Parental criminality and children's educational attainment : A population-based extended family study

Kailaheimo-Lonnqvist, Sanna

2022-07

Kailaheimo-Lonnqvist , S , Kuja-Halkola , R , Larsson , H , Lichtenstein , P & Latvala , A 2022 , ' Parental criminality and children's educational attainment : A population-based extended family study ' , Journal of Criminal Justice , vol. 81 . https://doi.org/10.1016/j.jcrimjus.2022.101920

http://hdl.handle.net/10138/354165
https://doi.org/10.1016/j.jcrimjus.2022.101920

Journal of Criminal Justice 81 (2022) 101920

Contents lists available at ScienceDirect

Journal of Criminal Justice

journal homepage: www.elsevier.com/locate/jcrimjus

Parental criminality and children's educational attainment: A population-based extended family study

Sanna Kailaheimo-Lönnqvist [a,b,c,d,*], Ralf Kuja-Halkola [b], Henrik Larsson [b,e], Paul Lichtenstein [b], Antti Latvala [a,b]

[a] University of Helsinki, Institute of Criminology and Legal Policy, Snellmaninkatu 10, FI-00014 Helsinki, Finland
[b] Karolinska Institutet, Department of Medical Epidemiology and Biostatistics, 171 77 Stockholm, Sweden
[c] University of Turku, INVEST-flagship, Assistentinkatu 7, 20014 Turku, Finland
[d] University of Helsinki, Centre for Social Data Science, Unioninkatu 35, FI-00014 Helsinki, Finland
[e] Örebro University, 701 82 Örebro, Sweden

ARTICLE INFO

Keywords:
Parental criminality
Family models
Education
Children

ABSTRACT

Objectives: We examine how parental criminality is associated with offspring education at different educational stages from primary to tertiary education and conduct separate analyses for non-violent and violent crimes and incarceration, and for paternal and maternal criminality.
Methods: We use Swedish total population register data of 513,886 children and their parents and estimate both population-level linear probability models and cousin fixed-effects models.
Results: Parental criminality was negatively associated with all stages of offspring education. In population-level models accounting for parental education, the strongest associations were observed for parental violent crimes and incarceration with offspring secondary education completion (beta: −0.16 to −0.18). Cousin fixed-effects models suggested that family-level unobserved heterogeneity played a role in the associations as they were reduced when analyzing cousins differently exposed to parental criminality.
Conclusions: Parental criminality is negatively associated with offspring educational attainment, and the associations are in part due to shared familial factors. The association is different at different educational stages and for parental violent vs. non-violent crime.

1. Introduction

The experience of parental criminality is relatively common during childhood. For example, about 5.5% of fathers and 0.5% of mothers in Sweden are convicted for a serious crime before the child is 18 (Rostila, Berg, Arat, et al., 2016), and the proportion is significantly larger when including non-violent crimes. Despite the relatively high percentages, evidence on how parental criminality is associated with children's educational achievement is limited.

We contribute to the literature, first, by examining how parental criminality is associated with children's education at different educational endpoints. Previous literature suggests that parental criminality may have a strong negative association with outcomes during the early steps of the educational path. For example, Rud, Van Klaveren, Groot, and van den Brink (2014) found that parental criminality was associated with an increased probability of primary education being the highest educational level attained (7–9 percentage points), and a decreased probability of attaining higher education (2–6 percentage points), but the evidence is not clear. Second, we examine associations with different types of crime that parents committed. Some evidence shows that parental incarceration may, in fact, have a positive association with children's education, possibly due to the removal of a negative role model (Billings, 2017; Arteaga, 2021). However, also here the evidence is inconclusive. Third, we examine associations separately for both paternal and maternal crimes. Some previous research suggests that maternal criminality may be more harmful than paternal criminality (Dobbie, Gronqvist, Niknami, Palme, & Priks, 2019). Lastly, by using genetically informed family-based models, we examine whether partly accounting for genetic effects giving rise to the intergenerational links attenuates the associations. This is important since previous studies have

* Corresponding author at: University of Helsinki, Institute of Criminology and Legal Policy, Snellmaninkatu 10, FI-00014 Helsinki, Finland.
E-mail addresses: sanna.kailaheimo-lonnqvist@helsinki.fi (S. Kailaheimo-Lönnqvist), ralf.kuja-halkola@ki.se (R. Kuja-Halkola), henrik.larsson@ki.se (H. Larsson), paul.lichtenstein@ki.se (P. Lichtenstein), antti.latvala@helsinki.fi (A. Latvala).

https://doi.org/10.1016/j.jcrimjus.2022.101920
Received 18 January 2022; Received in revised form 30 March 2022; Accepted 31 March 2022
Available online 9 April 2022

emphasized that one reason for the mixed findings on the role of parental criminality for children's outcomes is selection effects and unobserved heterogeneity, which may be in part driven by genetic differences (Brown, 2017; McCauley, 2020).

2. Background

It is well known that adverse experiences during childhood are negatively related to offspring's education and well-being. However, it has remained uncertain how parental criminality, specifically, is related to offspring education. More research is needed especially about associations with different educational stages, with regard to different types of parental criminality and paternal vs. maternal criminality. Further, it is unclear to what degree these associations are explained by shared familial factors rather than direct effects of parental criminality.

