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Kroese, Janique; Bernasco, Wim; Liefbroer, Aart C.; Rouwendal, Jan

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ORIGINAL ARTICLE

The Anticipatory, Short-Term, and Long-Term Effects of Parental Separation and Parental Death on Adolescent Delinquency

Janique Kroese[1,2] · **Wim Bernasco**[2,8] · **Aart C. Liefbroer**[3,4,5] · **Jan Rouwendal**[6,7]

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Abstract

Studies investigating the role of single-parent families in adolescent delinquency have seldom differentiated between types of single-parent families. Furthermore, they have typically assumed that parental disruption is a discrete event marking an abrupt change between dual-parenthood and single-parenthood. Using Dutch longitudinal population register data, we estimated fixed-effects panel models to assess (1) whether the event of parental disruption, either by parental separation or by parental death, increases subsequent adolescent delinquency and (2) whether parental disruption, either by parental separation or by parental death, has anticipatory, immediate, or delayed effects on adolescent delinquency. Our results showed that both parental separation and parental death seem to boost adolescent delinquency, and we found no difference between these types of single-parent families. However, when distinguishing between anticipatory, short-term, and long-term effects, we found a short-term increase in adolescent delinquency after a parental separation and an anticipatory reduction in adolescent delinquency before a parental death. Future research should pay more attention to diversity in the composition of single-parent families, as well as to the anticipatory, short-term, and long-term consequences.

Keywords Parental separation · Parental death · Adolescent delinquency · Fixed-effects panel models · Anticipatory and delayed effects

Introduction

Many studies have examined the association between family constellation and delinquent behavior of offspring. These studies showed that offspring growing up in single-parent families is more likely to engage in delinquent behavior than offspring growing up in two-parent families (Kroese et al., 2021a). Since delinquency has many negative consequences, both for the person committing the behavior (e.g., health problems, a

Extended author information available on the last page of the article

lower income and well-being, and a higher probability of adult criminal involvement; Apel & Sweeten, 2010; Gilman et al., 2015; Massoglia, 2008) and for the victim(s) of the delinquent behavior (e.g., injuries, mental health issues, and financial loss; Campagna & Zaykowski, 2020), it is important to discover what causes adolescent delinquency. Although many studies have addressed the relation between single-parent families and adolescent delinquency, many questions about this relation remain.

Several gaps in the literature can be noted. First, most studies only consider either single-parent families arising through parental separation, or else only consider single-parent families in general (i.e., irrespective of whether the single-parent family arose through parental separation or through parental death), but they do not distinguish between the effects of parental separation and parental death on adolescent delinquency (e.g., Brown, 2006; Champion et al., 2008; Vanassche et al., 2014). Because experiencing a parental death before adulthood is relatively rare in most parts of the industrialized world, these two potentially different effects are difficult to rigorously disentangle (Demuth & Brown, 2004). Therefore, we do not know whether single-parent families caused by parental separation or parental death have a different impact on adolescent delinquency. However, finding the differential effects of these two types of single-parent families may help us get a step closer to discovering the mechanisms that cause the general relation between single-parent families and delinquency. Second, to our knowledge, prior studies have only assessed the effect of growing up in a single-parent family on adolescent delinquency from a young age onwards (Kroese et al., 2021a). Hence, we are unaware of how experiencing the start of a single-parent family as an adolescent affects delinquent behavior. Since adolescence is a period of both growing autonomy and continued connectedness to parents (Laible et al., 2000), it is important to know how adolescents respond to a parental disruption. Third, previous studies have used statistical methods that are not optimally tailored to rigorously estimate the causal effects of living in a single-parent family on delinquency. For example, several studies used cross-sectional data (e.g., Spohn & Kurtz, 2011; Vanassche et al., 2014). These methods rely on strong and untestable assumptions. Consequently, it is possible that the observed association between single-parent families and delinquency in these studies is confounded due to spurious associations, and does not represent a causal effect. In contrast, fixed-effects panel models make much weaker assumptions, and can provide stronger evidence on the causal effects of living in single-parent families on adolescent delinquency (Ludwig & Brüderl, 2021). Fourth, other studies have treated parental disruption as a single event instead of as a long-term event (e.g., Banyard et al., 2006; Kierkus & Hewitt, 2009). They have thus assumed a homogenous "low risk" period before the parental disruption and a homogenous "high risk" period after the event. This assumption prevents an exploration of the possibility that the increased likelihood to engage in delinquency already commenced before the single-parent family started, or that increased delinquency quickly reduces after the start of the single-parent family.

These four gaps in the literature will be addressed in our study. We will test the causal effects of parental separation and parental death on adolescent delinquency, as well as take into account the anticipatory, short-term, and long-term effects of

these parental disruptions. In the following sections, we will more extensively discuss why it is important to address these four research gaps in our study.

Research Gap 1: Single-Parent Families Formed by Parental Separation and Parental Death

Many theories have been used to explain the delinquency-stimulating effects of growing up in a single-parent family, including *attachment theory* (Ainsworth & Bowlby, 1991), the *economic strain model* (Sogar, 2017), the *family crisis model* (Mack et al., 2007), the *general strain theory* (Agnew, 2006), the *social control/parental absence model* (Gottfredson & Hirschi, 1990), and the *social control theory* (Hirschi, 1969). These theories all argue that single-parent households create conditions that make offspring more likely to engage in delinquent behavior. However, only the family crisis model makes a distinction between single-parent families caused by separation and single-parent families caused by a parental death.

The family crisis model suggests that experiencing a parental separation causes psychological distress, emotional resentment, and social tension in offspring, more than a parental death. The emotional resentment of offspring towards their parents may decrease the level of family attachment and increase offspring's criminal behavior. In contrast, the model suggests that experiencing a parental death causes anxiety, emotional distress, and depression, but does not generate the same level of emotional resentment as experiencing a parental separation does (see Mack et al., 2007). Therefore, the family crisis model argues that offspring is more likely to display adolescent delinquency in response to parental separation than in response to parental death. However, according to a recent systematic review (Kroese et al., 2021a), only one empirical study investigated this relation. This study by Juby and Farrington (2001) compared delinquency rates between offspring who experienced parental separation and offspring who experienced parental death. They found reports of adolescent convictions, but not self-reported delinquency, to be higher amongst offspring of separated parents. Therefore, there is currently scarce and mixed evidence on the differential effects of parental separation and parental death on adolescent delinquency.

