

# Long-term Health and Social Outcomes in Children and Adolescents Placed in Out-of-Home Care

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**IMPORTANCE** Children who are placed in out-of-home care may have poorer outcomes in adulthood, on average, compared with their peers, but the direction and magnitude of these associations need clarification.

**OBJECTIVE** To estimate associations between being placed in out-of-home care in childhood and adolescence and subsequent risks of experiencing a wide range of social and health outcomes in adulthood following comprehensive adjustments for preplacement factors.

**DESIGN, SETTING, AND PARTICIPANTS** This cohort and cosibling study of all children born in Finland between 1986 and 2000 (N = 855 622) monitored each person from their 15th birthday either until the end of the study period (December 2018) or until they migrated, died, or experienced the outcome of interest. Cox and Poisson regression models were used to estimate associations with adjustment for measured confounders (from linked population registers) and unmeasured familial confounders (using sibling comparisons). Data were analyzed from October 2020 to August 2021.

**EXPOSURES** Placement in out-of-home care up to age 15 years.

**MAIN OUTCOMES AND MEASURES** Through national population, patient, prescription drug, cause of death, and crime registers, 16 specific outcomes were identified across the following categories: psychiatric disorders; low socioeconomic status; injuries and experiencing violence; and antisocial behaviors, suicidality, and premature mortality.

**RESULTS** A total of 30 127 individuals (3.4%) were identified who had been placed in out-of-home care for a median (interquartile range) period of 1.3 (0.2-5.1) years and 2 (1-3) placement episodes before age 15 years. Compared with their siblings, individuals who had been placed in out-of-home care were 1.4 to 5 times more likely to experience adverse outcomes in adulthood (adjusted hazard ratio [aHR] for those with a fall-related injury, 1.40; 95% CI, 1.25-1.57 and aHR for those with an unintentional poisoning injury, 4.79; 95% CI, 3.56-6.43, respectively). The highest relative risks were observed for those with violent crime arrests (aHR, 4.16; 95% CI, 3.74-4.62; cumulative incidence, 24.6% in individuals who had been placed in out-of-home care vs 5.1% in those who had not), substance misuse (aHR, 4.75; 95% CI, 4.25-5.30; cumulative incidence, 23.2% vs 4.6%), and unintentional poisoning injury (aHR 4.79; 95% CI, 3.56-6.43; cumulative incidence, 3.1% vs 0.6%). Additional adjustments for perinatal factors, childhood behavioral problems, and traumatic injuries, including experiencing violence, did not materially change the findings.

**CONCLUSIONS AND RELEVANCE** Out-of-home care placement was associated with a wide range of adverse outcomes in adulthood, which persisted following adjustments for measured preplacement factors and unmeasured familial factors.

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Globally, it has been estimated that more than 3.2 million children reside in institutional settings on an annual basis.<sup>1</sup> At least 660 000 children in the US<sup>2</sup> are annually part of the foster care system with direct federal costs for child protective services reaching nearly \$30 billion per year.<sup>3</sup> Similarly, approximately 1 million children in European Union countries<sup>4</sup> receive out-of-home care services. Despite efforts to compensate for early adverse home environments, systematic reviews<sup>5,6</sup> of nonexperimental studies have consistently found that children placed in out-of-home care are far more likely than their peers to be unemployed, develop psychiatric disorders, engage in antisocial behaviors, and to die prematurely in adulthood. However, whether these associations reflect causal effects of the out-of-home placement or whether they can be explained by background risk factors that predate such placement has not been sufficiently accounted for in previous work.

Out-of-home placement aggregates in families,<sup>7</sup> and many parental risk markers<sup>8,9</sup> are at least moderately heritable, including low socioeconomic status,<sup>10-12</sup> antisocial behaviors,<sup>13,14</sup> and psychiatric disorders.<sup>15</sup> Sibling comparison designs wherein risks of long-term outcomes are compared between biological full siblings who were differentially exposed to out-of-home care allow researchers to account for time-stable unmeasured familial confounders, including shared early-life environments and around half of cosegregating genes.<sup>16</sup> The few existing sibling comparison studies on the effects of out-of-home care have reached mixed conclusions<sup>17,18</sup> and require replication in considerably larger samples. Mixed findings have similarly been reported in studies using other designs.<sup>19-22</sup> Large-scale studies examining the effect of placement across the entire period of childhood and adolescence as well as those examining differences between foster care and institutional care placement within sibships are lacking.

To examine associations between out-of-home care placement and health and social outcomes in adulthood while accounting for preexisting risk markers, we used a sibling control design in the entire population of Finland born between 1986 and 2000, which included more than 885 000 individuals and 622 000 siblings. We monitored these individuals for a mean (range) of 9 (9.0-10.3) years to investigate 16 objectively measured social and health outcomes while accounting for an extensive set of measured and unmeasured familial and individual-level confounders. We were also able to study the relative contributions of age at placement, care type, number of placement episodes, and duration of care with rigorous controls for preplacement confounders.

