Early Parental Death and Its Unequal Impact on Children's Educational Success: Evidence from a Stratified Educational System

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The early death of a parent is a traumatic life course event for children. Research on contemporary populations in developed countries has shown that early parental death has negative effects on children's educational outcomes, such as the drop-out rate from secondary education (Prix & Erola, 2017) and the transition to tertiary education (Barclay & Hällsten, 2022). However, less is known about heterogeneity in the effect of early parental death on children's education. Moreover, most studies are situated in Nordic countries, including Sweden (Adda et al., 2011; Barclay & Hällsten, 2022; Berg et al., 2014), Finland (Kailaheimo-Lönnqvist & Erola, 2020; Kailaheimo-Lönnqvist & Kotimäki, 2020; Prix & Erola, 2017), and Norway (Burrell et al., 2020; Steele et al., 2009). Less is known about the early parental death penalty in other developed countries.

In this paper, we contribute to prior research by examining whether parental socio-economic status and migration background are associated with early parental death and whether the early parental death penalty on children's educational success varies by parental socio-economic status and migration background. From the theoretical perspective of cumulative inequality (Ferraro & Shippee, 2009), bereaved children with lower parental socio-economic status and migrant background may experience double disadvantages over the life course. Children with lower parental socio-economic status and migration background may have higher risks of early parental death. Moreover, the negative consequences of early parental death may be larger for children with lower parental socio-economic status and migration background as they may be more vulnerable and have fewer resources to compensate for such adverse life events. Prior research mostly examined whether parental socio-economic status compensates for the negative impact of parental death on children and revealed mixed findings (e.g., Barclay & Hällsten, 2022). However, little research investigates the socio-economic determinants of early parental death and the role of migration background.

Our study takes a further step to examine the impact of early parental death on children's educational success in a strongly stratified educational system (the Netherlands). As shown above, most previous studies focus on the contexts of Nordic countries. The educational systems in these Nordic countries are not highly differentiated and they select children into different tracks at a relatively high age (Van De Werfhorst & Mijs, 2010). However, it is still not clear the impact of early parental death in an early-tracked educational system although previous research has shown that the impact of divorce on children's education could be more harmful if countries have an earlier selection into educational tracks (Bernardi & Radl, 2014). The Netherlands is unique in that it has a stratified educational system with early tracking at age 12. This allows us to study the timing of parental death in relation to specific educational transitions, thereby obtaining more direct evidence on the way parental death affects children's success in school. Particularly, our study is the first to examine the impact of parental death on the choice of multiple and parallel educational tracks for children.

Data and Variables

Data We use administrative data from the system of social statistical datasets (SSD) of Statistics Netherlands, a longitudinal system that combines registers and surveys from 1994 to 2022 (Bakker et al., 2014). The SSD contains information on the full population in the Netherlands, including important demographic and socioeconomic variables. We select

Table 1. Sample selection

No. sample after selection on	No. individuals
Children born between 1994 and 2010	3,466,174
Match to both parents	3,272,090
Valid information on parental age	3,269,698
Parents die after 2022	3,267,931
Child's birth is earlier than the death of parents	3,267,515
Both parents die	3,264,462
Children die	3,242,169
Immigrants: 1) came to the Netherlands after age 6 2) EU migrants	2,983,673

children born between October 1994 and December 2010. The year 1994 is the earliest point to identify whether parents died or not in the data. Until the year 2022, the oldest children's age is 28 and the youngest children's age is 12. So the data allow us to examine all children's educational transitions from transition to secondary education at age 12 to the completion of tertiary education for children aged over 24. After sample selection as shown in Table 1, the data include 2,983,673 individuals in total.

Dependent Variables The dependent variables in our study include all outcomes related to educational transitions. We focus on three important educational transitional points: (1) the transition from primary to secondary education, (2) the transition from secondary to tertiary education, and (3) the completion of tertiary education.

For the transition from primary to secondary education, we focus on two indicators: (1) the standardized test in the final year of primary education (age 12); (2) the track enrolment in secondary education at the end of the transition period (age 14). First, students are supposed to take the standardized test in the final year of primary education at age 12. Most schools use the Central Institute of Test Development (CITO-test). We use this score of standardized test as our first dependent variable because it is objective, at a certain time point, and an important indicator for the later track enrolment. Second, based on the standardized test score and teacher's recommendation, students will be enrolled in three tracks in secondary education: (1) the lower-vocational (VMBO), (2) the general (HAVO), and (3) the pre-university (WO). We measure the track enrolment in the secondary education as a three-categorical variable.