However, it is important to know whether the diversity in the composition of single-parent families affects adolescent delinquency rates differently. A joint feature of parental separation and parental death is the transition from a two-parent household to a single-parent household, but there are also differences. After a parental separation, offspring sees one of their parents or both parents less often, depending on the co-parenting agreement the parents decided on (Meyer et al., 2017). Moreover, the relation between offspring and their parents can suffer from a parental separation, for instance, due to high-conflict divorces (Harman et al., 2019). This is all in contrast with a parental death, with offspring being unable to interact with the deceased parent. Differences between delinquency rates of offspring in single-parent families caused by separation and offspring in single-parent families caused by a parental death may further our insight in the mechanisms underlying the well-corroborated link between single-parent families and adolescent delinquency.

Research Gap 2: Constitution of the Single-Parent Family During Adolescence

Most theories and empirical studies focused on single-parent families that were constituted when the offspring was still relatively young. For instance, *Bowlby's attachment theory* (Ainsworth & Bowlby, 1991) suggests that parental disruption can lead to weaker attachment and/or the development of insecure attachment. Since attachment is formed early in life, this theory proposes that disruptions at younger ages (especially during the first five years of life) have more adverse effects than disruptions at later ages. Many empirical studies confirm this expected relation between experiencing the constitution of a single-parent family before adolescence and a higher level of adolescent delinquency (e.g., Kroese et al., 2021a, b; Price & Kunz, 2003).

However, because empirical studies have only assessed the effects of growing up in a single-parent family from a relatively young age onwards on adolescent delinquency (Kroese et al., 2021a), we do not know how experiencing the start of a single-parent family as an adolescent affects their more immediate delinquent behavior. Since adolescents already experience a great amount of change in their lives (i.e., next to biological and cognitive developments, adolescents also experience social developments such as a growing reliance on peers for support; Laible et al., 2000), it is interesting to examine how experiencing the start of a single-parent family during adolescence affects adolescent delinquency.

Research Gap 3: Causal Effects of Single-Parent Families on Adolescent Delinquency

Empirical studies attempting to study the effects of single-parent families on offspring have used numerous ways to test causal effects (Amato & Anthony, 2014). Researchers have tried to (1) control for all possible confounding variables (e.g., Banyard et al., 2006; Champion et al., 2008), despite not knowing whether all relevant variables were included in the model; (2) use propensity score methods to match offspring in single-parent families and two-parent families on parents' propensity to separate (e.g., Frisco et al., 2007), despite not knowing whether all factors causing a parental separation as well as all adverse offspring outcomes were included in the model; and (3) incorporate lagged dependent variables controlling for the same outcome measured prior to the start of the single-parent family (e.g., Keller, 2002), despite the high susceptibility to measurement errors and omitted-variable bias (Johnson, 2005). Since there are spurious associations between single-parent families and offspring's outcomes (i.e., due to a selection bias by the parents, especially in the case of single-parent families caused by parental separation), it is important to use a non-experimental method that is optimal for teasing out causal effects.

When longitudinal data is available with the relevant variables present at all time points, it is possible to use fixed-effects panel models (Allison, 2009). Fixed-effects panel models make weaker assumptions and can therefore provide stronger evidence for causal effects than alternative models (Ludwig & Brüderl,

2021). In fixed-effects panel models, each adolescent functions as his or her own control, and all observed and non-observed time-invariant variables are controlled for (including, for example, gender, genetic factors, and ethnicity). To our knowledge, fixed-effects panel models have thus far not been used to investigate the effects of parental separation and parental death on adolescent delinquency. Only a few studies looked at other outcomes than delinquency by means of fixed-effects panel models. Studies related to the effects of parental separation on youth showed an increase in alcohol and marijuana use (Arkes, 2013), a decrease in reading scores and an increase in math scores (Aughinbaugh et al., 2005), and a decline in achievement and adjustment (Amato & Anthony, 2014). One study regarding the effects of parental death on youth showed a decline in the well-being of the offspring (Amato & Anthony, 2014). Since fixed-effects panel models offer a more rigorous method of estimating causal effects than alternative non-experimental techniques, we use them to investigate the effects of parental separation and parental death on adolescent delinquency.

Research Gap 4: Parental Disruption, a Discrete Event or a Long-Lasting Event?

Two competing theoretical models can be used to predict how long the offspring experiences effects from a parental separation and a parental death (Amato, 2000). The *crisis model* views the start of a single-parent family as a crisis, implying that this event is only a short-term stressor to which most adolescents are able to adapt over time. However, the *chronic strain model* views the start of a single-parent family as a chronic strain, implying that adolescents will experience negative consequences of this event for a long time, if not indefinitely. Empirical studies have not yet looked at both the short-term and long-term effects of parental disruption on adolescent delinquency, but treated parental disruption as a discrete event.

Next to the issue of how long the effects of parental disruption last, one could also argue that there may be anticipation effects in the build-up to the parental disruption. Parental separation is often associated with conflicts between parents before they separate (Amato & Anthony, 2014). It is even possible that the offspring experiences more intimate partner violence and hostility between the parents in the two-parent household before a parental separation occurs (Kelly, 2000). However, other studies suggest that parents show little overt conflict before a parental separation, often surprising the offspring with a break-up (Amato & Hohmann-Marriott, 2007; Hetherington & Kelly, 2002). Moreover, many stable marriages also involve levels of chronic conflict (Hawkins & Booth, 2005), implying that offspring experiencing a parental death could have also been faced with conflicts between their parents prior to the death of one of their parents. Next to this, offspring experiencing a parental death could have witnessed a long-term illness of one of their parents, which could have influenced their mental well-being as well.

Besides the possible negative experiences before a parental disruption, there are also events that could occur after a parental disruption (e.g., a high-conflict divorce

or a long mourning process) that could influence adolescent delinquency. One study about the consequences of parental separation, without taking delinquency into account, showed short-term negative psychological outcomes for the offspring before and after the separation, as well as long-term negative consequences regarding their school results before and after the separation (Sun & Li, 2011). Since there are no empirical studies about the development of adolescent delinquency before and after parental separation and parental death, it is important to investigate the pre-, post-, and longer-term effects on adolescent delinquency.

