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RESEARCH ARTICLE

Long-term effects of experiencing childhood parental death on mental and physical health: A NESDA study

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Abstract

Experiencing parental death during childhood is an adverse, potentially traumatic experience that may have substantial long-term effects on mental and physical well-being. The current study was based on data of the Netherlands Study of Depression and Anxiety to investigate mental health (i.e., depressive symptoms, anxiety symptoms, and suicidal ideation) and physical health outcomes (i.e., metabolic syndrome, telomere length, and perceived physical health) as well as health behaviour (i.e., smoking status, alcohol use, and physical activity) to provide more insight into the long-term outcomes after experiencing childhood parental death (CPD). For individuals who experienced CPD, we also investigated the role of loss-related factors in these associations, namely the age of the child when their parent passed away and gender of the deceased parent. Interviews and questionnaires were completed by adults between 18 and 65 years; 177 participants experienced CPD (mean age = 45.19, 61.6% female) and 2463 did not (mean age = 41.38, 66.6% female). Results showed no overall association between the experience of CPD and mental and physical health indices and health behaviour. Within the CPD group, experiencing CPD at a younger age was related to a higher likelihood of suicidal ideation. These findings seem to illustrate a general positive adjustment with regard to long-term health functioning after experiencing such an impactful life event. Future research should focus on individual differences in terms of adaptation, especially elucidating on contextual factors after the loss, such as the kind of support that is or is not provided by the surviving parent and/or other important individuals.

KEYWORDS
childhood parental death, long-term health outcomes, NESDA

1 | INTRODUCTION

Adverse childhood experiences can have, besides their short-term deleterious effects, substantial long-term effects on health-risk behaviours as well as on mental and physical health directly (Bellis et al., 2019; Campbell et al., 2016; Felitti et al., 1998; Hughes et al., 2017). Parental death during childhood is one of these adverse, possibly traumatic childhood experiences that may have lifelong consequences. Previous research reported a wide range of mental and physical health consequences of childhood parental death, such as depressive symptoms, suicidality, and physical health complaints (Lytje & Dyregrov, 2019). Since mental and physical health outcomes are likely to be interrelated and are associated with health behaviours, it is important to examine these various aspects of an individual's health later in life and in a large sample (Luecken & Roubinov, 2012). Using data from the Netherlands Study of Depression and Anxiety (NESDA; Penninx et al., 2008), we aimed to investigate mental and physical health outcomes as well as health behaviours to provide more insight into the long-term outcomes after experiencing childhood parental death (CPD). Furthermore, from a prevention perspective, it is important to examine child and parent characteristics (e.g., the age of the child at the time of CPD and the gender of the deceased parent) as potential risk factors to better understand why some individuals develop less optimal health outcomes compared to others after experiencing CPD. Additionally, more insight into long-term outcomes after CPD and potential risk factors might help develop preventive strategies for individuals who experienced CPD.

The most commonly studied mental health outcomes in relation to CPD are depression and other affective symptoms and disorders (e.g., Lytje & Dyregrov, 2019; McKay et al., 2021). Recent meta-analyses and a narrative review showed that experiencing CPD is associated with a higher risk of depressive, anxiety, and psychotic disorders in children and adults (Lytje & Dyregrov, 2019; McKay et al., 2021; Simbi et al., 2020; Varese et al., 2012). These meta-analyses specifically focussed on clinical (DSM or ICD) diagnoses and case-control studies within the context of childhood parental loss (Simbi et al., 2020) with limited or no information with regard to subclinical symptoms (McKay et al., 2021). Studies that were not included in the abovementioned meta-analyses did not find an association between CPD and depressive or anxiety disorders and/or other DSM diagnoses in adulthood (Hovens et al., 2012; Perris et al., 1986; Sareen et al., 2005; Tennant, 1988). In addition to affective disorders, CPD has also been related to suicidality in adulthood (e.g., Hollingshaus & Smith, 2015), but other studies did not find this association (Chang et al., 2015; Thompson et al., 2019). Recent review papers (Lytje & Dyregrov, 2019; McKay et al., 2021) suggested that most individuals who experience CPD do not develop (lasting) mental health problems, suggesting that additional (environmental) factors may be relevant in determining specific outcomes. These factors have not yet been investigated in meta-analyses.

The association between CPD and physical health consequences has been studied less extensively and findings are inconsistent. Some studies did not find an association between CPD and physical health outcomes (for a review see Lytje & Dyregrov, 2019; Maier & Lachman, 2000), whereas other studies found a (slightly) increased risk of negative physical health outcomes, such as increased overall mortality relatively earlier in life (Hiyoshi et al., 2021; for a review see Lytje & Dyregrov, 2019). Additionally, two studies on individuals' perceived physical health showed that participants who experienced CPD were more likely to report (slightly) poorer overall physical health compared to those who did not experience CPD (Parsons, 2011; Tebeka et al., 2016). Other studies investigated known risk indices for health problems later in life which are suggested to be related to adverse childhood experiences, such as telomere length and metabolic syndrome (Deighton et al., 2018; Price et al., 2013). Telomere length is a biological indicator of cellular ageing and is considered a marker of biological age (Aubert & Lansdorp, 2008; Shammas, 2011), with shorter telomeres being associated with poor health outcomes (for a review see Price et al., 2013). A meta-analysis investigating telomere length showed that, contrary to childhood trauma, childhood parental loss (including death, divorce/separation, and separation from parent) was not related to shorter telomere length in adulthood (Li et al., 2017). Similarly, the few studies in this meta-analysis that did focus on CPD specifically did also not find an association with telomere length (Osler et al., 2016; Schaakxs et al., 2016; Verhoeven et al., 2015). However, another study did find a relation between CPD and shorter telomeres in 9-year-old children (Mitchell et al., 2017). The association between the presence of metabolic syndrome, a risk factor for developing cardiovascular diseases (e.g., obesity, hypertension; Deighton et al., 2018) and CPD has rarely been studied. The two studies that investigated this in the context of childhood parental loss found a positive association with metabolic syndrome (Alciati et al., 2013; McIntyre et al., 2012).