Various criminological theories, such as strain theory, the general theory of crime, and social learning theory can be used for deriving possible mechanisms for the intergenerational effects of parental criminality. Agnew (1992) concept of general strain, which refers to negative events and relationships, states that strains and their accumulation are linked with criminal behavior. Strain theory (e.g., Merton, 1938) states that structural inequality causes criminality because there are certain stressors or/and strains that increase an individual's likelihood for committing a crime. Thus, the main cause for criminal behavior and its intergenerational effects, such as children's educational attainment, lies in structural inequality. The general theory of crime claims that crimes are caused by low self-control (Gottfredson & Hirschi, 1990)in contrast, proposes a very different mechanism: low self-control increases the likelihood of committing crime, and low self-control also causes low education which is linked with criminality. According to theory, low self-control is caused by ineffective parenting. Thus, it is low self-control, not disadvantaged positions in the society that causes criminality. Moreover, low self-control may cause inadequacy in parenting, which is further theorized to affect self-control in offspring, which may explain the accumulation of criminality in families. Later on, behavior genetic research has found self-control to be substantially heritable (Willems, Boesen, Li, Finkenauer, & Bartels, 2019), and that there is also assortative mating by self-control which may further reinforce the accumulation (Boutwell & Beaver, 2010). On the other hand, social learning theory (e.g., Akers, Krohn, Lanza-Kaduce, & Radosevich, 1995; Sutherland, 1947) proposes that criminal behavior is learnt in the social environment, and if criminality is seen in parents, children may perceive it less negatively and thus have a lower threshold to commit a crime. Even though all these theories have different standings, they all agree that the social environment and parents have an important role for an individual's future achievements and attainments.

Previous studies (see overview in Table A23, Appendix) have mainly focused on parental incarceration and children's primary education and high school performance or graduation (Cho, 2010; Dobbie et al., 2019; McCauley, 2020), and there are only a few studies that investigate different educational stages (Brown, 2017; Rud et al., 2014) or different measures of parental criminality such as convictions vs. incarceration (an exception being Billings, 2017). Some of the studies find a negative association between parental criminality and children's education (e.g., Cho, 2010, maternal incarceration; Billings, 2017, parental arrest & parental incarceration; Rud et al., 2014, parental criminality), while some do not (e.g., Bhuller, Dahl, Loken, & Mogstad, 2018, paternal incarceration; McCauley, 2020, parental incarceration). A meta-analysis (Murray, Farrington, & Sekol, 2012) also found parental incarceration not to be negatively linked with children's educational performance. However, educational performance included school grades, cognitive tests as well as school performance scores. Thus, it is still unknown how parental incarceration and other criminality-related measures are associated with children's educational attainment at different educational endpoints.

Some previous studies suggest that parental criminality is especially strongly negatively associated with children's education at early educational stages such as completing primary education (Rud et al., 2014), or with grade point average (GPA) (Brown, 2017). However, some studies also find that parental criminality is not negatively related to children's school grades or GPA (e.g., Bhuller et al., 2018). Previous intergenerational research suggests that family resources in early childhood are more decisive than resources in late childhood in terms of socioeconomic outcomes and health (Duncan & Brooks-Gunn, 2000; Heckman, 2006; McEwen & McEwen, 2017). Older children may be better equipped to cope with adverse family situations, such as those related to parental criminality, because they are more independent from their parents (Kailaheimo-Lönnqvist & Erola, 2020; Mare, 1980; Müller & Karle, 1993; Pfeffer, 2008). On the other hand, the older the individuals are, the more likely the educational decisions have already been made, which is likely manifested as a weaker connection between parental criminality and the child's education. For example, in the U.S. maternal incarceration was found to be more negatively associated with children's drop-out risk when it occurred in early adolescence compared to childhood or late adolescence (Cho, 2010).

Different types of crimes committed by parents, along with the family circumstances and other factors associated with them, may also impact children differently. For example, when a parent is in prison due to committing a serious crime, such as violent crime, the child does not live with both parents and cannot benefit from the possible resources provided by her/his parent, whereas less severe crimes do not lead to imprisonment. In the previous literature studying parental presence, the years lived with the father and mother have particularly positive associations with various outcomes, such as children's cognitive skills, education, income, and wealth (Lang & Zagorsky, 2001). Moreover, a study by Billings (2017) showed that even though parental criminality was generally negatively associated with children's outcomes, parental incarceration may have benefited the child: the study found that parental arrest was negatively related to children's outcomes such as antisocial behavioral outcomes and days suspended from school, but the association with parental incarceration was positive (Billings, 2017). Similar results were found in a recent study using data from Columbia (Arteaga, 2021). The author speculatively explained the finding by the removal of a negative role model (Billings, 2017), but the positive association may be also due to improved family circumstances since the criminal parent is not at home. Parental incarceration may stabilize the family life of the child. However, the same study also found parental incarceration to be negatively associated with children's grade point average (GPA) in some specific cases, such as when mothers had committed violent crimes or fathers alcohol/drug offenses. Further, another study found that parental incarceration is not related to children's GPA or other school grades (Bhuller et al., 2018). Thus, the evidence is not clear.

