ORIGINAL ARTICLE

Parents Bereaved by Offspring Suicide

A Population-Based Longitudinal Case-Control Study

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Context: Suicide bereavement remains understudied and poorly understood.

Objectives: To examine outcomes of parents bereaved by the suicide death of their offspring and to compare these with both nonbereaved parent controls and parents who had offspring die in a motor vehicle crash (MVC).

Design: Population-based case-control study. Suicide-bereaved parents were compared with nonbereaved matched control parents in the general population (n=1415) and with MVC-bereaved parents (n=1132) on the rates of physician-diagnosed mental and physical disorders, social factors, and treatment use in the 2 years after death of the offspring. Adjusted relative rates (ARRs) were generated by generalized estimating equation models and adjusted for confounding factors.

Setting: Manitoba, Canada.

Participants: All identifiable parents who had an offspring die by suicide between 1996 and 2007 (n=1415).

Main Outcome Measures: Mental and physical disorders, social factors, and treatment use.

Results: Suicide bereavement was associated with an increased rate of depression (ARR, 2.14; 95% CI, 1.88-2.43), anxiety disorders (ARR, 1.41; 95% CI, 1.24-1.60), and marital breakup (ARR, 1.18; 95% CI, 1.13-1.23) in the 2 years after the suicide of an offspring, as compared with the 2 years prior to the death. Suicide-bereaved and MVC-bereaved parents had very few differences on predeath to postdeath outcomes. Depression rate increases were greater for MVC-bereaved parents (19.9%) compared with suicide-bereaved parents (15.9%; $P=.005$), whereas suicide-bereaved parents had higher rate increases of hospitalization for mental illness ($P=.049$). Suicide-bereaved parents were more likely than their MVC-bereaved counterparts to have depression (ARR, 1.30; 95% CI, 1.06-1.61), physical disorders (ARR, 1.32; 95% CI, 1.19-1.45), and low income (ARR, 1.34; 95% CI, 1.18-1.51) before their offspring's death.

Conclusions: Suicide bereavement is associated with adverse mental health and social outcomes. These consequences appear similar to those associated with MVC bereavement. Parents who lose offspring to suicide appear to be a vulnerable group even prior to their offspring's death.

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Bereavement is the recent loss of a significant person through death.[1] While almost everyone encounters bereavement at some point in their life, it is recognized as a time of intense suffering and a period of vulnerability for the development of mental and physical health problems, along with an increased mortality risk.[2] Suicide is a leading cause of death worldwide[3] and is estimated on average to result in 6 bereaved individuals, often termed *suicide survivors*.[4] The importance of suicide bereavement has been emphasized by the International Association for Suicide Prevention, which has established a task force on suicide bereavement and together with the World Health Organization has published guidelines for establishing suicide survivor support groups.[5] Considering there are more than 1 million suicide deaths annually worldwide, this presents a considerable population of suicide bereaved. The consequences experienced by these individuals have been reported to be different, and possibly more severe, than those bereaved by other causes of death because of shame, stigmatization, and other factors accompanying suicide.[6-14] Compared with other causes of death, suicide survivors consistently experience higher levels of rejection and blame.[8,15-19] Given the prevalence of suicide bereave-

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ment and the recognized burden of morbidity associated with other types of bereavement, there is a need for an understanding of the consequences unique to suicide bereavement.

Unfortunately, suicide bereavement remains poorly understood. Existing studies on mental health consequences experienced in suicide bereavement have reported mixed findings, with some showing elevated rates of depression, anxiety, shame, and social isolation,[8,12,20] whereas others find no differences when suicide bereaved are compared with people bereaved by other causes of death.[9,21,22] Elevated rates of suicidal ideation, suicide attempts, and completed suicide have been reported among people bereaved by suicide.[23,24] Some studies have shown an association between suicide bereavement and complicated grief[25,26] and found that complicated grief is accompanied by suicidal thoughts among the bereaved.[26] This contrasts other studies that did not find differences in grief reactions between suicide survivors and those bereaved by other causes of death.[16,27,28] Specific subpopulations of bereaved, such as parents who lose a child to suicide, are even less studied. Parents bereaved by suicide have been reported to have increased rates of depression, distress, and shame when compared with parents of children who died in car crashes.[10] Despite these difficulties, they describe inadequate support after the death.[29] However, several studies report contrasting findings, suggesting that suicide-bereaved parents do not have worse outcomes than parents bereaved by other causes of death.[27,30,31] These mixed findings may be explained by limitations in studies to date. Almost all studies are based on small cohorts recruited through bereavement groups or obituary notices. This can introduce sampling bias, as 1 study showed that people who respond to bereavement surveys tend to be healthier and more recovered than nonrespondents,[32] suggesting a nonrepresentative sample. Furthermore, study recruitment is affected by stigma,[13] which is consistently higher among suicide survivors compared with other bereaved groups.[33] To our knowledge, there are no population-based studies that have examined outcomes among parents who have lost a child to suicide. A recent systematic review examining mental health experiences of suicide survivors concluded that suicide-bereaved individuals did not differ from other bereaved persons on mental health outcomes but identified several methodological limitations of existing literature, including problems with sampling and study design.[33] Of the 41 studies examined in that review, the largest sample of suicide-bereaved individuals was 128,[27] underscoring the likelihood that statistical power may have influenced findings across the studies. The suicide survivor cohorts in these studies were often blended with different subgroups of bereaved persons, such as parents, siblings, and spouses, each of which may have different bereavement experiences based on the type of family relation. The authors of the review called for future research to use sufficient sample sizes, appropriate control groups, improved participant selection, standardized measures, and the use of multivariate statistical approaches.[33]