Research Aims

We aim to answer two research questions about the relation between single-parent families and adolescent delinquency. We address the four research gaps mentioned above in our study, by using fixed-effects panel models, to test the effects of parental separation and parental death on adolescent delinquency, as well as incorporating several time points before and after the parental disruption. First, we examine whether parental disruptions cause adolescent delinquency to increase after the parental disruption occurred. We analyze parental separation and parental death separately and we treat them as discrete events. Based on the reviewed theories and empirical studies, we expect a higher likelihood to engage in adolescent delinquency after the adolescent experiences parental separation than after experiencing parental death. Second, we investigate the existence of anticipatory (i.e., before the event) effects and lagged (i.e., after the event) short-term and long-term effects of parental disruption. Again, we will look at parental separation and parental death independently. We do not have a specific hypothesis for this exploratory research question, since there are no well-defined theoretical models about anticipatory effects and because theoretical models about the lagged effects of parental disruption (i.e., the crisis model and the chronic strain model) contradict each other.

Method

Data and Study Population

The data used in this study were constructed by combining various register-based datasets accessible via Statistics Netherlands (Centraal Bureau voor de Statistiek).[1] These datasets contain (generally longitudinal) data on the entire registered population of the Netherlands. We used the anonymized personal identifiers constructed by Statistics Netherlands to link the datasets. The datasets contain information from different sources.

[1] Under certain conditions, these microdata sets are accessible for statistical and scientific research. For further information: microdata@cbs.nl.

Basic demographic and administrative information about individuals and their family members, such as their age and registered address,[2] was extracted from the population register (Basisregistratie Personen). This register also includes historical information, such as former addresses and previous partners.

Information about adolescent delinquency, parental crime, and household income was derived from other register-based sources. Information on household income was based on data from The Dutch Tax and Customs Administration (Belastingdienst). From 2005 to 2018, the Dutch National Police provided data about adolescent delinquency and parental crime by means of the Basic Facility for Law Enforcement (Basisvoorziening Handhaving). This dataset contains suspects of all ages who have been charged with a serious offense eligible for prosecution. This means that a person received a "procès-verbal," an official report drawn up by a police officer about a crime that has occurred. Although the Basic Facility for Law Enforcement does not only contain data about convictions, over 90% of the people in the dataset are estimated to receive a transaction (e.g., a fine) or to be charged and found guilty (Blom et al., 2005). The offenses are divided into eight categories, including violent sex offenses (rape or sexual assault), other sex offenses (excluding rape or sexual assault), violent property crimes, property crimes (excluding violent property crimes), criminal damages and crimes against public order, road traffic offenses, drug offenses, and other offenses.

For the present study, we selected everyone who was born in the Netherlands in the period 1993–2000. We followed these individuals from age 12 until age 18. These birth years combined with this age category were chosen to maximize the period over which crime data is available, since all required datasets were available. In particular, the data included crime data for all selected individuals between the ages 12 and 18. Individuals were excluded from the analyses if they passed away before the age of 12, if they experienced a parental disruption or parental death before the age of 12, or if they were born outside the Netherlands. If adolescents emigrated, they were removed from the data from that year onwards.[3] If emigrated Dutch adolescents moved back to the Netherlands, they were reincluded in our sample from that year onwards. If adolescents passed away after the age of 12, these adolescents were removed from the sample from their year of death onwards.

[2] At any point in time, individuals can only be registered at a single address. For offspring of separated parents, this registered address will often coincide with the address where they spent most of their time. However, for offspring of separated parents in 50/50 custody arrangements, the registered address is the place where they spent only half of their time. Based on an in-depth investigation of the validity of the registered home addresses of offspring of separated parents, Van der Wiel and Kooiman (2019) concluded that, in general, the registered address of offspring of separated parents adequately represents where the offspring lives and sleeps. However, they also noted that a small number of these sons and daughters are registered with their father, yet actually live with their biological mother or live in a shared custody arrangement with both biological parents.

[3] The reason for this removal is that the crime data from the Dutch National Police only apply to crimes perpetrated in The Netherlands and do not include crimes perpetrated abroad.

Dependent Variable

Adolescent Delinquency The dependent variable was based on the recorded criminal behavior of the adolescents as registered by the Dutch National Police. It was defined as a time-varying dichotomous variable indicating whether or not the adolescent has been a suspect of a criminal act (i.e., legally prosecuted), independent of the number of crimes or the severity of the crime(s), reported separately for every year between age of 12 and 18.

Independent Variables

Type of Single-Parent Family We distinguished between (1) adolescents who live at the same address as their two biological parents, (2) adolescents who live with only one biological parent after their parents have separated, and (3) adolescents who live with one biological parent because the other biological parent has passed away. Adolescents living without any biological parents were excluded from the analyses. The type of family was measured at January 1st of every year, between the age of 12 and 18, by checking whether the child's registered address was the same as the registered address of both biological parents.

Single-parent families include children living with only one biological parent (possibly in combination with other adults, such as a stepparent or grandparent). In the first type of single-parent family, children live together with only one biological parent after their parents got separated. If one biological parent got a different registered address than the other biological parent and their offspring, this was coded as a parental separation. In most cases, this constitutes families who experienced a parental break-up of a marriage or a cohabiting union. This means that we do not distinguish between married and cohabiting parents. It is possible that the biological parents reunited after a (couple of) year(s), yet this child will still be categorized as having experienced a parental separation. The second type of single-parent family includes children who live with one biological parent because the other biological parent has passed away.

To construct the variable "type of single-parent family," we first checked whether one of the parents had passed away, and assigned these children to the second category of single-parent families "living in a single-parent family due to a parental death." In case this did not happen, we checked whether their biological parents had been separated, and assigned these children to the first category of single-parent families "living in a single-parent family due to a parental separation." The remaining adolescents live together with their two biological parents.

Number of Years Before and After the Single-Parent Family Started The number of years before and after the single-parent family was formed is measured at January 1st of every year, between the age of 12 and 18. We divided this into the following categories, separately for parental separation and parental death: "one year before

the parental disruption," "year of the parental disruption," "first year after the parental disruption," "second year after the parental disruption," and "third to seventh year after the parental disruption." The reference category was "more than one year before the parental disruption."

Covariates

Parental Crime First, we controlled for criminal behavior committed by the biological parent(s). We defined this variable as whether "none of the biological parents have been a suspect of a criminal act" or "one of the biological parents has been a suspect of a criminal act or both of the biological parents have been a suspect of a criminal act," reported separately for every year between age 12 and 18 of the adolescent. We did not distinguish between one or both biological parents having been a suspect of a criminal act, because it is unlikely that both of the biological parents have been a suspect of a criminal act in case one of the parents has passed away.

