Parental death by external causes during childhood and risk of psychiatric disorders in bereaved offspring

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Background: Previous studies have reported increased risks of psychiatric disorders in offspring who have lost a parent, but knowledge is lacking on the risks of several specific disorders and comorbidity. The present study investigated the influence of parental death by external causes during childhood and adolescence on risk of a range of psychiatric disorders and comorbidity. Method: The study cohort comprised 655,477 individuals born 1970–2012 with a link to both parents. Data on deceased parent’s cause and date of death between 1970 and 2012 and offspring’s psychiatric disorders between 2008 and 2012 were retrieved from four longitudinal Norwegian registers. Data were analyzed with Cox regression. Results: Compared to nonexposed offspring, offspring exposed to parental death by external causes had a significantly increased risk of depressive disorders, reactions to stress, anxiety disorders, substance use disorders, developmental disorders, childhood behavioral and emotional disorders, psychotic disorders, bipolar disorder, personality disorders, and psychiatric comorbidity, but not eating disorders. These increased risks were especially evident following parental suicide and accidental falls and poisoning. No differences were evident depending on gender of the deceased or age at bereavement, and generally no significant interactions with gender of the bereaved offspring were evident. Conclusions: The improved insight into several different psychiatric disorders and psychiatric comorbidity should guide postvention measures aimed at children and adolescents at greatest risk of future sequelae.

Key Practitioner Message

- Previous studies have reported increased risks of psychiatric disorders in offspring who have lost a parent to external causes of death.
- The present study is the first large-scale population study to report an increased risk of anxiety disorders, developmental disorders, childhood behavioral and emotional disorders, reactions to severe stress, and psychiatric comorbidity following parental death by external causes, as well as no increased risk of eating disorders.
- The study is also the first to uncover higher risks associated with parental suicide and accidental deaths such as poisoning and falls compared to deaths due to transport accidents.
- All bereaved offspring should be offered supportive follow-up in primary health care, and offspring bereaved by parental suicide should receive additional follow-up in mental health care.
- Clinicians should screen for a history of childhood parental bereavement in people suffering from mental illness to more effectively identify important targets for treatment.

Keywords: Psychiatric disorders; parental bereavement; population registers; childhood; adolescence

Introduction

The death of a parent during childhood or adolescence is one of the most life changing and potentially traumatic events a child can experience (Bowlby, 1969) and is accordingly associated with an increased risk of long-term psychosocial sequelae (Burrell, Mehlum, & Qin, 2017, 2020a; Høeg et al., 2018; Wilcox et al., 2010). Several population-based studies have reported an increased risk of a range of psychiatric disorders following parental death, including depression, bipolar disorder, substance use disorder, personality disorders, and schizophrenia (Berg, Rostila, & Hjern, 2016; Kessing, Agerbo, & Mortensen, 2003, 2004; Kuramoto et al., 2010; Laursen, Munk-Olsen, Nordentoft, & Mortensen, 2007; Mortensen, Pedersen, Melbye, Mors, & Ewald, 2003; Ostergaard, Waltoft, Mortensen, & Mors, 2013; Sorensen et al., 2014; Tsuchiya, Agerbo, & Mortensen, 2005; Wilcox et al., 2010). Investigation of the potential influence of bereavement-related variables, such as gender of the deceased parent and offspring’s age at bereavement, is, however, sparse, and an investigation of differences between different external causes of death is especially limited (Berg et al., 2016; Brent, Melhem, Donohoe, & Walker, 2009; Kuramoto et al., 2010; Melhem, Walker, Moritz, & Brent, 2008; Wilcox et al., 2010). Based on national data from Norway, we have recently identified an increased risk of deliberate self-harm (DSH) hospitalization in offspring following parental death by suicide and accidents such as falls, poisoning, and...
drowning, but not following transport accidents (Burrell, Mehlum, & Qin, 2020b). No previous study has investigated the potential for the development of psychiatric comorbidity in the bereaved offspring following parental death from different accidents, potentially accounting for previous inconclusive study results and warranting further investigation.

Moreover, no large-scale population studies to date have investigated the association between death by a parent and subsequent risk of anxiety disorders, childhood behavioral and emotional disorders, developmental disorders, eating disorders, and reactions to severe stress, including acute stress reaction, posttraumatic stress disorder (PTSD), and adjustment disorder. Investigations of these diagnoses are therefore necessary, alongside analyses investigating psychiatric comorbidity.

The present study aims to investigate the association between parental death from external causes during childhood and adolescence and risk of psychiatric disorders in the bereaved offspring. We aim to investigate potential differences in the risk of psychiatric disorders depending on the gender of the deceased parent, the gender of the offspring, offspring’s age at bereavement, and parental cause of death. Several specific diagnoses and psychiatric comorbidity will be investigated. External causes of death are a classification in the ICD coding system and refer to deaths where the cause is external to the body, such as accidents, suicides, and homicides.