There were 2 objectives of this study. The first was to investigate the consequences experienced by parents in the general population who are bereaved by the suicide death of their offspring. To answer this objective, we compared several health and social markers of parents in the periods before and after the suicide death of their offspring and also compared these parents with nonbereaved matched parent controls. The second objective was to compare the experiences of suicide-bereaved parents with parents bereaved by the death of their offspring in a motor vehicle crash (MVC) to determine whether suicide bereavement differs from bereavement related to another sudden cause of death. The specific correlates examined included a diverse set of health outcomes (physician-diagnosed mental and physical disorders), treatment use (outpatient physician contact and hospitalization), and social factors (marital status and income). Based on the recent published systematic review, we hypothesized that suicide bereavement would be associated with several negative health and social outcomes but would not differ from bereavement related to death by MVC.[33] By examining all parents who had an offspring suicide in a representative population-based sample, comparing them with other bereaved parents as well as nonbereaved matched controls, using standardized and objective measures, and adjusting for important confounders, this study was positioned to address many of the limitations of existing studies and thus provide a better understanding of suicide bereavement.

METHODS

DATA SOURCES

Data came from the Population Health Research Data Repository housed at the Manitoba Centre for Health Policy in the Faculty of Medicine of the University of Manitoba, which provides anonymized individual-level administrative data for almost all of the 1.2 million residents of the province of Manitoba in Canada. Persons not included in the repository data sets include military personnel and members of the Royal Canadian Mounted Police (the federal police service), whose health coverage is federally funded.[34] The data sources used in this study included physician claims, hospital discharge abstracts, the population registry, and vital statistics. Information across the data sets was linked by an encrypted personal health information number, and all data sets were deidentified (ie, no name or complete address). The linkage of these databases has been shown to have very high accuracy.[35-38] Health data included physician-generated mental and physical diagnoses and captured all hospitalizations and almost all outpatient physician contacts. The population registry contains individual-level information including age, sex, and region of residence. The vital statistics data set reported the cause of death as determined by medical examiners (in this study, suicide and death by MVC). The study period was 1996 to 2007 based on completeness of the linked data for that period. Together, these databases provide a longitudinal health profile for virtually all residents in the population.

COHORT FORMATION

There were 3 cohorts of interest in the study: (1) parents of children who died by suicide, (2) parents of children who died in an MVC, and (3) nonbereaved parent controls. Parents were specified based on a family registration number that is part of the encrypted provincial health insurance number. Mothers and their children shared the same registration number, and there-

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fore, almost all mothers were specified. Fathers were less specifiable because their linkage to the household is dependent on the marriage being reported to the provincial health registry, which does not always occur. The vital statistics data set was used to identify all persons who died by suicide (*International Classification of Diseases, Ninth Revision, Clinical Modification* [*ICD-9-CM*] codes: E950-E959; *ICD-10*, Canada [*ICD-10-CA*] codes: X40-X42, X46, X47, and X60-X84) or MVC (*ICD-9-CM* codes: E810-E819 and E822-E825; *ICD-10-CA* codes: V02.0-V09.9, V12.0-V14.9, V19.0-V19.2, V19.4-V19.6, V20.0-V79.9, V80.3-V80.5, V81.0-V82.1, V83.0-V83.3, V84.0-V85.3, V86.00-V86.38, V87.0-V87.8, V88.0-V88.8, V89.0-V89.2, V89.0, V89.2, and V99) between 1996 and 2007. There were 862 people who died by suicide who had specifiable parents, resulting in a suicide-bereaved parent group of 1415 (including mothers, fathers, stepmothers, and stepfathers). The suicide-bereaved parents were matched 1:1 to general population parents who had at least 1 specifiable offspring and had not lost an offspring to suicide or death by MVC. Matching was based on parent's age (±3 years), parental relation, region of residence (based on regional health authority and neighborhood clusters), and age of the offspring who died. The suicide-bereaved parents were also compared with parents who had an offspring die in an MVC (663 deaths, 1132 specified parents).