One of the potential mechanisms underlying the relation between CPD and both mental and physical health consequences is health-risk behaviour, such as smoking, alcohol use, and low levels of physical activity (e.g., Hiles et al., 2017; Luecken & Roubinov, 2012). Few studies investigated the association between experiencing CPD and health behaviours in adulthood and findings are inconsistent. A recent narrative review showed an association between CPD and high-risk behaviour (Lytje & Dyregrov, 2019). Other studies that were not included in this review have also shown an association with alcohol and/or substance use and dependence in adolescents and adults (Lacey et al., 2018; Otowa et al., 2014), and with smoking during adolescence and adulthood (Nielsen et al., 2012; Parsons, 2011), whereas other studies did not find these associations in adolescence or adulthood (Estaugh & Power, 1991; Hamdan et al., 2013; Hope et al., 1998; Kendler et al., 1996, 2002; Maier & Lachman, 2000; Muñiz-Cohen et al., 2010).

In sum, previous literature demonstrated inconsistent findings regarding the associations between CPD and different health outcomes, which may be due to the large variability in the experience of CPD. Loss-related factors, such as the age of the child at the time of CPD and the gender of the deceased parent, might play an important role in the association between CPD and long-term health outcomes. As such, experiencing parental death at a young age and experiencing

CPD of a primary caregiver or the same-sex parent may have stronger negative outcomes. Parental death is an intense disruption of one of the attachment bonds, especially when the primary attachment figure passes away (Berg et al., 2016; Bowlby, 1969, 1980). Because young children are more dependent on their caregiver(s) than older children (Bowlby, 1980; Dowdney, 2000; Rostila & Saarela, 2011), for example, to be able to regulate their emotions, children might also be more sensitive to changes and instability in the aftermath of parental death at a younger age (e.g., Biank & Werner-Lin, 2011; Bowlby, 1969; Rostila & Saarela, 2011; Werner-Lin et al., 2010). Furthermore, theoretically, as children are more dependent on their primary attachment figure and as mothers are still most often primary attachment figures, despite substantial changes in the traditional division of parental roles, the loss of a mother may be associated with less optimal outcomes. Alternatively, since children often identify most with the same-sex parent and this parent often serves as a role model with regard to coping (Cheng et al., 2014; Takeuchi et al., 2003), children might be more sensitive to changes after the same-sex parent passes away. However, findings regarding the role of the child's age at the time of CPD on different outcomes are inconclusive. Although some studies found an increased risk of more negative outcomes when an individual experienced CPD at a younger age (Agid et al., 1999; Berg et al., 2016; Nickerson et al., 2013), other studies did not (Brent et al., 2012; Li et al., 2014; Tyrka et al., 2008). Similarly, previous research is also inconsistent regarding the role of the gender of the deceased parent; one study found a stronger effect of maternal death compared to paternal death (Rostila & Saarela, 2011), other studies found this with regard to paternal death (Jacobs & Bovasso, 2009), the death of a same-sex parent (Takeuchi et al., 2003), or the death of the opposite-sex parent (Kivelä et al., 1998), whereas other studies did not find any associations (Burrell et al., 2018; Lacey et al., 2018; Li et al., 2014; Tyrka et al., 2008).

The aim of the current study is to investigate the association between CPD (i.e., prior to the age of 18 years) and long-term health outcomes. Using data from the NESDA-study (Penninx et al., 2008), we included a broad variety of health outcomes regarding mental health (i.e., depressive symptoms, anxiety symptoms, and suicidal ideation), physical health (i.e., metabolic syndrome, telomere length, and perceived physical health), and health behaviour (i.e., smoking status, alcohol use, and physical activity). We expected that participants who experienced CPD would have less optimal mental health, physical health (except for telomere length, see another study among NESDA participants; Verhoeven et al., 2015), and health behaviour outcomes compared to participants who did not experience CPD. Additionally, for individuals who experienced CPD, we investigated whether two loss-related factors (i.e., gender of the deceased parent and child's age at the time of CPD) could explain differences in health outcomes among individuals who experienced CPD. We expected that individuals who experienced CPD at a younger age would have less optimal long-term health outcomes compared to those who experienced CPD at a relatively older age. Given the inconsistent findings regarding gender of the deceased parent, we explored whether childhood maternal death is related to less optimal health outcomes in adulthood compared to childhood paternal death and whether loss of the parent with the same sex as the child is related to less optimal health outcomes in adulthood compared to loss of the opposite-sex parent.