Associations may also be different for paternal vs. maternal criminality. Previous research suggests that maternal criminality may be more strongly associated with offspring education than paternal criminality (Dobbie et al., 2019). On the other hand, some research shows differences also by educational stages of the child: paternal criminality was more strongly linked to children's secondary education, and maternal criminality to higher education (Rud et al., 2014). However, studies that have compared the association between maternal and paternal criminality are rare, possibly due to the low prevalence of maternal criminality.

It has been emphasized that one reason for the mixed findings on the role of parental criminality for children's outcomes are selection effects due to unobserved heterogeneity between families with and without parental criminality (Brown, 2017; McCauley, 2020). First, parental criminality is much more common among socioeconomically less advantaged families than among advantaged families. Second, it is likely that families in which a parent commits crimes and is potentially incarcerated have unobserved pre-existing risk factors that may contribute to both parental incarceration and poor education-related

outcomes, potentially creating a spurious non-causal association between the two (Brown, 2017; McCauley, 2020). Specifically, both criminal behavior and educational attainment are well known to be partly heritable (Kendler et al., 2014; Silventoinen et al., 2020; Tropf et al., 2017), and thus their intergenerational association may in part reflect genetic influences transmitted across generations. For example, Kendler et al. (2014) found in their study using Swedish register data with 21,603 twin pairs that for all criminal convictions, heritability was estimated at around 45% in both sexes. Whereas for educational inheritance, Silventoinen et al. (2020) found using a classical twin design with pooled data from 28 cohorts representing 16 countries and 193,518 twins that genetic factors explained a major part of individual differences in educational attainment (about 43%), but also environmental variation shared by co-twins was substantial (about 31%). Thus, in order to estimate the potential effect of parental criminality on offspring education, it is crucial to employ methods that can account for such unobserved heterogeneity and selection effects. One solution for this is to employ family-based models.

Our study aims to make several contributions towards clarifying the associations between parental criminality and offspring education. First, we examine the association between parental criminality and offspring education at different educational stages from primary through tertiary education. Second, we investigate the associations for different measures of crime, including incarceration, of the parents. Third, we analyze maternal and paternal criminality separately. Lastly, by using data from extended families we partly account for family-based unobserved heterogeneity in the intergenerational associations. According to our knowledge, no study has examined how parental criminality is related to children's education at different educational stages and by different types of parental criminality.

3. Methods

3.1. Data

We used high-quality Swedish full population register data for children born in Sweden between 1982 and 1988 and their parents. The advantage of this type of register-based data is that, in contrast to survey data, it does not suffer from non-response or response bias. Register data for this study was available until the end of 2013. The study cohorts were chosen so that all individuals had an opportunity to gain tertiary education by age 25. The Multi-Generation Register (MGR) (Ekbom, 2011) is part of the Total Population Register (Ludvigsson et al., 2016) and it identifies both biological and adoptive parents of each individual. MGR was used for identifying parents and children in the data and for creating extended family pedigrees. Parental criminality information was obtained as criminal convictions from the National Crime Register and as parental prison sentences from the register of the Swedish Prison and Probation Service. Parents' and children's birth year and country of birth were obtained from the Total Population Register. Data on children's and parental education were available from National Censuses undertaken in 1970, 1975, 1980, and 1985, and from the Longitudinal integration database for health insurance and labor market studies (LISA) from 1990 onwards (Ludvigsson et al., 2016). Children whose parents were not born in Sweden were excluded from this study due to missingness of educational data in the registers. The final study sample comprised 513,886 children, including 79,575 maternal full cousin-pairs and 80,598 paternal full cousin-pairs.

3.2. Variables

The outcome variable i.e., child's education, was assessed by three different educational outcome variables. *Primary education* was a binary variable that was measured using a variable that indicates eligibility to secondary education due to completed primary education, typically before age 16. Completing *secondary education* (binary) was measured by age 19 and completing *tertiary education* (binary) by age 25. Tertiary education includes all higher education, such as bachelor's and master's degrees. Thus, the educational variables cover all important educational transitions (See the illustration of the educational system in Sweden Fig. A7).

We studied three broad categories of parental criminality-related variables (binary): non-violent crimes, violent crimes, and prison sentences. Violent crimes included convictions of murder, manslaughter, assault, kidnapping, illegal restraint, illegal coercion or threats, robbery, threats or violence against an officer, arson, gross violation of a person's integrity, and harassment. Non-violent crimes included all other criminal convictions, and prison sentences were defined as having been sentenced to prison as a sanction for a crime. Parents were included in all groups in which they had convictions, and we measured the first conviction for each type of criminality during a child's childhood. 63% of fathers and 40% of mothers that had a criminal record had multiple types of criminality i.e., for example both violent and non-violent crimes. These different crime-related variables were defined in relation to the child's age. Thus, in analyses of primary education, parental criminality was measured between child's ages 0 and 16, in analyses of secondary education between child's ages 0–19, and for tertiary education between child's ages 0–25. We did not include criminal convictions or incarceration that occurred before children were born in the main analysis as it is unclear how they would affect family life. However, we accounted for this in a sensitivity analysis where we examined lifetime parental criminality (see below).

