

Article

The Impact of Family Complexity on the Risk of Developmental Delay and Socio-Emotional Difficulties in Early Childhood

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Abstract: The aim of this research is to examine how developmental progress and socio-emotional difficulties in early childhood are influenced by family complexity, and how socioeconomic status (SES) and interparental conflict influence these effects. To measure family complexity, full biological families, two-biological-parent families with half- and/or step-siblings, step-parent families, and single-parent families were separated. Dependent variables include the risk of developmental delay (based on ASQ-3) and socio-emotional difficulties (based on SDQ) at age 3. The data come from four waves of the Cohort '18 Growing Up in Hungary longitudinal birth cohort study (n = 5788). Based on the results, children in all non-intact family types have a higher risk of developmental delay than do children from full biological families, when controlled only for the basic socio-demographic characteristics of children and mothers. However, controlling for family SES or interparental conflict as well, only children raised by a step-parent have a higher risk. Considering socio-emotional difficulties, children living with their biological parents but also with half- or step-siblings, or in a single-parent family, were at higher risk, even adjusted for interparental conflict. After controlling for family SES, however, only children in single-parent families have a higher risk. Parental conflict and low family SES have significant negative effects on both child outcomes, even in intact families, and together these seem to explain the adverse effect of non-intact family types. To conclude, children's outcomes in the early years depend not only on whether they live with both their biological parents, but also on whether they are raised with half- and/or step-siblings or by a step-parent. That said, in many cases the negative impacts are due to selection effects, i.e., the fact that children of low-status parents are more likely to live in non-intact families.

Keywords: family structure; family complexity; early childhood development; socio-emotional difficulties



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1. Introduction

A large number of studies have documented the impact of family background on child development. Parental investment in children's cognitive and emotional development, well-being, and health is essential. Parental contributions include both economic resources and parental engagement. Family structure, however, influences how parents can provide these resources for their children. This conclusion is supported by a number of research projects whose findings indicate that children who spend their entire childhood in a two-biological-parent family have more positive outcomes on several dimensions than their peers living in other family structures [1–3].

Several theories have been developed to explain the impact on child development of events and changes in families. Amato provided a comprehensive summary of these theories, on which a number of studies have subsequently been based [4].

One explanation for the differences in developmental outcomes between children raised in intact and non-intact families is that children affected by the divorce/separation

of their parents suffer a loss of various resources when one parent moves out. After a divorce/separation, economic and material circumstances often deteriorate (inadequate resources theory). The child's relationship with the separating parent can weaken, since the absence of one biological parent can be related to a reduction in both parenting time and energy (parental loss theory). Research on this topic, however, shows that a well-functioning relationship between the child and the non-custodial parent can be a strong protective factor for young children. Children's cognitive development and their mental health are associated with the quality of the parental involvement of non-custodial parents [5].

After divorce/separation, custodial parents may also need to spend more time earning money and working in the household, which limits the time and energy they devote to the child (ineffective parenting theory). This can also have an adverse effect on children's development and psychological well-being.

However, children who do not grow up with both biological parents are heterogeneous: they may live in a single-parent family or in a step-family, and they may experience different sibling compositions. Some children live in a single-parent family from birth, while others experience the divorce/separation of their parents, or the loss of one parent during childhood. Some of the parents go on to form a new relationship and the child receives a step-parent. According to research findings, children growing up in single-parent families are at a disadvantage in multiple domains of child well-being, compared both to their peers living in intact families and to those living in step-families [6].

Step-parents can add to the material, social, and emotional resources in the child's family. At the same time, the relationship between the child and the step-parent is sometimes problematic and conflict-ridden. It can make the child's situation difficult if there is rivalry between adults with different parental roles. It can be difficult for step-parents to handle their step-parenthood, and it is not easy for children to relate to their step-parent, because even if they have a good relationship, the child may feel conflicted in his/her loyalty toward the separated biological parent [7]. The situation may be further complicated if the step-parent also has children from a previous partnership who live in the same or a separate household. Moreover, the biological preference theory (see, for example, [8]) states that step-parents invest less in those children living with them than do biological parents. This assumption is supported by empirical research [9]. Most studies conclude that the majority of children raised in step-families have a higher risk of lower-level outcomes than do those raised in intact families, in terms of academic, social, behavioral, and psychological well-being—something that is presumably related to the lower level of parental investment in these families [10,11].

Beyond the presence of a step-parent, sibling composition itself is also important. There is growing evidence that children raised with a half- or step-sibling often experience worse outcomes—in terms of school achievement and mental health issues—than those raised with only full siblings [12–16].

Family complexity measured at a certain point in time is an imprint of earlier parental and child life events. Of these life events, it is the divorce/separation of parents that is the most significant in terms of both impact and prevalence. Children affected by parental divorce/separation may later experience a variety of family structures, but they will most likely not live with both biological parents again. The question arises as to which of these effects is more important with regard to children's development: the fact that the divorce has taken place or the newly formed family structure in which the children continue to live. Although divorce generally has an adverse impact on children's well-being, cognitive and emotional development [17–23], it does not affect all children in the same way [24] and the negative consequences of divorce can be mitigated or amplified by a number of factors.

Studies show that interparental conflict is negatively associated with children's outcomes, including emotional, behavioral, social, and academic development, irrespective of whether the conflict precedes or follows the divorce [25–31]. High levels of conflict between parents are related to less warmth and lower-quality parenting [32], and can spill over into parent–child relationships; this is also a predictor of children's developmental

disadvantages (ineffective parental theory). The difference in well-being between children in intact and dissolved families decreases (or even vanishes) when conflict in the childhood family is controlled for [4].

It is also questionable whether the negative effects are really a consequence of divorce, or whether there are selection mechanisms (selection theory): i.e., divorce is more common in families where children's well-being and their cognitive and emotional development are already hampered, mainly due to interparental conflict or socioeconomic factors (e.g., poverty, housing problems, low level of parental education). Several studies have concluded that, after controlling for the effect of low educational attainment among parents and poor financial circumstances, the impact of family structure on cognitive outcomes is modest [33].

The detrimental short- and long-term effect of low socioeconomic status (SES) on children's health, socio-emotional well-being, and cognitive development has been reported in a large number of studies (for reviews, see [34–36]); the effects are often explained by differences in parenting practices [37]. Disrupted parenting—including insensitive, unsupportive, harsh, punitive, or over-controlling parenting behavior, low quality and quantity of time spent interacting with the child, and less provision of social and cognitive enrichment—is more common among families experiencing economic hardship and pressure, and has been linked to early childhood internalizing and externalizing problems, problems with literacy in the preschool years, and poor physical health [38]. The lower education level of parents has also been associated in previous Hungarian studies with spending less money on cognitively stimulating tools and services and less time on childcare activities [39], and with children's poorer intellectual and social development [40] and language skills [41].

As in many European countries, children's family structures in Hungary can also be complex. According to the Hungarian Microcensus 2016, in families with at least one child aged 24 or younger, the proportion of intact families was 64%; of step-families—12.4%; and of single-parent families—22.5%. Although research has shown differences between intact, step- and single-parent families in several respects [42–44], to the best of our knowledge the impact of family structure on early childhood development has not yet been studied in Hungary.

Our research uses the nationally representative sample of the Cohort '18 Growing Up in Hungary study to examine how early childhood outcomes—the risk of developmental delay and socio-emotional difficulties—are influenced by family complexity. Our concept of family complexity refers to how many parents are raising the child; to whether the parents are the biological parents of the child; and to the sibling composition in the family. The following question will be answered: Are there significant differences in the risk to children of developmental delay and socio-emotional difficulties according to their family complexity at age 3 (Q1)?

The distribution of family types differs significantly in Hungary between groups, according to the educational attainment of parents. Among parents with at most primary education, only 49.5% are intact families, 11.4% are step-families, and 39% are single-parent families, while among those with a university degree, the corresponding proportions are 73%, 11.5%, and 15.6% [45]. Since the educational attainment of parents in intact families is higher, and since parents with higher socioeconomic status invest more in their children (who in turn have more favorable outcomes), the following question arises. Are the benefits to children in full biological (intact) families due to a selection effect by high socioeconomic status, measured by parental educational attainment (Q2a), financial background (Q2b), or regional location of residence (Q2c)?

Reflecting on the literature, it is also hypothesized that if children are being raised by their biological parents, but there is intense conflict between those parents, that will have a similarly adverse effect as in families where the parents are separated. Additionally, if the biological parents do not live together, but there is no conflict between them, that can significantly reduce the negative consequences for a child not being raised exclusively by his/her biological parents. Thus, our research also examines how the relationships between family structure and child outcomes are affected by interparental conflict (Q3).

Lastly, family structure, low socioeconomic status, and interparental conflict are supposed to be interrelated. Thus, by analyzing multiple interaction effects, we investigate which of the combined patterns of family structure, educational attainment, and interparental conflict put children at highest risk of developmental delay and socio-emotional difficulties in early childhood (Q4).

2. Methods

2.1. Data

The source of data is Cohort '18 Growing Up in Hungary. This is a nationally representative, longitudinal, birth cohort study launched by the Hungarian Demographic Research Institute (HDRI) in 2017 [46–49]. The purpose of the survey is to examine the growth and development of almost 8700 children born between spring 2018 and spring 2019 from fetal age to adulthood.

The primary sampling units were the territorial health visitor districts. Thanks to the very high coverage of the Hungarian prenatal care system by health visitors (there were approximately 4000 health visitor districts in Hungary in 2017, with 98% of pregnant women having access to the service) and the relatively low rate of late fetal mortality, the sample covers almost 10% of all children born in that period in Hungary. HDRI selected 628 health visitor districts randomly, based on the expected number of live births in each of the districts (based on Hungarian Central Statistical Office (HCSO) live birth register data from 2015, 2016, and 2017), the geographical location (Budapest; Budapest agglomeration; large towns in Hungary; small- and medium-sized geographical districts), and the estimated average social status of each health visitor district (calculated from 11 relevant indicators available in the yearly reports of health visitors, such as the proportion of pregnant women requiring enhanced care for environmental reasons, the proportion of perceived child neglect and child abuse cases). The sample design also took into account the estimated response rates: 62–80% by type of settlement [50]. All of the pregnant women whose due date of delivery fell between 1 April 2018 and 30 April 2019 in the selected health visitor districts were included in the sample.