**Methods**

**Data sources**

Individual data from four longitudinal Norwegian registers were retrieved and merged. The Central Population Register provided data on gender, date of birth, death and emigration, and a link to parent’s personal identification number. This link enabled the identification of biological or adoptive parents, but note that we are unable to distinguish between biological and adoptive parents in the register. The link also enabled the retrieval of information on parental death by external causes from the Cause of Death Register. This register contains the cause and date of all deaths in Norway coded according to ICD-8 (International Classification of Diseases, Eight Revision) from 1969 to 1985, ICD-9 from 1986 to 1995, and ICD-10 from 1996 to 2012 (Statistics Norway, 2012a). Statistics Norway’s Events Database provided information on ethnicity. The Norwegian Population Register (NPR) contains information concerning all contacts in specialist health care, including all public institutions as well as private institutions and medical specialists contracted to a public health trust. These services all report to the NPR and encompass both inpatient and outpatient treatment (The Norwegian Health Directorate, 2016).

The study was approved by the Regional Committee for Medical and Health Research Ethics (ref. 2013/1620/REK South East and the registers of the regional health authorities waived the demand for informed consent from participants because this was a population-based study with deidentified data.

**Study design and population**

The present study is a cohort study, and the study population consisted of a 25% random sample of all Norwegian residents born between 1970 and 2012 who had a link to both parents in the Central Population register. The cohort comprised 655,477 individuals.

**Variables of interest**

The present study investigated psychiatric disorders reported to the NPR from patient’s first direct contact with the specialist mental health services between 2008 and 2012. Data from substance misuse services were only available from 2009. Diagnoses were coded according to ICD-10 codes, and any psychiatric disorder included codes F00-F99. Specific disorders of interest were depressive disorders (F32-F33), reactions to stress (F43), anxiety disorders (F40-F41), and substance misuse (F10-F19). Disorders in childhood and adolescence were developmental disorders (F80-F89), and childhood behavioral and emotional disorders (F90-F98). Lastly, less prevalent disorders were psychotic disorders (F20-F29), bipolar disorder (F30-F31), eating disorders (F50), and personality disorders (F60-F62). We considered both main and secondary diagnoses when coding specific disorders.

The explanatory variable of interest is parental death by external causes before age 18, referred to as parental DBEC (ICD-8 and ICD-9 codes E800-E999, ICD-10 codes V01-Y99), and investigated between 1970 and 2012. Given the aims of the study, we did not include parental death due to natural causes. Subjects were classified into categories of bereavement status as (a) no exposure to parental DBEC, and (b) exposure to parental DBEC. Gender of deceased parent was classified as (a) father, (b) mother, and (c) both parents. Furthermore, cause of parental death was classified as (a) suicide (ICD-8: E950-E959, ICD-10: X60-X84), (b) transport accidents (ICD-8: E800-E844, ICD-9: E800-E848, ICD-10: V01-V99), (c) other accidents (ICD-8: E850-E929, ICD-9: E929-E948, E980-E982, ICD-10: W00-X59), and (d) other external causes (ICD-8: E930-E949 and E960-E999, ICD-9: E970-E979, E929-E949, and E060-E099, ICD-10: X50-X59). Lastly, subject’s age at bereavement was classified as (a) ≤ 4 years, (b) 5–9 years, (c) 10–14 years, and (d) 15–18 years. Variables were classified based on the parent who died first when both parents died.

Multivariate analyses were adjusted for cohort members’ year of birth, gender, and ethnicity. (a) born in Norway with two Norwegian born parents, (b) immigrant, (c) born in Norway with immigrant parents or one parent born abroad, and (d) born abroad with one or two Norwegian born parents.

**Statistical analyses**

The cohort was followed from January 1, 2008, to date of psychiatric diagnosis, death, emigration, or December 31, 2012, whichever came first. Cohort members could be censored due to death or emigration from birth. When a specific diagnosis was investigated, people who received other diagnoses were censored due to death, emigration, or the end of follow-up alongside people who had not received a diagnosis. For bereaved offspring, we ensured that bereavement occurred before the psychiatric diagnosis in order to avoid the directional problem and infer causality (Bordens & Abbott, 2007). Differences in hazard ratios (HRs) with 95% confidence intervals (95% CI) were estimated using Cox regression, and the analyses were conducted in Stata, version 15 (StataCorp, 2017). Since exposure status can change during the follow-up period, the time before exposure is considered as unexposed and the time after exposure is considered as exposed in the analyses.