2 | METHOD

2.1 | Participants

Data of the NESDA, an ongoing multisite longitudinal study to investigate the course and consequences of depressive and anxiety disorders (Penninx et al., 2008), is used in this study. Due to recruitment in different settings (i.e., general population, via general practitioners, and via mental health organizations), the sample consists of participants at risk for mental health problems (i.e., due to symptoms or a family history of depressive and/or anxiety disorders), participants with depressive and/or anxiety disorders, and healthy controls (Penninx et al., 2008). Participants were excluded when they were not fluent in Dutch and/or when they had a primary diagnosis outside the scope of the study that would likely affect the outcomes and trajectory over time (i.e., psychotic disorder, obsessive-compulsive disorder, bipolar disorder, and/or severe addiction disorder; Penninx et al., 2008). Detailed information regarding the design of the study, the sample, and the sampling procedure is described in Penninx et al. (2008). At baseline, the NESDA-sample consisted of 2981 participants between the age of 18 and 65 years (M = 41.86; SD = 13.08). Two thirds of the participants were female (66.4%; n = 1979).

In the current study, participants were excluded from the analyses when it was unclear whether either one or both parents were alive or when it was unclear whether the parent(s) died during childhood or later in life (n = 61) or when there was missing data on one or more health outcomes (n = 274 (CPD group: n = 17; no CPD group: n = 257)). Participants who experienced the death of both parents during childhood (n = 6) were also excluded, since the circumstances and experience of these participants are likely to differ from the experience of participants who lost one of their parents and the loss-related variables (i.e., age at time of CPD and gender of the deceased parent) were not comparable. Excluded individuals (n = 341) were significantly older than included individuals (n = 2640) and had relatively less optimal outcomes compared to included individuals regarding mental health (i.e., the presence of a lifetime depression diagnosis, depressive and anxiety symptoms, and suicidal ideation) and telomere length, ps < 0.04. However, excluded individuals did not differ from included individuals regarding demographic variables (i.e., gender, whether they experienced parental death during adulthood, and number of siblings), the presence of a lifetime anxiety disorder diagnosis or combined lifetime anxiety and/or depression diagnosis, two physical health outcomes (i.e., metabolic syndrome and perceived physical health), and health behaviour variables (i.e., smoking, alcohol use, and physical activity), ps > 0.05.

In the current study, the total sample consisted of 2640 participants, of which 177 individuals indicated that one parent passed away

TABLE 1 Demographic characteristics and descriptive statistics of health outcomes.

	Total sample (n = 2640)	CPD (n = 177)	No CPD (n = 2463)	Statistics for initial group comparisons
Age in years *M* (SD)	41.63 (13.04)	45.19 (12.08)***	41.38 (13.07)***	Welch's $t(206.79) = -4.03$, $p < 0.001$
Female participants % (n)	66.3 (1749)	61.6 (109)	66.6 (1640)	$\chi^2(1) = 1.85$, $p = 0.174$
Years of education *M* (SD)	12.26 (3.24)	12.28 (3.36)	12.26 (3.23)	$t(2638) = -0.07$, $p = 0.946$
First nationality Dutch % (n)	98.2 (2593)	96.0 (170)	98.4 (2423)	$\chi^2(4) = 6.68$, $p = 0.154$
Number of siblings *M* (SD)	2.94 (2.37)	3.82 (3.09)***	2.88 (2.30)***	Welch's $t(190.30) = -4.00$, $p < 0.001$
Gender of DP (% paternal)	NA	70.6 (125)	NA	NA
Gender of DP (% same-sex)	NA	47.5 (84)	NA	NA
Age at time of CPD[a]	NA	10.92 (5.03)	NA	NA
Years since CPD[b]	NA	34.27 (13.40)	NA	NA
Parental death during adulthood % (n)	46.8 (1236)	50.8 (90)	46.5 (1146)	$\chi^2(1) = 1.24$, $p = 0.266$
Lifetime diagnosis % (n)				
Depressive disorder	65.5 (1728)	68.9 (122)	65.2 (1606)	$\chi^2(1) = 1.01$, $p = 0.315$
Anxiety disorder(s)	58.9 (1555)	61.6 (109)	58.7 (1446)	$\chi^2(1) = 0.56$, $p = 0.453$
Depressive and/or anxiety disorder(s)	77.6 (2049)	80.8 (143)	77.4 (1906)	$\chi^2(1) = 1.10$, $p = 0.294$
Depressive symptoms	21.19 (14.01)	21.82 (13.02)	21.14 (14.08)	$t(2638) = -0.63$, $p = 0.532$
Anxiety symptoms	11.86 (10.50)	12.16 (10.44)	11.83 (10.51)	$t(2638) = -0.40$, $p = 0.692$
Suicidal ideation (% [n] yes)	11.3 (299)	9.0 (16)	11.5 (283)	$\chi^2(1) = 0.99$, $p = 0.320$
Alcohol use	4.84 (4.74)	5.05 (4.78)	4.83 (4.74)	$t(2638) = -0.61$, $p = 0.542$
Smoking status (% [n] current/former)	71.6 (1889)	76.3 (135)	71.2 (1754)	$\chi^2(1) = 2.07$, $p = 0.150$
Physical activity	3668.78 (3118.93)	3600.53 (3187.43)	3673.68 (3114.55)	$t(2638) = 0.30$, $p = 0.763$
Metabolic syndrome	1.47 (1.29)	1.62 (1.31)	1.46 (1.29)	$t(2638) = -1.63$, $p = 0.104$
Perceived physical health	2.16 (0.71)	2.23 (0.75)	2.16 (0.71)	$t(2638) = -1.31$, $p = 0.192$
Telomere length	1.12 (0.31)	1.10 (0.31)	1.12 (0.31)	$t(2638) = 0.56$, $p = 0.575$

Abbreviations: CPD, childhood parental death; DP, deceased parent.

[a]Range of participants' age at time of CPD is 0–17 years.

[b]Range of years since CPD is 2–63 years.