The size of the target population was around 90,000 and the final birth cohort sample was 8700. In all, 8287 women answered the questionnaire in the prenatal wave at the seventh month of pregnancy (t_1); 8241 when their child was 6 months old (t_2); 4941 when their child was 18 months old (t_3); and 5948 when their child was 3 years old (t_4). During the lockdowns due to the COVID-19 epidemic, data collection of the Cohort '18 study was suspended in waves t_3 and t_4 .

There were 383 retrospective answers during the 6-month wave regarding the pregnancy, and 115 retrospective answers during the 18-month wave regarding the birth: in the first instance, the women who responded had been unable to answer during the prenatal wave; and in the second case, they had not completed the 6-month wave questionnaire.

Health visitors interviewed the mothers during the first two waves of this study, while (after training) professional interviewers took over for the next two waves of this study. The sample of pregnant women was adjusted by a cell weighting procedure, according to maternal educational attainment, parity, official marital status, and the mother's age at birth (based on HCSO vital statistics and population event statistics), and also according to the economic development of the maternal place of residence, based on GDP [50]. The dropout rates were adjusted by weighting, too [48,49].

Participation in this study was voluntary. All participants gave HDRI their written informed consent. The reference number of the Ethical Approval of the Ethical Committee for the Cohort '18 Growing Up in Hungary Study is 2022/1, and the date of approval was 15 November 2022. The methodology of this research was also in accordance with the Helsinki Declaration and the Code of Ethics of the Hungarian Psychological Association.

In this study, we analyze the responses of mothers of 3-year-old children, who did not give birth to twins and have no missing data regarding the predictor variable. The weighted number of cases is $n = 5788$.

2.2. Measures

2.2.1. Dependent Variables: Developmental Delay and Socio-Emotional Difficulties Risk of Developmental Delay

Mothers provided answers to the 36-month Ages and Stages Questionnaire—Third edition (ASQ-3) ([51]; Hungarian adaptation: [52]) at the 3-year wave. ASQ-3 data were only included in the analyses for children aged between 34 and 39 months. This 30-item screener consisted of five 6-item subscales: communication, gross motor skills, fine motor skills, problem solving, and personal-social skills. Items were rated on a 3-point scale (10 = yes, 5 = sometimes, 0 = not yet). Missing values were replaced by the mean of the answers to the other questions on the same subscale, provided at least four items in the given developmental domain were answered. In accordance with other studies [53–55], responses were summed to compute a raw total score of between 0 and 300, with a higher score indicating more optimal development (unweighted database: min = 0, max = 300, $M = 269.73$, $SD = 35.27$, $n = 5776$; weighted database: min = 0, max = 300, $M = 269.56$, $SD = 35.63$, $n = 5698$). This total score had excellent internal consistency (Cronbach's $\alpha = 0.87$). Since there are no current population-based Hungarian cut-off values regarding ASQ-3 scores for 3-year-olds, the total score was standardized, and children who scored at least 1 SD below the mean were identified as having a risk of some developmental delay, based on the unweighted database. This approach led to the best sensitivity and specificity in a previous study [55]. Overall, based on the unweighted database, 10.7% of children ($n = 620$, total score ≤ 234.0) were identified as having a risk of developmental delay (constituting 11.0%, $n = 627$ in the weighted database).

Socio-Emotional Difficulties

The psychological adjustment of children was measured by the Strengths and Difficulties Questionnaire (SDQ) for 2–4-year olds [56] (Hungarian adaptation: [57]) during the 3-year wave. This 25-item questionnaire comprises the following 5-item subscales: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. Mothers rated the items on a 3-point scale (0 = not true, 1 = somewhat true, 2 = certainly true). Missing values were replaced by the mean of the answers to the other questions on the same subscale, provided at least three items on the given subscale were answered. Four subscales used in this study representing problem scores (emotional symptoms, conduct problems, hyperactivity/inattention, and peer problems) were summed to compute a raw total score of between 0 and 40, with a higher score indicating more socio-emotional difficulties (unweighted database: min = 0, max = 31, $M = 10.77$, $SD = 5.52$, $n = 5844$; weighted database: min = 0, max = 31, $M = 10.91$, $SD = 5.58$, $n = 5770$). This total score had good internal consistency (Cronbach's $\alpha = 0.76$). Since population-specific norms are needed to estimate the prevalence of psychological difficulties [58], and since there is no current population-based Hungarian cut-off value validated for 3-year-olds, we followed the practice of Dahlberg et al. [59], and considered the 80th percentile as the cut-off for socio-emotional difficulties (including both borderline and abnormal mental health). Hence, based on the unweighted database, 23% of children ($n = 1347$, total score ≥ 15.0) were identified as having socio-emotional difficulties (constituting 24%, $n = 1383$, in the weighted database).

2.2.2. Predictor Variable: Family Complexity

The predictor variable—i.e., family complexity in the 3-year wave—is computed by taking account of the partnership status of the cohort child's mother and the role of the cohort child within the family (living with only biological parents and siblings; with biological parents and with any kind of siblings; or with a step-father at the time of the survey wave). Thus, the categories of the family complexity index are the following:

1. Biological child, with two parents, only with full (if any) siblings (83.1%);
2. Biological child, with two parents with half- and/or step-siblings (8.4%);
3. Step-child, with two parents (1.5%);

4. Child with a single mother (7%).

2.2.3. Moderator Variables

Mother's Highest Educational Attainment

The mother's educational attainment was measured at the seventh month of pregnancy, as reported by the mother during the prenatal wave or retrospectively at the time of the 6-month wave. The three categories of educational attainment are the following: at most vocational education (corresponding to ISCED 97: 0, 1, 2, and 3C categories); secondary education (ISCED 97: 3A, 3B, and 4); and higher education (ISCED 97: 5, 6). Some 28.4% of mothers had at most vocational education; 33.9% had secondary education; and 37.6% had higher education ($n = 5788$). We do not know the educational level of seven women.

Covering Household Expenses

For evaluation of a household's financial background, we use the response to the question "How do you think your household is able to cover regular expenses?", as answered at the time of pregnancy. The six answer categories (with great difficulty, with difficulty, with some difficulty, relatively easily, easily, very easily) were grouped into four categories: very difficult or difficult (5.2%), slightly difficult (21.0%), rather easy (39.7%), and easy or very easy (33.9%) ($n = 5788$). There were 12 women who did not answer this question.

Place of Residence of the Mother at the Time of Birth

The mother's place of residence was measured at the time of pregnancy. The NUTS2 counties of Hungary were categorized into three groups based on the GDP of the county in 2018. The three categories are the following: Central Hungary, as the most developed region; developed NUTS2 counties; and less-developed NUTS2 counties [50].

Relationship Quality of the Biological Parents of the Children

The quality of the relationship between the child's biological parents was based on two measurements. The first is a computed variable for families where the mother is in partnership with the biological father. The second is based on a variable that refers to the relationship of divorced/separated parents.

In the first case, mothers filled in an 11-item version of the Gilford–Bengtson Marital Satisfaction Scale [60,61] (Hungarian adaptation: [62]) with respect to their current partnership at the time of the 3-year wave, using a self-administered questionnaire. In this analysis, a 6-item negative interaction subscale of the total scale was applied. Mothers indicated the frequency of certain negative interactions with their partner on a 5-point scale (1 = hardly ever, 2 = sometimes, 3 = fairly often, 4 = very often, 5 = always). Missing values were replaced by the mean of the answers to the other items, provided at least four questions were answered. Responses were summed to compute a raw total score of between 6 and 30, with a higher score indicating more frequent conflict (unweighted database: min = 6, max = 30, $M = 9.89$, $SD = 3.26$, $n = 5536$; weighted database: min = 6, max = 30, $M = 9.90$, $SD = 3.30$, $n = 5457$). This total score had good internal consistency (Cronbach's $\alpha = 0.76$). A total score of above 12 (i.e., a value of above "hardly ever" or "sometimes" for each item on average) indicates frequently experienced negative relationship interactions between the mother and her partner, which was interpreted as a conflictual relationship (unweighted database: 15.1%, $n = 834$; weighted database: 15.4%, $n = 839$).

Mothers who stated that they were not in a relationship with the cohort child's biological father (unweighted database: $n = 358$; weighted database: $n = 361$) evaluated their relationship quality with the biological father on a 5-point scale (1 = very bad, 2 = bad, 3 = neither good nor bad, 4 = good, 5 = very good, with additional "I don't know" and "Not applicable" response options), unless the biological father was deceased (unweighted database: 4.5%, $n = 16$; weighted database: 4.7%, $n = 17$). These seven response options were grouped into three categories: no relationship with biological father (uncertain and

not applicable responses; unweighted database: 14.3%, $n = 49$; weighted database: 15.2%, $n = 52$); non-conflictual relationship (very good, good, neither good nor bad; unweighted database: 65.8%, $n = 225$; weighted database: 63.6%, $n = 219$); and conflictual relationship (very bad or bad; unweighted database: 19.9%, $n = 68$; weighted database: 21.3%, $n = 73$).

Combining these two variables, we computed a three-value relationship quality index measuring a mother's relationship with the biological father (unweighted database: $n = 5778$; weighted database: $n = 5696$): no relationship (unweighted database: 0.8%, $n = 49$; weighted database: 0.9%, $n = 52$); non-conflictual relationship (unweighted database: 83.8%, $n = 4843$; weighted database: 83.4%, $n = 4748$); and conflictual relationship (unweighted database: 15.3%, $n = 886$; weighted database: 15.7%, $n = 896$).

2.2.4. Control Variables

Birthweight

The mean birthweight of the children was 3309.9 g (SD: 508.5 g, $n = 5748$), and 5.3% of children were born weighing less than 2500 g (i.e., with low birthweight, LBW).

Sex of the Cohort Child

We asked the mothers about the sex of the cohort child at the time of the 6-month questionnaire: the proportion of boys was 52.1% and the proportion of girls was 47.9% ($n = 5788$).

Age of the 3-Year-Old Cohort Child, in Months

The mean age of the children at the time of the 3-year data collection was 36.2 months (SD = 0.9 months). The majority of the children (89.9%) were aged 35–37 months at the time of the 3-year wave. Only 0.2% were younger than 35 months and 10.0% were older than 37 months at the time of the interview.