The transition from secondary to tertiary education also has three tracks: (1) the vocational (MBO), (2) the university of applied sciences (HBO), and (3) the university (WO). Students in VMBO around age 16 could continue with the vocational track or leave the educational system. Students in HAVO around age 17 can choose to continue with HBO, MBO, or leave the educational system. Students in VWO around age 18 have four options, including WO, HBO, MBO, and leaving. As the transition to tertiary education largely depends on the track in secondary education, we create three binary variables for students in each track to measure whether they continue tertiary education or leave the educational system. To note, if students do not graduate from secondary education, they are coded as leaving the educational system. For those students who enter tertiary education, we focus on whether they complete the tertiary education successfully or not in each track: (1) the completion of MBO; (2) the completion of HBO; (3) the completion of WO.

Independent Variables The independent variables are exposure to parental death at varying ages (see below). As the timing of educational transitions differs by children's age, we define eight different independent variables. We summarize all independent variables, dependent variables, and regression models in Table 2.

TABLE 2. SUMMARY OF DEPENDENT VARIABLES, INDEPENDENT VARIABLES, AND METHODS

	Early parental death	Educational transition indicators	Regression Model
Transition from primary to secondary education	Experience parental death before age 12	The standardized test score in the final year of primary education	Linear regression model
	Experience parental death before age 14	Three tracks: (1) the lower-vocational (VMBO), (2) the general (HAVO), and (3) the pre-university (WO)	Multinominal logit model
Transition from secondary to tertiary education	Experience parental death before age 16	VMBO → MBO: continue or leave	Binary logit model
	Experience parental death before age 17	HAVO→ HBO/MBO: continue or leave	Binary logit model
	Experience parental death before age 18	VWO→WO/HBO/MBO: continue or leave	Binary logit model
The completion of tertiary education	Experience parental death before age 20	The completion of MBO	Binary logit model
	Experience parental death before age 22	The completion of HBO	Binary logit model
	Experience parental death before age 24	The completion of WO	Binary logit model

Migration background Migration background is measured by the country of birth of parents. If both parents are born in the Netherlands, they are coded as Dutch background. If one of their parents were born in a country outside of the European Union, they are coded as non-EU migration background. We exclude EU immigrant children as only a small percentage of EU immigrant children experience parental death (<5%) and it is hard to analyze separately. As we consider children who are enrolled in the educational systems in the Netherlands from the beginning, we also exclude foreign-born children immigrants who arrived in the Netherlands after age 6.

Parental education Parental education is coded as a three-category variable. If at least one of the parents has a diploma from a higher vocational or university, they are coded as tertiary-educated. If no parents have a diploma from a higher vocational or university, they are coded as no tertiary-educated. If both parents do not have information on their educational level, they are coded as missing on tertiary education. To note, parental education is only one of the indicators of parental socio-economic status. We will add parental income in the future analysis.

Preliminary Findings Table 3 presents the number of children born between 1994 and 2010 who experienced parental death in our data. We find that 4.1% of children experienced parental death before age 28 (N = 122,142). Furthermore, the results show that children experienced the father's death (N = 42,164) are almost twice times more than those who experienced the mother's death (N = 79,978). As some children may not be old enough to experience educational transitions, we further examine the number of parental deaths by current age in 2022 and age at parental death. Table 4 shows that we have enough sample size to examine children at different educational points. The minimum group is children who experienced parental death before age 12 (N = 43,221).

Table 3. The number of children who experienced parental death

	No.	Percent
Parental death		
No	2861531	95.9
Yes	122142	4.1
Mother's death		
No	2941509	98.6
Yes	42164	1.4
Father's death		
No	2903695	97.3
Yes	79978	2.7
Total	3,242,169	

Table 4. The number of parental death by current age in 2022 and age at parental death

Current age in 2022	Age at parental death	No. parental death	No. individuals
>=12	0-11	43,221	2,983,673
>=14	0-13	50,335	2,637,174
>=16	0-15	56,233	2,292,279
>=17	0-16	58,784	2,117,526
>=18	0-17	60,812	1,940,320
>=20	0-19	61,458	1,566,149
>=22	0-21	57,308	1,180,381
>=24	0-23	47,020	790,155