In the univariate analyses, the potential effect of bereavement variables on receiving psychiatric diagnoses was estimated, while the multivariate analyses included covariates to yield adjusted HRs. Interactions between variables of study and gender were assessed with the log likelihood ratio test based on results from the multivariate analyses. For any psychiatric disorder, we investigated univariate analyses, multivariate analyses, and gender interactions for all bereavement-related predictors. For the specific diagnoses depressive disorders, reactions to stress, anxiety disorders, substance use disorders, developmental disorders in childhood and adolescence, and personality disorders, we investigated multivariate analyses for all predictors and gender interaction for bereavement status. Lastly, for the less common diagnoses psychotic disorders, bipolar disorder, eating disorders, and personality disorders, we
only investigated multivariate analyses for bereavement status. These restrictions were due to low statistical power for less prevalent diagnoses since information in the NPR was only available from 2008 to 2012. Results were also investigated with Bonferroni corrected alpha levels of .001 (0.05/50) in order to highlight the most robust results. The results that remained significant after Bonferroni correction are indicated in the tables with the sign †.

In Norwegian specialist mental health services, patients can be diagnosed with up to 24 psychiatric diagnoses. We performed a multivariate regression to compare the risk of comorbidity (receiving multiple psychiatric diagnoses) between bereaved and nonbereaved peers.

Results
In the present cohort of 655,477 individuals, 48.6% (318,554) were females. In total, 4723 individuals (2265 females and 2458 males) had experienced parental DBEC before age 18. For the follow-up period 2008–2012, 3.0% (19,406) of people who had not experienced parental DBEC were diagnosed with a psychiatric disorder, while 7.5% (353) of people who had experienced parental DBEC received a diagnosis. Frequencies of psychiatric disorders according to the study variable categories are presented in Table 1. The mean age at diagnosis was 25.6 for depressive disorders, 22.9 for reactions to stress, 25.0 for anxiety disorders, 27.9 for substance use disorders, 28.2 for psychotic disorders, 28.6 for bipolar disorder, 29.4 for personality disorders, 22.6 for eating disorders, 12.9 for developmental disorders, and 14.9 for childhood behavioral and emotional disorders.

Table 2 presents the crude and adjusted HRs with 95% CIs for any psychiatric disorder (F00-F99) associated with the variables under study. Children and adolescents who had experienced parental DBEC had a significantly increased risk of developing any psychiatric disorder compared to offspring who had not experienced parental DBEC. Table 3 presents the adjusted HRs with 95% CIs for the most common specific disorders associated with the variables under study. Offspring who had experienced parental DBEC had significantly increased risks of depressive disorders, reactions to stress, anxiety disorders, substance use disorders, developmental disorders, and childhood behavioral and emotional disorders compared to nonexposed people. Of the lesser common disorders, bereaved offspring had significantly increased risks of psychotic disorders (HR: 2.42, 95% CI: 1.33–4.39), bipolar disorder (HR: 2.30, 95% CI: 1.23–4.30), and personality disorders (HR: 2.60, 95% CI: 1.59–4.28). Bereaved offspring did not have an increased risk of eating disorders (HR: 0.53, 95% CI: 0.17–1.66) compared to people who had not experienced such loss.

Causes of parental death
Offspring exposed to parental suicide, transport accidents, other accidents such as falls, poisoning, and drowning, and other external causes had a significantly increased risk of any psychiatric disorder compared to people who had not experienced parental DBEC (Table 2). Parental suicide was associated with the highest risk, with offspring being approximately 2.5 times more likely to develop a disorder, while parental death due to transport accidents was associated with the lowest risk. Parental suicide was associated with a significantly increased risk of all the specific diagnoses investigated, while death due to transport accidents was only associated with a significantly increased risk of substance use disorders (Table 3). Other accidents such as falls, poisoning, and drowning were associated with a significantly increased risk of depressive disorders, reactions to stress, substance use disorders, developmental disorders, and childhood behavioral and emotional disorders. Parental death by other external causes was only associated with a significantly increased risk of childhood behavioral and emotional disorders.

Gender of deceased parent
Children and adolescents who had lost a father, mother, and both parents had a significantly increased risk of developing any psychiatric disorder (Table 2). Loss of a father was associated with a significantly increased risk of all the specific diagnoses, while loss of a mother was associated with a significantly increased risk of depressive disorders, substance use disorders, and childhood behavioral and emotional disorders (Table 3). Loss of both parents was associated with a significantly increased risk of substance use disorders, developmental disorders, and childhood behavioral and emotional disorders. Note, however, that the confidence intervals for maternal and paternal bereavement were highly overlapping and that considerably more fathers than mothers died from external causes. Similarly, very few people had lost both parents.

Age at bereavement
Parental DBEC was associated with a significantly increased risk of any psychiatric disorder when bereavement occurred from birth through age 18 (Table 2). Offspring’s risk of depressive disorders and substance use disorders was significantly increased following bereavement from birth to 15 years, while risk of reactions to severe stress was significantly increased after bereavement from 5 to 15 years (Table 3). Furthermore, risk of anxiety disorders was significantly increased following bereavement from birth to 5 years and 15 to 18 years, while risk of childhood behavioral and emotional disorders was significantly increased after bereavement from birth to 10 years and 15 to 18 years. Risk of developmental disorders was only significantly increased following bereavement from 5 to 10 years.