OUTCOMES OF INTEREST

Mental Disorders

The *ICD-9-CM* and *ICD-10-CA* codes were used to identify mental disorders of interest, including depression (unipolar and bipolar; *ICD-9-CM* codes: 296.2-296.3, 296.5, 300.4, 309, and 311; *ICD-10-CA* codes: F31.3-F31.5, F32, F33, F341, F380, F381, F432, F438, and F530), anxiety (*ICD-9-CM* codes: 300.0, 300.2, and 300.3; *ICD-10-CA* codes: F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42, and F431), alcohol abuse or dependence (*ICD-9-CM* codes: 291 and 303; *ICD-10-CA* code: F10), drug abuse or dependence (*ICD-9-CM* codes: 292, 304, and 305; *ICD-10-CA* codes: F11-F19 and F55), suicide attempts (*ICD-9-CM* codes: E950-E959; *ICD-10-CA* codes: X60-X84), and dementia (*ICD-9-CM* codes: 290, 291.1, 291.2, 292.82, 294, 331, and 797; *ICD-10-CA* codes: F00-F04, F05.1, F06.5, F06.6, F06.8, F06.9, F09, F10.7, F11.7, F12.7, F13.7, F14.7, F15.7, F16.7, F18.7, F19.7, G30, G31.0, G31.1, G31.9, G32.8, G91, G93.7, G94, and R54). An aggregate "any mental disorder" category was computed that included individuals who met criteria for any of these disorders. Preexisting disorder definitions validated in previous studies using the same data sets were used.[39] Disorders were based on physician-generated diagnoses from both hospitalization abstracts and outpatient physician contacts and were treated as dichotomous variables. Rates of disorders within parent groups were based on parents receiving a diagnosis of the disorder of interest at least once during the examined period. Two periods of interest were examined based on the index event (offspring death): the predeath period (2 years prior to offspring death) and the bereavement period (2 years following offspring death). Two years was chosen as the bereavement period given previous work demonstrating a continued rise in depression incidence among suicide bereaved in the second year after death.[40] For the nonbereaved parent cohort, the date of death of the offspring in the matched suicide cohort was designated the index date.

Physical Disorders

Disorders of interest included cardiovascular disease (*ICD-9-CM* codes: 410-414; *ICD-10-CA* codes: I20-I25), cancer (*ICD-9-CM* codes: 140-208; *ICD-10-CA* codes: C00.0-C41.9 and C45.0-C97), chronic obstructive pulmonary disease (*ICD-9-CM* codes: 491, 492, 494, and 496; *ICD-10-CA* codes: J41, J42, J43, J44, and J47), hypertension (*ICD-9-CM* codes: 401-405; *ICD-10-CA* codes: I10-I13 and I15), diabetes mellitus (*ICD-9-CM* codes: 250; *ICD-10-CA* codes: E10-E14), and a similar aggregate "any physical disorder" that included individuals with any of these disorders. Disorders were based on validated diagnostic definitions.[41] Similar to the mental disorder analysis, the various physical disorders were treated as dichotomous variables with rates based on physical disorder exposure in the parent group, using the same 2-year predeath and postdeath timelines.

Social Factors

Income and marital status served as social variables in the study. Income was derived from census data, representing the average household income of the enumeration area where the individual resided. Average household income was divided into 5 quintiles, with the lowest quintile defined as the 20% of the population with the lowest average household income. Lowest income quintile was considered the outcome of interest with the remaining quintiles combined as the reference group. Marital status was determined using health registry databases. Single marital status was the outcome of interest and included all people not registered as married; married persons served as the reference group. The same 2-year preindex and postindex event date periods were used.

Health Service Use

Six measures were examined: outpatient physician visits for mental health, physical health, or any reason and hospitalization for mental health, physical health, or any reason. Rates of each measure were based on the total sum of occurrences within each parent group for each period of interest. Hospitalization was based on spending more than 1 day in the hospital. The same 2-year preindex and postindex event date periods were used.

STATISTICAL ANALYSES

Adjusted relative rates (ARRs) for each of the outcomes of interest were obtained from generalized estimating equation regression models where the type of distribution applied was either that of a negative binomial or a Poisson. Generalized estimating equation models were used to account for correlated observations. In addition, the log of the population was also included as an offset in the model to ensure that a relative rate as opposed to a relative count of events was modeled. Covariates potentially entered into each of the mental and physical disorder models included deceased offspring being the only offspring in the family (yes, no), marital status of the parent (married, single), parent income level (lowest quintile, other), parental status type (mother or stepmother, father or stepfather), age of the offspring at index date (grouped 18 years or younger, 19 years or older), age of the parent at time of offspring's death (grouped 39 years or younger, 40 years or older), presence of a mental disorder (yes, no), and/or presence of a physical disorder (yes, no). Two sets of analyses were conducted. The first exclusively focused on the cohort of suicide-bereaved parents and compared ARRs of the outcomes of interest in the 2-year postdeath period with the 2-year predeath period. The second set of analyses compared the suicide-bereaved parents with the nonbereaved parent controls and also with the MVC-bereaved parents. In this set of analyses, we were particularly interested in determining if there was a significant interaction between the period (predeath vs postdeath) and

