides and 790 accidental deaths whose records have been identified in the 17 to 51 year follow-up period. For each decedent, two classmates who lived as long as the decedent and have not since died from these causes were randomly chosen as control subjects. Decedents and controls were compared as to the frequency with which each group exhibited specific character-

istics recorded in college. In general, findings were similar between the two schools and could be pooled for presentation.

Certain characteristics underwent temporal trends over the period of 1916-1950 when students entered the study. This required examination of decedent and *matched* control groups as to the prevalence of these characteristics. Estimated mortality ratios of suicide and accidental death were computed to measure the risk of death associated with a characteristic, as opposed to the risk in its absence. The formula is:

$$\text{Estimated mortality ratio} = \frac{\frac{\text{No. decedents with characteristic}}{\text{No. decedents without characteristic}}}{\frac{\text{No. controls with characteristic}}{\text{No. controls without characteristic}}}$$

A ratio of 1.5 for a given characteristic indicates that 50 per cent more subjects with the characteristic die from the stated cause than do subjects without the characteristic.

For former students from Pennsylvania, mortality *rates* were computed for self-assessed psychological traits. These rates, presented for the interval between college case-taking and 1967, were adjusted for differences in student age and length of follow-up. Significant differences were measured by chi square or *t*-tests, and a probability level of 0.05 was considered meaningful.

Of the 381 suicides, 40 per cent (153) killed themselves by firearm or explosive, 33 per cent (126) by poison or gas, 10 per cent (39) by hanging or strangulation, and 17 per cent (63) by other means. Suicides in and after college were alike in methods of self-destruction, and comparative study showed these method-groups not to differ in characteristics associated with suicide; thus they were combined into a single group.

Of the 790 accidental deaths generated from the starting population, 25 per

Table 1—Estimated suicide ratios in a 17-51 year follow-up, by familial characteristics assessed in college

Familial characteristic	Per cent with characteristic		Suicide ratio by age (years) at death		
	Suicides	Controls	Total	<35	35+
	N=326	N=652			
Father dead	12.4*	8.1	1.6	1.9	1.4
Parents separated	12.6	8.9	1.5	1.6	1.3
paternal loss	22.8†	15.8	1.6	1.8	1.4
Father college educated	69.1†	56.6	1.7	1.9	1.6
Father professional	48.8†	38.4	1.5	1.9	1.2

* Significantly different from controls at <0.05.

† Significantly different from controls at <0.01.

cent (199) were killed as a consequence of car crashes, 24 per cent (193) from plane crashes, 10 per cent (76) from poison or gas, 7 per cent (59) from explosive or firearm, 11 per cent (84) from drowning, and 23 per cent (179) from other means. Pooling of accidental deaths was employed despite some differences in the antecedent circumstances associated with some accident subgroups (e.g., victims of drowning were more apt to have been college athletes than victims of car crash).

Findings

Profile of the Suicide

In the 17-51 year follow-up interval, the 381 men who took their own lives had produced a suicide rate of 25 per 100,000 person-years. The mean age at suicide was 38 (± 12) years, an "interim mean" from college case-taking to 1967.

Table 1 shows the most prominent of numerous familial characteristics that distinguished eventual suicides. A larger proportion of suicides (23 per cent) than controls (16 per cent) had lost their fathers through death or marital separations before college case-taking. The suicide ratio shows that the risk of self-destruction was increased by 50 per cent

among such fatherless subjects. Similar increased risks are seen for subjects whose fathers had attended college and those whose fathers were in professional occupations. The trends suggest these influences are stronger for suicide before the age of 35, but that they persist in later years also.

Loss, death, or occupation of a mother before the student entered college did not influence suicide risk as did these attributes of a father. Of the familial characteristics precursive of suicide, the strongest was early loss of father, or his reduced accessibility, perhaps depriving the son of male guidance, companionship, security, or a needed disciplinary influence. On the other hand, the son of a busy and successful professional man may find his father a difficult model to emulate, leading to a sense of frustration or failure.

Three pronounced social characteristics precursive of suicide are shown in Table 2: boarding school attendance for secondary education, cigarette smoking at time of college case-taking, and failure to graduate from college. Each was associated with a 50 per cent increased risk of suicide over the risk in the absence of the characteristic. The added hazard persisted beyond the age of 35 years, and the influence of board-

ing school suggested even a slight increase at older ages. A fourth characteristic listed in Table 2, consumption of alcohol, did not differentiate suicides from controls.