***$p < 0.001$.

during the participants' childhood (i.e., prior to the age of 18 years; childhood parental death (CPD) group) and 2463 individuals indicated that they did not lose a parent during childhood (no CPD group). Descriptive information regarding both groups is provided in Table 1. Given the current age of the participants (range: 18–65 years), it was not surprising that in both groups almost 50% of participants (also) experienced parental death (PD) of one or both parents during adulthood (see Table 1). In total, 49.8% of the participants did not experience parental death, neither during childhood nor during adulthood.

2.2 | Procedure

The study was approved by the Medical Ethical Committee of the VUmc (reference number 2003/183). All participants provided written informed consent. The data collection at baseline lasted approximately four hours and consisted of interviews, self-report questionnaires, and a medical assessment. Additionally, blood and saliva samples were obtained (Penninx et al., 2008). The data collection was carried out by (clinically) trained research assistants.

2.3 | Measurements

2.3.1 | Mental health outcomes

Diagnoses of depressive and anxiety disorders

Current and lifetime diagnoses of depressive and anxiety disorders were assessed with the Composite Interview Diagnostic Instrument (CIDI; Wittchen, 1994). The CIDI (CIDI WHO, version 2.1) is a widely used structured interview to diagnose disorders according to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2001). The scoring of the CIDI is computerized. Current (i.e., past month, past

six months, and past year) and lifetime diagnoses of depressive (i.e., minor depressive disorder, major depressive disorder, and dysthymia) and anxiety disorders (i.e., social phobia, panic with agoraphobia, panic without agoraphobia, agoraphobia, and generalized anxiety disorder) were obtained.

Depressive symptoms

The Inventory of Depressive Symptoms (IDS) is a self-report questionnaire, which was used as an indicator of the severity of depressive symptoms during the past week (Rush et al., 1996). The IDS consists of 30 items (ranging from 0 to 3) to assess the criteria of major depressive disorder and other depression-related as well as melancholic and atypical symptoms according to the DSM-IV (American Psychiatric Association, 2001). A total sum score was obtained (between 0 and 84), in which a higher score indicates a higher severity of the depressive symptoms. The Cronbach's alpha (α) of the IDS within the complete NESDA sample ($N = 2981$) was 0.93.

Anxiety symptoms

Beck's Anxiety Inventory (BAI) is a self-report questionnaire, which was used as an indicator of the severity of anxiety and panic symptoms during the past week (Beck et al., 1988). The BAI consists of 21 items (ranging from 0 (not at all) to 3 (severely)). A total sum score was obtained (between 0 and 63), in which a higher score indicates a higher severity of the anxiety symptoms. The Cronbach's alpha (α) of the BAI within the complete NESDA sample ($N = 2981$) was 0.93.

Suicidal ideation

The first five items of the Scale for Suicide Ideation (SSI) were rated by the interviewer and used to screen current suicidal ideation and behaviour during the past week (Beck et al., 1979). The SSI was assessed during a semi-structured interview. Dependent on the presence of one or more diagnoses and the participants' answer(s), the (clinically trained) interviewer asked one or more of the five screening questions (i.e., desire to die, desire to live, reasons for living or dying, desire for an active suicide attempt, and parasuicidal behaviour). The items were scored on a 3-point Likert scale (ranging from 0 to 2), in which 0 indicated no suicidal intent, 1 indicated a weak suicidal intent, and 2 indicated a moderate to strong suicidal intent. A binary score was obtained as a measure of potential suicidal ideation. More specifically, a positive interviewer-rated score (i.e., score 1 or 2) on one or more items indicated potential suicidal ideation, whereas zero positive scores (i.e., score 0) indicated no potential suicidal ideation during the past week. The Cronbach's alpha (α) of five items of the SSI within the complete NESDA sample ($N = 2981$) was 0.79.

2.3.2 | Physical health outcomes

Metabolic syndrome

According to the US National Cholesterol Education Program (NCEP) —adjusted Adult Treatment Panel III (ATP III) criteria (Grundy et al., 2005), metabolic syndrome is defined as the presence of three or more of the following metabolic risk factors: abdominal obesity (i.e., waist circumference >102 cm in men; >88 cm in women), hypertriglyceridemia (i.e., triglycerides ≥1.7 mmol/L [150 mg/dl] or medication for hypertriglyceridemia), low high-density lipoprotein (HDL) cholesterol (i.e., HDL <1.03 mmol/L [40 mg/dl] in men; <1.30 mmol/L [50 mg/dl] in women or medication for reduced HDL cholesterol), hypertension (i.e., blood pressure ≥130/85 mmHg or antihypertensive medication), and hyperglycemia (i.e., fasting plasma glucose ≥5.6 mmol/L [100 mg/dl] or anti-diabetic medication). In the current study, the number of present metabolic factors (according to the adjusted ATP-III criteria of the NCEP; Grundy et al., 2005) was used (score 0–5), in which a higher number of factors is an indicator of a more severe metabolic health.

Telomere length

Telomere length (TL) was obtained via blood samples of participants and operationalized as the ratio between the telomere sequence copy number in each patient's sample (T) and a single-copy gene copy number (S), relative to a reference sample. The resulting T/S ratio is proportional to the mean TL (Aviv et al., 2011; Cawthon, 2002), in which a lower T/S-ratio is an indication of shorter telomeres. A detailed description of the TL measurement can be found in Verhoeven et al. (2014).

Perceived physical health

Participants were asked how they perceived their current overall physical health on a 5-point Likert scale, ranging from 1 (very good) to 5 (very bad).

