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Antecedents and Sequelae of Sudden Parental Death in Offspring and Surviving Caregivers

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Abstract

Objectives—To examine the psychiatric antecedents that put parents at risk for early death, and the psychological sequelae of bereavement in offspring and caregivers.

Design—A population-based study.

Setting—Bereaved families were recruited through the coroner’s records and by advertisement. Control families were recruited by random-digit dialing and advertisement.

Participants—Families with biological offspring from 7 to 25 years of age in which 1 parent died of suicide, accident, or sudden natural death were included (n=140). Controls (n=99) had 2 living parents and their biological offspring and had no death of a first-degree relative within the past 2 years.

Main Outcome Measures—Lifetime psychiatric history for deceased parents (probands) and new-onset psychiatric disorders, self-reported symptoms, and functional status in offspring and surviving caregivers.

Results—Bipolar disorder, substance abuse, and personality disorders are more common in probands who died of suicide or accident than in control parents. Bereaved offspring and their caregivers were at increased risk for depression and posttraumatic stress disorder. Bereaved offspring had a 3-fold (95% confidence interval, 1.3–7.0) increased risk of depression, even after controlling for antecedent and concomitant risk factors. Offspring bereaved by suicide showed similar outcomes compared with those bereaved by other types of death.

Conclusions—Bereavement conveys an increased risk of depression and posttraumatic stress disorder above and beyond other vulnerability factors. Better integration of medical and psychiatric

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care may prevent premature parental death, but once it occurs, physicians should be alert to the increased risk for depression and posttraumatic stress disorder in bereaved offspring and their caregivers.

The death of a parent, which is experienced by 4% of children in Western countries, is consistently rated as one of the most stressful life events that a child can experience.^{1,2} Retrospective, record linkage, and prospective studies have found enduring psychiatric sequelae in children bereaved after a parent's death.³⁻¹⁷ However, little is known about the range, course, or predictors of psychiatric outcomes in bereaved offspring.

Parents who die suddenly are likely to have higher than expected rates of psychiatric disorder. Mood, alcohol and substance abuse, and personality disorders convey an increased mortality not only from suicide but also from accidents and cardiovascular diseases.¹⁸⁻²⁴ Moreover, the psychiatric factors that increase the risk for parental sudden death may also predispose offspring to adverse outcomes, which then may put bereaved offspring doubly at risk for psychological sequelae.

Although psychiatric illness may increase mortality from a variety of causes, death due to suicide is a direct consequence of mental disorder. It is widely believed that children whose parents died by suicide are at greater risk for adverse outcomes compared with offspring whose parents died of other causes, although the evidence from initial empirical studies is mixed.²⁵⁻³⁰ These studies have relatively small samples, ascertain subjects through referral, and have not considered the effect of the deceased parent's psychiatric disorder on the bereaved child's subsequent course.

To address these issues and provide more in-depth information about the sequelae of parental death in bereaved offspring, we initiated a controlled, prospective, population-based study of the effect of sudden parental death. In this initial report, we address 4 questions: (1) what psychiatric factors in the deceased parent are associated with suicide, accidental death, and sudden natural death? (2) what are the psychological sequelae of offspring bereaved after the death of a parent? (3) does bereavement make an independent contribution to child outcome after controlling for antecedent and concomitant risk factors? and (4) does parental suicide confer a higher risk of adverse sequelae than loss of a parent due to accidental or sudden natural death?

METHODS

SAMPLE

The sample includes 140 families in which 1 parent died. The deceased parents (probands) were aged 30 to 60 years, had biological offspring aged 7 to 25 years, and died within 24 hours of definite verdicts of either suicide (n=44), accidental death (n=36), or sudden natural death (n=60). No ambiguous accidents, such as single-passenger vehicular accidents or deaths by firearms thought to be accidental, were included in the study. To study the effect of parental death alone, accidents in which multiple family members died or were seriously injured were not included, and the accident and sudden natural death groups could not have had a completed suicide among first- or second-degree relatives in the past 2 years. The accidental deaths consisted of 13 drug overdoses, 14 motor vehicle accidents, 4 accidental falls, and 5 others (drowning, exposure to cold, etc). Drug overdoses were carefully reviewed to rule out those with possible suicidal intent. Parents who died of a drug overdose had a much lower rate of previous suicide attempt than did parents who died of suicide (6.7% vs 40.5%, Fisher exact test, $P=.02$). The causes of sudden natural death were myocardial infarction (n=48), infections (n=5), and 12 others (diabetes mellitus, stroke, aneurysm, gastric bypass surgery, etc). Undetermined and ambiguous cases were excluded.