Household Income Second, we controlled for the annual income of the household in which the adolescent lived, reported separately for every year between the age of 12 and 18. In order to correct for differences in household size and composition, we used an equivalence scale (CBS, 2019), by taking into consideration (1) the size of the household and (2) whether the members were adults (18 years and older) or minors. Moreover, to prevent households showing a negative household income being excluded from the sample as a consequence of using the natural logarithm function for household income, an additional dummy variable was included for negative household incomes and the original household income variable showing a negative value was altered to an income of "1."

Stepparents Third, we controlled for the possibility that a biological parent in a single-parent family repartnered in the form of a cohabiting union or remarriage. We categorized this variable into "none of the biological parents had a new partner" or "one or two of the biological parents had a new partner," reported every year between age 12 and 18 of the adolescent. We combined the adolescents with one or two biological parents with a new partner, because it is impossible that both of the biological parents had a new partner in case one of the parents has passed away.

Age Fourth, to account for the age-crime curve (i.e., a universally found phenomenon involving a steep increase in delinquency until humans reach the center years of adolescence, followed by a subsequent decrease; Moffitt, 1993), we controlled for the age of the adolescent. This is reported separately for every year between the age of 12 and 18.

Analyses

A person-year file was created with each adolescent contributing a record for each year he or she was observed between the age of 12 and 18. Using this file, a

fixed-effects panel analysis was performed to estimate the relation between single-parent families and adolescent delinquency. A fixed-effects panel model examines only within-individual change (e.g., in family structure, family income, delinquency) and controls for all observed and unobserved stable individual characteristics (e.g., gender, country of birth). By controlling for both observed and unobserved differences between individuals, the fixed-effects panel model accounts for time-constant selection bias (Allison, 2005). In addition, it is possible to control for time-varying variables that might influence the relation between single-parent families and adolescent delinquency. A potential disadvantage of the fixed-effects model is that the main effects of stable background characteristics cannot be estimated, because the model controls for these characteristics. In the present research, however, this does not apply because our focus is on the role of characteristics that do or can change over time, such as family structure, parental crime involvement, household income, and age.

Since the dependent variable is a dichotomous measure (i.e., whether or not an adolescent was a suspect of a criminal act in a given year), logistic regression analyses were performed to test all models. First, we tested whether parental disruptions cause adolescent delinquency to increase after the parental disruption occurred. We analyzed parental separation and parental death separately and we treated them as discrete events. Second, we investigated the existence of anticipatory (before the event) effects and lagged (after the event) short-term and long-term effects of parental disruption. Again, we looked at parental separation and parental death independently. Data management, record linkage, and analyses were executed on the secure server of Statistics Netherlands with STATA, version 16.0.

It is well-known that in panel data regression analysis, fixed-effects estimators are less efficient than random-effects estimators because the fixed-effects estimators only use variability in the dependent variable within analytical units (here: adolescents) over time, whereas random-effects estimators in addition use variability between analytical units (Brüderl & Ludwig, 2015). To verify whether the less efficient but more rigorous fixed-effects model was actually required, we performed a Hausman test (Hausman, 1978). This test assesses whether the fixed-effects and random-effects estimates are significantly different. If they are, it indicates that the additional assumptions that underly the random-effects model but not the fixed-effects model are violated and, thus, that the fixed-effects model is to be preferred. As the Hausman test was strongly significant, we decided to present the fixed-effects estimates.

Results

Descriptive Statistics

The study population consisted of 1,163,975 adolescents. However, adolescents who were never a suspect of a criminal act and adolescents who were a suspect every year (i.e., no within-individual change on the dependent variable) were dropped from the fixed-effects analyses, resulting in a total of 95,219 adolescents included in

Table 1 Descriptive Statistics (in percentages, unless otherwise stated)

Age	12	13	14	15	16	17	18
Adolescents with separated parents	1.67	3.21	4.65	6.06	7.43	8.73	9.93
Adolescents with a deceased parent	0.16	0.35	0.55	0.77	1.00	1.25	1.52
Adolescents who engaged in adolescent delinquency	0.40	0.90	1.60	2.03	2.20	2.25	2.12
Adolescents with one or two parents who engaged in crime	1.49	1.47	1.44	1.36	1.30	1.23	1.09
Household income in euros p/y	41,978	43,294	44,498	45,350	46,447	48,578	44,596
Adolescents with parents with one or two new partner(s)	0.36	0.87	1.47	2.12	2.79	3.48	4.14

In contrast to the other variables in this table, both “Adolescents with separated parents” and “Adolescents with a deceased parent” are cumulative variables

Table 2 Parameter estimates and 95% confidence intervals of a fixed-effects panel model with adolescent delinquency as dependent variable and type of single-parent family as main independent variable ($N = 95{,}219$)

	OR	95% CI
Type of single-parent family—Ref: when the same adolescent would have lived in a standard family		
Separated parents	1.06**	1.02, 1.11
One biological parent passed away	1.14*	1.03, 1.27
Number of parents who engaged in crime—Ref: no parents who engaged in crime		
One or two biological parent(s) who engaged in crime	1.68***	1.63, 1.74
Age—Ref: 12		
13	2.44***	2.36, 2.53
14	4.78***	4.62, 4.95
15	6.38***	6.17, 6.60
16	7.11***	6.87, 7.35
17	7.38***	7.14, 7.63
18	6.89***	6.66, 7.13
Household income	0.97**	0.96, 0.99
Negative household incomes	0.70***	0.58, 0.85
New partner(s)—Ref: no new partners		
One or two new partner(s)	0.95	0.90, 1.00

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

the final analyses (examined for 6.9 years on average). See Table 1 for the descriptive statistics of each variable. More adolescents experienced a parental separation than a parental death. With an increasing age of the adolescent, we found (1) a reduction in the percentage of adolescents with one or two parents who engaged in criminal behavior, (2) an increase in the percentage of adolescents with parents with one or two new partner(s), and (3) a higher household income. Moreover, an age-crime curve with a peak around ages 16–17 is also visible in our population.