Gender of bereaved offspring
No significant interaction between gender of the bereaved offspring and bereavement status was evident for any psychiatric disorder, indicating comparative associations between parental DBEC and developing a psychiatric disorder in daughters and sons (Table 2). This was also true for all the specific diagnoses investigated (data not shown). Tests for interactions between gender of the offspring and cause of death, gender of deceased, and age at bereavement for any psychiatric disorder resulted in a significant interaction between gender and age at bereavement (Table 2). Evidently, bereavement before age 10 was more detrimental to sons than daughters, while bereavement after age 10 was more detrimental to daughters than sons.

Comorbidity
In the present study, 1.2% (56) of bereaved offspring received multiple diagnoses, while 0.5% (3466) of
| Variables | Bereaved at age 18 | Any psychiatric disorder | N = 19,759 | Depressive disorders | N = 4079 | Reactions to stress | N = 3150 | Anxiety disorders | N = 2476 | Substance use disorders | N = 2222 | Developmental disorders | N = 1554 | Childhood disorders* | N = 4944 | Psychotic disorders | N = 477 | Bipolar disorder | N = 443 | Eating disorders | N = 626 | Personality disorders | N = 629 |
|-----------------|------------------|-------------------------|------------|---------------------|---------|-------------------|---------|-------------------|---------|----------------------|---------|----------------------|---------|---------------------|---------|-----------------|---------|------------------|---------|------------------|---------|
| Bereavement status |                  |                         |            |                     |         |                   |         |                    |         |                      |         |                     |         |                    |         |                  |         |                  |         |                  |         |
| No exposure to parental DBEC | 650,754 | 19,406 | 4000 | 3100 | 2443 | 2163 | 1531 | 4860 | 466 | 433 | 623 | 613 |
| Exposure to parental DBEC | 4723 | 353 | 79 | 50 | 33 | 59 | 23 | 84 | 11 | 10 | 3 | 16 |
| Cause of death |                  |                         |            |                     |         |                   |         |                    |         |                      |         |                     |         |                    |         |                  |         |                  |         |                  |         |
| No exposure to parental DBEC | 650,754 | 19,406 | 4000 | 3100 | 2443 | 2163 | 1531 | 4860 | 466 | 433 | 623 | 613 |
| Suicide | 1922 | 167 | 38 | 21 | 22 | 27 | 11 | 35 | 8 | 6 | 2 | 9 |
| Transport accidents | 1331 | 71 | 13 | 12 | 6 | 14 | 5 | 13 | 1 | 2 | 0 | 2 |
| Other accidents | 1254 | 97 | 24 | 15 | 5 | 15 | 7 | 32 | 0 | 2 | 1 | 3 |
| Other external causes | 216 | 18 | 4 | 2 | 0 | 3 | 0 | 4 | 2 | 0 | 0 | 2 |
| Gender of deceased |                  |                         |            |                     |         |                   |         |                    |         |                      |         |                     |         |                    |         |                  |         |                  |         |                  |         |
| No exposure to parental DBEC | 650,754 | 19,406 | 4000 | 3100 | 2443 | 2163 | 1531 | 4860 | 466 | 433 | 623 | 613 |
| Father | 3794 | 273 | 61 | 42 | 28 | 49 | 21 | 61 | 7 | 7 | 3 | 13 |
| Mother | 867 | 73 | 16 | 8 | 5 | 8 | 1 | 21 | 3 | 3 | 0 | 3 |
| Both parents | 62 | 7 | 2 | 0 | 0 | 2 | 1 | 2 | 1 | 0 | 0 | 0 |
| Age at bereavement |                  |                         |            |                     |         |                   |         |                    |         |                      |         |                     |         |                    |         |                  |         |                  |         |                  |         |
| No exposure to parental DBEC | 650,754 | 19,406 | 4000 | 3100 | 2443 | 2163 | 1531 | 4860 | 466 | 433 | 623 | 613 |
| 4 years | 1344 | 90 | 16 | 7 | 11 | 18 | 6 | 33 | 1 | 2 | 0 | 4 |
| 5–9 years | 1339 | 117 | 22 | 24 | 8 | 12 | 11 | 33 | 5 | 2 | 0 | 5 |
| 10–14 years | 1306 | 97 | 30 | 14 | 6 | 21 | 5 | 12 | 2 | 3 | 1 | 5 |
| 15–18 years | 734 | 49 | 11 | 5 | 8 | 8 | 1 | 6 | 3 | 3 | 2 | 2 |

Both main and secondary diagnoses were considered when coding specific disorders.