## Methods

Our target study population included all individuals born in Finland between 1986 and 2000 who were alive and resided in Finland at age 15 years, which represented the baseline of the study. A total of 903 951 individuals were included in this population. All Finnish residents are assigned a personal identification number, which is used in different nationwide registers and provides accurate linkage.<sup>23</sup> The Board of Statisti-

## Key Points

**Question** What is the risk of experiencing adverse social and health outcomes in adulthood among children and adolescents placed in out-of-home care?

**Findings** In this cohort study, risk of adverse social and health outcomes in adulthood were elevated 1.4- to 5-fold among children placed in out-of-home care compared with their siblings who had never been placed in out-of-home care. By comparing differentially exposed siblings, the study was able to account for shared genetic and environmental preplacement factors.

**Meaning** Although it may be necessary to remove children from parents who expose them to severe maltreatment, neglect, or abuse, out-of-home care placement is associated with important outcomes that need careful review.

cal Ethics of Statistics Finland granted permission to use pseudonymized data. Finnish law does not require informed consent for register-based studies. The study was approved by the Ethics Board of Statistics Finland.

We identified children who were placed in out-of-home care from the Child Welfare Register maintained by the Finnish Institute for Health and Welfare, which includes data on all placement episodes since January 1991, including earlier episodes for those who were placed at any point after January 1990. The population registers maintained by Statistics Finland provided data on sociodemographic factors and migration dates between January 1987 and December 2018. Mortality dates and underlying and contributory causes based on *International Classification of Diseases, Ninth Revision (ICD-9)* and *ICD-10* were derived from the Causes of Death Register, which is maintained by Statistics Finland and has excellent coverage (greater than 99%).<sup>24</sup> Diagnoses of unintentional injuries, self-harm, and psychiatric and substance use disorders were retrieved from the Care Register for Health Care maintained by the Finnish Institute for Health and Welfare, which includes all inpatient care episodes (*ICD-8*, *ICD-9*, and *ICD-10*), and specialist outpatient visits (*ICD-10*). Similarly, we identified all reimbursed psychotropic drug purchases, classified according to the Anatomical Therapeutic Chemical system from the Prescription Drug Register (January 2001 to December 2018), maintained by the Social Insurance Institution of Finland. All individuals with criminal arrests from January 2001 to December 2017 were identified using police record registers maintained by Statistics Finland. Owing to the sensitive nature of the crime data, we were given access to annual arrest dates, which we subsequently set to December 31 for each year.

From the target sample of 903 951 individuals (a flowchart of all subsamples can be found in eFigure 1 in the Supplement), we excluded 9585 individuals who were missing data on their biological parents and 8744 who were placed in out-of-home care for the first time after their 15th birthday. Our analytical sample therefore retained 98.0% of the target sample of 885 622. We monitored participants from their 15th birthday until the first of the following events: the individual experienced the outcome of interest, migrated, died, or was alive

at the end of the follow-up period (December 2017 for the outcomes derived from patient and crime registers and December 2018 for the outcomes derived from the population and prescription drug registers).

We categorized individuals who had been placed in out-of-home care by child welfare services at least once before their 15th birthday as having been exposed to out-of-home care. There are 4 main types of out-of-home care settings in Finland: family foster care (kinship or nonrelative care), professional group homes, institutional care, and other or unclassified care. We assigned each child to the type of care setting to which they had been exposed for the longest period.

We examined a total of 16 outcomes that allowed us to comprehensively assess specific dimensions of health, social, and behavioral functioning across 4 categories. Psychiatric disorders included any inpatient episode or outpatient visit associated with any diagnosis of a severe mental illness (defined as schizophrenia-spectrum disorder and bipolar disorder);<sup>25</sup> depression; anxiety; or personality disorder (ICD codes in eTable 1 in the [Supplement](#); diagnostic validity in eAppendix 1 in the [Supplement](#)). Low socioeconomic status encompassed low education, which indicated that the individual had not achieved secondary school qualifications by the end of the study (not available for 53 730 individuals born in 2000); welfare benefits, which denoted whether the individual had received means-tested social assistance benefits; long-term unemployment, which indicated whether the individual had received unemployment benefits for a minimum of 6 months in a given year; and disability pension, which denoted whether the individual had received benefits because of work incapacity. Injuries and experiencing violence included any inpatient episode, outpatient visit, or death associated with any diagnosis for an unintentional motor vehicle-related injury, fall-related injury, unintentional poisoning injury, or assault. Antisocial behaviors, suicidality, and premature mortality included violent crime arrest (penal codes in eTable 2 in the [Supplement](#)),<sup>26</sup> substance misuse (eg, a substance use disorder diagnosis, an arrest for a drug-related crime, or a prescription for medications used to treat substance use disorders; Anatomical Therapeutic Chemical codes in eTable 3 in the [Supplement](#)), suicidal behavior (a diagnostic code for suicide attempt or a completed suicide), and premature mortality, which indicated whether the individual died by the end of the study period (December 2018).