Type of Single-Parent Family

Table 2 shows the results of the fixed-effects analysis of the effect of single-parent families on adolescent delinquency, separately for adolescents who experienced a parental separation and adolescents who experienced a parental death. Parental separation (OR = 1.06) was significantly related to adolescent delinquency. This implies that an adolescent who experienced a parental separation is more likely to engage in adolescent delinquency compared to when that same adolescent would have continued to live with both parents. Parental death (OR = 1.14) was also significantly associated with adolescent delinquency. This means that an adolescent who experienced a parental death is more likely to engage in adolescent delinquency compared to when that same adolescent would have continued to live with both parents. When comparing parental separation and parental death, the results do not

show a statistically significant difference between the two types of single-parent families (OR = 1.14/1.06 = 1.08). This means that our results do not suggest a difference between adolescents who experienced a parental separation and adolescents who experienced a parental death (yet, we also cannot assure equality between these groups).

Number of Years Before and After the Single-Parent Family Started

Table 3 shows the results of the fixed-effects analysis with regard to the number of years before and after the single-parent family started, again separately for adolescents who experienced a parental separation and adolescents who experienced a parental death. The reference category consists of the period of more than one year before the parental disruption, when the adolescent still lived with both parents. Figure 1 visualizes the estimated odds ratios and their 95% confidence intervals.

With regard to the adolescents who experienced a parental separation, we found statistically significant positive outcomes for the year of the parental separation (OR = 1.12), the first year after the parental separation (OR = 1.15), and the second year after the parental separation (OR = 1.13). This implies that adolescents in the year they experienced a parental separation and in the next two years afterwards show an increased likelihood to engage in delinquency compared to the period of more than one year before the separation occurred. We did not observe a statistically significant effect for the year before the parental separation and for three to seven years after the parental separation.

Adolescents who experienced a parental death show quite different results. We found statistically significant negative results for the year before the parental death (OR = 0.71) and the year of the parental death (OR = 0.83). This implies that during these two years, adolescents are less likely to engage in delinquency than in the period of more than one year before the parent passed away, when they lived with both parents. The other periods do not statistically significantly differ from the reference category.

Covariates

We included the time-varying covariates in every fixed-effects panel model, and they produced the same outcomes in every model. In a given year, criminal involvement of parents increased their offspring's likelihood of criminal involvement. Moreover, with an increasing age of the adolescent, we found an increase in the likelihood to engage in adolescent delinquency. In contrast, increases in household income reduced adolescent delinquency and we did not find a statistically significant outcome for the presence of stepparents. These four covariates, however, did not alter the results of the analyses.

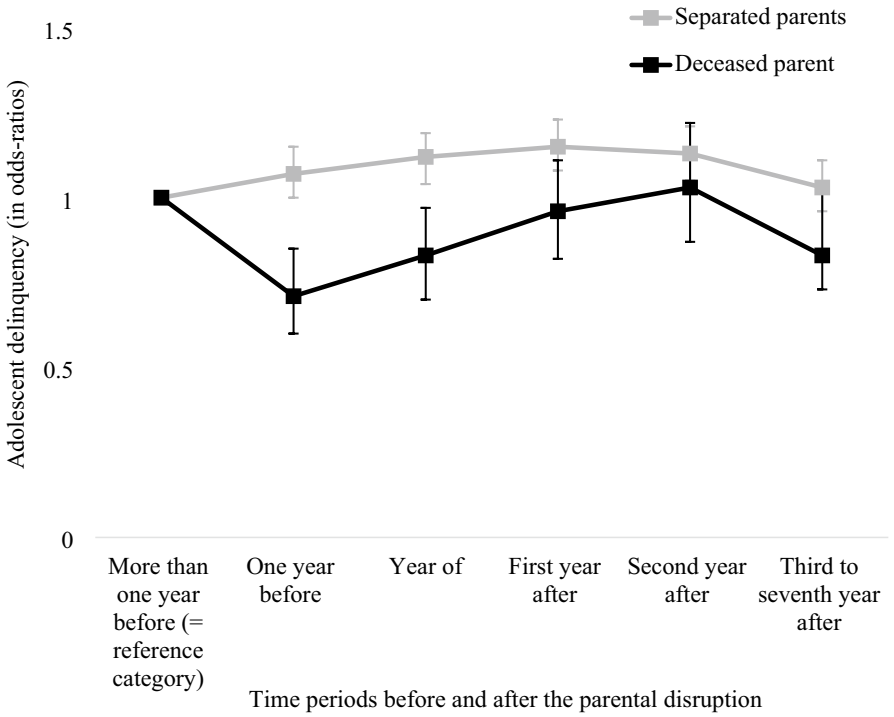

Fig. 1 Parameter estimates and 95% confidence intervals of a fixed-effects panel model with adolescent delinquency as dependent variable and number of years before or after the parental separation or the parental death as main independent variables (in odds ratios, $N = 95{,}219$; reference category, more than one year before the parental disruption)

Discussion

By using longitudinal population register data and by applying fixed-effects panel models, this study tried to enlarge our knowledge about the effects of living in a single-parent family on adolescent delinquency. More specifically, we tested (1) whether the event of parental disruption, either by parental separation or by parental death, increases subsequent adolescent delinquency and (2) whether parental disruption, either by parental separation or by parental death, has anticipatory, immediate, or delayed effects on adolescent delinquency. The first test assumes that parental disruption is an event with a discrete effect that moves delinquency to a new level. The second test allows for behavioral changes to take effect in anticipation of the event, or to take effect after the event with some delay.

Based on the first analysis, we found that adolescents who experienced a parental separation or a parental death are more likely to engage in adolescent delinquency compared to when that same adolescent would have continued to live with both parents. These results confirm the expectations of many theories (e.g., attachment theory, general strain theory, and social control theory; Agnew, 2006; Ainsworth &

Table 3 Parameter estimates and 95% confidence intervals of a fixed-effects panel model with adolescent delinquency as dependent variable and number of years before or after the parental separation or the parental death as main independent variables ($N = 95{,}219$)

	OR	95% CI
Number of years before or after the parental disruption—Ref: more than one year before the parental disruption		
Parental separation		
One year before the parental separation	1.07	1.00, 1.15
Year of the parental separation	1.12**	1.04, 1.19
First year after the parental separation	1.15***	1.08, 1.23
Second year after the parental separation	1.13**	1.05, 1.21
Third to seventh year after the parental separation	1.03	0.96, 1.11
Parental death		
One year before the parental death	0.71***	0.60, 0.85
Year of the parental death	0.83*	0.70, 0.97
First year after the parental death	0.96	0.82, 1.11
Second year after the parental death	1.03	0.87, 1.22
Third to seventh year after the parental death	0.87	0.73, 1.03
Number of parents who engaged in crime—Ref: no parents who engaged in crime		
One or two biological parent(s) who engaged in crime	1.67***	1.62, 1.73
Age—Ref: 12		
13	2.44***	2.35, 2.53
14	4.79***	4.62, 4.95
15	6.40***	6.18, 6.62
16	7.14***	6.90, 7.38
17	7.42***	7.17, 7.68
18	6.95***	6.72, 7.19
Household income	0.98**	0.96, 0.99
Negative household incomes	0.71**	0.59, 0.87
New partner(s)—Ref: no new partners		
One or two new partner(s)	0.98	0.93, 1.04