Short for childhood behavioral and emotional disorders.
nonbereaved people received multiple diagnoses. Childhood behavioral and emotional disorders, and especially attention deficit hyperactivity disorder (ADHD), were the most common comorbid disorders: 41.5% (1469) of people receiving multiple diagnoses received at least one diagnosis of childhood behavioral and emotional disorder. These patients most often received these diagnoses together with a diagnosis of developmental disorder, or they received multiple diagnoses of childhood behavioral and emotional disorders. Other disorders that often co-

Table 2. Crude and adjusted HRs with 95% CIs for developing any psychiatric disorder associated with the variables under study, for all subjects and males and females separately

| Variablesb | Crude HR | Adjusted HRa | Gender interaction |
|------------|----------|--------------|--------------------|
|            | All subjects | Female | Male | x² | p |
| Bereavement status | | | | | | |
| Exposure to parental DBEC | 2.02 (1.82–2.24)† | 2.19 (1.97–2.43)† | 2.17 (1.87–2.52)† | 2.19 (1.89–2.54)† | 0.00 | 1 |
| Cause of death | | | | | | |
| Suicide | 2.56 (2.20–2.98)‡ | 2.57 (2.21–2.99)‡ | 2.62 (2.11–3.25)‡ | 2.52 (2.03–3.12)‡ | 0.00 | 0.997 |
| Transport accidents | 1.19 (0.94–1.50)† | 1.49 (1.18–1.89)† | 1.51 (1.10–2.08)† | 1.47 (1.04–2.07)† | | |
| Other accidents | 2.34 (1.91–2.85)‡ | 2.35 (1.93–2.87)‡ | 2.29 (1.71–3.07)‡ | 2.39 (1.82–3.13)‡ | | |
| Other external causes | 2.12 (1.34–3.37)† | 2.33 (1.47–3.70)‡ | 2.20 (1.10–4.41)† | 2.43 (1.31–4.52)† | | |
| Gender of deceased | | | | | | |
| Father | 1.89 (1.68–2.13)‡ | 2.10 (1.87–2.37)‡ | 2.04 (1.72–2.42)‡ | 2.15 (1.82–2.54)‡ | 0.00 | 0.392 |
| Mother | 2.59 (2.05–3.25)‡ | 2.48 (1.97–3.12)‡ | 2.83 (2.05–3.89)‡ | 2.20 (1.58–3.06)‡ | | |
| Both parents | 2.77 (1.32–5.81)† | 3.21 (1.53–6.73)‡ | 2.04 (0.66–6.32)† | 5.41 (2.03–14.42)† | | |
| Age at bereavement | | | | | | |
| 4 years | 1.91 (1.56–2.35)‡ | 2.09 (1.70–2.57)‡ | 1.90 (1.39–2.59)‡ | 2.26 (1.71–2.99)‡ | 0.00 | 0.036 |
| 5–9 years | 2.34 (1.95–2.81)‡ | 2.49 (2.07–2.98)‡ | 2.01 (1.50–2.70)‡ | 2.92 (2.31–3.68)‡ | | |
| 10–14 years | 1.93 (1.58–2.35)‡ | 2.09 (1.71–2.56)‡ | 2.46 (1.90–3.18)‡ | 1.71 (1.25–2.34)‡ | | |
| 15–18 years | 1.78 (1.34–3.35)‡ | 1.96 (1.48–2.59)‡ | 2.38 (1.67–3.39)‡ | 1.49 (0.94–2.37)‡ | | |

No exposure to parental DBEC as reference.

*The HRs derived from these models were adjusted for ethnicity, year of birth and gender.
†The estimates for these variables were generated from separate models.
* p < 0.05, † p < 0.01, ‡ p < 0.001.

Table 3. Adjusted HRs with 95% CIs for developing the most common specific disorders investigated, associated with the variables under study