The nonbereaved control group included 99 families, each with 2 living biological parents and offspring living at home in which no first-degree relatives had died within the past 2 years. Control families were recruited by frequency matching to the deceased probands on sex, age, and neighborhood.

The sample of deceased parents and controls was primarily male (184 of 239 or 77.0%), of European origin (203 of 239 or 84.9%), and in their early 40s (133 of 239 or 55.6%), and surviving caregivers were mostly female (195 of 240 or 81.2%) (Table 1). All offspring in this sample were biological offspring of the proband, with a median of 2 offspring per family (interquartile range, 1). Most surviving caregivers (226 [94.0%]) had a parental relationship with the child before the proband's death as biological parents (219 [91.0%]) or as adoptive parents or step-parents (7 [3.0%]). The remainder (14 [5.0%]) were relatives who became caregivers only after the death of the parent.

RECRUITMENT AND CONSENT PROCEDURES

Bereaved families (n=140) were recruited through the coroner's records (65 [46.4%]) and by newspaper advertisement (75 [53.6%]). Probands recruited by these 2 methods were similar on demographic characteristics, but the probands recruited through the coroner's office had higher rates of psychiatric disorder (89% vs 69%; $\chi^2_1=8.2$; $P=.004$), mainly due to a higher rate of alcohol/substance abuse disorders (78% vs 49%; $\chi^2_1=12.2$; $P<.001$). A higher proportion of sudden natural death probands (70%) were recruited by advertisement, because sudden natural deaths frequently do not come to the attention of the coroner. The demographic characteristics of probands who died of suicide and accidents were similar to those of all people who died of suicide and accident in Allegheny County (metropolitan Pittsburgh, Pennsylvania), and there were no demographic differences as a function of method of recruitment. The rate of acceptance into the study for eligible bereaved families was 71%.

Control families were frequency matched to deceased parents by neighborhood, age, and sex. Subjects were recruited by random-digit dialing or by advertisement. Of those who were eligible, 55% agreed to participate.

This study was approved by the University of Pittsburgh Institutional Review Board. After a complete description of the study, caregivers' consent was obtained for their participation, as well as that of their offspring. Assent or consent was obtained from offspring, depending on their age. Interviews were conducted at participants' homes or in our offices.

ASSESSMENT

Master's-degree-level interviewers with a background in psychology or social work conducted the interviews after receiving extensive training. Interviews with offspring and caregivers were conducted by separate interviewers blind to their psychiatric status. Interviews were conducted at a median of 9 months (inter-quartile range, 6) after the proband's death. There was no significant difference in the time from death to study intake by type of death (Kruskal-Wallis test $\chi^2_2=2$, $P=.38$). In addition, time since the death was unrelated to children's symptoms or rates of new-onset disorder. Psychiatric disorder was assessed using the Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) Axis I disorders for offspring 18 years and older and caregivers, or the Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version for offspring younger than 18 years.^{31,32} Personality disorder was assessed in those 18 years and older using the Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) Axis II disorders.³³ For deceased parents, diagnoses were obtained using the abovenoted instruments in a psychological autopsy procedure, with the surviving

spouse and/or next of kin serving as informants. Previous work has shown this approach to yield reliable and valid diagnoses.^{34–36} In conjunction with the clinical interview, functional impairment was assessed using the Children’s Global Assessment Scale³⁷ for young offspring or the Global Assessment Scale for young adult offspring and caregivers.³⁸ High interrater reliability was maintained for psychiatric diagnoses and global impairment (κ , 0.74–0.85; intraclass correlation=0.88).

The Circumstances of Exposure to Death, a semistructured interview developed and tested in a previous study, was used to assess offsprings’ experience surrounding and following the death of their parent.³⁵ Complicated grief was assessed using the Inventory of Complicated Grief³⁹ in caregivers. In offspring, a version of the Inventory of Complicated Grief–Revised that consisted of 28 items retained after factor analyses was used.⁴⁰ A history of abuse, including onset and duration, was obtained using a measure based on the Abuse Dimensions Inventory.⁴¹ The severity of *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) posttraumatic stress disorder (PTSD) symptoms was assessed by the Child PTSD Symptom Scale Interview⁴² in children and the parallel PTSD Symptom Scale Interview⁴³ for adults. Socioeconomic status and household income were rated using the Hollingshead scale.⁴⁴

Self-reported depression, anxiety, and suicidal ideation were assessed in offspring using the Mood and Feelings Questionnaire, the Screen for Child Anxiety Related Emotional Disorders, and the Suicidal Ideation Questionnaire–JR, respectively.^{45–47} Parallel measurements in adults were obtained using the Beck Depression Inventory, the Beck Anxiety Inventory, and the Adult Suicidal Ideation Questionnaire.^{48–50} Intercurrent life events were assessed using the Life Events Checklist⁵¹ in offspring younger than 18 years and the shortened Social Readjustment Rating Scale of Holmes and Rahe⁵² in offspring 18 years and older.⁵³