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Bowlby, 1991; Hirschi, 1969) and the outcomes in literature reviews (Kroese et al., 2021a; Price & Kunz, 2003) about growing up in single-parent families, stating that single-parent households and adolescent delinquency are related. Next to this, our results did not suggest a difference in the engagement in delinquency between adolescents who experienced a parental separation and adolescents who experienced a parental death. These results do not confirm the expectations of the family crisis model (Mack et al., 2007), because the family crisis model assumes that offspring is more likely to display negative behavior after experiencing a parental separation than after experiencing a parental death. However, not many empirical studies have tested this difference between the two types of single-parent families in relation to adolescent delinquency. We are aware of only one study, conducted by Juby and

Farrington (2001), that found that offspring from families disrupted by separation is more likely to engage in adolescent delinquency than families disrupted by parental death when they checked reports on adolescent convictions, yet found no difference when adolescent delinquency was self-reported by the offspring. Therefore, there is no well-established relation between the different effects of parental separation and parental death, possibly explaining our finding.

In our second analysis, we examined whether the effects of parental disruption changed over time. Indeed, we found that parental separation only had a short-term effect on adolescent delinquency. Adolescents' likelihood to engage in delinquency increased in the year of the parental separation and in the next two years afterwards. Subsequently, the likelihood of delinquency decreased to pre-separation levels. This result confirms the expectations of the crisis model (Amato, 2000), implying that a parental separation could be an event to which most adolescents are able to adjust over time. A parental separation can be difficult for adolescents in an emotional and practical way. They have to get used to not being able to see both parents as often as before the parental separation as well as to any practical changes, such as a new school and new neighborhood. However, our result suggests that after the short-term unfavorable effects on delinquency, adolescents generally are able to adapt to these changes, meaning that a parental separation does not affect their likelihood to engage in adolescent delinquency in the long run. Naturally, this result is in contrast with the chronic strain model that views the start of a single-parent family as a chronic strain, implying that adolescents will experience negative consequences due to this event for a long time.

The results in our second analysis for adolescents who experienced a parental death were quite different, since we observed a statistically significant negative effect for the year before the parental death and the year of the parental death. This suggests some level of anticipatory behavior, with adolescents being less likely to engage in delinquent behavior in the run-up to and during the year of parental death. One possible explanation for this finding is that the adolescent knew that one of their parents was going to pass away soon, therefore resulting in preferring to stay at home with their ill parent instead of engaging in crime. In the Netherlands, the cause of death for people between 0 and 60 years of age usually is prolonged illness (CBS StatLine, 2023). These data on the cause of death may help to understand the reduction in adolescent crime prior to the death of their parent.

At first glance, the results of the effect of parental death in our first analysis, shown in Table 2, and the second analysis, shown in Table 3, may look contradictory, but this is not necessarily true. Table 2 shows that, on average, adolescents are more likely to engage in delinquency once a parent passed away, but Table 3 suggests that this is mainly due to adolescents being much less likely to engage in delinquency in the year before a parent dies. So the positive effect in Table 2 is mainly caused by the much reduced incidence of adolescent delinquency in the run-up to parental death. Therefore, these results contradict the expectations of theories on single-parent families (e.g., attachment theory, general strain theory, and social control theory; Agnew, 2006; Ainsworth & Bowlby, 1991; Hirschi, 1969).

Implications

Our results underscore the importance of modelling parental separation and parental death as an event with anticipatory, short-term, and long-term consequences by means of fixed-effects panel models. Looking at the overall effect of parental disruption only would have led us to underestimate the short-term association between parental separation and adolescent delinquency and overestimate (i.e., since we found positive effects when treating parental death as a discrete event and negative effects when treating parental death as a long-term event) the association between parental death and adolescent delinquency. Moreover, we found a negative result for the year before the parental death, implying that anticipatory effects should also be considered in studying parental disruptions.

Limitations

A key strength of our approach is that we use population data in combination with a fixed-effects approach that allows us to get a much better grasp on the causal relation between parental disruption and delinquent behavior during adolescence. Nevertheless, this study also has limitations. First, due to the nature of register data, several possible confounding time-varying variables could not be included in the analyses. For example, interesting time-varying variables that would have been added in case they would have been available are (1) the number and the severity of conflicts between the parents before the parental disruption occurred and, in case of the families disrupted by a parental separation, conflicts after the parental separation as well; (2) the quality of the caregiving by the parents in a stressful period (e.g., parental supervision); and (3) the quality of a possible new neighborhood and new school after having to move away. Being able to test these types of time-varying variables could help us find the mechanisms that cause the relation between single-parent families and adolescent delinquency. Second, it would have been interesting in studying the role of parental death to be able to include the cause of death, but these data are only allowed to be accessed under very strict circumstances due to privacy reasons. This means we do not know whether the parent passed away due to (short-term or long-term) illness, due to suicide, or due to murder, reasons that could impact how a family copes with the parental death. Third, a limitation of fixed-effects estimates is that they can only be generalized to the subset of the population on which they are based. This means that in our study, the estimates can only be generalized to adolescents who displayed intra-individual variation in delinquency between ages 12 and 18. For a more elaborate argument on preferring unbiased estimates (i.e., fixed-effects estimates) over generalizability, see Collischon and Eberl (2020, Sect. 3.5).