| Variablesb | Depressive disorders | Reactions to stress | Anxiety disorders | Substance use disorders | Developmental disorders | Childhood disordersc |
|------------|----------------------|---------------------|------------------|-------------------------|------------------------|---------------------|
|            | All subjects | Female | Male | Adjusted HRa |            | Adjusted HRa |            |          | Adjusted HRa |            | Adjusted HRa |            |
| Bereavement status | | | | | | | | | | | | |
| Exposure to parental DBEC | 2.09 (1.68–2.62)† | 1.90 (1.43–2.51)† | 1.45 (1.03–2.05)* | 2.75 (2.13–3.57)‡ | 2.47 (1.63–3.73)‡ | 2.64 (2.13–3.28)‡ | | | | | |
| Cause of death | | | | | | | | | | | | |
| Suicide | 2.51 (1.82–3.46)‡ | 1.97 (1.28–3.02)† | 2.40 (1.58–3.66)† | 3.17 (2.17–4.63)‡ | 2.71 (1.50–4.90)‡ | 2.56 (1.84–3.57)‡ | | | | | |
| Transport accidents | 1.15 (0.67–1.98)† | 1.55 (0.88–2.72)‡ | 0.89 (0.40–1.98) | 2.18 (1.29–3.69)‡ | 2.26 (0.94–5.44) | 1.60 (0.93–2.76) | | | | | |
| Other accidents | 2.55 (1.71–3.80)‡ | 2.25 (1.35–3.73)† | 0.87 (0.36–2.10) | 2.82 (1.70–4.68)‡ | 2.61 (1.24–5.48)* | 3.65 (2.58–5.17)† | | | | | |
| Other external causes | 2.17 (0.81–5.78) | 1.57 (0.39–6.30) – | – | 2.58 (0.83–8.02) – | – | 3.13 (1.17–8.34)* | | | | | |
| Gender of deceased | | | | | | | | | | | | |
| Father | 2.00 (1.56–2.58)‡ | 1.98 (1.46–2.69)‡ | 1.53 (1.05–2.22)* | 2.85 (2.14–3.78)‡ | 2.89 (1.87–4.42)‡ | 2.42 (1.88–3.12)‡ | | | | | |
| Mother | 2.38 (1.46–3.89)‡ | 1.68 (0.84–3.35) | 1.23 (0.51–2.95) | 2.03 (1.01–4.06)* | 0.52 (0.07–3.70) | 3.36 (2.19–5.16) | | | | | |
| Both parents | 3.52 (0.88–14.09) – | – | – | 7.48 (1.87–29.93)* | 10.53 (1.48–74.84)* | 5.78 (1.44–23.10)* | | | | | |
| Age at bereavement | | | | | | | | | | | | |
| 4 years | 1.72 (1.06–2.82)* | 1.01 (0.48–2.12) | 1.91 (1.06–3.46)* | 3.49 (2.19–5.55)* | 1.84 (0.82–4.09) | 3.15 (2.24–4.44)* | | | | | |
| 5–9 years | 2.11 (1.39–3.21)‡ | 3.17 (2.12–4.73)‡ | 1.24 (0.62–2.49) | 2.02 (1.15–3.57)* | 3.22 (1.78–5.82)† | 3.01 (2.14–4.24)† | | | | | |
| 10–14 years | 2.61 (1.83–3.74)‡ | 1.81 (1.07–3.06)* | 0.89 (0.40–1.98) | 3.32 (2.16–5.11)* | 2.32 (0.97–5.60) | 1.55 (0.88–2.73) | | | | | |
| 15–18 years | 1.67 (0.93–3.02) | 1.20 (0.50–2.90) | 2.10 (1.05–4.21)* | 1.99 (0.99–3.98) | 2.07 (0.29–14.71) | 2.29 (1.03–5.10)* | | | | | |

No exposure to parental DBEC as reference.
Both main and secondary diagnoses were considered when coding specific disorders.
*The HRs derived from these models were adjusted for ethnicity, year of birth and gender.
†The estimates for these variables were generated from separate models.
* p < 0.05, † p < 0.01, ‡ p < 0.001.

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occurred were depression and anxiety, depression and substance use disorder, multiple forms of anxiety, and multiple forms of substance use disorder.

Children and adolescents who had experienced parental DBEC had a significantly increased risk of psychiatric comorbidity compared to offspring who had not experienced such loss (HR: 1.97, 95%CI: 1.51–2.56).

Discussion

The present study found that children and adolescents who had lost a parent to external causes of death had a significantly increased risk of a wide range of psychiatric disorders and psychiatric comorbidity compared to people who had not experienced such loss. This increased risk was especially evident following parental suicide and accidents such as falls, poisoning, and drowning and impacted daughters and sons equally with respect to their later psychiatric morbidity. Offspring displayed an increased risk from loss throughout their childhood and adolescence, and after losing their mother and father.

Bereaved offspring in Norway have an increased risk of depressive disorders, substance use disorders, psychotic disorders, bipolar disorder, and personality disorders, all in accordance with previous Scandinavian register studies (Berg et al., 2016; Laursen et al., 2007; Wilcox et al., 2010). The present study is, however, the first large-scale population study to report an increased risk of childhood behavioral and emotional disorders, reactions to severe stress, anxiety disorders, developmental disorders, and psychiatric comorbidity. Symptoms of conduct disorder, a subcategory of childhood behavioral and emotional disorders, were reported to be more prevalent in offspring bereaved from all causes compared to nonbereaved peers in a previous US survey study (Kaplow, Saunders, Angold, & Costello, 2010). Another US survey study found a significantly increased risk of PTSD 9 months after parental suicide, but no significantly increased risk of anxiety disorders the first 9 or 21 months after parental suicide (Brent et al., 2009; Melhem et al., 2008). Likewise, a later US survey study also reported significantly higher prevalence of PTSD, but not anxiety disorders, for up to 7 years after the loss of a parent from all causes (Pham et al., 2018). This latter study also reported an increased incidence of functional impairment, such as impairment in school, partially mediated by the development of depression and negative life events. Methodological differences from the present study, including lower sample size and self-report, may account for the differences between the previous survey studies and the present register study.