As suicidal influences, these social characteristics must be merely indicators rather than directly causative in their action of increasing the risk. For example, boarding school attendance may be taken as another measure of paternal deprivation; it may impose a pattern of conformity leading to eventual monotony and discouragement; or it may signify monetary wealth substituted for essential family relationships. Contrasting explanations of the association between boarding school and eventual suicide might include the self-selection of children with emotional, affective problems that make them unpleasant to keep at home; or the selection of children who were told they were unwanted.

The tendency to self-destruction among cigarette smokers persists beyond the middle years, and may reflect personality traits such as compensation for self-consciousness or insecurity, overindulgence in social conformity, or gradual depression related to organic effects of smoking. The cigarette habit showed no quantitative relationship to risk of suicide, there being no difference between heavy and light smokers in this regard.

The role of college dropout as precursive of later suicide seems not to reflect academic failure, but rather some dissatisfaction or maladjustment. Grade records of eventual suicides were similar to those of control subjects, and the proportions of honor students did not differ between the groups.

A questionnaire administered at Harvard college case-taking, during the years 1939-1946, included self-assessment of family wealth as represented by annual income, motor cars, and servants. Although the numbers are small, a significantly larger proportion of suicides than controls were from families of affluence.

Table 3 gives rates of suicide during a 27-36 year follow-up period, in terms of ten psychological traits self-assessed by 13,500 University of Pennsylvania students at time of college case-taking. Four of these traits differentiated eventual suicides from their classmates. Suicide rates were significantly higher among students who answered affirmatively when questioned whether they were subject to insomnia, worries, being particularly self-conscious, and being subject to periods of alternating gloom and cheerfulness. Not shown in the table, these associations held for suicide at ages 35 years and older as well as under 35.

Although not statistically significant

Table 2—Estimated suicide ratios in a 17-51 year follow-up, by social characteristics assessed in college

Social characteristic	Per cent with characteristic		Suicide ratio by age (years) at death		
	Suicides N=381	Controls N=762	Total	<35	35+
Boarding school	41.5*	33.5	1.4	1.3	1.5
Cigarette smoker	43.0†	33.1	1.5	1.6	1.4
Alcohol consumer‡	38.6	37.3	1.1	0.9	1.7
College dropout	27.7†	20.1	1.5	1.7	1.5

* Significantly different from controls at <0.05.

† Significantly different from controls at <0.01.

‡ Follow-up limited to 17-32 years.

Table 3—Suicide rates (age- and interval-adjusted) per 1,000 former students in a 27-36 year follow-up, by self-assessed psychological traits in college (University of Pennsylvania)

Psychological trait	Men with trait		Men without trait		A/B
	Number	Suicide rate (A)	Number	Suicide rate (B)	
Palpitation	2,258	5.0	9,545	4.4	1.1
Nervousness	2,835	5.2	10,282	3.9	1.3
Insomnia	745	10.1†	12,414	3.8	2.6
Exhaustion	1,397	5.5	11,748	4.0	1.4
Worries	4,481	5.8*	8,675	3.2	1.8
Self-consciousness	3,508	6.7†	9,637	3.2	2.1
Persecution	2,102	5.4	10,946	3.9	1.4
Moodiness	4,130	5.7	9,024	3.4	1.7
Cyclothymia	4,038	6.0*	9,066	3.3	1.8
Secretive-seclusiveness	1,792	6.1	11,269	3.8	1.6

* Significantly different from controls at <0.05 .

† Significantly different from controls at <0.01 .

for all questions, suicide rates were higher among affirmative respondents to each of the ten questions. Rates were doubled among those who answered "yes" to any five or more of the ten psychological queries over rates for those who answered fewer (6.6 v. 3.4 per 1,000).

Similar psychological traits at Harvard, not self-assessed by the students but physician-observed at college case-taking, failed to differentiate eventual suicides from their classmates. Evidently, subjective judgment of psychological traits by self-assessment more readily reveals suicidal tendencies than objective interpretations of personality by practicing clinicians.

Profile of the Accident Decedent

The 790 men reported to have died from accidents thus far have produced an interim death rate of 55 per 100,000 person-years in the follow-up interval. Mean age at death from accident for the interim from college case-taking to 1967 was 32 (± 11) years.

Only two of the familial characteristics identified as correlates of eventual suicide showed association with accidental death: having a father who attended college, and affluent status. The college-trained father of the accident decedent tended to be managerial rather than professional in occupation, a reversal of the finding for fathers of suicides. Of accident decedents, 68 per cent had reported fathers to be college graduates, as compared with 61 per cent of their classmates. Similarly, family wealth was an attribute of accident decedents more frequently than of controls. Could it be that permissive and overindulgent parents encouraged attitudes and behavior patterns that contributed to the accidental deaths of their sons?