As control variables, we included child's sex (binary), child's year of birth (continuous), mother's year of birth (continuous), and the highest parental education (categorical, measured at child's age 0–18). Parental education was categorized as follows: 0 = primary education, 1 = secondary education and 2 = tertiary education.

3.3. Analysis

We first examined population-level associations between parental criminality and children's educational attainment using linear regression with robust standard errors (clustered on the mothers) to account for deviations from modeling assumptions (normally distributed residuals and homoscedasticity) and non-independence of siblings in the offspring generation. Second, we used linear fixed effects regression models (Allison, 2009; Berg, Kuja-Halkola, D'Onofrio, Lichtenstein, & Latvala, 2020; Khemiri et al., 2020) to account for unobserved heterogeneity shared by cousins. All analyses were adjusted for child's sex, child's year of birth, highest parental education, mother's year of birth and co-parent's criminality. Linear regression models for binary outcomes (i.e., linear probability models) were used because their estimates are directly interpretable as probabilities, and the estimation of models with fixed effects is unbiased and a growing body of literature has established that the use of linear models in estimating binary outcomes is safer especially when using fixed effects models or they are interaction terms (Gomila, 2020). In practice, the cousin fixed effects models compare cousins that have vs. have not been exposed to parental criminality, and any estimated effects are based on the characteristics that *distinguish* cousins (D'Onofrio, Sjölander, Lahey, Lichtenstein, & Sara Öberg, 2020). Analyses among cousins are especially informative in situations where siblings cannot be thought to differ meaningfully in the exposure variable. For example, full siblings raised together are likely to be similarly exposed to parental criminality and related factors, and sibling fixed effects models would thus be less interpretable for this research question.

The advantage of family-based models is that they take into account family-level unobserved heterogeneity (i.e., unmeasured genetic and environmental influences shared within extended families) which is important when studying criminal behavior (Brown, 2017; McCauley, 2020). For example, full cousins share 12.5% of genetic effects and 100% of the extended family environmental factors that are constant. By

design, fixed effects models in full cousins rule out these unobserved factors shared between cousins. However, in the context of parental criminality and offspring outcomes, it is illustrative to highlight the proportion of genetic effects shared between a child and a parent—which potentially contribute to the intergenerational association—that are ruled out by this design. For example, fixed effects models in paternal full cousins rule out 50% of the genetic influences shared between the father and the child, because the child shares, on average, 25% of his/her genes with the uncle, which is half of the genetic resemblance between the child and the father (50%). To examine possible differences in associations with maternal and paternal criminality, we fitted separate models within cousins whose mothers were full sisters and cousins whose fathers were full brothers. Therefore, opposite-sex parental sibling pairs were not included in these models. Family based models such as cousin analyses exploit the fact that relatives are similar in many aspects such as genetics, socioeconomic standing and e.g., the neighborhoods they live in. Moreover, when main differences between cousins are controlled in the model, for example parental education, it also takes partly into account possible differences in factors such as neighborhoods since neighborhood characteristics and socioeconomic status are closely related.

We also conducted several sensitivity analyses. First, previous studies propose that educational underperformance, developmental delays and regression are more common among children of incarcerated parents (Miller & Barnes, 2015). This may partially explain the negative association between parental criminality and children's educational attainment. In order to study whether the negative association between parental criminality and children's education is permanent in the sense that children with parental criminality do not catch up the educational level of other children at a later age, or rather reflected postponement of the educational milestones, we examined children's educational level at the age of 30 and used Kaplan-Meier figures to illustrate the possible difference. We included offspring born 1982–1984 so that all individuals had follow-up until age 30, and we examined the completion of secondary and tertiary education as the educational endpoints.

In the second sensitivity analysis, we examined whether the results differed when we defined parental criminality as criminal convictions during their lifetime, before child's age 25 where the follow-up period ends. Lifetime parental criminality includes both criminality before child's birth and after the measured educational variable. We restricted the parental cohort to be born between 1958 and 1973 so that they would have full criminal records history in the data from age 15 (the minimum age of criminal responsibility in Sweden) onwards. The children's cohorts were the same as in the main analysis, i.e., 1982–1988.

In the third sensitivity analysis, we examined how parental criminality before a child's birth is related to a child's educational attainment. In addition, we examined how parental criminality after measured educational endpoint is related to a child's educational attainment. We also performed stratified models by child's sex in order to examine whether the effects of parental criminality differed by child's sex. In addition, we studied how parental criminality is related to children's academic success by using grade point average (GPA) from the end of primary school as an outcome variable. Lastly, we studied whether parental death by child's age 18 changes the association between parental criminality and children's educational outcomes by adding maternal and paternal death dummies to the models. Analyses were conducted using Stata 16.1 software.

4. Results

Of the children, 93% had completed primary education (compulsory), i.e., were eligible to apply to secondary education, 80% had a secondary education by the age of 19, and 42% had a tertiary education by the age of 25 (Table 1). Only about 5% of the children had parents with primary education, 49% with secondary education, and 46% with tertiary education as the highest attained education. As expected, the proportion of parents that had committed a crime increased by child's age, being the highest for paternal non-violent crimes by offspring age 25 (11.4%) (Table 2).

Table 1
Descriptive statistics ($N = 513,886$).