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Table 1. Characteristics of Parent Groups

Characteristic	Suicide-Bereaved Parents (n = 1415) No. (%)	Nonbereaved Parent Controls (n = 1415) No. (%)	χ^2	MVC-Bereaved Parents (n = 1132) No. (%)	χ^2
Relation of parent to deceased offspring					
Father	506 (35.8)	506 (35.8)	0.00	417 (36.8)	5.42
Mother	757 (53.5)	757 (53.5)		616 (54.4)	
Stepfather	109 (7.7)	109 (7.7)		80 (7.1)	
Stepmother	43 (3.0)	43 (3.0)		19 (1.7)	
Marital status at time of offspring's death					
Married	856 (60.5)	889 (62.8)	1.63	769 (68.0)	15.07[a]
Single	559 (39.5)	526 (37.2)		363 (32.0)	
No. of offspring in the family					
Index offspring is the only offspring in the family	126 (14.6)[b]	215 (22.1)[c]	16.99[a]	93 (14.0)[d]	0.11
More than 1 offspring in the family	736 (85.4)	757 (78.0)		570 (86.0)	
Age of offspring at death, y					
Mean (SD)	30 (10.8)	NA	NA	25 (11.0)	NA
Median	28	NA		23	NA
0-18	171 (19.8)[b]	NA		188 (28.4)[d]	15.11[a]
≥19	691 (80.2)	NA		475 (71.6)	
Age of parent at time of offspring's death, y					
Mean (SD)	56 (13.4)	NA	NA	52 (12.7)	NA
Median	55	NA		51	NA
39 or younger	149 (11.8)	NA		156 (13.8)	6.31[e]
≥40	1266 (89.5)	NA		976 (86.2)	
Income of parent at time of offspring's death					
Lowest quintile	495 (35.0)	380 (26.9)	24.86[a]	297 (26.2)	26.10[a]
Second lowest quintile	279 (19.7)	299 (21.1)		240 (21.2)	
Middle quintile	262 (18.5)	271 (19.2)		215 (19.0)	
Second highest quintile	203 (14.3)	243 (17.2)		209 (18.5)	
Highest quintile	176 (12.4)	222 (15.7)		171 (15.1)	

Abbreviations: MVC, motor vehicle crash; NA, not applicable.
[a] χ^2 Tests show differences from suicide-bereaved parents noted by the following significance level: $P < .001$.
[b] Denominator = 862.
[c] Denominator = 972.
[d] Denominator = 663.
[e] χ^2 Tests show differences from suicide-bereaved parents noted by the following significance level: $P < .05$.

the parent group (suicide-bereaved vs nonbereaved controls or MVC-bereaved). Hence, a period × parent group interaction term was included in each of the models.

RESULTS

The characteristics of the 3 parent groups are listed in **Table 1**. Among the suicide-bereaved parent group, most specified parents were mothers, and a little more than 60% of the parents were married. The mean age of offspring who died by suicide was 30 years, and one-fifth died before age 19 years. Nonbereaved parent controls had higher rates of single-children families and lesser rates of low income when compared with suicide-bereaved parents. Motor vehicle crash–bereaved parents were more likely to be married and younger than 40 years and had lesser rates of low income than suicide-bereaved parents. Offspring who died in an MVC were more likely to be younger than 19 years than offspring who died by suicide; respective rates were 28.4% and 19.8%.

Table 2 displays correlates of suicide-bereaved parents, comparing rates in the 2 years after the death of their offspring with the 2-year period prior to the offspring's death. After adjusting for confounders, parents had more than double the rates of physician-diagnosed depression after losing an offspring to suicide. There was an observed 40% increase in the rate of anxiety disorders and a 60% increase in the overall rate of mental disorders. The rate of single marital status increased by 18% after offspring loss, showing a significant rate of marital breakup. Significant rate increases were also seen for cancer, diabetes, and physician visits for mental and physical illness.

The same correlates are compared between suicide-bereaved parents and nonbereaved matched parent controls in **Table 3**. Alcohol use disorders were diagnosed among suicide-bereaved parents at a rate more than 3 times that of control parents, both before and after the death. Suicide-bereaved parents had significantly higher rates of physician-diagnosed depression, anxiety disorders, and any mental disorder prior to the offspring's death when compared with matched controls. These differences were amplified in the 2 years after the suicide of the offspring. There were significant period × parent group interactions for depression, anxiety disorders, and receiving any mental disorder diagnosis, demonstrating that the rate change for these disorders from the predeath to the postdeath period was significantly different

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Table 2. Mental and Physical Disorders, Social Factors, and Treatment Use Among 1415 Suicide-Bereaved Parents Before and After the Suicide Death of Their Offspring