2.3.3 | Health behaviour

Smoking status

Past and current smoking were assessed. Participants were categorised as either non-smokers or former/current smokers.

Alcohol use

The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) was used to assess the frequency and quantity of alcohol consumption (i.e., number of glasses per week). Participants were categorised as non-drinkers, mild to moderate drinkers (i.e., 1–14 (women) or 1–21 (men) glasses per week), or heavy drinkers (i.e., more than 14 (women) or more than 21 (men) glasses per week). In the analyses, alcohol use was included as continuous variable.

Physical activity

Physical activity was assessed with the 7-item short form of International Physical Activity Questionnaire (IPAQ; Booth, 2000; Craig et al., 2003). Participants were asked to fill in how many days and how much time a day during the past week they were physically active, distinguishing between vigorous and moderate activities as well as walking and sitting. For each activity type (i.e., walking, moderate, and vigorous), a measure of energy expenditure was obtained, which was

expressed in Metabolic Equivalent of Task (MET)-minutes per week (Craig et al., 2003). The total score of MET-minutes per week was included as a continuous variable in the analyses.

2.4 | Statistical analyses

Baseline differences between groups on several demographic variables (i.e., age and gender of the participant, the number of siblings, and parental death after the age of 17 years) were examined with chi-square tests (for gender and parental death during adulthood) and independent samples *t*-tests (for age and number of siblings) to identify possible confounding factors. The groups did significantly differ on age in years at baseline (Welch's $t(206.79) = -4.03$, $p < 0.001$; Table 1) as well as on the total number of siblings (Welch's $t(190.3) = -4.00$, $p < 0.001$; Table 1). Age, gender, years of education, and total number of siblings were included in subsequent analyses to control for possible confounding effects, since these sociodemographic variables were related to health outcomes (see Table 2).

All analyses were performed using RStudio version 1.3.959 (RStudio R Core Team, 2020; R Core Team, 2020). All non-binary variables were standardized. Nine separate regression analyses were conducted for all health-related outcomes, which included group (i.e., CPD vs. no CPD) as a predictor and all control variables (i.e., participants' age, gender, years of education, and total number of siblings). Logistic regression analyses were conducted for the two binary outcome variables (i.e., suicidal ideation in the past week (yes or no) and smoking status (non-smoker vs. former/current smoker)). For the other numeric outcome variables, seven linear regression analyses were conducted.

Second, to examine whether loss-related factors were associated with long-term health outcomes, separate regression analyses were conducted for all nine health-related outcomes for individuals who experienced CPD of one parent ($n = 177$). Participants' age at time of CPD and the gender of the deceased parent were added as predictors in the analyses. Regarding the gender of the deceased parent, maternal versus paternal loss and loss of the same-sex parent versus opposite-sex parent were explored.

3 | RESULTS

3.1 | Initial group comparisons

Participants within the CPD and no CPD group did not significantly differ on gender ($\chi^2(1) = 1.85$, $p = 0.174$) and on whether they experienced parental death after the age of 17 years ($\chi^2(1) = 1.24$, $p = 0.266$). Descriptive statistics of demographic variables and health outcomes are depicted in Table 1 and correlations between the observed health outcomes and other variables of interest are presented in Table 2. Overall, moderate to high significant correlations were observed between mental health outcomes (i.e., depressive symptoms, anxiety symptoms, and suicidal ideation) and perceived physical health. Most correlations between other different health outcomes were fairly low ($rs < 0.21$; see Table 2).

3.2 | Associations between childhood parental death and long-term health outcomes

First, participants within the CPD and no CPD group did not significantly differ on the presence of lifetime diagnosis of depressive disorders ($\chi^2(1) = 1.01$, $p = 0.315$), anxiety disorders ($\chi^2(1) = 0.56$, $p = 0.453$), nor combined lifetime diagnosis of depressive and/or anxiety disorders ($\chi^2(1) = 1.10$, $p = 0.294$). Nine separate regression analyses (i.e., two logistic regression analyses and seven linear regression analyses) were conducted to examine the association between the experience of CPD and health-related outcomes (controlled for age, gender, years of education, and total number of siblings), while applying a Bonferroni correction for multiple testing (α divided by 9, i.e., $\alpha = 0.006$). Results of these analyses are depicted in Table 3. In the regression models with all sociodemographic covariates (i.e., age, gender, years of education, and total number of siblings), CPD was not associated with any of the health outcomes.

3.3 | Associations between loss-related factors and long-term health outcomes

Within the group of participants who experienced CPD, again nine separate regression analyses (i.e., two logistic regression analyses and seven linear regression analyses) were conducted to examine the association between loss-related factors and long-term health outcomes, while applying a Bonferroni correction for multiple testing (α divided by 9, i.e., $\alpha = 0.006$). Results of these analyses are depicted in Table 4. When controlling for participants' age, gender, years of education, and total number of siblings, participants' age at time of CPD was not associated with health-related outcomes, except for suicidal ideation (see Table 4), $b = -0.83$, $p = 0.002$, OR = 0.44. This indicated that experiencing CPD at a younger age was related to a higher likelihood of suicidal ideation in the past week.

Regarding the role of the gender of the deceased parent of the participant, we explored both maternal versus paternal loss and loss of the same-sex versus opposite-sex parent, while applying a Bonferroni correction for multiple testing (α divided by 9, i.e., $\alpha = 0.006$). Although the models on alcohol use and metabolic syndrome were significant, the gender of the deceased parent (neither paternal or maternal death nor death of the same- or opposite-sex parent) did not predict any of the health outcomes (see Table 4).