Maternal Age at Birth of the Cohort Child

The age of the mother at the birth of the cohort child was calculated from the dates of birth of the mother and of her child. We grouped the continuous age variable into three categories: 14–24 years (18.3%), 25–29 years (27.1%), and 30–49 years (54.6%, $n = 5788$).

Siblings in the Household, by Siblings' Age

A relative majority of 3-year-old cohort children had only older siblings living in the same household (41.4%, $n = 5788$). The second-highest proportion was made up of those children who did not have siblings in the household (31.6%). The third-highest proportion included children who had only younger siblings in the household (17.2%). Only 9.8% of mothers answered that the cohort child had both younger and older siblings living in the household.

2.3. Statistical Analyses

Our analysis includes 5862 (weighted $n = 5788$) mothers of 3-year-olds, who had a singleton pregnancy in 2018–2019 (86 mothers with more than one fetus were excluded). The outcome variables are dichotomized indexes of the risk of developmental delay of the child and of socio-emotional difficulties, based on ASQ-3 and SDQ scores (see the Measures section above). The predictor variable is the family complexity, measured using four categories (see the Measures section). First, we test the bivariate relationships between the outcome, predictor, and confounding variables, using ANOVA F-tests, the Welch robust test of equality of means, and both LSD and Tamhane multiple comparison tests. Next, we test the multivariate relationships between the predictor variable and the two outcome variables, using logistic regression analysis, controlling for several covariates. The five models tested are the following.

In Model 1, we test the main effect of family complexity, as the predictor variable, controlling for the biological and demographic characteristics of the child and the mother:

sex of the child; age of the child at the time of the 3-year interview, in months; birthweight; siblings in household, by age; age group of the mother at the time of the birth.

In Model 2, to the covariates of Model 1 we added socioeconomic variables: highest educational attainment of the mother; ease of covering household expenses; place of residence of the mother, by region. All these variables were measured during the seventh month of pregnancy.

In Model 3, to the covariates of Model 1 we added the variable that measures the partnership quality of the biological parents of the cohort child (three categories), regardless of whether or not the father was living with the mother.

In Model 4, to the Model 1 covariates we added the socioeconomic variables from Model 2 and the variable from Model 3 that measures the partnership quality of the biological parents of the cohort child.

And finally, in Model 5, we include all the variables from the previous models, also including the interaction effects between family complexity and each SES variable, between family complexity and the partnership-quality variable, and between family complexity, the highest educational attainment of the mother, and the partnership-quality variable.

We report odds ratios and margins with 95% confidence intervals. All multivariate statistical analyses were performed with Stata 14 statistical software, with logistic, margins at means and marginsplot commands, using longitudinal weights.

3. Results

3.1. Bivariate Analyses

Based on ASQ-3, 11.0% of children are at risk of developmental delay. However, this proportion differs significantly by family complexity and other characteristics. Regarding our observed variables, compared to the total sample a significantly higher proportion of step-children (25.6%) is at risk of developmental delay (Figure 1). The children of mothers who have only primary education (16.7%), who can cover the household expenses only with difficulty (17.1%), and who have either no relationship (31.8%) with the cohort child's biological father or else a conflictual relationship (17.8%) are also at higher risk of developmental delay.

Based on SDQ, 24.0% of children have socio-emotional difficulties. Compared to the total sample, a significantly higher proportion of the children have socio-emotional difficulties if they are not only living with biological siblings (30.0%), are step-children (35.8%), or are living with a single mother (40.1%) (Figure 2). The children of mothers who have only primary education (41%), who can cover the household expenses only with difficulty (45.5%), who are living in a less-developed NUTS2 region of Hungary (32.1%), and who have a conflictual relationship with the cohort child's biological father (37.4%) are also at higher risk of having socio-emotional difficulties.

3.2. Logistic Regression Analyses

We ran logistic regression analyses for the explanation of both outcomes: the risk of developmental delay (based on ASQ-3) and of socio-emotional difficulties (based on SDQ).

Our first research question was the following:

Q1: Are there significant differences in the risk to children of developmental delay and socio-emotional difficulties according to their family complexity at age 3?

The statistical models include the main biological and demographic characteristics of mothers and children as control variables. The variables that are of particular interest were included in different statistical models.

According to our results, there is a significant relationship between family complexity and the risk of child development delay, controlling for the basic biological and demographic characteristics of the child and the mother. Compared to children living in full biological families, children living as step-children within a family (i.e., in a two-parent

family with a step-father) are 2.6 times more likely to be at risk of developmental delay (Model 1a; Figure 3).

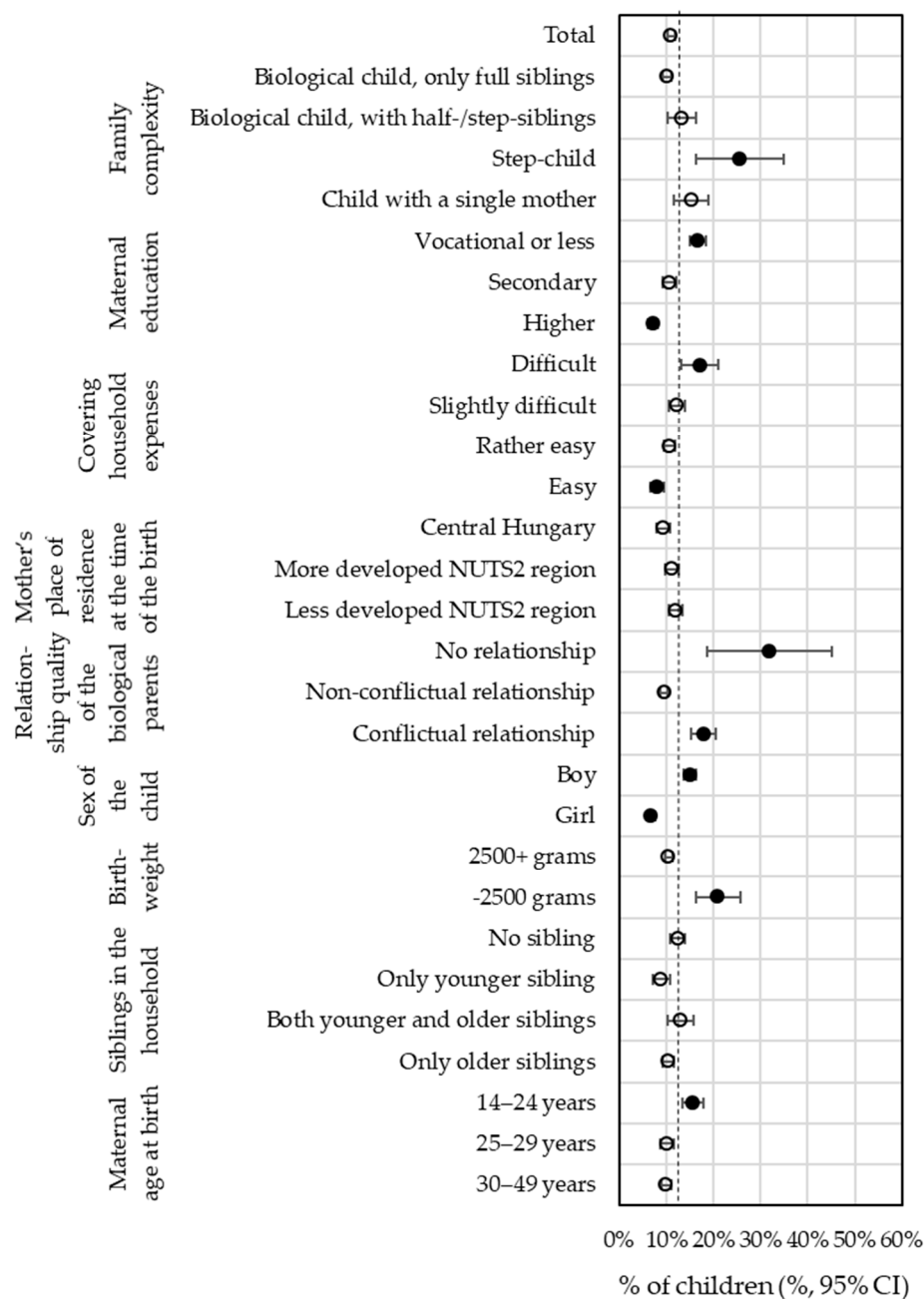


Figure 1. The proportion of 3-year-old children with a risk of developmental delay, by demographic characteristics (%; 95% CI). Note: Significant effects are marked in black. Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors' calculation.

Step-children are significantly more likely than children who live in a full biological family to be at risk of developmental delay, even if (alongside the biological and demographic characteristics of the child and the mother) we control for the socioeconomic characteristics of the mother (OR = 2.6; Model 2a; Figure 3); for the quality of the relationship between the biological parents of the child (OR = 2.1; Model 3a; Figure 3); and for both the socioeconomic characteristics and the quality of the relationship between the biological parents of the child (OR = 2.0; Model 4a; Figure 3).