Variable	%	*N*
Primary education	93	477,920
Secondary education	80	411,443
Tertiary education	42	216,233
Woman	49	252,034
Highest parental education		
Primary	5	24,203
Secondary	49	251,620
Tertiary	46	238,021

	Mean	*Median*	*SD*
Mother's year of birth	1957	1962	5.7

In population-level analyses, all measures of parental criminality were negatively associated with children's educational attainment from primary through tertiary education (Tables 3–5). The highest estimates were observed for the associations of parental violent crimes and incarceration with offspring secondary education: the probability to complete secondary education was reduced by 15.5–17.5 percentage points as compared to offspring without parental criminality (Tables 4 and 5). The associations were weakest for parental non-violent crimes and offspring primary education, with maternal and paternal non-violent criminality associated with 5.5% and 1.5% lower probabilities to complete primary education, respectively, as compared to children whose parents did not have non-violent criminal convictions (Table 3).

Maternal criminality had stronger negative associations with offspring education as compared to paternal criminality in the population-level models for non-violent criminality (Appendix Table 1: p values < 0.001). For violent crimes, maternal estimates were stronger than paternal, but with weaker statistical support (p-values ranging from 0.453 to 0.039). For prison sentences, maternal estimates were not stronger than paternal (p values ranging from 0.851 to 0.228). In the cousin fixed-effects models, there were no statistically significant differences in the estimates for maternal and paternal criminality since the confidence intervals were overlapping and the estimates were very similar. Lastly, the comparison between population-level models and cousin fixed-effects models showed that accounting for family-level unobserved heterogeneity shared by cousins often attenuated the estimates but did not fully explain the associations. Similar results were found when we used only the cousin samples in the population-level OLS

Table 2
Parental criminality according to child's age and educational stage ($N = 513,886$).

	Child's age and education		
	0–16 years (primary)	0–19 years (secondary)	0–25 years (tertiary)
Maternal criminality			
Non-violent	3.6% ($N = 18,622$)	4.1% ($N = 20,914$)	4.9% ($N = 25,177$)
Violent	0.4% ($N = 1954$)	0.5% ($N = 2334$)	0.6% ($N = 3087$)
Prison	0.2% ($N = 1235$)	0.3% ($N = 1521$)	0.4% ($N = 2066$)
Paternal criminality			
Non-violent	8.5% ($N = 43,720$)	9.5% ($N = 48,865$)	11.4% ($N = 58,305$)
Violent	2.3% ($N = 11,630$)	2.6% ($N = 13,179$)	3.1% ($N = 16,124$)
Prison	2.4% ($N = 12,180$)	2.6% ($N = 13,496$)	3.1% ($N = 15,709$)

Table 3
Results from linear regressions for the association between parental *non-violent criminality* and children's education, population-level and adjusted for unmeasured factors shared by cousins.

	Primary education	Secondary education	Tertiary education
Population level (N = 513,886)			
Mother	−0.055*** [−0.067, −0.044]	−0.112*** [−0.127, −0.097]	−0.091*** [−0.104, −0.079]
Father	−0.015*** [−0.021, −0.008]	−0.036*** [−0.045, −0.026]	−0.035*** [−0.045, −0.026]
Cousin analysis			
Mother (N = 79,575)	−0.040* [−0.072, −0.008]	−0.049* [−0.090, −0.009]	−0.048* [−0.085, −0.010]
Father (N = 80,598)	−0.017 [−0.034, 0.001]	−0.046*** [−0.070, −0.021]	−0.043** [−0.069, −0.017]

Notes: all models adjust for child's sex, child's year of birth, highest parental education, and mother's year of birth as well as co-parent's criminality. 95% confidence intervals in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4
Results from linear regressions for the association between parental *violent criminality* and children's education, population-level and stratified by different types of cousin pairs.

	Primary education	Secondary education	Tertiary education
Population level (N = 513,886)			
Mother	−0.115*** [−0.157, −0.074]	−0.175*** [−0.220, −0.131]	−0.134*** [−0.160, −0.107]
Father	−0.088*** [−0.104, −0.072]	−0.155*** [−0.174, −0.136]	−0.111*** [−0.125, −0.096]
Cousin analysis			
Mother (N = 79,575)	−0.082 [−0.207, 0.043]	−0.052 [−0.186, 0.082]	−0.072 [−0.166, 0.023]
Father (N = 80,598)	−0.028 [−0.069, 0.013]	−0.083** [−0.138, −0.028]	−0.043 [−0.089, 0.004]

Notes: all models adjust for child's sex, child's year of birth, highest parental education, and mother's year of birth as well as co-parent's criminality. 95% confidence intervals in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

regression (Tables A8–A10, Appendix).

4.1. Sensitivity analyses

Kaplan-Meier curves suggested that the association between parental criminality and offspring educational outcomes was not explained by postponement (Appendix, Figs. A1–A6). In these figures, we included offspring born 1982–1984 (N = 215,554) so that all individuals had follow-up until age 30, and we examined the completion of secondary and tertiary education as the educational endpoints.