4 | DISCUSSION

The current study investigated the association between the experience of childhood parental death (CPD) and mental and physical health outcomes as well as health behaviour in adults (18–65 years

TABLE 2 Descriptive statistics and correlations between health-related outcomes, age, and (childhood) parental death variables of the sample (n = 2640).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Age																			
2. Gender of participants	−0.08***																		
3. Years of education	−0.05**	0.02																	
4. First nationality Dutch[a]	0.01	−0.05*	−0.09***																
5. Total number of siblings	0.31***	−0.02	−0.13***	0.02															
6. CPD (group)	0.07***	−0.03	0.00	−0.04*	0.10***														
7. Gender of DP[b,d]	−0.09	0.05	0.03	0.07	−0.01	NA													
8. Same-sex gender of DP[c,d]	−0.03	−0.41***	0.03	0.08	0.02	NA	0.23**												
9. Age at time of CPD[d]	−0.07	0.03	−0.01	0.00	0.00	NA	−0.02	0.03											
10. Years since the loss[d]	0.93***	−0.12	−0.07	0.06	0.19*	NA	−0.07	−0.04	−0.44***										
11. PD during adulthood	0.69***	−0.07***	−0.10***	0.01	0.28***	0.02	0.04	−0.06	−0.10	0.55***									
12. Depressive symptoms	0.02	0.03	−0.23***	−0.04*	0.07***	0.01	−0.13	−0.11	−0.14	−0.05	0.04*								
13. Anxiety symptoms	0.00	0.06**	−0.23***	−0.03	0.07***	0.01	−0.08	−0.05	−0.09	0.03	0.03	0.77***							
14. Suicidal ideation (%/n yes)	−0.02	−0.03	−0.05*	−0.02	0.05*	−0.02	0.06	0.17*	−0.23**	−0.02	0.00	0.42***	0.29***						
15. Alcohol use	−0.03	−0.26***	0.08***	−0.01	−0.07***	0.01	−0.02	0.30***	0.07	0.03	−0.03	0.00	0.01	0.06**					
16. Smoking status (%/n current/former)	0.13***	−0.06**	−0.09***	0.01	0.04*	0.03	−0.08	0.05	−0.01	0.19*	0.09***	0.06**	0.08***	0.03	0.21***				

(Continues)

TABLE 2 (Continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
17. Physical activity	−0.01	−0.02	−0.09***	0.00	0.00	−0.01	0.04	−0.07	−0.12	0.13	−0.02	−0.07***	−0.05*	−0.07***	−0.01	0.03			
18. Metabolic syndrome	0.38***	−0.19***	−0.19***	0.04	0.14***	0.03	0.05	−0.06	−0.08	0.27***	0.32***	0.10***	0.11***	0.00	−0.03	0.08***	−0.06**		
19. Perceived physical health	0.09***	0.02	−0.17***	0.02	0.07***	0.03	0.00	0.02	−0.04	−0.03	0.10***	0.44***	0.39***	0.17***	−0.04*	0.03	−0.08***	0.19***	
20. Telomere length	−0.31***	0.08***	0.02	0.02	−0.08***	−0.01	0.09	−0.12	−0.02	−0.18*	−0.18***	−0.06**	−0.04*	−0.02	−0.05**	−0.09***	−0.02	−0.17***	−0.05*

Abbreviations: CPD (group), childhood parental death (0 = no CPD; 1 = CPD); DP, deceased parent; PD, parental death.

[a]0 = no, 1 = yes.

[b]0 = father, 1 = mother.

[c]0 = opposite-sex, 1 = same-sex parent deceased.

[d]Only applicable to individuals who experienced CPD (group 1; n = 177).

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

old). We found no associations between experiencing CPD and various long-term health outcomes, not for mental nor for physical health and health behaviour. Additionally, for individuals who experienced CPD, we investigated whether loss-related factors, namely participants' age at the time of CPD and gender of the deceased parent, were related to differences in health outcomes. The age at time of CPD was related to suicidal ideation and not to other long-term health outcomes, with CPD at a younger age being related to a higher likelihood of suicidal ideations. This finding should be interpreted with caution due to the very small sample of participants who experienced CPD and reported suicidal ideation (n = 16). Regarding gender of the deceased parent, we found that neither maternal or paternal death nor death of the same-sex or opposite-sex parent predicted long-term health outcomes.

The fact that we did not find any associations between CPD and severity of depressive or anxiety symptoms and suicidal ideation contrasts with previous meta-analyses and reviews, that showed a small association between CPD and mental health outcomes in adults (Lytje & Dyregrov, 2019; McKay et al., 2021; Simbi et al., 2020). Regarding physical health (i.e., perceived physical health, metabolic syndrome, and telomere length) and health behaviour (i.e., smoking status, alcohol use, and physical activity), we also found no differences between individuals who experienced CPD and those who did not, which was in line with some studies (e.g., Maier & Lachman, 2000; Osler et al., 2016; Schaakxs et al., 2016) and in contrast to others (e.g., Alciati et al., 2013; Parsons, 2011; Tebeka et al., 2016). As opposed to previous studies on the NESDA sample that investigated the association between adverse childhood experiences, such as childhood (emotional) abuse and neglect, and long-term (mental) health outcomes (e.g., Kuzminskaite et al., 2021; Spinhoven et al., 2010), we did not find such associations for experiencing CPD. This seems to illustrate a general positive adjustment with regard to health functioning of individuals who experienced an impactful loss of their parent during childhood. Although we have no information available on pre-loss functioning or health functioning throughout the years, our results suggest that individuals who experienced parental death during childhood were able to cope with their loss in a way which did not affect their health. This is in line with previous research and could be an indication of resilience (e.g., Bonanno, 2004; Lytje & Dyregrov, 2019).