Outcomes	No. (%)		Adjusted Relative Rate[a] (95% CI)
	2-Year Prevalence Predeath	2-Year Prevalence Postdeath	
Mental disorders			
Depression	206 (14.6)	431 (30.5)	2.14 (1.88-2.43)[b]
Anxiety disorder	235 (16.6)	326 (23.0)	1.41 (1.24-1.60)[b]
Alcohol use disorder	45 (3.2)	52 (3.7)	1.04 (0.76-1.40)
Drug use disorder	55 (3.2)	60 (4.2)	1.00 (0.71-1.40)
Dementia	20 (1.4)	29 (2.0)	1.26 (0.82-1.94)
Suicide attempt	9 (0.64)	9 (0.64)	0.86 (0.38-1.96)
Any mental disorder	402 (28.4)	638 (45.1)	1.60 (1.47-1.74)[b]
Physical disorders			
Cardiovascular disease	133 (11.7)	155 (11.0)	1.07 (0.91-1.25)
Cancer	78 (5.5)	107 (7.6)	1.26 (1.04-1.53)[c]
COPD	105 (7.4)	108 (7.6)	0.96 (0.78-1.20)
Hypertension	397 (28.1)	428 (30.2)	1.06 (0.98-1.15)
Diabetes mellitus	263 (18.6)	304 (21.5)	1.15 (1.05-1.25)[d]
Any physical disorder	668 (47.2)	721 (51.0)	1.07 (1.03-1.13)[d]
Demographic factors			
Low income	495 (35.0)	474 (33.5)	0.96 (0.91-1.01)
Single marital status	511 (36.1)	604 (42.7)	1.18 (1.13-1.23)[b]
Treatment use[e]			
Physician visit for mental illness	2324 (1.64)	4104 (2.90)	1.91 (1.61-2.26)[b]
Physician visit for physical illness	4240 (3.00)	4839 (3.42)	1.14 (1.04-1.26)[d]
Physician visit for any reason	29 992 (21.2)	32 584 (23.0)	0.97 (0.92-1.03)
Hospitalization for mental illness	90 (0.06)	122 (0.09)	1.18 (0.84-1.66)
Hospitalization for physical illness	400 (0.28)	531 (0.38)	1.06 (0.81-1.38)
Hospitalization for any reason	664 (0.47)	687 (0.49)	0.83 (0.71-0.96)[c]

Abbreviation: COPD, chronic obstructive pulmonary disease.

[a] Adjusted rate in 2 years after death compared with 2 years prior to death. Model covariates: deceased offspring was the only offspring in the family, parental status (mother vs father), marital status, low income, any mental disorder, any physical disorder, age of offspring at time of death, and age of parent at time of offspring's death (variably entered based on outcome of interest and model fit).

[b] $P < .001$.

[c] $P < .05$.

[d] $P < .01$.

[e] Treatment use variables are measured as a summarized count of treatment contacts, with the mean number of physician visits or hospitalizations per person in parentheses.

between the 2 parent groups. For example, the prevalence of depression in the 2 years prior to index date was 14.6% among suicide-bereaved parents and 10.5% for control parents (prevalence rates not shown in the Tables). In the 2 years after offspring death, the prevalence rose to 30.5% among suicide-bereaved parents, whereas controls had a rate of 10.2% in the 2 years after the index date. Therefore, even though suicide-bereaved parents had depression rates that were significantly higher in both periods, the difference between groups became even more pronounced following the offspring suicide. The significant interaction reflected the absolute rate increase in depression of 15.9% for suicide-bereaved parents compared with the decrease of 0.3% observed in controls. Single marital status was associated with a significant period × parent group interaction, showing that suicide-bereaved parents had higher rates of marital breakup after their offspring's death compared with control parents. Physician visits for mental illness and physician visits for any reason also showed significant period × parent group interactions. While no differences were observed between groups prior to the index date, suicide-bereaved parents went to physicians for mental health reasons at a rate almost 3 times that of control parents after the index date.

Table 4 shows comparisons between suicide-bereaved and MVC-bereaved parents, both in the predeath and postdeath time intervals. Most interaction terms were nonsignificant, indicating that in general there were few differences between the parent groups in terms of how the rates of measured outcomes changed following offspring death. However, significant differences were observed for depression and hospitalization for mental illness. In the 2 years prior to offspring death, suicide-bereaved parents had a prevalence of depression of 14.6%, compared with 11.1% in MVC-bereaved parents (prevalence rates not shown in Table 4). This rate difference was significant in adjusted models (ARR, 1.30; 95% CI, 1.06-1.61; $P < .05$). The 2 parent groups showed increased rates of depression after their offspring died, with respective rates of 30.5% and 31% in the postdeath period. Thus, the MVC-bereaved parents had an absolute rate increase of 19.9% in depression between the predeath and postdeath periods, which was significantly larger than the 15.9% increase observed among suicide-bereaved parents (period × parent group interaction term significant at $P = .005$). Prior to offspring death, suicide-bereaved parents and MVC-bereaved parents were hospitalized for mental illness at similar rates. In the postdeath period, suicide-bereaved parents were hospitalized