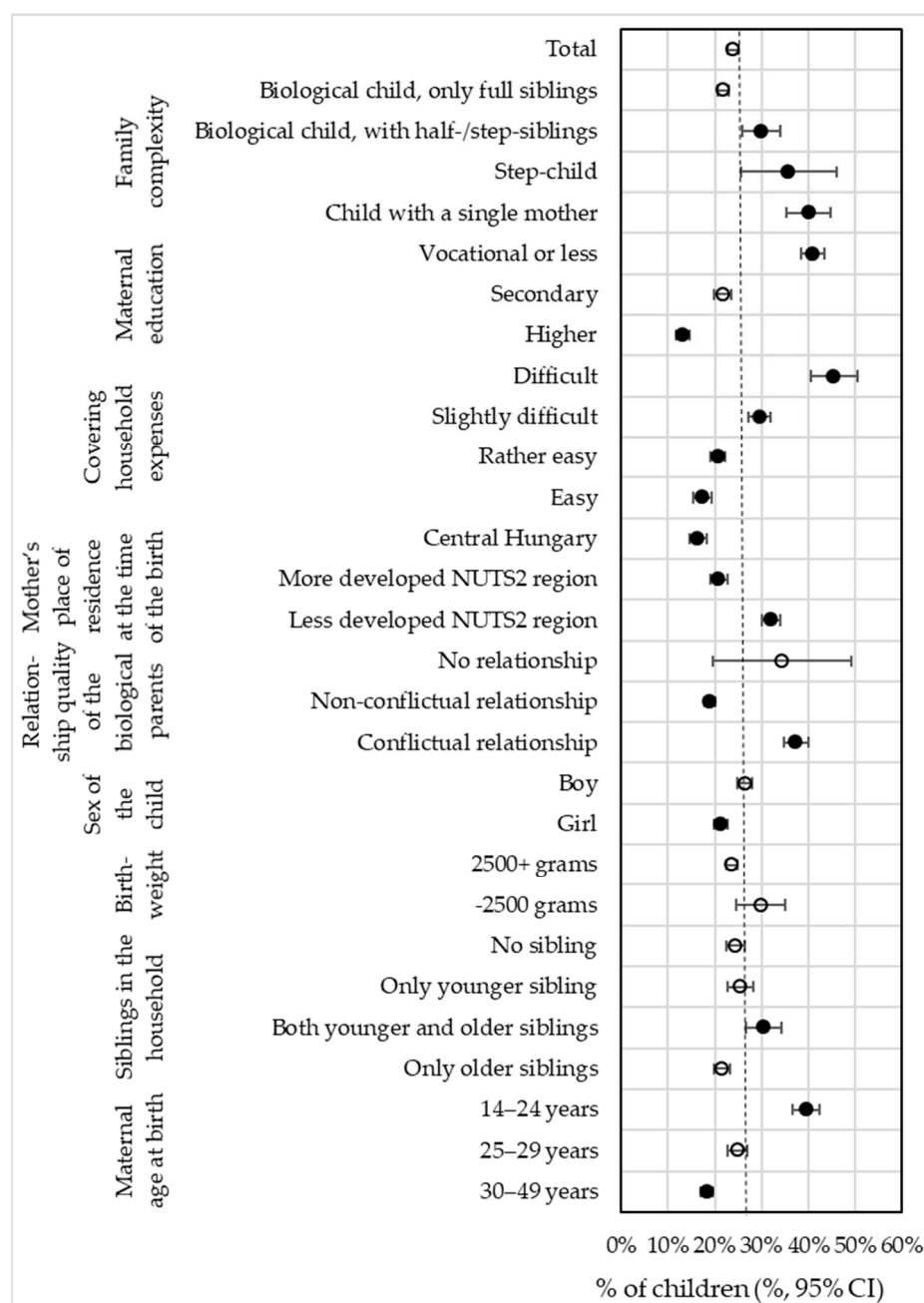


Figure 2. The proportion of 3-year-old children with socio-emotional difficulties, by demographic characteristics (%; 95% CI). Note: Significant effects are marked in black. Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors's calculation.

The relationship between the risk of developmental delay and family complexity is no more significant if we control for the socioeconomic characteristics, the quality of the relationship, and the interaction effects of these covariates (Model 5a; Figure 3). (See also Table A1).

According to our results, there is a significant relationship between family complexity and a child's socio-emotional difficulties as well, controlling for certain biological and demographic characteristics of the child and the mother. Compared again to children living in full biological families, those children who live with both biological parents, but also with step- and/or half-siblings are 1.7 times more likely to have socio-emotional difficulties, and those children who live in single-mother families are 2.1 times more likely—in both

cases controlling for the main biological and demographic characteristics of the child and the mother (Model 1b; Figure 4).

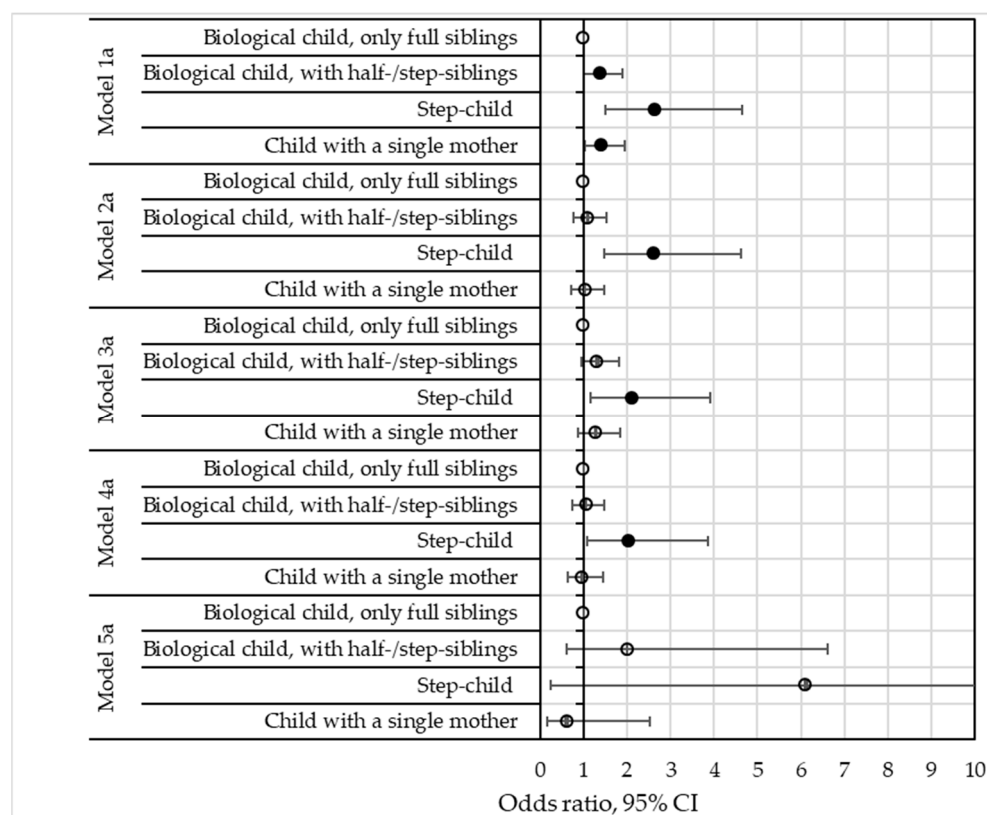


Figure 3. The effect of family complexity on the risk of developmental delay of the 3-year-old children. Notes: Significant effects are marked in black. Controlling for demographic characteristics of the child and mother (Model 1a), socioeconomic variables of the mother (Model 2a), relationship quality between the cohort child’s biological parents (Model 3a), socioeconomic variables and relationship quality between the cohort child’s biological parents (Model 4a), socioeconomic variables, relationship quality between the cohort child’s biological parents, and interaction effects (Model 5a). Odds ratios (OR) and 95% confidence intervals. See also Table A1. Source: Cohort ‘18 Growing Up in Hungary, 2017–2022. The authors’s calculation.

However, the risk of those children who live in single-mother families suffering socio-emotional difficulties is not significant in Model 5b (OR = 1.3, 95% CI: 0.4–3.8; Figure 4), controlling for interaction effects.

We should note here that the interaction effects from Model 5a are not significant (Table A1), and in all but two cases, this is also true of Model 5b. The risk of socio-emotional difficulties is OR = 0.4 (95% CI: 0.2–1.0) for the children of single mothers with a secondary level of education; and it is OR = 5.5 (95% CI: 1.4–20.6) for children living with both biological parents, but also with step- and/or half-siblings, where the mother has secondary education, and the relationship of the biological parents is conflictual (Table A2).

Q2: Are the benefits to children in full biological (intact) families due to a selection effect by high socioeconomic status, measured by parental educational attainment (Q2a), financial background (Q2b) and regional location of residence (Q2c)?

The relationships between child outcomes and the socioeconomic status—educational attainment, financial situation, and regional location of residence—of the mother were checked in models 2a, 4a, and 5a (explaining the risk of developmental delay), as well in models 2b, 4b, and 5b (explaining the risk of socio-emotional difficulties).

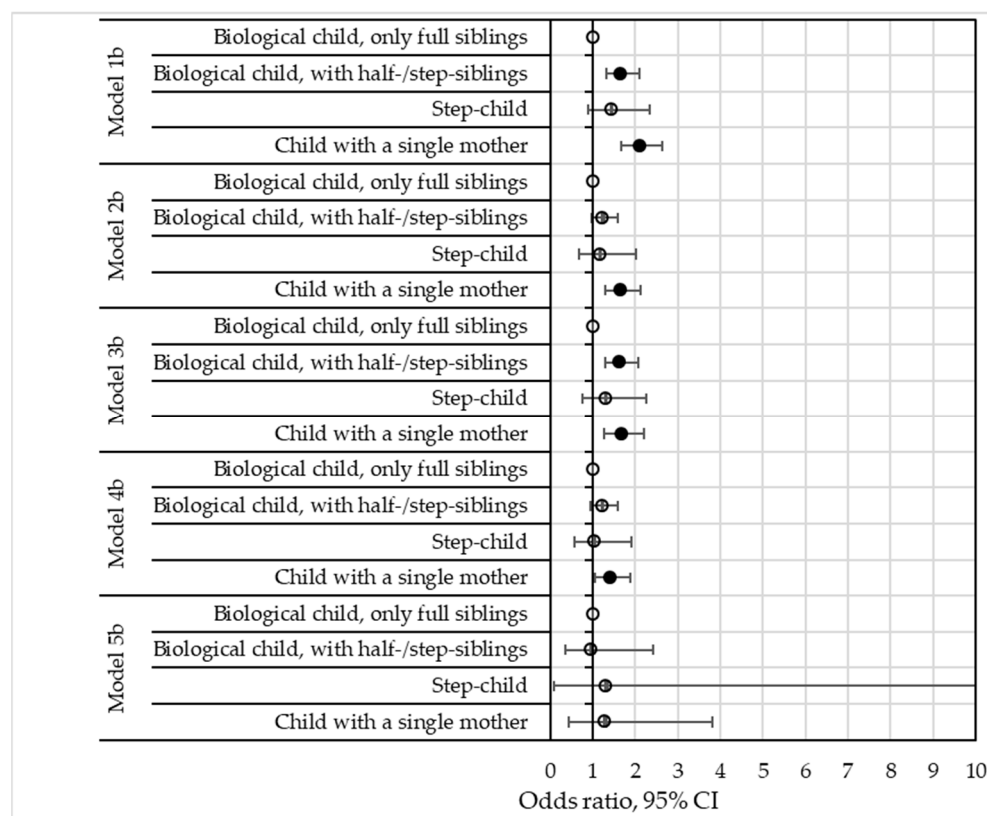


Figure 4. The effect of family complexity on the socio-emotional difficulties of the 3-year-old children. Notes: Significant effects are marked in black. Controlling for the demographic characteristics of the child and mother (Model 1b), socioeconomic variables of the mother (Model 2b), relationship quality between the cohort child’s biological parents (Model 3b), socioeconomic variables and relationship quality between the cohort child’s biological parents (Model 4b), socioeconomic variables, relationship quality between the cohort child’s biological parents, and interaction effects (Model 5b). Odds ratios (OR) and 95% confidence intervals. See also Table A2. Source: Cohort ‘18 Growing Up in Hungary, 2017–2022. The authors’s calculation.