The inconsistency in findings of the various studies begs for more research on which factors may contribute to more optimal outcomes after CPD. Therefore, we investigated whether a child's age at time of parental death and gender of the deceased parent could explain differences in health outcomes between individuals who experienced CPD. These factors were overall not associated with long-term health outcomes, except for the association between age at time of CPD and suicidal ideation. This suggests that other factors may explain differences in health outcomes among individuals who experienced CPD. It is important to notice that CPD is not an adverse experience that stands on its own, but is related to various transitions in the family and a broad diversity of experiences and circumstances, which may differ between individuals who

TABLE 3 Results of the nine separate regression analyses.

	β	p[a]	R^2	F(5, 2634)	p
Depressive symptoms			0.06	32.10	<0.001
CPD	0.04	0.621			
Age	0.00	0.961			
Gender	0.08	0.044			
Years of education	−0.23	<0.001			
Total number of siblings	0.04	0.046			
Anxiety symptoms			0.06	32.79	<0.001
CPD	0.03	0.734			
Age	−0.02	0.395			
Gender	0.13	0.002			
Years of education	−0.23	<0.001			
Total number of siblings	0.04	0.031			
Suicidality[b]			0.01		
CPD	−0.32	0.240			
Age	−0.14	0.035			
Gender	−0.23	0.068			
Years of education	−0.13	0.045			
Total number of siblings	0.17	0.004			
Smoking status[b]			0.02		
CPD	0.18	0.324			
Age	0.29	<0.001			
Gender	−0.22	0.020			
Years of education	−0.19	<0.001			
Total number of siblings	−0.03	0.584			
Alcohol use			0.08	44.45	<0.001
CPD	0.05	0.489			
Age	−0.03	0.090			
Gender	−0.55	<0.001			
Years of education	0.08	<0.001			
Total number of siblings	−0.06	0.004			
Physical activity			0.01	4.94	<0.001
CPD	−0.02	0.827			
Age	−0.01	0.475			
Gender	−0.03	0.426			
Years of education	−0.09	<0.001			
Total number of siblings	−0.01	0.690			
Metabolic syndrome			0.20	132.60	<0.001
CPD	0.01	0.939			
Age	0.36	<0.001			
Gender	−0.33	<0.001			
Years of education	−0.17	<0.001			
Total number of siblings	0.00	0.980			
Perceived physical health			0.04	21.31	<0.001
CPD	0.07	0.332			
Age	0.08	<0.001			
Gender	0.06	0.166			
Years of education	−0.17	<0.001			
Total number of siblings	0.02	0.307			
Telomere length			0.10	56.85	<0.001
CPD	0.05	0.532			
Age	−0.31	<0.001			
Gender	0.12	0.002			
Years of education	0.01	0.732			
Total number of siblings	0.01	0.516			

Abbreviation: CPD (group), childhood parental death.

[a]*p*-values prior to applying a Bonferroni correction for multiple testing (α divided by 9, i.e., $\alpha = .006$).

[b]Binary outcome variables, where the beta refers to log odds and R^2 to McFadden's R^2.

experienced CPD. The complex interplay between the child, its family, and their environment might be essential to consider (e.g., Lytje & Dyregrov, 2019; McKay et al., 2021). More specifically, various pre-loss factors (e.g., socioeconomic status; Lytje & Dyregrov, 2019; McKay et al., 2021), parent-child relationship (McKay et al., 2021), loss-related factors (e.g., sudden vs. expected or external/traumatic causes such as suicides or accidents; e.g., Li et al., 2014; Rostila & Saarela, 2011), and factors after the death of a parent such as accompanying changes of routines and secondary stressors (e.g., a potential move or a change of school due to a loss of income after parental death) within the child's family or environment may affect the child's ability to cope with the death of a parent and their social-emotional development (e.g., Dowdney, 2000; Worden, 2009), which could, in turn, affect health outcomes (e.g., Berg et al., 2016). Future studies should assess and take into account different loss-related factors and factors after the death of a parent, such as whether children attend the funeral (Dowdney, 2000), accompanying changes, support and parenting by the surviving parent (e.g., Luecken & Roubinov, 2012), socioeconomic resources and support as well as social and emotional support for the child and their family (Christ & Christ, 2006; Lytje & Dyregrov, 2019; McKay et al., 2021). More (longitudinal) studies with large samples are needed to draw conclusions regarding these loss-related factors. To conclude, it may not be experiencing CPD itself, but various (pre- and post-loss) factors may explain why some individuals experience relatively less optimal (health) outcomes compared to others on short as well as longer term.

The current study contributes to previous research with a comprehensive approach of investigating multiple aspects of health, namely mental health outcomes, physical health outcomes, and health behaviours. The assessment of the various health-related

TABLE 4 Results of the separate regression analyses for individuals who experienced childhood parental death (n = 177).