Factors that might buffer the impact of bereavement were also assessed in offspring. Family cohesion and self-esteem were assessed using the Family Adaptability and Cohesion Evaluation Scale II⁵⁴ and the Weinberger Adjustment Inventory self-esteem subscale,⁵⁵ respectively. Social support and coping style were assessed using the Survey of Children’s Social Support⁵⁶ and Kidcope,⁵⁷ respectively, in offspring younger than 18 years. These domains were assessed by the Multidimensional Scale of Perceived Social Support⁵⁸ and the Ways of Coping questionnaire in offspring 18 years and older.⁵⁹ When different measures were used for offspring who were younger than 18 years or 18 years and older, scores from these measures were standardized.

DATA ANALYSIS

The lifetime psychiatric characteristics of probands and previous psychiatric history, current symptoms, and rates of new-onset psychiatric disorder in caregivers and offspring from bereaved families were compared with those of controls using standard univariate statistics. For the analyses of psychiatric characteristics that antedated the death, we included only those caregivers who had a parental role before the death (227 of 240). To control for multiple comparisons in our examination of psychiatric characteristics, we divided $\alpha=.05$ by the number of contrasts, resulting in corrected values that ranged from .01 to .008. We compared offspring with new-onset diagnoses (depression and PTSD) with those without a new-onset disorder, and then used logistic regression to identify the most salient predictors of new-onset diagnoses and examine the effect of bereavement after controlling for demographic, familial, and clinical risk factors, and tested the roles of sex and age as moderators of the effect of bereavement on child outcome. We also adjusted for the difference in age of the proband between the different groups. Because multiple offspring were recruited per family, a cluster effect was introduced in the regression analyses.

RESULTS

PSYCHIATRIC DISORDERS IN PROBANDS

Probands in the 4 groups—suicide, sudden natural death, accidental death, and controls—were significantly different with respect to bipolar disorder, alcohol/substance abuse, personality disorder, and any disorder (Table 2). As expected, probands who died of suicide had higher rates of bipolar disorder, alcohol/substance abuse disorders, personality disorder, and any disorder than controls. Probands who died of accidental death also had higher rates of alcohol/substance abuse and personality disorders than controls. Though not statistically significant, probands who died of accidental or sudden natural death had higher rates of bipolar disorder than controls that were not significantly lower than in probands who died of suicide. The suicide group was significantly different from the sudden natural death group with regard to rates of alcohol/substance abuse disorders, personality disorder, and any psychiatric disorder.

PREDEATH PSYCHIATRIC DISORDER IN CAREGIVERS AND OFFSPRING

Group differences were found for prior history of depression, anxiety, and any psychiatric disorder in caregivers with a parental role before the proband's death (Table 2). Caregivers in the suicide group were more likely to have had a prior history of depression and any disorder than control parents. Caregivers in both the suicide and sudden natural death groups had higher rates of anxiety disorder than did control parents. Predeath history of any disorder was different across offspring groups, with higher rates in offspring of parents who died of suicide vs controls.

PSYCHOLOGICAL SEQUELAE OF PARENTAL BEREAVEMENT

Group differences were found for any new-onset psychiatric disorder, depression, and PTSD (Table 3). Offspring in the suicide, accident, and natural death groups showed higher rates of new-onset depression than did control offspring. Bereaved offspring were at increased risk for PTSD compared with control offspring (8.6% vs 0%, $P<.001$); post hoc, offspring in the suicide and natural death groups showed higher rates of new-onset PTSD compared with controls. Offspring in the natural death group were significantly different from the control group in the new onset of any psychiatric disorder. Offspring in the suicide and natural death groups showed more functional impairment than those in the control group. The bereaved groups were similar in their complicated grief scores.

CONCOMITANT RISK FACTORS

Caregivers in all 3 bereaved groups showed similarly increased rates of new-onset depression and PTSD compared with caregivers in the control group (Table 4). Similarly, higher levels of self-reported depression, anxiety, PTSD, suicidal ideation, and functional impairment were found in the bereaved groups relative to the control group. Similar to offspring, the rates of complicated grief were comparable among caregivers in the 3 bereaved groups. Caregiver and child symptoms of depression, anxiety, PTSD, suicidal ideation, and complicated grief were intercorrelated ($r=0.26-0.48$; $P<.001$).