The only disorder not found to be associated with an increased risk following parental DBEC in the present study was eating disorders, including anorexia nervosa, bulimia nervosa, and overeating. Since no previous study has investigated the impact of bereavement on these specific disorders, the lack of association is difficult to explain. A potential explanation may stem from the lower fertility in women with current or former eating disorders (Stewart, 1992), and a concomitant lower genetic transmission of this disorder to offspring. Note, however, that few people were diagnosed with eating disorders in our cohort, and the results may stem from a lack of statistical power.

Presumably, loss of a close family member can function as an underlying vulnerability factor, as well as provoke, aggravate, or alter the development of psychiatric disorders (Shear & Clayton, 2008). The increased risk of mental ill health following loss of a parent may be explained by both pre- and postbereavement factors, and there may exist a dose–response relationship between the number of pre- and postbereavement factors and the severity of psychiatric sequelae (Andriessen, Draper, Dudley, & Mitchell, 2016). Factors preceding the loss that may increase risk of psychiatric disorders include low household resources and parental education (Fauth, Thompson, & Penny, 2009), parental psychiatric illness (Brent, Melhem, Masten, Porta, & Payne, 2012; Melhem et al., 2008), and a family environment characterized by discord and conflict. Such pre-bereavement factors may influence the risks of both parental death and offspring psychopathology and hence function as confounders in the present analyses. Additionally, the emotional closeness of the relationship with the deceased has been reported to influence the mental health of the bereaved following the loss (Andriessen et al., 2016). Previous studies have reported that the association between bereavement and psychosocial sequelae remains significantly increased, albeit reduced, following adjustment for such pre-bereavement factors (Melhem et al., 2008; Pham et al., 2018).

After the loss, postbereavement factors that may increase risk of mental ill health include sleep disturbances (Levenson, Nusslock, & Frank, 2013), lower stress resilience and coping skills (Kennedy et al., 2018; Hoeg et al., 2017), educational challenges (Burrell, Mehlem, & Qin, 2020a), a poor relationship with the remaining parent, and further family problems and lack of social support (Andriessen et al., 2016; Brent et al., 2012). Postbereavement factors function as mediators and contribute to the total effect of bereavement on psychopathology. In addition, there is probably a direct effect of bereavement on mental health due to the sudden nature of external deaths, bereaved offspring’s lack of control and preparation, the accompanying shock and potential trauma, and the following rumination, grief, and counterfactual thinking. Combined, these pre- and postbereavement factors may create a negative spiral where one problem enhances another, which again fuels further challenges. The present study is, unfortunately, unable to investigate these specific risk factors.

A general finding throughout the specific diagnoses investigated was that the highest risks were associated with parental suicide and accidental deaths such as poisoning and falls, while deaths due to transport accidents were associated with a lower risk. These differences in risk of psychiatric disorders between different types of accidents have not been previously ascertained, but comparable differences have formerly been reported for bereaved offspring’s risk of DSH hospitalization (Burrell et al., 2020b). Different risks of psychiatric disorders associated with different types of accidents may explain previous discrepant findings regarding potential differences between parental suicide and accidental deaths in general (Berg et al., 2016; Brent et al., 2009; Kuramoto et al., 2010; Melhem et al., 2008; Wilcox et al., 2010). An external validation of data from the Cause of Death Register reported that suicides are relatively seldom misclassified as accidental deaths in Norway (Tøllefsen et al., 2015), leaving misclassification as a fairly unlikely
Parental death and risk of psychiatric disorders

that postbereavement factors are more in differences may mask different processes from bereavement studies on risks of suicide (Burrell et al., 2017), educational attainment (Burrell et al., 2020a), and DSH (Burrell et al., 2020b). This lack of gender differences may be a result of the relative gender equality in Norway today concerning child rearing responsibilities and economic and occupational functioning (Statistics Norway, 2012b; World Economic Forum, 2016). As a result, both parents may function as primary attachment figures, the remaining parent of both genders can be able to maintain household resources following the loss, and bereaved daughters and sons may have equal ability to seek social support and express their grief. Future studies can benefit from directly investigating the potential reasons behind the lack of gender differences, for example through interactions with parental socioeconomic status and occupation.