	β	p[a]	R^2	$F(6, 170)$	p
Depressive symptoms			0.08	2.17	0.039
Age at CPD	−0.16	0.034			
Gender DP (father vs. mother)	−0.33	0.056			
Gender DP (opposite-sex vs. same-sex parent)	−0.03	0.845			
Age	−0.13	0.089			
Gender	0.28	0.106			
Years of education	−0.07	0.333			
Total number of siblings	−0.01	0.934			
Anxiety symptoms			0.05	1.33	0.240
Age at time of CPD	−0.11	0.162			
Gender DP (father vs. mother)	−0.23	0.189			
Gender DP (opposite-sex vs. same-sex parent)	0.11	0.531			
Age	−0.02	0.790			
Gender	0.36	0.038			
Years of education	−0.11	0.162			
Total number of siblings	0.05	0.537			
Suicidality[b]			0.19		
Age at time of CPD	−0.83	0.002			
Gender DP (father vs. mother)	−7.80	0.991			
Gender DP (opposite-sex vs. same-sex parent)	9.04	0.990			
Age	−0.47	0.125			
Gender	8.02	0.991			
Years of education	0.20	0.512			
Total number of siblings	0.30	0.307			
Smoking status[b]			0.06		
Age at time of CPD	0.00	0.994			
Gender DP (father vs. mother)	−0.39	0.355			
Gender DP (opposite-sex vs. same-sex parent)	0.24	0.570			
Age	0.38	0.039			
Gender	−0.48	0.262			
Years of education	−0.19	0.306			
Total number of siblings	0.14	0.523			
Alcohol use			0.17	5.04	<0.001
Age at time of CPD	0.08	0.256			
Gender DP (father vs. mother)	−0.12	0.444			
Gender DP (opposite-sex vs. same-sex parent)	0.42	0.009			
Age	0.05	0.501			
Gender	−0.46	0.006			
Years of education	0.17	0.020			
Total number of siblings	0.06	0.382			
Physical activity			0.03	0.77	0.617
Age at time of CPD	−0.11	0.150			
Gender DP (father vs. mother)	0.12	0.474			
Gender DP (opposite-sex vs. same-sex parent)	−0.14	0.427			
Age	0.08	0.321			
Gender	0.05	0.778			
Years of education	−0.02	0.790			
Total number of siblings	0.04	0.601			
Metabolic syndrome			0.13	3.65	0.001
Age at time of CPD	−0.05	0.501			
Gender DP (father vs. mother)	0.26	0.112			
Gender DP (opposite-sex vs. same-sex parent)	−0.29	0.083			
Age	0.24	0.001			
Gender	−0.33	0.050			
Years of education	−0.15	0.038			
Total number of siblings	−0.02	0.780			
Perceived physical health			0.04	0.91	0.499
Age at time of CPD	−0.05	0.477			
Gender DP (father vs. mother)	−0.04	0.832			
Gender DP (opposite-sex vs. same-sex parent)	0.09	0.601			
Age	−0.09	0.271			
Gender	0.09	0.627			
Years of education	−0.15	0.051			
Total number of siblings	0.08	0.290			
Telomere length			0.11	2.90	0.007
Age at time of CPD	−0.04	0.589			
Gender DP (father vs. mother)	0.17	0.305			
Gender DP (opposite-sex vs. same-sex parent)	−0.13	0.442			
Age	−0.20	0.008			
Gender	0.39	0.021			
Years of education	−0.08	0.256			
Total number of siblings	0.08	0.311			

Abbreviations: CPD, childhood parental death; DP, deceased parent.

[a]p-values prior to applying a Bonferroni correction for multiple testing (α divided by 9, i.e., α = .006).

[b]Binary outcome variables, where the beta refers to log odds and R^2 to McFadden's R^2.

outcomes was diverse and based on biological methods (i.e., blood and saliva samples) as well as self-report (i.e., interview and questionnaires), which is a strength of the current study. The study was conducted in a large sample, with high prevalence of individuals with (lifetime) depressive and/or anxiety disorders. Due to a higher base rate of (mental) health problems compared to the general population, the findings might be less generalizable to the general population. It did, however, enable us to investigate the long-term health outcomes of CPD and the possible role of loss-related factors without sampling or self-selection bias with regard to investigating long-term outcomes related to grief. Another limitation is the use of a previous version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the cross-sectional nature of the current study. No causal inferences can be made, since functioning and (the presence or absence of) health problems prior to CPD or during childhood after experiencing CPD are unknown.

To conclude, overall, we did not find an association between experiencing CPD and long-term health outcomes regarding mental health, physical health, and health behaviour. Although such findings are often considered as an indication of resilient functioning, the results should be interpreted with caution given the cross-sectional nature of the study and limited generalizability to the general population. In addition, given the dynamic, multidimensional nature of resilience (e.g., Bonanno, 2004; Luthar et al., 2000; Rutter, 2012), future research should adopt a lifespan approach and consider other loss-related factors and also other areas of functioning next to health outcomes to draw conclusions regarding resilient functioning. Furthermore, future research should also aim to investigate long-term outcomes after experiencing parental death in a culturally diverse sample to be able to examine potential differences in outcomes across cultures. Our finding concerning age of the child at time of CPD underlines the importance to study the role of loss-related factors to gain more insight into protective and risk factors, which may better reflect the diversity or variety of experiences and circumstances after CPD. More knowledge regarding such factors is important from a prevention as well as intervention perspective. This knowledge is important for professionals but especially also for other people who play an important role in the child's life.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

According to European law (GDPR) data containing potentially identifying or sensitive patient information are restricted, our data involving clinical participants are not freely available in a public repository. However, data are—under some specifications—available upon request via the NESDA Data Access Committee (nesda@amsterdamumc.nl). See also our website: www.nesda.nl.

ETHICS STATEMENT

Information anonymised for double-blind peer review: The study was approved by the Medical Ethical Committee of the VUmc (reference number 2003/183).

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