No physical characteristics measured at college case-taking differentiated future accident decedents from classmates. This is a further contrast with the eventual suicides who were distinguished by height and weight patterns and a history of allergic reactions.¹

Of many social characteristics found significant as precursors of suicide, the

three most outstanding were attendance at boarding school for secondary education, cigarette smoking at time of college case-taking, and failure to finish college. These same three characteristics mark the future accident decedent (Table 4). The sharing of this social pattern by both groups destined for unnatural death invites contrasting interpretation. Perhaps it signifies an attitude of depression or despair in the future suicide, but a care-free or irresponsible outlook in the eventual accident victim.

On a Harvard questionnaire administered at college case-taking from 1935-1950, students reported their use or nonuse of alcohol. Of the eventual accident decedents, 47 per cent were users as contrasted with only 37 per cent of controls (Table 4). The estimated mortality ratio suggests a 50 per cent increased risk of accidental death among former students who had reported using alcohol. Similar association is found for accidental death at ages under and over 35 years. These findings, relating collegiate patterns of alcohol consumption to eventual accidental death, depart from the finding that such patterns of drinking do not predispose to suicide, per se. College records of drinking showed no quantitative relationship to risk of accidental death, insofar as stu-

dents characterized themselves as "light" or "moderate" drinkers.

Comparison of Tables 2 and 4 shows that attendance at boarding school tends to correlate more strongly with suicide at ages 35 years or older, but with accidental death at ages under 35. Cigarette smoking predisposed equally to suicide and accidental death, but heavy smoking did not further increase the risk of either. Dropping out of college was a stronger correlate of subsequent accidental death than of eventual suicide.

Table 5 gives paired combinations of alcohol usage with other social and familial characteristics that predisposed to accidental death for the period where comparison is possible (case-taking years of 1935-1950). College training of fathers, boarding school attendance, and cigarette smoking seem confounded with the stronger correlate of alcohol usage. Dropping out of college, however, was the strongest of these characteristics and, coupled with alcohol usage, the effect on risk of accidental death seemed especially strong.

Of ten self-assessed psychological traits reported at the University of Pennsylvania, three showed negative correlation with subsequent accidental death (Table 6). Death rates from accident were significantly lower among subjects who admitted a sense of exhaustion,

Table 4—Estimated accident death ratios in a 17-51 year follow-up, by social characteristics assessed in college

Social characteristic	Per cent with characteristic		Accident death ratio by age (years) at death		
	Accidents N=634	Controls N=1,268	Total	<35	35+
Boarding school	47.2†	34.9	1.7	1.8	1.4
Cigarette smoker	45.0†	34.2	1.6	1.6	1.6
Alcohol consumer‡	47.3*	37.4	1.5	1.4	2.2
College dropout	36.5†	20.0	2.3	2.7	1.7

* Significantly different from controls at P<0.05.
 † Significantly different from controls at P<0.01.
 ‡ Follow-up limited to 17-32 years.

Table 5—Estimated accident death ratios in a 22-28 year follow-up, by paired combinations of alcohol usage and other social characteristics assessed in college

Social characteristics		Estimated accident death ratio by characteristics present			
		Neither	A only	B only	Both
A	B				
Alcohol consumer	Father college	1.0	1.5	1.1	1.6
Alcohol consumer	Boarding school	1.0	1.4	1.1	1.6
Alcohol consumer	Cigarette smoker	1.0	1.5	1.2	1.6
Alcohol consumer	College dropout	1.0	1.3	2.1	3.2

NOTE: Findings based on 223 accident decedents and 446 control subjects.

being subject to worries, or being particularly self-conscious, than the corresponding rates among classmates denying these traits. For worries and self-consciousness this is a diametric reversal of the findings noted for suicide.

Physician-assessed personality traits at Harvard failed to differentiate students at higher risk of accidental death from classmate controls. The reversal in psychological traits of the suicides and accident decedents invites the same interpretation given of their shared social

characteristics. Both sets of findings may reveal anxiety in the future suicide and nonchalance in the future accident victim.