With regard to age at bereavement, previous studies investigating the association between parental death and offspring psychiatric disorders have both reported decreasing risks with increasing age (Berg et al., 2016; Laursen et al., 2007; Mortensen et al., 2003; Tsujiya et al., 2005; Wilcox et al., 2010) and no systematic changes in associations with regard to age at bereavement (Appel et al., 2013; Wilcox et al., 2010), somewhat dependent on the type of psychiatric disorder investigated. Direct comparison with previous studies is, however, difficult given that many previous studies investigate all causes of death combined (Appel et al., 2013; Berg et al., 2016; Laursen et al., 2007; Mortensen et al., 2003) and different age classifications are used. The present results indicating an increased risk of psychiatric disorders following bereavement throughout childhood and adolescence and a lack of differences between different age groups are in line with our earlier studies on risks of suicide (Burrell et al., 2017), educational attainment (Burrell et al., 2020a), and DSH hospitalization (Burrell et al., 2020b). Notably, this lack of age differences may mask different processes from bereavement to psychiatric disorder, and we can hypothesize that postbereavement factors are more influential when bereavement occurs in early childhood, while prebereavement factors are more important when bereavement occurs in later adolescence. The authors are not aware of any present studies investigating the potentially different explanatory mechanisms associated with loss at different ages, and qualitative studies could effectively investigate the abovementioned hypothesis.

The primary strength of the present study is the investigation of disorders for which the scientific and therapeutic communities lack information, specifically anxiety disorders, developmental disorders, childhood behavioral and emotional disorders, eating disorders, and reactions to severe stress, as well as psychiatric comorbidity. Moreover, data in Norwegian registers cover the entire population, ensuring external validity, and are collected systematically and uniformly. The extent of national registers enables a large sample size, increasing statistical power when investigating rare events such as parental DBEC and psychiatric disorders. Furthermore, register studies are not affected by problems caused by sampling and attrition, or biases related to observations and self-report. Data in Norwegian registers hold high quality and are continuously monitored, corrected, and analyzed (Bakken et al., 2019; Pedersen & Ellingsen, 2015).

Present study results must be interpreted in light of limitations, most importantly limitations in data access and the ability to include important confounders and mediators such as the quality of the parent-child relationship, and parental socioeconomic status and psychiatric disorders. Data access also limits the information from the NPR to a relatively short time frame, and some members of the cohort have probably been in contact with specialist mental health services prior to the time period under investigation. These people will be censored, but will in reality possess the event in question. This limitation may lead to a type II error, potentially reducing our chances of significant findings. Additionally, we have only focused on the diagnosis at the first recorded contact in the patient register, which may also imply an underestimation of specific disorders. Moreover, people may suffer from mental illness without being in contact with mental health services, and the present results cannot automatically be generalized to them. A final limitation is a result of the study excluding all offspring without a registered link to parents, effectively excluding disproportionately many first generation immigrants given that their parents are not registered in Norway.

Conclusion

In conclusion, bereaved offspring have a higher risk of a range of psychiatric disorders compared to people who have not experienced such loss, especially following parental suicide and accidental poisonings and falls. The increased risk is evident for daughters and sons, after losing a mother and father and following loss throughout childhood and adolescence. Yet again, results indicate that parental death by external causes has vast and long-lasting effects on bereaved offspring.

Since all children and adolescents who have experienced parental death by external causes have an increased risk of psychiatric disorders, we advocate that all bereaved offspring should be offered supportive follow-up, both in primary healthcare and mental health services. Results from the present study indicate that
children and adolescents bereaved by parental suicide and accidental poisonings and falls are especially vulnerable, and we would recommend a particularly proactive follow-up in mental health services for these groups. Follow-up in the form of individual counseling, support groups, and peer-to-peer support can indeed be beneficial in reducing psychopathology (Andriessen, Dudley, Draper, & Mitchell, 2017). Similarly important is to screen for a history of childhood parental bereavement in people suffering from mental illness to more effectively identify important targets for treatment. Future studies can aim to bridge the gap between population-based registry studies and recommendations for postvention measures, for example through qualitative studies investigating bereaved offspring’s own experience of loss and mental health, how they cope with the loss, and their need for postvention. Furthermore, future studies should aim to investigate the effectiveness of postvention measures, particularly for bereaved children and adolescents (Andriessen et al., 2019).

In addition to an increased awareness of bereavement-related challenges in mental health care, other groups working with children and adolescents, such as teachers, school nurses, and child welfare services should be targeted for increased awareness of bereavement-related sequelae in children and youth. These community gatekeepers are well placed to identify bereaved offspring who are struggling and guide them to seek further help. Most importantly, the extensive and long-lasting sequelae of parental bereavement call for a comprehensive and multilevel follow-up of this vulnerable group, hopefully halting the generational transfer of mental disorder and early mortality.

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Ethical information

The study was approved by the Regional Committee for Medical and Health Research Ethics (ref. 2013/1620/REK South East) and owners of the registers.

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