Figure 1. Risk of parental death by child's age and parental education

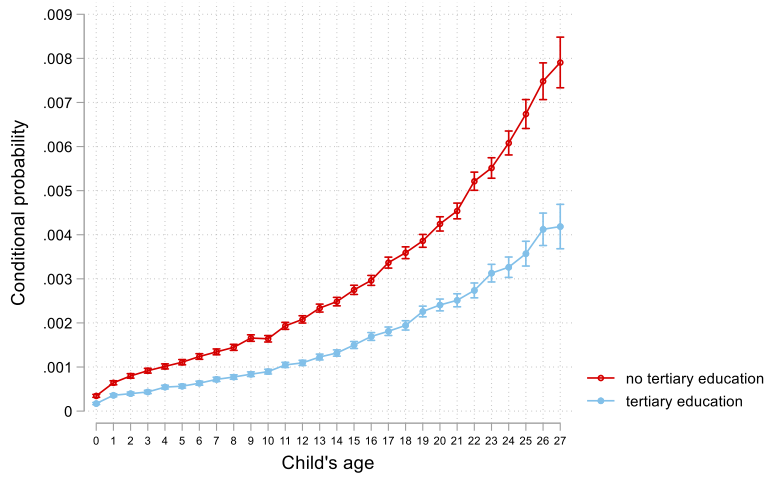

Figure 1 presents the risk of parental death by child's age and parental education. This is a descriptive figure without adding other covariates. We find that children are more likely to experience parental death as they grow up. Moreover, children of tertiary-educated parents have a lower risk of parental death than those children of no tertiary-educated parents. For instance, when children age 27, the risk of parental death for children of no

tertiary educated parents is almost twice as high as those children of tertiary parents.

Table 5. Event-history model of parental death in the Netherlands

	Coefficients
Children's gender (1 = Female)	.006
	(.006)
Migrant (1 = Non-EU countries)	-.041***
	(.007)
Parental education (ref. = no tertiary-educated)	
Tertiary-educated	-.710***
	(.008)
Missing on tertiary education	.287***
	(.007)
Age of the oldest parent	.090***
	(.000)
Time (Child's age)	.007***
	(.001)
Constant	-10.483***
	(.019)
Chi2	106623.41
N	61,102,592

Table 6. Linear probability model on whether children over age 23 attained tertiary education or not

	Coefficients
Parental death before age 24	-.053***
	(.002)
Children's gender (1 = Female)	.127***
	(.001)
Migrant (1 = Non-EU countries)	-.074***
	(.001)
Child's age	.031***
	(.000)
Parental education (ref. = no tertiary-educated)	
Tertiary-educated	.284***
	(.001)
Missing on tertiary education	.104***
	(.001)
Constant	-.556***
	(.011)
R2	.1
N	753,087

Table 5 presents the results of the discrete-time event-history model of parental death. We find that migrant background and parental education are both significantly associated with the risk of parental death. Immigrant children from non-EU countries are less likely to experience parental death than natives with a Dutch background with a 4 per cent lower odds. Similar to Figure 1, we find that children of tertiary-educated parents have a 51 per cent times lower odds of parental death than children of no tertiary-educated parents.

Table 6 shows the results of the linear probability model on whether children over age 23 attained tertiary education or not. On average, children who experienced parental death before age 24 are less likely to attain tertiary education than those children who did not experience parental death with a 5.3 per cent point decrease in probability.

Discussion and next steps

These preliminary findings show that 4.1% of children experience parental death in our data and sample sizes are large enough for us to examine each educational transition in our future analysis. One of the new findings is that children with tertiary-educated parents and non-EU migration backgrounds are less likely to experience parental death. Children over age 23 who experienced parental death before had a lower probability of attaining tertiary education in the Netherlands, which is consistent with previous studies (Barclay & Hällsten, 2022).

For the next steps, we will enrich the analysis with data on children's academic test scores and educational transitions by tracks. Detailed analyses of heterogeneity in the effect of early parental death on children's educational success will be presented in the full paper. Particularly, we will study whether children who experience parental death decide their initial educational track differently for the first time. Moreover, we will add parental income as another measurement of parental socio-economic status. Parental income is a more accurate indicator than parental education in register data. In terms of methods, we will also run the sibling fixed effects models, separate the mother's and father's deaths, and add more control variables in each model (e.g., birth order). We will also examine the timing of parental death in relation to specific educational transitions. For instance, it is important to examine when the impact of parental death is more harmful, childhood, adolescence, or the ages around educational transitions.

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