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Table 3. Predeath and Postdeath Comparisons of Suicide-Bereaved Parents and Nonbereaved Matched Parent Controls

Outcomes	Suicide-Bereaved (n = 1415) vs Nonbereaved (n = 1415) (Reference)		
	2 Years Predeath ARR[a] (95% CI)	Period × Parent Group Interaction *P* Value	2 Years Postdeath ARR[a] (95% CI)
Mental disorders			
Depression	1.41 (1.16-1.71)[b]	<.001	3.09 (2.60-3.68)[b]
Anxiety disorder	1.27 (1.07-1.51)[c]	.005	1.69 (1.44-1.98)[b]
Alcohol use disorder	3.41 (1.81-6.44)[b]	.90	3.60 (1.89-6.82)[b]
Drug use disorder	1.53 (1.00-2.33)[d]	.51	1.29 (0.86-1.92)
Dementia	1.05 (0.60-1.87)	.69	1.20 (0.69-2.10)
Suicide attempt	[e]		[e]
Any mental disorder	1.27 (1.12-1.43)[b]	<.001	1.96 (1.76-2.19)[b]
Physical disorders			
Cardiovascular disease	1.24 (0.98-1.57)	.56	1.15 (0.91-1.45)
Cancer	1.00 (0.74-1.36)	.82	1.04 (0.79-1.37)
COPD	1.56 (1.16-2.09)[c]	.71	1.46 (1.09-1.97)[d]
Hypertension	0.97 (0.87-1.08)	.96	0.97 (0.87-1.08)
Diabetes mellitus	1.52 (1.26-1.83)[b]	.22	1.40 (1.18-1.65)[b]
Any physical disorder	1.10 (1.02-1.19)[c]	.33	1.07 (1.00-1.15)
Demographic factors			
Low income	1.29 (1.17-1.42)[b]	.45	1.33 (1.19-1.48)[b]
Single marital status	0.99 (0.96-1.03)	<.001	1.08 (1.01-1.12)[b]
Treatment use			
Physician visit for mental illness	1.38 (0.96-1.98)	<.001	2.64 (1.97-3.55)[b]
Physician visit for physical illness	1.14 (1.00-1.31)	.93	1.13 (1.00-1.29)
Physician visit for any reason	1.05 (0.96-1.15)	.009	0.94 (0.87-1.02)
Hospitalization for mental illness	1.87 (1.00-3.50)[d]	.54	2.23 (1.28-3.91)[c]
Hospitalization for physical illness	1.62 (1.08-2.45)[d]	.52	1.39 (0.96-2.03)
Hospitalization for any reason	1.38 (1.10-1.72)[c]	.34	1.21 (0.97-1.50)

Abbreviations: ARR, adjusted relative rate; COPD, chronic obstructive pulmonary disease.

[a] Adjusted rate among suicide-bereaved parents compared with nonbereaved parent controls within each period. Model covariates: deceased offspring was the only offspring in the family, parental status (mother vs father), marital status, low income, any mental disorder, any physical disorder, age of offspring at time of death, and age of parent at time of offspring's death (variably entered based on outcome of interest and model fit).

[b] $P < .001$.

[c] $P < .01$.

[d] $P < .05$.

[e] Suppressed because of low cell size (<6).

at a rate almost double that of MVC-bereaved parents, demonstrating a predeath to postdeath rate increase that was significantly different between the 2 parent groups ($P = .049$). Suicide-bereaved parents had significantly higher rates of cardiovascular disease, chronic obstructive pulmonary disease, hypertension, diabetes, outpatient physician visits for mental and physical illness, and hospitalizations for physical illness when compared with MVC-bereaved parents, both before and after the death of their offspring. Suicide-bereaved parents were also more likely to have low income and be single in both periods.

COMMENT

To our knowledge, this study is the first to examine the consequences of suicide bereavement among parents in the general population. Parents of suicide victims have considerable negative health and social outcomes after the death of their offspring, including elevated rates of depression, anxiety, and marital breakup. The latter underscores a damaging effect of suicide on family structure, even within a relatively short time frame of 2 years. This study also provided novel findings about how the effects of suicide bereavement compare with bereavement from another cause of sudden death. While both parent groups showed increased rates of depression and anxiety following the loss of their offspring, the increase in depression rates was significantly higher for MVC-bereaved parents. This is possibly related to the higher rate of depression in the predeath period observed among suicide-bereaved parents. Alternatively, it may be that the loss of offspring in an MVC was in most cases without warning, whereas some parents may have been alerted to the possibility of suicide before it happened. The former may thus be more shocking to parents and may translate into greater increases in rates of depression. Findings from this study reveal that suicide-bereaved parents have a substantial burden of mental disorders, physical disorders, and low income even prior to their offspring's death, compared both with matched control parents and MVC-bereaved parents. Together, these new findings have significant implications for clinical work with individuals who have lost child and adult offspring to suicide, providing some guidance in a clinical realm without consensus. The results of this study will hopefully assist the development of guidelines for the care of suicide survivors, an active area of focus in suicide prevention strategies around the world.