Whereas in models unadjusted for SES, children from all types of non-intact families had a significantly higher risk of developmental delay (Model 1a, Table A1), adjusting for SES variables (Model 2a) or for SES variables and the quality of the relationship between the parents (Model 4a), only children living with step-fathers have a higher risk of developmental delay than children who live in full biological families. Thus, the impact of maternal SES “cancels out” the risk for those children with step- and/or half-siblings, and with single mothers. Moreover, family complexity no longer has a significant relationship to child development when we adjust the models for SES, parental relationship quality, and the interactions between family complexity, maternal education, and parental relationship quality (Model 5a).

The risk of socio-emotional difficulties is significantly higher for those children who live with their biological parents, but also with half- and/or step-siblings, and for those children with single mothers, unadjusted for SES variables. Controlling for SES variables, however, only the children of single mothers have a higher risk of socio-emotional difficulties (Model 2b, Model 4b, Table A2). Just as in the case of child development, family complexity no longer has a significant relationship with socio-emotional difficulties when we adjust the models for SES, parental relationship quality, and the interactions between family complexity, maternal education, and parental relationship quality (Model 5b).

It is important to note that the socioeconomic background of the family is associated with child development and socioeconomic difficulties in all the models: the higher the

mother's educational attainment, the lower the risk of her child suffering developmental delay (Model 2a, 4a, 5a) or socio-emotional difficulties (Model 2b, Model 4b, Model 5b), all covariates being equal. Similarly, the ability to cover household expenses easily or very easily significantly reduces the risk of developmental delay, all other covariates being equal, in all but the last model (in Model 2a and 4a); meanwhile, the easier it is to cover household expenses, the lower the risk of socio-emotional difficulties (Model 2b, Model 4b). The region of the mother's place of residence showed no significant relationship with the risk of the child's developmental delay, but those children who live in less-developed Hungarian regions do face a higher risk of socio-emotional difficulties.

Q3: How are the relationships between family structure and child outcomes affected by interparental conflict?

Those children who live with a step-father are at increased risk of developmental delay, even adjusted for the relationship quality of the biological parents (Model 3a, 4a). Adjusting the regression according to the quality of the relationship between the biological parents, however, "cancels out" the significant relationship between family complexity and risk of developmental delay for children who live with both parents, but also with step- and/or half-siblings, and for children who live with single mothers. As stated before, family complexity is not significantly related to child development, if we adjust the models for the quality of the relationship of the parents and for SES variables, and their interaction effects (Model 5a, Table A1).

The risk of socio-emotional difficulties remains significantly higher among children who live with their biological parents, but also with step- and/or half-siblings, as well as among children who live with single mothers after the models are adjusted for the parents' quality of relationship (Model 3b). But when adjusted both for the quality of the parental relationship and for SES variables, only the children of single mothers still have a significantly higher risk of socio-emotional difficulties than children who live in full biological families (Model 4b). As stated before, family complexity is not significantly related to socio-emotional difficulties, if we adjust the models for the quality of the relationship of the parents and for SES variables, and their interaction effects (Model 5b, Table A2).

The relationship quality of the biological parents is an important variable explaining child outcomes. A conflictual relationship between parents significantly increases the risk of developmental delay (OR = 1.9, 1.9, and 1.5 in models 3a, 4a, and 5a, respectively, Table A1) and of socio-emotional difficulties (OR = 2.7, 2.6, and 3.1 in models 3b, 4b, and 5b, respectively, Table A2) in all models. Having no relationship with the biological father has an even stronger significant effect on the risk of developmental delay (OR = 3.0, 3.3, and 5.6 in models 3a, 4a, and 5a, respectively, Table A1), while it is not associated with the child having socio-emotional difficulties.

It is important to highlight the fact that SES characteristics and the quality of the relationship between the parents have independent effects on the children's outcomes (Models 4a–5a, Models 4b–5b, Tables A1 and A2).

Q4: Which of the combined patterns of family structure, educational attainment and interparental conflict put children at highest risk of developmental delay and socio-emotional difficulties in early childhood?

In Models 5a and 5b, where the effects of family complexity on child outcomes are adjusted for SES variables, for the quality of the relationship of the parents, and for the interaction effects between each variable, family complexity no longer has any significant relationship with child outcomes. Thus, the effect of family complexity on child outcomes may be explained by the complex relationship patterns among these covariates.

If we investigate the interaction effects between family complexity, the mother's highest educational attainment (the SES variable that has the strongest effect), and the quality of the parents' relationship, we find seven groups of children—of those where the model was estimable—at significantly greater risk of developmental delay (see Table 1, Figure 5, and Table A3) than those children who live in the most "ideal" family, i.e., a full

biological family, where there is no conflict between the parents and where the mother has higher education ($M = 0.06$; 95% CI: 0.05–0.07). In full biological families, a conflictual relationship between the parents increases the risk of developmental delay across all levels of maternal education, while a low level of education is a risk factor even in non-conflictual families. For step- and single-parent families, the absence of a relationship between the biological parents carries the greatest risk, coupled with maternal education at secondary (or lower) level.

Table 1. Children with significantly higher risk of developmental delay, controlling for all covariates and their interaction (Model 5a). Source: Cohort '18 Growing Up in Hungary, 2017–2022.

Children from Different Families:	Margin	95% CI	
		Lower	Upper
<i>Biological child, only full siblings * Non-conflictual relationship * Higher education (reference group)</i>	0.06	0.05	0.07
1. Biological child, only full siblings * Non-conflictual relationship * Vocational or less	0.12	0.09	0.15
2. Biological child, only full siblings * Conflictual relationship * Vocational or less	0.17	0.12	0.23
3. Biological child, only full siblings * Conflictual relationship * Secondary	0.18	0.12	0.23
4. Biological child, only full siblings * Conflictual relationship * Higher	0.11	0.07	0.15
5. Step-children * No relationship * Secondary	0.74	0.35	1.14
6. Child with a single mother * Non-conflictual relationship * Vocational or less	0.18	0.08	0.28
7. Child with a single mother * No relationship * Vocational or less	0.56	0.25	0.86

The margin for socio-emotional difficulties of children who live in the most “ideal” family (full biological family, with no conflict between the parents and where the mother has a higher educational attainment) is 0.12 (95% CI: 0.10–0.13). There are 14 groups of children with a significantly higher risk of socio-emotional problems, compared to this “ideal” type of family background (see Table 2, Figure 6, and Table A4). Those children who live in a family where the mother has a lower level of education and where there is interparental conflict have a particularly high risk of socio-emotional difficulties—even if they are being raised by their biological parents. The children of mothers with a low level of education and who are being raised by step-fathers or single mothers have a relatively high risk as well, even if the relationship between their parents is not conflictual.

Table 2. Children with significantly higher risk of socio-economic difficulties, controlling for all covariates and their interaction (Model 5b). Note: See also Table A4. Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors’s calculation.

Children from Different Families:	Margin	95% CI	
		Lower	Upper
<i>Biological child, only full siblings * Non-conflictual relationship * Higher education (reference group)</i>	0.12	0.10	0.13
1. Biological child, only full siblings * Non-conflictual relationship * Vocational or less	0.28	0.24	0.31
2. Biological child, only full siblings * Non-conflictual relationship * Secondary	0.18	0.16	0.21
3. Biological child, only full siblings * Conflictual relationship * Vocational or less	0.54	0.47	0.61
4. Biological child, only full siblings * Conflictual relationship * Secondary	0.34	0.27	0.41
5. Biological child, only full siblings * Conflictual relationship * Higher	0.26	0.21	0.32
6. Biological child, with half-/step-siblings * Non-conflictual relationship * Vocational or less	0.31	0.22	0.39
7. Biological child, with half-/step-siblings * Conflictual relationship * Vocational or less	0.46	0.31	0.61

Table 2. Cont.