PREDICTORS OF OUTCOME AND INDEPENDENT CONTRIBUTION OF BEREAVEMENT

We examined the correlates of new-onset disorders in depression and PTSD, the 2 conditions that were more prevalent among bereaved offspring (Table 5). We included significant antecedent and concomitant risk factors in regression analyses, as well as sex and age and their interactions with bereavement, to examine whether they moderated the effect of bereavement on outcome. Bereavement conveyed an increased risk for depression (odds ratio [OR], 3.0; 95% confidence interval [CI], 1.3–7.0) even after controlling for all covariates. In addition, caregiver functioning (higher functioning is protective; OR, 0.96; 95% CI, 0.9–1.0) and

offspring self-esteem (higher score reflects poorer self-esteem; OR, 1.1; 95% CI, 1.0–1.2) were also significant predictors (Hosmer-Lemeshow goodness-of-fit test; $\chi^2=10.3$; $P=.25$). No significant interactions were found between bereavement and offspring age or sex. Among bereaved offspring, having a last confiding conversation with the deceased (OR, 4.7; 95% CI, 1.8–12.1) predicted new-onset depression in addition to caregiver's functioning and child's self-esteem. The type of death was not a significant predictor within the bereaved group (Hosmer-Lemeshow goodness-of-fit test; $\chi^2=7.2$; $P=.52$).

Because no PTSD cases were observed in the control group, we examined correlates of new-onset PTSD among bereaved offspring only (Table 6). Logistic regression, including all significant predictors, as well as sex and age and their interactions with type of death, revealed that a previous history of any psychiatric disorder in offspring (OR, 9.4; 95% CI, 2.3–38.7), a history of bipolar disorder in the deceased parent (OR, 6.4; 95% CI, 1.9–21.9), being at the scene when death occurred (OR, 8.3; 95% CI, 1.8–36.1), and a family history of PTSD (OR, 6.8; 95% CI, 1.6–28.5) predicted new-onset of PTSD. Type of death was not a significant predictor of new-onset PTSD. In addition, no significant main effects of sex and age were found, nor any interactions with type of death (Hosmer-Lemeshow goodness-of-fit test; $\chi^2=6.7$, $P=.35$).

COMMENT

Bereaved offspring are at increased risk for adverse outcome in part due to factors that antedate and may have contributed to their parents' early deaths. This was particularly marked in the suicidal death group compared with the control group, with the former showing much higher rates of bipolar disorder. However, accidental deaths were also more likely to have psychiatric disorders compared with controls, specifically alcohol/substance abuse and personality disorder. We also demonstrate that the loss of a parent conveys an increased risk for new-onset depression and PTSD in their children, even after controlling for antecedent and concomitant risk factors. Finally, we demonstrate that, despite greater loading for antecedent risk factors, bereavement due to suicide does not convey an increased risk for adverse outcome 9 months after the death, compared with other types of sudden death.

Psychiatric disorder in the parent is clearly an antecedent to early parental death. The disorders most closely associated with premature parental death were bipolar disorder, alcohol and substance abuse, and personality disorder. High rates of bipolar disorder are expected in suicide victims, but the accidental and sudden natural death groups also showed a trend toward higher rates of bipolar disorder than the control group. While the association between bipolar disorder and suicide is well known, there are also reports that patients with bipolar disorder have a greater number of cardiovascular risk factors, including smoking and obesity, and an increased risk of pulmonary embolism.^{18,20–23} Thus, the previously reported association between parental bereavement and bipolar disorder in offspring may be explained in part by a higher rate of bipolar disorder in parents who die prematurely.^{4,6,8,10} In addition, psychological autopsy studies of traffic accidents show an overrepresentation of substance abuse disorders and personality styles that are termed impulsive and sensation seeking.^{19,24} These findings highlight the importance of reducing health risk behaviors in individuals with these complex and challenging disorders and providing integrated medical and psychiatric management for these individuals.

Moreover, offspring who lose a parent due to suicide, accident, or sudden natural death are at increased risk for adverse outcomes, not only due to higher incidence of psychiatric disorders among probands but also because of higher rates of disorder in the coparent and the offspring themselves. These findings may be explained by assortative mating, and by the familial transmission of parental disorder to offspring.

Loss of a parent due to sudden death conveys an increased risk of depression and PTSD in bereaved offspring, above and beyond increased antecedent risk. Higher caregiver functioning was protective against depression, which was similar to the results of a previous study by Sandler et al.⁹ Caregivers had higher rates of disorder before the death and increased risk of depression and PTSD after the death, which in turn affected offspring's outcome. Other factors that affected outcome included the nature of the last conversation with the deceased. A recollection of a supportive conversation with the deceased was associated with a higher risk of depression, which is consistent with other studies finding that the closer the relationship to the deceased, the higher the risk of depression.⁶⁰ Understanding the mechanisms through which bereavement conveys its effects is essential to identify those at highest risk who should be the target of future prevention and intervention efforts.