The findings from this study suggest that parents who lose an offspring to suicide have increased rates of men-

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Table 4. Predeath and Postdeath Comparisons of Suicide-Bereaved Parents and MVC-Bereaved Parents

Outcomes	Suicide-Bereaved (n = 1415) vs MVC-Bereaved (n = 1132) (Reference)		
	2 Years Predeath ARR[a] (95% CI)	Period × Parent Group Interaction *P*-Value	2 Years Postdeath ARR[a] (95% CI)
Mental disorders			
Depression	1.30 (1.06-1.61)[b]	.005	0.97 (0.86-1.09)
Anxiety disorder	1.07 (0.90-1.29)	.79	1.05 (0.90-1.21)
Alcohol use disorder	1.12 (0.69-1.80)	.15	1.69 (1.00-2.88)
Drug use disorder	1.01 (0.67-1.52)	.35	1.31 (0.84-2.04)
Dementia	1.27 (0.62-2.59)	.16	2.18 (1.01-4.71)[b]
Suicide attempt[c]	1.16 (0.30-4.52)	.55	1.86 (0.44-7.87)
Any mental disorder	1.13 (1.00-1.29)	.24	1.04 (0.95-1.14)
Physical disorders			
Cardiovascular disease	1.54 (1.16-2.03)[d]	.69	1.63 (1.23-2.16)[e]
Cancer	1.42 (1.00-2.04)	.68	1.32 (0.96-1.83)
COPD	1.68 (1.20-2.37)[d]	.33	2.01 (1.40-2.90)[e]
Hypertension	1.37 (1.19-1.59)[e]	.59	1.32 (1.15-1.52)[e]
Diabetes mellitus	1.45 (1.20-1.76)[e]	.08	1.66 (1.37-2.00)[e]
Any physical disorder	1.32 (1.19-1.45)[e]	.55	1.28 (1.17-1.41)[e]
Demographic factors			
Low income	1.34 (1.18-1.51)[e]	.56	1.38 (1.21-1.56)[e]
Single marital status	1.21 (1.08-1.36)[d]	.57	1.24 (1.12-1.36)[e]
Treatment use			
Physician visit for mental illness	1.55 (1.16-2.07)[d]	.30	1.34 (1.05-1.71)[b]
Physician visit for physical illness	1.38 (1.15-1.65)[e]	.92	1.39 (1.18-1.63)[e]
Physician visit for any reason	1.02 (0.93-1.13)	.65	1.04 (0.96-1.14)
Hospitalization for mental illness	0.86 (0.49-1.52)	.049	1.72 (1.05-2.80)[b]
Hospitalization for physical illness	1.49 (1.01-2.20)[b]	.94	1.52 (1.07-2.16)[b]
Hospitalization for any reason	0.92 (0.75-1.13)	.46	1.00 (0.82-1.24)

Abbreviations: ARR, adjusted relative rate; COPD, chronic obstructive pulmonary disease; MVC, motor vehicle crash.

[a] Adjusted rate among suicide-bereaved parents compared with MVC-bereaved parents within each period. Model covariates: deceased offspring was the only offspring in the family, parental status (mother vs father), marital status, low income, any mental disorder, any physical disorder, age of offspring at time of death, and age of parent at time of offspring's death (variably entered based on outcome of interest and model fit).

[b] $P < .05$.

[c] Relative rate based on summarized count of suicide attempts, because the dichotomous measure could not be modeled.

[d] $P < .01$.

[e] $P <$ 001.

tal disorders, specifically depression and anxiety, in the 2 years following the death. This finding persisted after adjustment for a broad range of potential confounders and was demonstrated both in models that compared rates observed in the same parents prior to the death, as well as in models that compared nonbereaved parent controls in the general population. This finding is consistent with previous literature finding suicide bereavement to be associated with vulnerability to anxiety and depression.[20,25,42-45] However, not all mental disorders increased after offspring suicide. Bereaved parents did not show any increase in the rate of alcohol or drug use disorders when compared with their rates prior to the suicide of their offspring and compared with controls. This may indicate that alcohol and drugs are not coping strategies used by grieving parents. Alternatively, since the disorder measures in this study were dependent on treatment seeking, bereaved parents may not be disclosing their substance use to care providers. Thus, it is possible that alcohol disorders are indeed associated with suicide bereavement, especially considering the higher rates observed in the predeath and postdeath periods when compared with controls. Suicide-bereaved parents also saw physicians for mental health–related reasons after the death of offspring at almost double the rate prior to the death. This increased use of mental health services likely reflects the increased rates of depression and anxiety and may indicate that suicide-bereaved parents are seeking out appropriate treatment for their emotional distress.