Children from Different Families:	Margin	95% CI Lower Upper	
8. Biological child, with half-/step-siblings * Conflictual relationship * Secondary	0.63	0.41	0.85
9. Step-children * Non-conflictual relationship * Vocational or less	0.47	0.22	0.73
10. Step-children * Conflictual relationship * Vocational or less	0.47	0.17	0.77
11. Child with a single mother * Non-conflictual relationship * Vocational or less	0.46	0.33	0.58
12. Child with a single mother * Conflictual relationship * Vocational or less	0.50	0.25	0.75
13. Child with a single mother * Conflictual relationship * Secondary	0.44	0.14	0.75
14. Child with a single mother * No relationship * Vocational or less	0.65	0.44	0.87

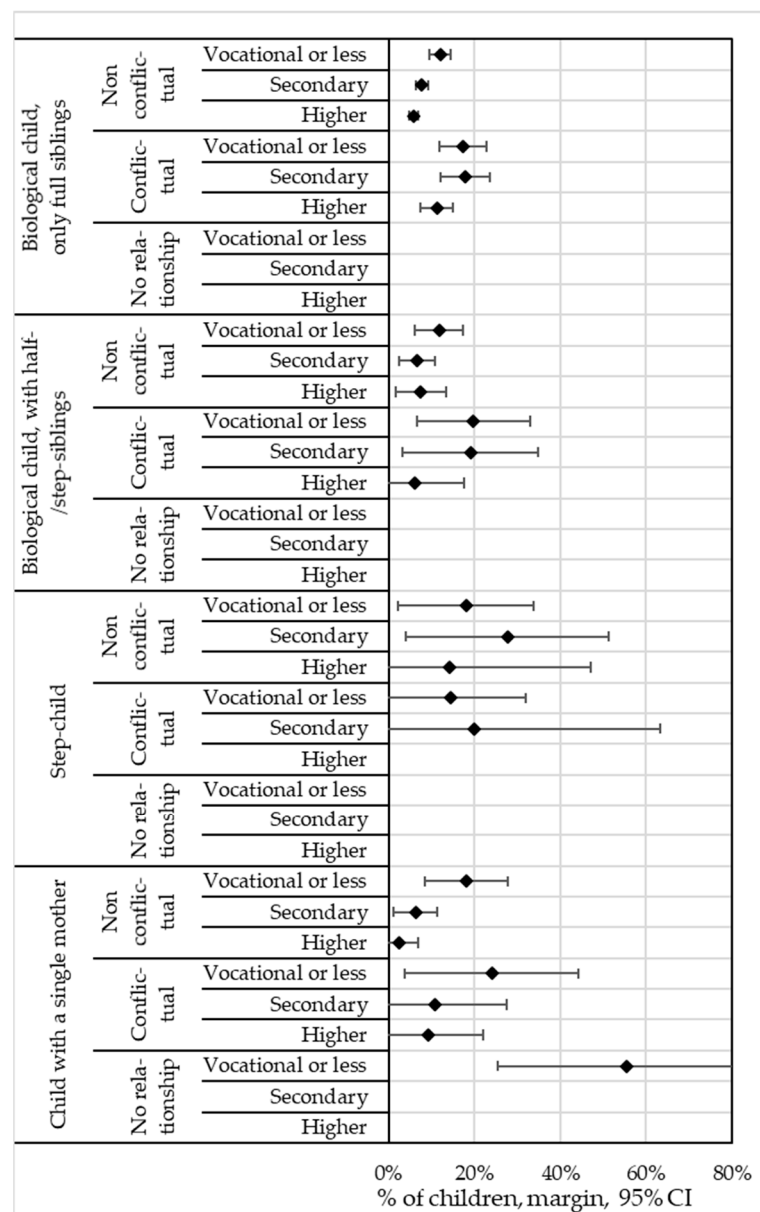


Figure 5. The risk of developmental delay—interaction effects, marginsplots (Model 5a). Note: See also Table A3. Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors's calculation.

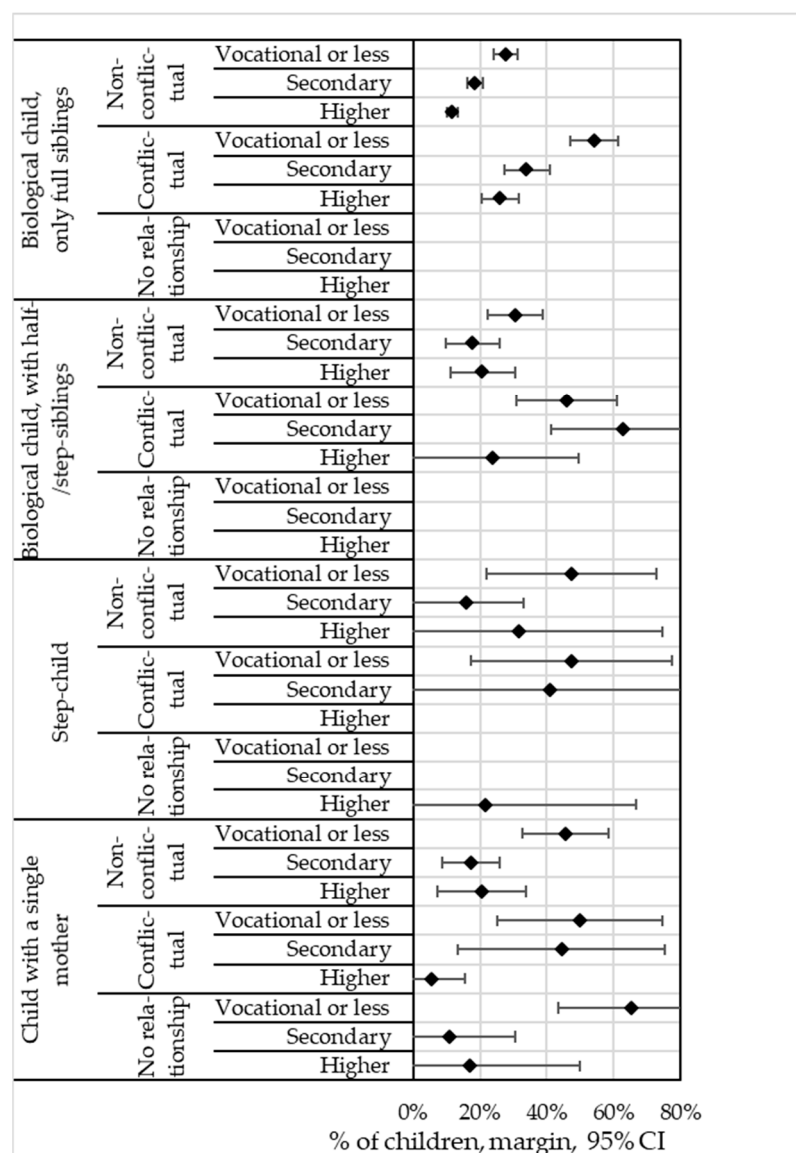


Figure 6. Socio-emotional difficulties—interaction effects, marginal differences (Model 5b). Note: See also Appendix A Table A4. Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors's calculation.

4. Discussion

In our study, we have addressed the question of how the family background of a child determines early childhood outcomes, including developmental progress and psychological adjustment. Among the family characteristics, we have focused on family structure, which we interpret in a complex manner. Our family complexity indicator takes account not only of whether a child is raised by one (single mother) or two biological parents, but also of whether there is a step-parent in the family, and whether there are children in the family who have only one of the resident parents as a biological parent. Since relatively few studies have interpreted family structure in such a complex way, this diversification of children's pathways enriches the previous literature.

In our baseline models, we analyzed the effects of family complexity on child outcomes, controlling only for the basic biological and demographic characteristics of the child and the mother. In the next steps, the socioeconomic status of the family and the quality of the relationship between the biological parents were included in the analyses.

The baseline model regarding early childhood development shows that children in all non-intact family types are at greater risk of developmental delay than are children from full biological families, which is in line with previous results [1–3,6,12,15]. In our study, those children who live with a step-father are at greatest risk of developmental delay, followed by those who live in a single-parent family and then those who do not live with only full biological siblings. However, after controlling for family SES, the effect of family complexity disappears—except for the higher risk for those children who live with step-parents. The same result is observed when interparental conflict—or both family SES and interparental conflict—is included in the models, while these characteristics themselves clearly influence the risk of developmental delay.

The fact that children growing up with a step-father are at greater risk of developmental delay than are children who live in full biological families can, on the one hand, be explained by the theory of biological preference for parental investment [8]: step-parents may invest less in the children than if they were their biological children. Compared to single mothers (among whom the developmental risk to their children seems to be attributable to low SES and conflict between the biological parents), re-partnered mothers may invest even less time in enriching activities (free play, book reading, etc.) at that young age. It could also be the case that the biological fathers reduce their financial and emotional investment in their children if the mother has re-partnered.

The baseline model of children's socio-emotional difficulties shows that, compared to the situation where a child lives in a full biological family, the risks are higher in two types of family: single-parent families (where the risk is highest) and families in which the child is the biological child of both parents, but where there are also half- and/or step-children living in the family. The elevated socio-emotional risks facing these two groups confirm previous results [1–3,6,16]. In our analyses, while adjusting for conflict between the parents did not significantly affect any of these relationships, when we include family SES (either by itself or together with conflict) then only children raised by a single mother have a higher risk of socio-emotional difficulties. The difficulties of single parents therefore have an independent impact on the socio-emotional difficulties of the child, which may be explained by the stress experienced by the family after the divorce/separation and the related loss of resources, and by the loss or weakening of the father–child relationship.

Overall, these results show that—taking family SES and interparental conflict into account—children who live with only one biological parent and a step-parent have a greater risk of developmental delay, while children in single-parent families face a higher risk of socio-emotional difficulties. This may be related to a previous finding [3] that family instability seems to matter more than family structure for cognitive outcomes—we assume that a high proportion of those children who (even at this young age) have a step-father experienced intense family instability—whereas growing up with a single mother seems to matter more than instability for behavioral problems. This, of course, does not mean that the same mechanisms are necessarily responsible for these outcomes within all step-families or all single-parent families. For children with step-parents, a smaller investment by the step-father is reasonable, for example, but it could also be the case that the biological father invests less in the separated child, because he thinks the step-father will make a bigger investment. Family instability and the quality of the child's relationships with the step-father and the biological father may also be important (here unobserved) factors that influence child outcomes just as much as they do the parenting behavior and emotional well-being of the mother herself.

Since non-intact families are heavily over-represented among families with low socioeconomic status in Hungary [45] and since low SES has an adverse effect on child outcomes [34–36], we investigated whether the benefits to children in intact families are due to a selection effect by high family SES. As mentioned before, this selection effect partly explains the differences in child development and socio-emotional difficulties by family complexity in our sample, as in some other research [6,12]. The elevated risks for children who live with both biological parents, but also with half- and/or step-siblings were

“cancelled out” by SES differences. The quality of the relationship between the biological parents—in particular, a conflictual relationship—can be another important explanatory factor [25–31]. Our research also showed that frequent conflict between the biological parents (or no relationship between them) significantly increases the risk of a child’s developmental delay and socio-emotional difficulties, and can partly explain the developmental delay of children in non-intact families.

Lastly, the inclusion of all interactions in the models—and our analysis of which of the combined patterns of family structure, educational attainment, and interparental conflict put children at greatest risk of developmental delay and socio-emotional difficulties in early childhood—produced important additional results. Above all, taking the interplays between family complexity, SES, and interparental conflict into account, family complexity in itself no longer had an impact on child development or psychological adjustment. This suggests that there are complex interactions between these variables that largely determine the differences observed between certain family structures. Identification of the most vulnerable groups pointed to the fact that a conflictual relationship between the birth parents and a low maternal level of education are important risk factors for child outcomes, even in full biological families. These factors and their coexistence have a detrimental effect for children in step-parent and single-parent families as well. For the latter families, however, the absence of a relationship between the biological parents, coupled with a secondary (or lower) level of maternal education, carried the highest risks regarding child development.