At the initial assessment, suicide-bereaved offspring had the greater loading for predeath risk factors. However, their outcome was similar to those of other bereaved youth. This supports a view that, in the short term, there are more similarities than differences among offspring whose parents die of suicide and those who lose a parent to accidental or sudden natural death. Further follow-up is indicated to determine whether these groups begin to diverge over time.

This study has several strengths and limitations. To our knowledge, it is the first controlled, population-based study of the effect of sudden parental death on offspring and has the largest sample of suicide-bereaved offspring. However, it is very difficult to determine whether this sample is representative or not because coroners' records do not routinely list surviving offspring, and because natural deaths usually are not the province of the coroner. However, our sample of suicides and accidents was demographically similar to Allegheny County overall, and our response rate was 71%, which is relatively high for these types of studies. Although it is possible that there were referral biases, because disturbed families more worried about their children might have been more likely to participate, bereaved families recruited by advertisement showed lower rates of some proband disorders, which would argue against such a referral bias. Our profile of the deceased parents is similar to those obtained in previous psychological autopsy studies, which makes it more likely that our results are not simply the result of sampling bias.^{19,61} A second limitation is the use of an informant rather than self-report in the case of the deceased probands. However, the psychological autopsy procedure is a specific and fairly sensitive method for determining psychiatric disorder,³⁴ and if anything, is likely to underestimate the rate of disorder, thus biasing the results more toward the null hypothesis.³⁶

Our findings have important clinical and public health implications. The best way to attenuate the effect of parental bereavement among offspring is to prevent early death in their parents by improving the detection and treatment of bipolar illness, substance and alcohol abuse, and personality disorders, and by addressing the lifestyle correlates of these illnesses that lead to premature death. The caregiver should be monitored for depression and PTSD, because restoration of functioning is a positive prognosticator for offspring. Given the increased risk of depression and PTSD, bereaved offspring should be monitored and, if needed, referred and treated for their psychiatric disorder. Further studies are needed to examine the course and long-term effect of bereavement on offspring and their surviving caregivers, to test the mechanisms by which parental bereavement exerts these effects, and to identify the subset of bereaved families who may require treatment, which can then frame targets for intervention and prevention efforts.

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Table 1
Demographic Characteristics of Probands, Caregivers, and Offspring

Characteristic	Proband Cause of Death				Controls	Test	P Value
	Suicide	Accident	Natural Causes				
No. of probands	44	36	60	99			
Males, No. (%)	34 (77)	26 (72)	49 (82)	75 (76)	$\chi^2_3 = 1.3$	.73
White race, No. (%)	41 (93)	28 (78)	49 (82)	85 (86)	$\chi^2_3 = 4.3$	.23
Age, mean (SD), y	43.2 (7.4) ^{ab}	41.4 (6.7) ^a	46.9 (8.0) ^b	43.5 (7.1) ^a	$F_{3,235} = 5.0$	.002
Hollingshead SES, mean (SD)	36.4 (7.3)	33.7 (7.9)	35.6 (7.9) ^a	36.4 (6.9)	$F_{3,224} = 1.2$	.30
No. of caregivers	43	36	60	101			
Males, No. (%)	7 (16) ^{ab}	7 (19) ^{ab}	5 (8) ^a	26 (26) ^b	$\chi^2_3 = 7.7$	.05
White race, No. (%)	40 (93)	28 (78)	51 (85)	88 (87)	Fisher exact	.27	
Age, mean (SD), y	41.8 (7.6) ^a	45.2 (10.6) ^{ab}	45.9 (7.4) ^b	42.4 (6.3) ^a	$F_{3,226} = 4.0$	.008
Parental role before death	40 (93) ^{ab}	31 (86) ^a	55 (92) ^a	101 (100) ^b	Fisher exact	.003	
No. of offspring	66	51	94	183			
Males, No. (%)	34 (52)	24 (47)	53 (56)	92 (50)	$\chi^2_3 = 1.4$	.70
White race, No. (%)	61 (92) ^a	42 (82) ^{ab}	69 (73) ^b	155 (85) ^a	$\chi^2_3 = 10.7$	.01
Age, mean (SD), y	13.6 (3.7)	13.1 (4.1)	13.4 (3.4)	12.9 (3.2)	$F_{3,390} = 0.9$	.44
7–11, No. (%)	20 (30)	22 (43)	28 (30)	69 (38)	$\chi^2_6 = 8.4$	.21
12–17, No. (%)	34 (52)	21 (41)	52 (55)	98 (54)			
≥18, No. (%)	12 (18)	8 (16)	14 (15)	16 (9)			
Time from death to study intake, median (IQR)	8 (6.5)	5 (8)	6 (9)	NA	$\chi^2_2 = 2.0$ (Kruskal-Wallis)	.38	

Abbreviations: IQR, interquartile range; NA, not applicable; SES, socioeconomic status. Similar superscripts are used when no significant post-hoc differences are observed.