The results from models with *lifetime parental criminality* as exposure were quite similar to the main results, but the confidence intervals were often larger. Lifetime parental criminality includes both criminality before child's birth and after the measured educational variable. For non-violent criminality, population level and cousin results were similar compared to main models (Table 3 and Table A2), expect for maternal cousin models the estimates were somewhat larger for secondary education (−0.122 [95% CI −0.219, −0.026] vs. −0.049 [95% CI −0.090, −0.009]) and tertiary education (−0.124 [95% CI −0.200, −0.048] vs. −0.048 [95% CI −0.085, −0.010]). Results for violent criminality were similar both in population level and cousin models (Table 4 and Table A3), except for maternal cousin models for primary education where the estimate was larger (−0.262 [95% CI −0.473, –0.051] vs. [95% −0.082 CI −0.207, 0.043]). In prison models, the results were similar both in population-level and cousin models, but all cousin models were statistically non-significant, and the estimates were quite similar (Table 5 and Table A4).

Table 5
Results from linear regressions for the association between parental *prison sentence* and children's education, population-level and stratified by different types of cousin pairs.

	Primary education	Secondary education	Tertiary education
Population level (N = 513,886)			
Mother	−0.081** [−0.130, −0.032]	−0.167*** [−0.222, −0.113]	−0.124*** [−0.158, −0.090]
Father	−0.087*** [−0.102, −0.071]	−0.172*** [−0.191, −0.154]	−0.120*** [−0.134, −0.105]
Cousin analysis			
Mother (N = 79,575)	−0.015 [−0.261, 0.230]	−0.130 [−0.339, 0.080]	−0.052 [−0.161, 0.057]
Father (N = 80,598)	−0.030 [−0.077, 0.017]	−0.116*** [−0.171, −0.060]	−0.066** [−0.113, −0.018]

Notes: All models adjust for child's sex, child's year of birth, highest parental education, and mother's year of birth as well as co-parent's criminality. 95% confidence intervals in brackets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

We also conducted sensitivity analysis by measuring parental criminality *before child's birth* (Tables A20-A22, Appendix) and *after the measured educational endpoint* (Tables A17-A19, Appendix). The results were similar to the main results, but weaker. The only exception was that maternal incarceration seemed to have a somewhat stronger association when it occurred before the child's birth or after the education endpoint. Thus, our results suggest that the association between parental criminality and children's educational outcomes is not due solely to a direct causal effect of experiencing parental criminality, but that underlying familial factors likely explain a notable part of the associations.

We also performed stratified models by child's sex (Tables A11–A16, Appendix) in order to examine whether the effects of parental criminality differed by child's sex. There were no clear differences according to child's sex for parental violent criminality or prison sentence, but some differences were observed for non-violent criminality. For men, in the population-level analysis only paternal criminality was statistically significantly associated with child's education, but for women both maternal and paternal criminality were statistically significantly related to child's educational outcomes (Tables A11 and A14, Appendix). In cousin analysis, maternal criminality seemed to matter more for women and paternal criminality more for men.

In addition, we studied how parental criminality is related to children's academic success by using grade point average (GPA) from the end of primary school as an outcome variable (Fig. A8). GPA gave a similar pattern of results as the binary outcomes. Parental criminality was negatively related to a child's GPA (Fig. A8) for all types of criminality and for both mothers and fathers. Full population estimates were larger than the estimates of the cousin fixed effects models, suggesting that family-level unobserved heterogeneity shared by cousins explains part of the association.

Lastly, we studied whether parental death changes the association between parental criminality and children's outcomes by adjusting for maternal and paternal death by child's age 18 in the population level sample, and did not observe large changes in the estimates of parental criminality (Appendix, Tables A5–A7). In addition, the estimates for parental criminality were often higher than those for parental death.

Thus, it seems that parental absence (due to death) does not affect the results notably.

5. Discussion

In a large-scale register-based study, we found parental criminality to be negatively associated with children's education, which is in line with previous studies (e.g., Brown, 2017; Rud et al., 2014; except e.g., Bhuller et al., 2018). However, until now it has been less clear how parental criminality is associated with education at different educational stages of the child, how different crime types of the parent are related to children's education, and whether the associations are different for paternal and maternal criminality. Moreover, very few studies (e.g., Brown, 2017; McCauley, 2020) have attempted to account for selection effects which is a serious problem in criminological studies. Thus, it is often unclear whether the negative association is due to an effect of parental criminality itself or rather due to social and socioeconomic characteristics or other familial confounds. We aimed to fill these gaps using genetically informed family-level models with Swedish total population data that allows linking multiple generations and families and does not suffer from small sample size like many previous studies using survey data (e.g., McCauley, 2020; Rud et al., 2014).

The contribution of our study is fourfold. First, even when adjusting for parental education, parental criminality was negatively associated with offspring's educational attainment at different stages. The association seemed to be strongest at the secondary and tertiary education level, and weakest for primary education. This is not surprising since most children completed primary education (93%). We also showed that the negative association is persistent and not only due to possible delay of completing studies. Previous research from the Netherlands found somewhat similar results: parental criminality increased the probability of having primary education of the highest education 6–9 percentage points and decreased the probability for getting higher education 2–6 percentage points (e.g., Rud et al., 2014). On the other hand, some studies find that parental criminality is not negatively related to children's school performance (Bhuller et al., 2018; McCauley, 2020).