Combinations of Precursors

Although social characteristics as precursors are, at best, indexes rather than direct causes of either suicide or accidental death, their cumulative effects may be studied in terms of estimated mortality ratios (Table 7). The combina-

Table 6—Accident death rates (age- and interval-adjusted) per 1,000 former students in a 27-36 year follow-up, by self-assessed psychological traits in college (University of Pennsylvania)

Psychological trait	Men with trait		Men without trait		A/B
	Number	Suicide rate (A)	Number	Suicide rate (B)	
Palpitation	2,258	12.1	9,545	12.3	1.0
Nervousness	2,835	13.7	10,282	11.4	1.2
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Exhaustion	1,397	8.2*	11,748	12.2	0.7
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Persecution	2,102	9.4	10,946	12.2	0.8
Moodiness	4,130	11.0	9,024	12.1	0.9
Cyclothymia	4,038	13.1	9,066	11.3	1.2
Secretive-seclusiveness	1,792	13.4	11,269	11.4	1.2

* Significantly different from controls at <0.05.

tion of boarding school attendance and cigarette smoking doubled the risk of suicide and accidental death over the risk in the absence of both characteristics. A still greater risk developed with the combination of cigarette smoking and college dropout versus their absence. The table shows college dropout to exert the strongest influence toward both types of unnatural death, with smoking second, and boarding school the weakest of the three precursors.

The collective effect of boarding school attendance and cigarette smoking seems to potentiate the risk of suicide, but to be less than additive in its influence on accidental death. Also attendance at boarding school and college dropout seem confounded as precursors of suicide, but their combination nearly quadrupled the risk of fatal accident. These departures in findings for combined precursors of suicide and accidental death are consistent with the tendencies already noted for individual social and psychological traits.

Discussion

Suicide and accidental death have in common that both are unnatural events suggesting a disregard for living. Sui-

cide is considered the result of deep and long-acting psychological impulses. An accident is more often considered the circumstance of a moment, while in fact it may be deeply rooted in the social and psychological background of the individual. The data reported here concentrate on early precursive elements in host and environmental characteristics. Suicides and accident decedents are shown to share some predisposing indexes and to be quite in opposition on others.

Reduced paternal availability, together with specific social and personality patterns, suggests anxiety or despair in the future suicide. Similar social patterns for differing personality types, coupled with use of alcohol, may translate into irresponsibility or nonchalance in the future accident decedent. The social patterns associated with suicide and accidental death would seem to have meaning chiefly in terms of their psychological implications.

The present study does not support the common impression that suicide is often a result of alcoholic excesses. While not implicated as an early precursor of suicide, alcohol may yet be involved as a prodromal symptom—removing inhibitions, clouding judgment, caus-

Table 7—Estimated suicide ratios and accident death ratios in a 17-51 year follow-up, by paired combinations of social characteristics assessed in college

Social characteristics		Cause of death	Estimated mortality ratio by characteristics present			
A	B		Neither	A only	B only	Both
Boarding school	Cigarette smoker	Suicide	1.0	1.1	1.3	1.9
		Accident	1.0	1.7	1.8	2.1
Cigarette smoker	College dropout	Suicide	1.0	1.6	1.6	2.4
		Accident	1.0	1.4	2.1	2.9
Boarding school	College dropout	Suicide	1.0	1.5	1.9	2.1
		Accident	1.0	1.6	2.1	3.9

NOTE: Findings for suicide are based on 381 decedents and 762 controls; for accidental death, 634 decedents and 1,268 controls.

ing depression, or acting organically.

Substitution of appropriate guidance for the early loss or absence of father might prove an effective deterrent to suicide. Controlled studies of students at higher risk of self-destruction, with follow-up procedures utilizing services of alumni activities, may identify important preventive measures.²

The convenient term "accident proneness" has fallen into disuse. Now, identification of early precursors of accidental death may encourage revival of the concept. Since it is unknown whether changes could be effected in psychological traits, perhaps more realistic attempts to prevent accidents are still those of safety precautions and engineering design. There is little doubt that some deaths ascribed to accident were actually suicide. Comparisons thus far possible are not sufficient to identify these errors or misrepresentations. Study of larger subgroups comprising deaths from gray area causes such as barbiturate poisoning, carbon monoxide inhalation, and gunshot wound may reveal sociopsychological patterns in youth firmly established for suicide rather than mere accident.

Summary

A total of 381 suicides and 790 accident decedents were identified among 50,000 male former students from Harvard University and the University of

Pennsylvania in a 17-51 year follow-up. Decedents were compared with classmates in search of personal and environmental characteristics at the time of college record that predisposed to these unnatural deaths later in life. Antecedent characteristics of suicide included: college education and professional occupation of father; loss of father before the son entered college; boarding school for secondary education; cigarette smoking in college; failure to graduate from college; and self-assessed characteristics of insomnia, worries, self-consciousness, and mood swings. Antecedent characteristics of accidental death included: college training and managerial occupation of father; secondary boarding school; cigarette smoking and alcohol consumption in college; college dropout; and self-assessed characteristics denying exhaustion, worries and self-consciousness. These respective antecedent patterns, representing both similarities and contrasts, lead to the speculation that anxiety and despair characterize the future suicide, whereas irresponsibility and nonchalance mark the future accident decedent.

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