Predeath Psychiatric History

Table 2

Characteristic	Proband Cause of Death*					P Value
	Suicide	Accident	Natural Causes	Controls*	Test	
No. of probands	44	36	60	99		
Psychiatric disorder, No. (%)						
Depression	24 (56)	16 (44)	22 (38)	32 (33)	$\chi^2=7.0$	.07
Bipolar	10 (23) ^a	3 (8) ^{a,b}	4 (7) ^{a,b}	2 (2) ^b	Fisher exact	<.001
Psychotic	3 (7)	1 (3)	0	0	Fisher exact	.01
Anxiety	11 (26)	9 (25)	11 (19)	27 (28)	$\chi^2=1.7$	.63
Behavioral	8 (20)	4 (11)	3 (5)	11 (11)	Fisher exact	.16
Alcohol/substance abuse	36 (84) ^a	26 (72) ^a	25 (42) ^b	42 (42) ^b	$\chi^2=29.1$	<.001
Personality	19 (43) ^a	7 (19) ^{a,b}	9 (15) ^{b,c}	4 (4) ^c	$\chi^2=34.5$	<.001
Any disorder [†]	43 (98) ^a	28 (78) ^{a,b}	39 (65) ^b	70 (75) ^b	$\chi^2=15.9$	<.001
No. of caregivers [‡]	40	31	55	101		
Psychiatric disorder, No. (%)						
Depression	25 (63) ^a	14 (45) ^{a,b}	23 (42) ^{a,b}	31 (31) ^b	$\chi^2=12.0$	.007
Bipolar	1 (3)	1 (3)	2 (4)	1 (1)	Fisher exact	.50
Psychotic	0	0	0	1 (1)	Fisher exact	.99
Anxiety	15 (38) ^a	9 (29) ^{a,b}	19 (35) ^a	14 (14) ^b	$\chi^2=12.9$	.005
Behavioral	5 (13)	0	3 (6)	5 (5)	Fisher exact	.17
Alcohol/substance abuse	15 (42)	11 (36)	12 (22)	28 (28)	$\chi^2=4.6$	.20
Personality	4 (10)	1 (3)	0	2 (2)	Fisher exact	.04
Any disorder [†]	34 (87) ^a	21 (68) ^{a,b}	35 (65) ^{a,b}	54 (56) ^b	$\chi^2=12.3$	.007
No. of offspring	66	51	94	183		
Psychiatric disorder, No. (%)						
Depression	11 (17)	8 (16)	9 (10)	15 (8)	$\chi^2=5.0$	.17
Bipolar	0	2 (4)	2 (2)	0	Fisher exact	.03
Psychotic	2 (3)	0	0	0	Fisher exact	.04
Anxiety	8 (12)	4 (8)	6 (6)	14 (8)	Fisher exact	.60
Behavioral	9 (14)	6 (12)	10 (11)	7 (4)	Fisher exact	.02
Alcohol/substance abuse	2 (3)	1 (2)	2 (2)	3 (2)	Fisher exact	.91

Characteristic	Proband Cause of Death*				Test	P Value
	Suicide	Accident	Natural Causes	Controls*		
Any disorder [†]	30 (46) ^a	17 (33) ^{a,b}	30 (32) ^{a,b}	42 (23) ^b	$\chi^2=12.6$	.006
Physical abuse, No. (%)	3 (5)	2 (4)	0	2 (1)	Fisher exact	.05
Sexual abuse, No. (%)	2 (3)	4 (8)	4 (4)	2 (1)	Fisher exact	.05

Abbreviations: Similar superscripts are used when no significant post-hoc differences are observed.

* For probands and adult caregivers, $\alpha=.007$; for offspring, $\alpha=.006$; pairwise comparison, $\alpha=.008$.

[†] Any disorder is computed based on the other diagnoses and thus not included as an independent outcome.

[‡] Only caregivers with a parental role prior to death are included in this analysis.