Future Research

We have a few suggestions for future research, building on the results of our study. First, future studies could examine delinquency in more detail, including a more

detailed distinction between incidental and persistent delinquency, between minor and serious delinquency, and between different types of delinquency. For instance, because the household income is generally lower in families with only one biological parent, it is possible that the adolescents are more inclined to engage in offenses such as burglary to obtain money. Second, we recommend studying the topic of family structure and delinquency more extensively with population register data. Data limitations caused researchers to have difficulties in studying this topic (Demuth & Brown, 2004). Because some family structures are relatively rare, such as offspring living in single-father families and offspring being born into a single-parent family, researchers experienced problems with finding enough respondents for their studies. Since some of our results do not confirm existing theories, we recommend to use population register data more often to study the relation between single-parent families and delinquency to obtain more knowledge about the validity of these theories. Third, building on one of the limitations we mentioned above, we recommend to include more time-varying variables in datasets that could potentially explain the relation between single-parent families and adolescent delinquency. Because we found different outcomes for parental separation and parental death, it is possible that each of these events come with a significantly higher probability of a set of preceding consequences that exert a differential prior impact. With respect to parental separation, it is possible that other factors, such as interparental conflict preceding parental separation, actually explain the increase in adolescent delinquency. Regarding parental death, the anticipation of this event could lead to broader consequences. If adolescents want to spend more time with their ill parent, they may reduce their time hanging around with their peers. This removal of opportunities for social learning of criminal behaviors (i.e., offending peers) may help to reduce the likelihood of offspring engaging in criminal behavior. These examples show that we need more research focusing on finding the mechanisms that cause the relation between parental dissolution and adolescent delinquency. If we are able to better identify the mechanisms that cause this relation, interventions and policies designed to target this relation could be improved.

Conclusion

In this study, we found that both parental separation and parental death seem to boost adolescent delinquency, and we found no difference between these types of single-parent families. However, when distinguishing between anticipatory, short-term, and long-term effects, we found a short-term increase in adolescent delinquency after a parental separation and an anticipatory reduction in adolescent delinquency before a parental death. Therefore, future research should pay more attention to diversity in the composition of single-parent families, as well as to the anticipatory, short-term, and long-term consequences.

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Declarations

Conflict of Interest The authors declare no competing interests.

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References

Agnew, R. (2006). General strain theory: Current status and directions for further research. Taking stock. *The Status of Criminological Theory*, *15*, 101–123. https://doi.org/10.4324/9781315130620-4.

Ainsworth, M. S., & Bowlby, J. (1991). An ethological approach to personality development. *American Psychologist, 46*(4), 333. https://doi.org/10.1037/0003-066X.46.4.333

Allison, P. D. (2009). *Fixed effects regression models* (Vol. 160). SAGE.

Amato, P. R. (2000). The consequences of divorce for adults and children. *Journal of Marriage and Family, 62*(4), 1269–1287. https://doi.org/10.1111/j.1741-3737.2000.01269.x

Amato, P. R., & Anthony, C. J. (2014). Estimating the effects of parental divorce and death with fixed effects models. *Journal of Marriage and Family, 76*(2), 370–386. https://doi.org/10.1111/jomf.12100

Amato, P. R., & Hohmann-Marriott, B. (2007). A comparison of high-and low-distress marriages that end in divorce. *Journal of Marriage and Family, 69*(3), 621–638. https://doi.org/10.1111/j.1741-3737.2007.00396.x

Apel, R., & Sweeten, G. (2010). The impact of incarceration on employment during the transition to adulthood. *Social Problems, 57*(3), 448–479. https://doi.org/10.1525/sp.2010.57.3.448

Arkes, J. (2013). The temporal effects of parental divorce on youth substance use. *Substance & Misuse, 48*(3), 290–297. https://doi.org/10.3109/10826084.2012.755703

Aughinbaugh, A., Pierret, C. R., & Rothstein, D. S. (2005). The impact of family structure transitions on youth achievement: Evidence from the children of the NLSY79. *Demography, 42*(3), 447–468. https://doi.org/10.1353/dem.2005.0023

Banyard, V. L., Cross, C., & Modecki, K. L. (2006). Interpersonal violence in adolescence: Ecological correlates of self-reported perpetration. *Journal of Interpersonal Violence, 21*(10), 1314–1332. https://doi.org/10.1177/0886260506291657

Brown, S. L. (2006). Family structure transitions and adolescent well-being. *Demography*, *43*(3), 447–461. https://doi.org/10.1353/dem.2006.0021.

Brüderl, J., & Ludwig, V. (2015). Fixed-effects panel regression. In H. Best & C. Wolf (Eds.), *The SAGE handbook of regression analysis and causal inference.* Sage Publications Ltd.

Campagna, L., & Zaykowski, H. (2020). Health consequences and help-seeking among victims of crime: An examination of sex differences. *International Review of Victimology, 26*(2), 181–195. https://doi.org/10.1177/0269758019900392

CBS (2019). Welvaart in Nederland 2019. Retrieved March 12, 2024, from https://longreads.cbs.nl/welvaartinnederland-2019/bijlagen/

CBS StatLine (2023). *Overledenen; belangrijke doodsoorzaken (korte lijst), regio*. Retrieved March 12, 2024, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/80202ned/table?ts=1706462610479

Champion, H., Wagoner, K., Song, E. Y., Brown, V. K., & Wolfson, M. (2008). Adolescent date fighting victimization and perpetration from a multi-community sample: Associations with substance use and other violent victimization and perpetration. *International Journal of Adolescent Medicine and Health*, *20*(4), 419–429. https://doi.org/10.1515/IJAMH.2008.20.4.419.

Collischon, M., & Eberl, A. (2020). Let's talk about fixed effects: Let's talk about all the good things and the bad things. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *72*(2), 289–299. https://doi.org/10.1007/s11577-020-00699-8

Demuth, S., & Brown, S. L. (2004). Family structure, family processes, and adolescent delinquency: The significance of parental absence versus parental gender. *Journal of Research in Crime and Delinquency*, *41*(1), 58–81. https://doi.org/10.1177/0022427803256236.

Frisco, M. L., Muller, C., & Frank, K. (2007). Parents' union dissolution and adolescents' school performance: Comparing methodological approaches. *Journal of Marriage and Family*, *69*(3), 721–741. https://doi.org/10.1111/j.1741-3737.2007.00402.x.

Gilman, A. B., Hill, K. G., & Hawkins, J. D. (2015). When is a youth's debt to society paid? Examining the long-term consequences of juvenile incarceration for adult functioning. *Journal of Developmental and Life-Course Criminology*, *1*(1), 33–47. https://doi.org/10.1007/s40865-015-0002-5.

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

Harman, J. J., Bernet, W., & Harman, J. (2019). Parental alienation: The blossoming of a field of study. *Current Directions in Psychological Science*, *28*(2), 212–217. https://doi.org/10.1177/0963721419827271.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica*, *46*(6), 1251–1271. https://doi.org/10.2307/1913827.