Second, we found that parental incarceration and violent crimes were often more strongly associated with children's education than non-violent criminality. Billings (2017) found using U.S. data that parental criminality was negatively related to children's education but parental incarceration, in fact, had a positive association with children's education. Similar results were found in a recent study using data from Columbia (Arteaga, 2021). Another study found that parental incarceration was not related to children's school performance i.e., GPA and grades (Bhuller et al., 2018). Our study did not support these findings since parental incarceration had a negative association with all the offspring educational outcomes, and the associations of paternal incarceration with offspring secondary and tertiary education remained statistically significant also in the cousin analyses. In fact, the associations of parental violent criminality and prison sentences with offspring education were highly similar, which is not surprising because of their overlap.

Third, the association between parental criminality and children's education differed by the sex of parent only for non-violent criminality. In mutually adjusted models, maternal non-violent criminality was more strongly related to children's education than paternal criminality, but the estimates of maternal and paternal criminality did not differ in violent criminality or prison models. More, we did not find differences according to parental sex in cousin fixed-effects models. Thus, our findings suggest that the gender of the parent has only a limited role in the negative association. There are not many studies that have compared maternal and paternal criminality; however, our results are partly in line with an earlier study that has found that maternal criminality is more negatively related to offspring education than is paternal criminality (Dobbie et al., 2019).

Fourth, accounting for family-level unobserved heterogeneity when using genetically informed models typically explained part of the negative association but not all of it. When taking into account family-level unobserved heterogeneity, the association between parental criminality and child's education weakened, often as much as by 50%, which suggests that genetic influences and/or other family-level unobserved heterogeneity plays an important role, and population level models tend to overestimate the contribution of parental criminality.

Like all studies, our study also had its limitations. The main limitations included that register data did not allow examining and accounting for the parent-child relationship or quality of parenting which may have a role on children's educational attainment. Moreover, our study included only official records of offending, thus many crimes, especially smaller ones, are excluded and they are underestimated. Future research should explore the differences and overlap between self-reported and officially recorded criminality in more detail. Thus, our study did not allow investigating all possible mechanisms and our results should be interpreted as associations, not as causal relations. Similarly, our aim was to account for familial confounds in the cousin fixed effects models but estimating the contributions of genetic and environmental factors to the associations was beyond the scope of this study. Thus, cousin fixed effects models can only control for familial confounds. Further, cousin fixed-effects models can only be estimated in extended families with two or more cousins, which may affect the generalizability of the within-cousin estimates (Francesconi, Jenkins, & Siedler, 2010). Generalizability of our findings to other countries should be done with caution because countries differ much in terms of educational system, criminal justice system and welfare system. For example, in the U.S. the levels of poverty and incarceration are higher than in Sweden, and the education is free of charge in Sweden but not in the U.S. Thus, our results can be most safely generalized to other Nordic countries with similar welfare systems. In the future, it would be interesting to study whether the association between parental criminality and children's education varies in these respects. The role of a child's age at the time of parental criminal conviction or incarceration would also be an important focus for future studies. It would be also interesting to study how the length of parental prison sentences is related to children's education.

To summarize, both paternal and maternal criminality and incarceration were negatively associated with children's educational achievement from primary through tertiary education, and the associations were in part driven by unobserved familial factors. As our findings suggests that the gender of the parent has only a limited role in the negative association, it seems that the support should be targeted to all children regardless of the sex of the parent that has criminal history. Moreover, parental incarceration and violent crimes were often more strongly associated with children's education than non-violent criminality. Thus, our findings may help to target support better.

Acknowledgements

This research was funded by the Academy of Finland (grant 335589 to Dr. Latvala), the University of Helsinki, and the Swedish Research Council (grant 2016-01989 to Dr. Lichtenstein). Dr. Kailaheimo-Lönnqvist is also funded by the Academy of Finland (320162 for the INVEST Flagship) and the Strategic Research Council (SRC), FLUX consortium, decision numbers: 345130 and 345131.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcrimjus.2022.101920.

References

Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology, 30*(1), 47–88.

Akers, R. L., Krohn, M. D., Lanza-Kaduce, L., & Radosevich, M. (1995). Social learning and deviant behavior: A specific test of a general theory. *Contemporary Masters in Criminology*, 187–214.

Allison, P. D. (2009). *Fixed effects regression models*. London: SAGE.

Arteaga, C. (2021). Parental Incarceration and Children's Educational Attainment. *The Review of Economics and Statistics*, 1–45. https://doi.org/10.1162/rest_a_01129

Berg, V., Kuja-Halkola, R., D'Onofrio, B. M., Lichtenstein, P., & Latvala, A. (2020). Parental substance misuse and reproductive timing in offspring: A genetically informed study. *Evolution and Human Behavior*, (January), 1–8.

Bhuller, M., Dahl, G. B., Loken, K. V., & Mogstad, M. (2018). Effects of incarceration. *AEG Papers and Proceedings, 108*, 234–240.

Billings, S. B. (2017). Parental arrest and incarceration: How does it impact the children? *SSRN*, 1–63. https://doi.org/10.2139/ssrn.3034539

Boutwell, B. B., & Beaver, K. M. (2010). The intergenerational transmission of low self-control. *Journal of Research in Crime and Delinquency, 47*(2), 174–209.