Table 3

New-Onset Diagnoses and Symptoms in Offspring

Characteristic	Proband Cause of Death*					Test	P Value
	Suicide (n=66)	Accident (n=51)	Natural Causes (n=94)	Controls* (n=183)			
Psychiatric disorder, No. (%)							
Depression	15 (23) ^a	10 (20) ^a	20 (21) ^a	10 (6) ^b		$\chi^2=21.0$	<.001
PTSD	7 (11) ^a	1 (2) ^{a,b}	10 (11) ^a	0 ^b		Fisher exact	<.001
Bipolar	0	1 (2)	3 (3)	2 (1)		Fisher exact	.37
Anxiety	5 (8)	5 (10)	19 (20)	18 (10)		$\chi^2=8.1$	.04
ADHD	1 (2)	2 (4)	9 (10)	19 (10)		Fisher exact	.06
Behavioral	1 (2)	0	4 (5)	7 (4)		Fisher exact	.50
Alcohol/substance abuse	2 (3)	0	0	0		Fisher exact	.04
Any disorder	22 (39) ^{a,b}	15 (32) ^{a,b}	42 (49) ^a	40 (24) ^b		$\chi^2=17.6$	.001
Symptoms, mean (SD) [†]							
Depression, MFQ/BDI score	0.37 (1.16) ^a	0.21 (1.14) ^a	0.13 (0.97) ^a	-0.23 (0.86) ^b		F=7.2	<.001
PTSD	7.3 (7.5) ^a	3.5 (6.0) ^b	5.7 (8.0) ^a	1.1 (3.2) ^b		F=11	<.001
Anxiety, SCARED/BAI score	0.15 (1.04)	0.08 (1.01)	0.06 (1.07)	-0.09 (0.94)		F=1.1	.34
Suicidal ideation, SIQ score	25.2 (13.0) ^a	21.9 (14.6) ^{a,b}	21.3 (7.9) ^{a,b}	19.8 (9.6) ^b		F=3.7	.02
Functioning, CGAS score	76.0 (11.0) ^a	78.0 (10.7) ^{a,b}	76.0 (13.1) ^a	82.4 (10.0) ^b		F=9.5	<.001
Complicated grief, ICG-R, No. (%)	59 (21)	54 (18)	53 (19)	NA		F=1.9	.16

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; CGAS, Children's Global Assessment Scale; ICG-R, Inventory for Complicated Grief—Revised, Child version; MFQ, Mood and Feelings Questionnaire; NA, not applicable; PTSD, posttraumatic stress disorder; SCARED, Screen for Child Anxiety-Related Emotional Disorders; SIQ, Suicidal Ideation Questionnaire. Similar superscripts are used when no significant post-hoc differences are observed.

* For psychiatric disorders, $\alpha=.007$; for symptoms, $\alpha=.008$; pairwise comparison, $\alpha=.008$.

[†] For a description of the tests administered, please see the "Assessment" subsection of the "Methods" section.

Table 4

New-Onset Diagnoses and Symptoms in Caregivers

characteristic	Proband Cause of Death*				Test	P value(n=60)
	Suicide	Accident (n=36)	Natural (n=60)	Controls*		
Psychiatric disorders, No. (%)						
Depression	12 (28) ^{a,b}	13 (36) ^a	21 (35) ^a	9 (11) ^b	$\chi^2=15.7$	.001
PTSD	11 (26) ^a	11 (31) ^a	14 (23) ^a	1 (1) ^b	Fisher exact	<.001
Bipolar	1 (2)	0	0	2 (2)	Fisher exact	.66
Anxiety	13 (30)	12 (33)	13 (22)	12 (14)	$\chi^2=7.8$	.05
Alcohol/substance abuse	3 (7)	1 (3)	0	2 (2)	Fisher exact	.15
Any disorder	20 (49) ^{a,b}	16 (44) ^{a,b}	31 (52) ^a	22 (27) ^b	$\chi^2=11.3$	.01
Symptoms, mean (SD) [†]						
Depression, BDI score	12.5 (12.1) ^a	13.4 (11.1) ^a	11.9 (9.3) ^a	4.9 (5.9) ^b	F=12.3	<.001
PTSD	12.4 (13.1) ^a	10.0 (10.0) ^a	8.8 (10.3) ^a	1.8 (4.1) ^b	F=10.8	<.001
Anxiety, BAI score	10.7 (12.8) ^a	10 (12.4) ^a	8.5 (10.2) ^{a,b}	4.2 (5.7) ^b	F=5.6	<.001
Suicidal ideation, SIQ score	26.7 (13.8) ^a	28.5 (14.9) ^a	26.2 (14.7) ^a	19.3 (5.0) ^b	F=7.9	<.001
Functioning, GAS score	72.0 (14.3) ^a	75.0 (11) ^a	26.2 (14.7) ^a	82.0 (9.3) ^b	F=10	<.001
Complicated grief, ICG, No. (%)	13 (32)	7 (25)	16 (31)	NA	$\chi^2=0.44$	.80

Abbreviations: BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; GAS, Global Assessment Scale; ICG, Inventory for Complicated Grief; NA, not applicable; PTSD, posttraumatic stress disorder; SIQ, Suicidal Ideation Questionnaire. Similar superscripts are used when no significant post-hoc differences are observed.