When evaluating these results, some limitations must be taken into account. First, children’s outcomes were based not on medical or psychological observations or on multiple informants, but solely on mothers’ self-reporting. Mothers’ responses may vary not only along individual lines, but also according to social patterns. For example, educational attainment can influence not only the parents’ parenting practices and the resources they draw upon to support their children, but also their ability to observe their children’s development and the problems they perceive with it. Second, given the rare occurrence of family structure changes, we could not take into account the number of changes and the time elapsed since the divorce/separation. Third, interparental relationship quality was measured differently for biological parents who were in a relationship with each other and for those who were not. Fourth, the small number of children living with a step-father leads to uncertain results, due to the low statistical power to detect significant results and the large confidence intervals observed.

We should emphasize that in our study we looked at the early stages of child development, at a point in time when the majority of children have not yet experienced significant changes in family structure or the divorce/separation of their parents. In addition, if there has been a change in the family structure, that change has most likely occurred recently, which means that we were measuring the short- or medium-term effect of a change in family structure. It may be assumed that stronger effects would be measured with respect to older children who have been living in a certain family arrangement for a longer period of time. The subsequent waves of the Cohort ’18 study will provide an opportunity to analyze the outcomes for older children. The longer observation period may also allow us to observe the effect on a child’s outcomes of a number of changes in the mother’s partnership status.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Hungarian Demographic Research Institute (reference number: 2022/1; date of approval: 15 November 2022).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Risk of developmental delay (based on ASQ-3), odds ratios and 95% CIs, and the model parameters of the logistic regression analyses.

[illegible]

Table A1. *Cont.*

Risk of Developmental Delay (Based on ASQ-3)	Model 1a.		Model 2a.		Model 3a.		Model 4a.		Model 5a.	
	OR	P > z	OR	P > z	OR	P > z	OR	P > z	OR	P > z
Biological child, only with full siblings * Higher * No relationship									1	
Biological child, with half- and/or step-siblings * Vocational or less * No relationship									1	
Biological child, with half- and/or step-siblings * Secondary * Conflictual relationship									1.046	0.956
Biological child, with half- and/or step-siblings * Secondary * No relationship									1	
Biological child, with half- and/or step-siblings * Higher * Conflictual relationship									0.315	0.357
Biological child, with half- and/or step-siblings * Higher * No relationship									1	
Step-child * Secondary * Conflictual relationship									0.488	0.696
Step-child * Secondary * No relationship									1	
Step-child * Higher * Conflictual relationship									1	
Step-child * Higher * No relationship									1	
Step-child * Secondary * Conflictual relationship									0.745	0.808
Child with a single mother * Secondary * No relationship									1	
Child with a single mother * Higher * Conflictual relationship									2.185	0.593
Child with a single mother * Higher * No relationship									1	
Constant	1352.9	0.000	2420.0	0.000	1399.3	0.000	2356.2	0.000	4348.9	0.000
Log pseudolikelihood		−1867.3		−1733.0		−1809.0		−1681.1		−1659.9
Number of obs.		5775		5490		5692		5409		5391
Wald chi2(8)		188.3		233.1		225.3		260.4		283.4
Prob > chi2		0.000		0.000		0.000		0.000		0.000
Pseudo R2		0.055		0.070		0.068		0.083		0.094

Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors' s calculation.

Table A2. Risk of socio-emotional difficulties (based on SDQ), odds ratios and 95% CIs, and the model parameters of the logistic regression analyses.

Socio-Emotional Difficulties (Based on SDQ)	Model 1b.		Model 2b.		Model 3b.		Model 4b.		Model 5b.	
	OR	P > z	OR	P > z	OR	P > z	OR	P > z	OR	P > z
Age of the mother (Ref. 25–29 years old)										
14–24 years old	1.844	0.000	1.133	0.232	1.647	0.000	1.039	0.719	1.020	0.855
30–49 years old	0.685	0.000	0.881	0.141	0.689	0.000	0.878	0.137	0.865	0.103
Sex of child (girl)	0.741	0.000	0.745	0.000	0.741	0.000	0.746	0.000	0.745	0.000
Age of child (month)	0.928	0.045	0.927	0.052	0.923	0.039	0.925	0.052	0.926	0.058
Born with LBW (yes)	1.334	0.035	0.948	0.718	1.348	0.034	0.970	0.843	0.954	0.763
Sibling composition in household by their age (Ref. No sibling)										
Only younger sibling	1.090	0.377	1.242	0.036	1.128	0.226	1.290	0.015	1.283	0.018
Both younger and older sibling	1.270	0.042	0.992	0.948	1.208	0.123	0.969	0.814	0.956	0.735
Only older sibling	0.996	0.964	0.831	0.041	0.954	0.586	0.812	0.025	0.801	0.018
Family complexity (Ref. Biological child, only full siblings)										
Biological child, with half- and/or step-siblings	1.658	0.000	1.235	0.100	1.634	0.000	1.229	0.112	0.946	0.908

Table A2. *Cont.*[illegible]

Table A2. Cont.

Socio-Emotional Difficulties (Based on SDQ)	Model 1b.		Model 2b.		Model 3b.		Model 4b.		Model 5b.	
	OR	P > z	OR	P > z	OR	P > z	OR	P > z	OR	P > z
Family complexity * Quality of relationship with biological father										
Biological child, full siblings * No relationship									1	
Biological child, half/step-siblings * Conflictual relationship									0.626	0.215
Biological child, half/step-siblings * No relationship									1	
Step-child * Conflictual relationship									0.326	0.175
Step-child * No relationship									0.741	0.890
Child with a single mother * Conflictual relationship									0.386	0.085
Child with a single mother * No relationship									1	
Educational attainment of mother * Quality of relationship with biological father										
Secondary * Conflictual relationship									0.738	0.202
Secondary * No relationship									0.259	0.265
Higher * Conflictual relationship									0.855	0.495
Higher * No relationship									0.353	0.453
Family complexity * Educational attainment of mother * Quality of relationship with biological father										
Biological child, only with full siblings * Vocational or less * No relationship									1	
Biological child, only with full siblings * Secondary * No relationship									1	
Biological child, only with full siblings * Higher * No relationship									1	
Biological child, with half- and/or step-siblings * Vocational or less * No relationship									5.461	0.012
Biological child, with half- and/or step-siblings * Secondary * Conflictual relationship									1	
Biological child, with half- and/or step-siblings * Secondary * No relationship									0.729	0.717
Biological child, with half- and/or step-siblings * Higher * Conflictual relationship									1	
Biological child, with half- and/or step-siblings * Higher * No relationship									1	
Step-child * Secondary * Conflictual relationship									4.956	0.274
Step-child * Secondary * No relationship									1	
Step-child * Higher * Conflictual relationship									1	
Step-child * Higher * No relationship									1	
Child with a single mother * Secondary * Conflictual relationship									4.388	0.106
Child with a single mother * Secondary * No relationship									1	
Child with a single mother * Higher * Conflictual relationship									0.216	0.220
Child with a single mother * Higher * No relationship									1	
Constant	4.8	0.244	13.7	0.065	5.0	0.250	11.7	0.094	11.5	0.099
Log pseudolikelihood		−3037.2		−2748.6		−2896.5		−2633.1		−2604.5
Number of obs.		5843		5551		5761		5471		5461

Table A2. Cont.

Socio-Emotional Difficulties (Based on SDQ)	Model 1b.		Model 2b.		Model 3b.		Model 4b.		Model 5b.	
	OR	P > z	OR	P > z	OR	P > z	OR	P > z	OR	P > z
Wald chi2(8)		245.1		470.2		316.6		486.9		540.9
Prob > chi2		0.000		0.000		0.000		0.000		0.000
Pseudo R2		0.044		0.089		0.061		0.100		0.109

Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors's calculation.

Table A3. Risk of developmental delay (based on ASQ-3), margins from logistic regression analysis, Model 5a, and 95% CIs.

	Delta-Method				95% CI	
	Margin	Std. Err.	z	P > z	Lower	Upper
Family complexity * Quality of relationship with biological father						
Biological child, only full siblings * Non-conflictual relationship	0.078	0.005	16.830	0.000	0.069	0.087
Biological child, only full siblings * Conflictual relationship	0.148	0.014	10.400	0.000	0.120	0.176
Biological child, only full siblings * No relationship		–				
Biological child, with half- and/or step-siblings * Non-conflictual relationship	0.082	0.017	4.940	0.000	0.049	0.114
Biological child, with half- and/or step-siblings * Conflictual relationship	0.126	0.050	2.540	0.011	0.029	0.223
Biological child, with half- and/or step-siblings * No relationship		–				
Step-child * Non-conflictual relationship	0.192	0.091	2.100	0.036	0.013	0.370
Step-child * Conflictual relationship		–				
Step-child * No relationship		–				
Child with a single mother * Non-conflictual relationship	0.058	0.024	2.430	0.015	0.011	0.106
Child with a single mother * Conflictual relationship	0.127	0.051	2.510	0.012	0.028	0.227
Child with a single mother * No relationship		–				
Family complexity * Educational attainment of mother						
Biological child, only full siblings * Vocational or less		–				
Biological child, only full siblings * Secondary		–				
Biological child, only full siblings * Higher		–				
Biological child, with half- and/or step-siblings * Vocational or less		–				
Biological child, with half- and/or step-siblings * Secondary		–				
Biological child, with half- and/or step-siblings * Higher		–				
Step-child * Vocational or less	0.175	0.068	2.560	0.011	0.041	0.309
Step-child * Secondary	0.266	0.109	2.440	0.015	0.052	0.479
Step-child * Higher		–				
Child with a single mother * Vocational or less	0.191	0.048	4.000	0.000	0.098	0.285
Child with a single mother * Secondary		–				
Child with a single mother * Higher		–				
Family complexity * Educational attainment of mother * Quality of relationship with biological father						
Biological child, only full siblings * Non-conflictual relationship * Vocational or less	0.120	0.013	9.320	0.000	0.095	0.145
Biological child, only full siblings * Non-conflictual relationship * Secondary	0.077	0.008	10.020	0.000	0.062	0.092

Table A3. Cont.