Brown, C. (2017). Maternal incarceration and children's education and labor market outcomes. *Labour, 31*(1), 43–58.

Cho, R. M. (2010). Maternal incarceration and children's adolescent outcomes: Timing and dosage. *Social Service Review, 84*(2), 257–282.

Dobbie, W., Gronqvist, H., Niknami, S., Palme, M., & Priks, M. (2019). The intergenerational effects of parental incarceration. *SSRN*, 1–75.

D'Onofrio, B. M., Sjölander, A., Lahey, B. B., Lichtenstein, P., & Sara Öberg, A. (2020). Accounting for confounding in observational studies. *Annual Review of Clinical Psychology, 16*(1), 25–48.

Duncan, G. J., & Brooks-Gunn, J. (2000). Family poverty, welfare reform, and child development. *Child Development, 71*(1), 188–196.

Francesconi, M., Jenkins, S. P., & Siedler, T. (2010). Childhood family structure and schooling outcomes: evidence for Germany. *Journal of Population Economics, 23*(3), 1073–1103.

Gomila, R. (2020). Logistic or linear? Estimating causal effects of experimental treatments on binary outcomes using regression analysis. *Journal of Experimental Psychology: General*, 1–27.

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford University Press.

Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science, 312*(5782), 1900–1902.

Kailaheimo-Lönnqvist, S., & Erola, J. (2020). Child's age at parental death and university education. *European Societies, 22*(4), 433–455.

Kendler, K. S., Larsson Lönn, S., Morris, N. A., Sundquist, J., Långström, N., & Sundquist, K. (2014). A Swedish national adoption study of criminality. *Psychological Medicine, 44*(9), 1913–1925.

Khemiri, L., Larsson, H., Kuja-Halkola, R., D'Onofrio, B. M., Lichtenstein, P., Jayaram-Lindström, N., & Latvala, A. (2020). Association of parental substance use disorder with offspring cognition: A population family-based study. *Addiction, 115*(2), 326–336.

Lang, K., & Zagorsky, J. L. (2001). Does growing up with a parent absent really hurt? *Journal of Human Resources, 36*(2), 253–273.

Ludvigsson, J. F., Almqvist, C., Bonamy, A. K. E., Ljung, R., Michaëlsson, K., Neovius, M., & Ye, W. (2016). Registers of the Swedish total population and their use in medical research. *European journal of epidemiology, 31*(2), 125–136.

Mare, R. D. (1980). Social background and school continuation decisions. *Journal of the American Statistical Association, 75*(370), 295–305.

McCauley, E. (2020). Beyond the classroom: The intergenerational effect of incarceration on children's academic and nonacademic school-related outcomes in high school. *Socius: Sociological Research for a Dynamic World, 6*, 237802312091536.

McEwen, C. A., & McEwen, B. S. (2017). Social structure, adversity, toxic stress, and intergenerational poverty: An early childhood model. *Annual Review of Sociology, 43*(1), 445–472.

Merton, Robert K. (1938). Social Structure and Anomie. *American Sociological Review, 3*, 672–682.

Miller, H. V., & Barnes, J. C. (2015). The association between parental incarceration and health, education, and economic outcomes in young adulthood. *American Journal of Criminal Justice, 40*(4), 765–784.

Müller, W., & Karle, W. (1993). Social selection in educational systems in Europe. *European Sociological Review, 1*(9), 1–23.

Murray, J., Farrington, D. P., & Sekol, I. (2012). Children's antisocial behavior, mental health, drug use, and educational performance after parental incarceration: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 175–210.

Pfeffer, F. T. (2008). Persistent inequality in educational attainment and its institutional context. *European Sociological Review, 24*(5), 543–565.

Rostila, M., Berg, L., Arat, A., et al. (2016). Parental death in childhood and self-inflicted injuries in young adults-a national cohort study from Sweden. *European Child and Adolescent Psychiatry, 25*(10), 1103–1111. https://doi.org/10.1007/s00787-016-0833-6. Springer Berlin Heidelberg:.

Rud, I., Van Klaveren, C., Groot, W., & van den Brink, H. M. (2014). The externalities of crime: The effect of criminal involvement of parents on the educational attainment of their children. *Economics of Education Review, 38*, 89–103.

Silventoinen, K., Jelenkovic, A., Sund, R., Latvala, A., Honda, C., Inui, F., … Kaprio, J. (2020). Genetic and environmental variation in educational attainment: An individual-based analysis of 28 twin cohorts. *Scientific Reports, 10*(1), 1–11.

Sutherland, E. H. (1947). *Principles of criminology* (4th ed.). Philadelphia: Lippincott.

Tropf, F. C., Hong Lee, S., Verweij, R. M., Stulp, G., Van Der Most, P. J., De Vlaming, R., … Mills, M. C. (2017). Hidden heritability due to heterogeneity across seven populations. *Nature Human Behaviour, 1*(10), 757–765.

Willems, Y. E., Boesen, N., Li, J., Finkenauer, C., & Bartels, M. (2019). The heritability of self-control: A meta-analysis. *Neuroscience and Biobehavioral Reviews, 100*, 324–334. https://doi.org/10.1016/j.neubiorev.2019.02.012