* For psychiatric disorders, $\alpha=.01$; for symptoms, $\alpha=.008$; pairwise comparison, $\alpha=.008$.

[†] For a description of the tests administered, please see the "Assessment" subsection of the "Methods" section.

Table 5
Correlates of New-Onset Depression in Offspring

Characteristic	Odds Ratio (95% Confidence Interval)		
	Bereaved	Control	Total
Males	0.94 (0.5–1.8)	0.23 (0.05–1.1)	0.80 (0.4–1.3)
White race	1.56 (0.6–4.0)	2.18 (0.4–13.5)	1.76 (0.7–4.3)
Age, y			
7–11	1 [Reference]	1 [Reference]	1 [Reference]
12–17	1.74 (0.8–3.8)	5.23 (0.6–43.5)	2.04 (1.0–4.1)
≥18	1.65 (0.6–4.6)	9.71 (0.8–114.7)	2.65 (1.1–6.6)
Bereavement			4.70 (2.3–9.7)
Time from death to study intake	1.00 (0.9–1.1)	NA	1.00 (0.9–1.1)
Caregiver's functioning, GAS score	0.97 (0.9–1.0)	0.98 (0.9–1.1)	0.94 (0.9–1.0)
Previous history of depression	2.49 (1.0–5.9)	5.75 (1.3–25.1)	3.30 (1.6–6.8)
Previous history of any disorder	1.93 (0.9–3.8)	3.65 (1.0–13.3)	2.59 (1.5–4.6)
Lifetime history of personality disorder in proband	1.98 (0.9–4.0)	2.18 (0.3–15.3)	2.89 (1.5–5.6)
Previous history of anxiety in caregiver	1.91 (0.9–3.8)	1.55 (0.3–7.7)	2.46 (1.3–4.5)
Sexual abuse	4.08 (1.1–14.8)	5.12 (0.7–40.7)	4.80 (1.5–15.7)
Impulsive aggression, score	1.02 (1.0–1.04)	1.02 (1.0–1.05)	1.02 (1.01–1.04)
Family cohesion and adaptability	0.97 (0.9–1.0)	0.90 (0.8–1.0)	0.95 (0.9–1.0)
Social support	0.97 (0.7–1.4)	0.30 (0.2–0.6)	0.68 (0.5–0.9)
Self-esteem	1.07 (1.0–1.1)	1.28 (1.1–1.4)	1.12 (1.1–1.2)
Stressful life events before death	1.33 (1.0–1.9)	1.53 (0.8–3.0)	1.44 (1.1–1.9)
Frequency of negative coping strategies ^a	1.27 (1.0–1.7)	1.87 (1.1–3.3)	1.30 (1.0–1.6)
Seeing the scene of death	2.08 (1.0–4.2)	NA	NA
Confiding last conversation	3.11 (1.4–6.7)	NA	NA

Abbreviations: GAS, Global Assessment Scale; NA, not applicable.

^aWays of Coping questionnaire does not provide scores for frequency and efficacy of negative coping strategies equivalent to the Kidcope. Thus, analyses were restricted on child and adolescent offspring.

Table 6
Correlates of New-Onset PTSD in Bereaved Offspring

Characteristic	Odds Ratio (95% Confidence Interval)
Males	0.71 (0.3–1.9)
White race	1.11 (0.3–4.1)
Age, y	
7–11	1 [Reference]
12–17	0.55 (0.2–1.6)
≥18	0.75 (0.2–3.0)
Time from proband's death to study intake	1.02 (0.9–1.2)
Caregiver's functioning, GAS score	0.94 (0.9–1.0)
Previous history of anxiety	3.63 (1.1–12.5)
Previous history of any disorder	7.23 (2.3–22.9)
Family history of PTSD	4.06 (1.3–12.3)
Family history of anxiety	5.72 (1.6–20.8)
Lifetime history of bipolar disorder in proband	7.28 (2.6–20.7)
Lifetime history of alcohol/substance abuse in proband	3.38 (0.9–12.1)
Previous history of anxiety in caregiver	6.66 (2.0–21.9)
Seeing the scene of death	3.12 (1.1–9.1)
Confiding last conversation	0.10 (0.01–0.8)
Something could have been done to prevent death	4.48 (1.5–13.1)
Feeling accountable for the death	3.04 (1.1–8.3)
Feeling that other people are accountable for the death	2.78 (1.0–7.4)

Abbreviations: GAS, Global Assessment Scale; PTSD, posttraumatic stress disorder.