	Margin	Delta-Method			95% CI	
		Std. Err.	z	P > z	Lower	Upper
Biological child, only full siblings * Non-conflictual relationship * Higher	0.057	0.006	10.250	0.000	0.046	0.068
Biological child, only full siblings * Conflictual relationship * Vocational or less	0.172	0.028	6.190	0.000	0.118	0.227
Biological child, only full siblings * Conflictual relationship * Secondary	0.178	0.029	6.200	0.000	0.122	0.235
Biological child, only full siblings * Conflictual relationship * Higher	0.112	0.020	5.720	0.000	0.073	0.150
Biological child, only full siblings * No relationship * Vocational or less		–				
Biological child, only full siblings * No relationship * Secondary		–				
Biological child, only full siblings * No relationship * Higher		–				
Biological child, with half- and/or step-siblings * Non-conflictual relationship * Vocational or less	0.117	0.029	4.110	0.000	0.061	0.173
Biological child, with half- and/or step-siblings * Non-conflictual relationship * Secondary	0.067	0.021	3.160	0.002	0.025	0.108
Biological child, with half- and/or step-siblings * Non-conflictual relationship * Higher	0.075	0.030	2.520	0.012	0.016	0.133
Biological child, with half- and/or step-siblings * Conflictual relationship * Vocational or less	0.198	0.067	2.960	0.003	0.067	0.329
Biological child, with half- and/or step-siblings * Conflictual relationship * Secondary	0.191	0.081	2.360	0.018	0.032	0.349
Biological child, with half- and/or step-siblings * Conflictual relationship * Higher	0.060	0.059	1.020	0.307	−0.055	0.175
Biological child, with half- and/or step-siblings * No relationship * Vocational or less		–				
Biological child, with half- and/or step-siblings * No relationship * Secondary		–				
Biological child, with half- and/or step-siblings * No relationship * Higher		–				
Step-child * Non-conflictual relationship * Vocational or less	0.180	0.081	2.210	0.027	0.020	0.339
Step-child * Non-conflictual relationship * Secondary	0.277	0.121	2.300	0.022	0.041	0.514
Step-child * Non-conflictual relationship * Higher	0.141	0.168	0.840	0.404	−0.189	0.471
Step-child * Conflictual relationship * Vocational or less	0.145	0.089	1.630	0.104	−0.030	0.320
Step-child * Conflictual relationship * Secondary	0.198	0.222	0.890	0.373	−0.238	0.634
Step-child * Conflictual relationship * Higher		–				
Step-child * No relationship * Vocational or less	0.387	0.289	1.340	0.180	−0.179	0.954
Step-child * No relationship * Secondary	0.743	0.201	3.700	0.000	0.349	1.137
Step-child * No relationship * Higher		–				
Single mother * Non-conflictual relationship * Vocational or less	0.181	0.049	3.670	0.000	0.085	0.278
Single mother * Non-conflictual relationship * Secondary	0.062	0.026	2.390	0.017	0.011	0.113
Single mother * Non-conflictual relationship * Higher	0.023	0.024	0.970	0.330	−0.023	0.070
Single mother * Conflictual relationship * Vocational or less	0.240	0.103	2.330	0.020	0.038	0.443
Single mother * Conflictual relationship * Secondary	0.107	0.086	1.240	0.215	−0.062	0.276

Table A3. *Cont.*

	Delta-Method				95% CI	
	Margin	Std. Err.	z	P > z	Lower	Upper
Single mother * Conflictual relationship * Higher	0.091	0.066	1.370	0.170	−0.039	0.221
Single mother * No relationship * Vocational or less	0.555	0.154	3.620	0.000	0.255	0.856
Single mother * No relationship * Secondary		–				
Single mother * No relationship * Higher		–				

Note: – not estimable. Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors's calculation.

Table A4. Risk of socio-emotional difficulties (based on SDQ), margins from logistic regression analysis, Model 5b, and 95% CIs.

	Delta-Method				95% CI	
	Margin	Std. Err.	z	P > z	Lower	Upper
Family complexity * Quality of relationship with biological father						
Biological child, only full siblings * Non-conflictual relationship	0.176	0.007	26.880	0.000	0.163	0.189
Biological child, only full siblings * Conflictual relationship	0.359	0.020	18.070	0.000	0.320	0.398
Biological child, only full siblings * No relationship		–				
Biological child, with half- and/or step-siblings * Non-conflictual relationship	0.221	0.028	7.920	0.000	0.166	0.276
Biological child, with half- and/or step-siblings * Conflictual relationship	0.424	0.082	5.180	0.000	0.264	0.584
Biological child, with half- and/or step-siblings * No relationship		–				
Step-child * Non-conflictual relationship	0.290	0.095	3.060	0.002	0.104	0.476
Step-child * Conflictual relationship		–				
Step-child * No relationship		–				
Child with a single mother * Non-conflictual relationship	0.248	0.038	6.480	0.000	0.173	0.323
Child with a single mother * Conflictual relationship	0.234	0.085	2.760	0.006	0.068	0.401
Child with a single mother * No relationship	0.240	0.108	2.230	0.026	0.029	0.452
Family complexity * Educational attainment of mother						
Biological child, only full siblings * Vocational or less		–				
Biological child, only full siblings * Secondary		–				
Biological child, only full siblings * Higher		–				
Biological child, with half- and/or step-siblings * Vocational or less		–				
Biological child, with half- and/or step-siblings * Secondary		–				
Biological child, with half- and/or step-siblings * Higher		–				
Step-child * Vocational or less		–				
Step-child * Secondary		–				
Step-child * Higher		–				
Child with a single mother * Vocational or less	0.463	0.062	7.510	0.000	0.342	0.584
Child with a single mother * Secondary	0.204	0.045	4.550	0.000	0.116	0.292
Child with a single mother * Higher	0.167	0.053	3.130	0.002	0.063	0.272
Family complexity * Educational attainment of mother * Quality of relationship with biological father						
Biological child, only full siblings * Non-conflictual relationship * Vocational or less	0.277	0.018	15.470	0.000	0.242	0.312

Table A4. Cont.

	Margin	Delta-Method			95% CI	
		Std. Err.	z	P > z	Lower	Upper
Biological child, only full siblings * Non-conflictual relationship * Secondary	0.185	0.012	15.750	0.000	0.162	0.208
Biological child, only full siblings * Non-conflictual relationship * Higher	0.118	0.008	14.940	0.000	0.103	0.133
Biological child, only full siblings * Conflictual relationship * Vocational or less	0.541	0.037	14.780	0.000	0.469	0.613
Biological child, only full siblings * Conflictual relationship * Secondary	0.340	0.035	9.700	0.000	0.272	0.409
Biological child, only full siblings * Conflictual relationship * Higher	0.261	0.028	9.280	0.000	0.206	0.316
Biological child, only full siblings * No relationship * Vocational or less		–				
Biological child, only full siblings * No relationship * Secondary		–				
Biological child, only full siblings * No relationship * Higher		–				
Biological child, with half- and/or step-siblings * Non-conflictual relationship * Vocational or less	0.305	0.042	7.180	0.000	0.222	0.388
Biological child, with half- and/or step-siblings * Non-conflictual relationship * Secondary	0.179	0.041	4.410	0.000	0.099	0.258
Biological child, with half- and/or step-siblings * Non-conflictual relationship * Higher	0.208	0.050	4.190	0.000	0.111	0.306
Biological child, with half- and/or step-siblings * Conflictual relationship * Vocational or less	0.459	0.077	5.960	0.000	0.308	0.610
Biological child, with half- and/or step-siblings * Conflictual relationship * Secondary	0.629	0.110	5.700	0.000	0.413	0.845
Biological child, with half- and/or step-siblings * Conflictual relationship * Higher	0.241	0.130	1.860	0.063	−0.013	0.495
Biological child, with half- and/or step-siblings * No relationship * Vocational or less		–				
Biological child, with half- and/or step-siblings * No relationship * Secondary		–				
Biological child, with half- and/or step-siblings * No relationship * Higher		–				
Step-child * Non-conflictual relationship * Vocational or less	0.473	0.129	3.660	0.000	0.219	0.726
Step-child * Non-conflictual relationship * Secondary	0.158	0.088	1.800	0.072	−0.014	0.330
Step-child * Non-conflictual relationship * Higher	0.317	0.218	1.460	0.145	−0.110	0.745
Step-child * Conflictual relationship * Vocational or less	0.474	0.153	3.100	0.002	0.174	0.774
Step-child * Conflictual relationship * Secondary	0.408	0.243	1.680	0.093	−0.068	0.884
Step-child * Conflictual relationship * Higher		–				
Step-child * No relationship * Vocational or less		–				
Step-child * No relationship * Secondary		–				
Step-child * No relationship * Higher	0.216	0.230	0.940	0.347	−0.234	0.667
Child with a single mother * Non-conflictual relationship * Vocational or less	0.455	0.066	6.950	0.000	0.327	0.583
Child with a single mother * Non-conflictual relationship * Secondary	0.172	0.044	3.900	0.000	0.086	0.259

Table A4. Cont.

	Delta-Method				95% CI	
	Margin	Std. Err.	z	P > z	Lower	Upper
Child with a single mother * Non-conflictual relationship * Higher	0.204	0.067	3.020	0.003	0.071	0.336
Child with a single mother * Conflictual relationship * Vocational or less	0.498	0.126	3.940	0.000	0.250	0.746
Child with a single mother * Conflictual relationship * Secondary	0.445	0.158	2.820	0.005	0.135	0.754
Child with a single mother * Conflictual relationship * Higher	0.053	0.052	1.030	0.305	−0.048	0.154
Child with a single mother * No relationship * Vocational or less	0.654	0.112	5.850	0.000	0.435	0.873
Child with a single mother * No relationship * Secondary	0.109	0.101	1.080	0.280	−0.089	0.306
Child with a single mother * No relationship * Higher	0.170	0.168	1.010	0.313	−0.160	0.500

Note: – not estimable. Source: Cohort '18 Growing Up in Hungary, 2017–2022. The authors's calculation.

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