Interestingly, suicide-bereaved parents appear to have mental and physical health vulnerability even prior to the death of their offspring. When compared with matched parent controls, suicide-bereaved parents had higher rates of depression and anxiety before their offspring died. Their rate of alcohol abuse or dependence was more than 3 times higher than control parents. These findings may be partially explained by the shared genetic or environmental factors between parent and offspring that predispose both to mental disorders.[46-50] Although the mental disorder profile of offspring suicides was not examined in this study, mental disorders are strong risk factors for suicide[3,51] and were likely contributing factors in a proportion of the suicide deaths. An alternative consideration is that parents may have been experiencing stress-related psychopathology secondary to the factors that led to the suicide of their offspring, such as psychiatric illness or stressful life events. Another interesting observation is the higher physical disease burden among suicide-bereaved parents. They had higher rates of cardiovascular disease, chronic obstructive pulmonary disease, hypertension, diabetes, and physical health-related hospitalization when compared with MVC-bereaved parents, both before and

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after the death of their offspring. This may be related to the higher predeath rates of depression among suicide-bereaved parents, given the relationship between depression and cardiovascular disease.[52] Alternatively, these markers of poor health may be explained by factors associated with both mental and physical disorders, such as tobacco use, low levels of exercise, adverse childhood experiences, or poverty.[53-56] Evidence for the latter is demonstrated by higher rates of low income when comparing suicide-bereaved parents with both nonbereaved controls and MVC-bereaved parents, a finding also pervasive across both the predeath and postdeath periods.

The findings of this study should be interpreted within the context of several limitations. Suicide can be underreported or misclassified in mortality records.[57,58] Mental and physical diagnoses came from physician billing claims and thus were dependent on treatment seeking. In Canada, 12-month mental health service use rates have been reported at 8.7% among an estimated 20.1% of the general population who are deemed to be in need of treatment.[59] Major depression is strongly associated with help seeking, along with marital breakup, low income, anxiety, and substance use disorders.[59] Among suicide-bereaved individuals, levels of perceived need have been reported at 80%, whereas rates of contact with professionals have varied.[60-62] Rates of primary care physician contact have been reported at 55% to 60%.[60,63] Therefore, the rates reported in the current study are likely an underrepresentation of the true population prevalence and could thus affect the representativeness of the findings, although it is unknown whether this would have preferentially affected 1 of the parent cohorts. Stigma and social isolation have been described among suicide-bereaved individuals[13] and thus could contribute to less treatment seeking. Although higher rates of physician visits were observed in this group when compared with controls and MVC-bereaved parents, it is possible that stigma and social isolation prevented them from being even higher. The advantage with claims data is that they are not prone to subject recall bias. Another strength of this study is the inclusion of outpatient physician visits, which is often not possible in administrative data sources. However, the outcomes examined in this study were limited to those identifiable in administrative data. Important differences in shame, complicated grief, and perceived support described in previous studies[12,64] could not be evaluated and underscore the need for future studies examining these outcomes among suicide-bereaved parents. A third limitation pertains to the specification of family members. The specification of fathers is dependent on registered marriages, and as such, a proportion of fathers could not be identified. Other methods, such as in-person interviews of family members, would improve the specification of family members. Although not a limitation per se, this study examined parents who had lost an offspring of any age and therefore was not restricted to the suicide deaths of children younger than 18 years. Finally, the choice of comparison parent groups introduces important limitations. Motor vehicle crash death was chosen since it represents a sudden cause of death that affects young people, leaving grieving parents. Suicide in some instances is without warning but often is precipitated by an observable period of deterioration that may affect parents well before the death.[12,65] The control group included matched parents who had not experienced the suicide or MVC death of an offspring. However, they may have had a child die of other causes and thus may not truly represent a nonbereaved cohort. This may result in an underestimate of difference, however, so our findings of differences would, if anything, be conservative. Finally, these results pertain to a population with universal access to free health care and therefore may not generalize to countries with other health systems.

In conclusion, this study provides novel findings regarding the health and social consequences of suicide bereavement in the general population. Using matched controls, a bereaved comparison group, and physician-generated diagnoses and adjusting for important confounders in rigorous statistical models, this study addresses many of the limitations of previous work. Findings demonstrate suicide bereavement to be associated with a number of adverse consequences, including depression, anxiety, and marital breakup. Clinicians should recognize grieving parents as a group in need and should facilitate the assessment and treatment of these individuals. The findings of adverse health and social markers among parents even prior to the suicide of their offspring have potential implications for understanding, predicting, and possibly preventing youth suicide. Future studies could evaluate whether modifying these factors correlates with a reduction in offspring suicide. The results of this study should help inform guidelines for public policy aimed at reducing the societal impact of suicide.

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