Hawkins, D. N., & Booth, A. (2005). Unhappily ever after: Effects of long-term, low-quality marriages on well-being. *Social Forces*, *84*(1), 451–471. https://doi.org/10.1353/sof.2005.0103.

Hetherington, E. M., & Kelly, J. (2002). *For better or for worse: Divorce reconsidered*. Norton.

Hirschi, T. (1969). A control theory of delinquency. In F. P. Williams III, & M. D. McShane (Eds.), *Criminology theory: Selected classic readings* (pp. 289–305). Routledge.

Johnson, D. (2005). Two-wave panel analysis: Comparing statistical methods for studying the effects of transitions. *Journal of Marriage and Family*, *67*(4), 1061–1075. https://doi.org/10.1111/j.1741-3737.2005.00194.x.

Juby, H., & Farrington, D. P. (2001). Disentangling the link between disrupted families and delinquency. *British Journal of Criminology*, *41*(1), 22–40. https://doi.org/10.1093/bjc/41.1.22.

Keller, T. E., Catalano, R. F., Haggerty, K. P., & Fleming, C. B. (2002). Parent figure transitions and delinquency and drug use among early adolescent children of substance abusers. *American Journal of Drug and Alcohol Abuse*, *28*(3), 399–427. https://doi.org/10.1081/ada-120006734.

Kelly, J. B. (2000). Children's adjustment in conflicted marriage and divorce: A decade review of research. *Journal of the American Academy of Child & Adolescent Psychiatry*, *39*(8), 963–973. https://doi.org/10.1097/00004583-200008000-00007.

Kierkus, C. A., & Hewitt, J. D. (2009). The contextual nature of the family structure/delinquency relationship. *Journal of Criminal Justice*, *37*(2), 123–132. https://doi.org/10.1016/j.jcrimjus.2009.02.008.

Kroese, J., Bernasco, W., Liefbroer, A. C., & Rouwendal, J. (2021a). Growing up in single-parent families and the criminal involvement of adolescents: A systematic review. *Psychology Crime & Law*, *27*(1), 61–75. https://doi.org/10.1080/1068316X.2020.1774589.

Kroese, J., Bernasco, W., Liefbroer, A. C., & Rouwendal, J. (2021b). Single-parent families and adolescent crime: Unpacking the role of parental separation, parental decease, and being born to a single-parent family. *Journal of Developmental and Life-Course Criminology*, *7*(4), 596–622. https://doi.org/10.1007/s40865-021-00183-7.

Laible, D. J., Carlo, G., & Raffaelli, M. (2000). The differential relations of parent and peer attachment to adolescent adjustment. *Journal of Youth and Adolescence*, *29*(1), 45–59. https://doi.org/10.1023/A:1005169004882.

Ludwig, V., & Brüderl, J. (2021). What you need to know when estimating impact functions with panel data for demographic research. *Comparative Population Studies*, 46. https://doi.org/10.12765/CPoS-2021-16.

Mack, K. Y., Leiber, M. J., Featherstone, R. A., & Monserud, M. A. (2007). Reassessing the family-delinquency association: Do family type, family processes, and economic factors make a difference? *Journal of Criminal Justice*, *35*(1), 51–67. https://doi.org/10.1016/j.jcrimjus.2006.11.015.

Massoglia, M. (2008). Incarceration as exposure: The prison, infectious disease, and other stress-related illnesses. *Journal of Health and Social Behavior*, *49*(1), 56–71. https://doi.org/10.1177/002214650804900105.

Meyer, D. R., Cancian, M., & Cook, S. T. (2017). The growth in shared custody in the United States: Patterns and implications. *Family Court Review*, *55*(4), 500–512. https://doi.org/10.1111/fcre.12300.

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*(4), 674–701. https://doi.org/10.1037/0033-295X.100.4.674.

Price, C., & Kunz, J. (2003). Rethinking the paradigm of juvenile delinquency as related to divorce. *Journal of Divorce & Remarriage*, *39*(1–2), 109–133. https://doi.org/10.1300/J087v39n01_07.

Sogar, C. (2017). The influence of family process and structure on delinquency in adolescence—An examination of theory and research. *Journal of Human Behavior in the Social Environment, 27*(3), 206–214. https://doi.org/10.1080/10911359.2016.1270870

Spohn, R. E., & Kurtz, D. L. (2011). Family structure as a social context for family conflict: Unjust strain and serious delinquency. *Criminal Justice Review, 36*(3), 332–356. https://doi.org/10.1177/0734016811402495

Sun, Y., & Li, Y. (2011). Effects of family structure type and stability on children's academic performance trajectories. *Journal of Marriage and Family, 73*(3), 541–556. https://doi.org/10.1111/j.1741-3737.2011.00825.x

Vanassche, S., Sodermans, A., Matthijs, K., & Swicegood, G. (2014). The effects of family type, family relationships and parental role models on delinquency and alcohol use among Flemish adolescents. *Journal of Child & Family Studies, 23*(1), 128–143. https://doi.org/10.1007/s10826-012-9699-5

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Authors and Affiliations

Janique Kroese[1,2] · Wim Bernasco[2,8] · Aart C. Liefbroer[3,4,5] · Jan Rouwendal[6,7]

✉ Janique Kroese
j.h.kroese@vu.nl

[1] Department of Criminology, Vrije Universiteit Amsterdam, De Boelelaan 1077, Amsterdam 1081 HV, the Netherlands

[2] Netherlands Institute for the Study of Crime and Law Enforcement (NSCR), De Boelelaan 1077, Amsterdam 1081 HV, the Netherlands

[3] Netherlands Interdisciplinary Demographic Institute (NIDI-KNAW), Lange Houtstraat 19, The Hague 2511 CV, the Netherlands

[4] Department of Epidemiology, University Medical Center Groningen, University of Groningen, Hanzeplein 1, Groningen 9713 GZ, the Netherlands

[5] Department of Sociology, Vrije Universiteit Amsterdam, De Boelelaan 1105, Amsterdam 1081 HV, the Netherlands

[6] Department of Spatial Economics, Vrije Universiteit Amsterdam, De Boelelaan 1105, Amsterdam 1081 HV, the Netherlands

[7] Tinbergen Institute, Gustav Mahlerplein 117, Amsterdam 1082 MS, the Netherlands

[8] Department of Human Geography, Planning and International Development Studies, University of Amsterdam, PO Box 15629, 1001 NC Amsterdam, the Netherlands