### Data Analysis

We quantified the associations between being placed in out-of-home care and subsequent risk of long-term adverse outcomes by fitting Cox regression models with age as the primary time scale and adjusting for sex, birth year, and birth order. We treated the low educational attainment outcome as a binary measure by fitting a corresponding robust Poisson regression model. The associations were therefore either expressed as hazard ratios or rate ratios. We subsequently accounted for familial confounding by fitting stratified Cox regression models (or the analogous fixed-effects robust Poisson regression model for low educational attainment), where we allowed the baseline hazards to vary across clusters of biologi-

cal full siblings using a fixed-effects estimator.<sup>16</sup> This approach allowed us to compare outcome rates between 16 774 differentially exposed siblings in the same families (ie, where 1 sibling was placed in out-of-home care and cosiblings were not), a design that indirectly accounted for all time-invariant unmeasured familial confounders (eg, approximately half of the cosegregating genes and shared childhood environments). To additionally account for familial confounders that potentially varied between siblings, we further adjusted these models for the following covariates measured at offspring birth or age 1 year for those born in 1986 (definitions in eTable 4 in the [Supplement](#)): urbanicity, single-parent household, parental age, family income, parental long-term unemployment, welfare benefits, and disability pension. Complementary sensitivity analyses are described in eAppendix 2 in the [Supplement](#).

In a subset of families where all children ( $n = 11\,092$ ) had been placed in out-of-home care, we tested for the following placement characteristics: care setting (eg, foster care vs institutional care), number of placement episodes, duration of care summed across all episodes (binary measure, age 5 to 15 years vs birth to age 4 years), and age at first placement (binary measure, age 12 to 15 years vs birth to age 11 years). We refitted the sibling models presented above using these factors as covariates in the model. We further accounted for measured preplacement factors by adjusting for specific traumatic injuries, neurodevelopmental and neurological disorders, and behavioral problems (eAppendix 2 in the [Supplement](#)). The estimates were determined to be statistically significant if their false discovery rate-corrected  $P$  values were less than .05.<sup>27</sup>

## Results

Our nationwide sample included a total of 885 662 children, of whom 433 088 (48.9%) were female and 452 574 (51.1%) were male. The mean (SD) age at the end of follow-up was 25.1 (4.2) years. A total of 30 127 (3.4%) children had been placed in out-of-home care at least once before reaching age 15 years. These children had a median (interquartile range) of 2 (1-3) placements during the exposure period, which lasted for a median (interquartile range) of 1.3 (0.2-5.1) years accumulated across all placement episodes. Compared with their peers who had never been placed in out-of-home care, children who had been placed in out-of-home care experienced more psychosocial adversities and socioeconomic disadvantages ([Table 1](#)). We monitored individuals for a mean (range) of 9.4 (9.0-10.3) years across outcomes ([Table 2](#)). Children placed in out-of-home care had considerably higher unadjusted cumulative incidence rates of adverse outcomes compared with their peers.

We initially found that the children placed in out-of-home care were between approximately 1.5 times (adjusted hazard ratio [aHR] for those with a fall-related injury, 1.53; 95% CI, 1.48-1.58) and 7 times (aHR for those receiving welfare benefits, 6.80; 95% CI, 6.71-6.89) more likely than their peers to meet criteria for adverse outcomes following adjustments for sex, birth year, and birth order ([Figure](#)). We subsequently adjusted for familial confounders by comparing full siblings who were differentially exposed to out-of-home care, which al-

Table 1. Sociodemographic Characteristics of the Study Population (N = 885 622)

Characteristic	No. (%)	
	Never placed in out-of-home care (n = 855 495)	Placed in out-of-home care at least once by age 15 y (n = 30 127)
Offspring demographic characteristics		
Sex		
Female	417 912 (48.9)	14 883 (49.4)
Male	437 583 (51.1)	15 244 (50.6)
Birth year		
1986-1990	291 941 (34.1)	7706 (25.6)
1991-1995	299 217 (35.0)	10 569 (35.1)
1996-2000	264 337 (30.9)	11 852 (39.3)
Birth order		
First	357 020 (41.7)	12 320 (40.9)
Second	291 823 (34.1)	8893 (29.5)
Third	133 158 (15.6)	4949 (16.4)
Fourth or higher	73 494 (8.6)	3965 (13.2)
Urbanicity		
Urban	495 676 (57.9)	21 485 (71.3)
Semiurban	134 043 (15.7)	3519 (11.7)
Rural	225 776 (26.4)	5123 (17.0)
Parental sociodemographic factors measured at offspring birth		
Immigrant background	38 634 (4.5)	2971 (9.9)
Teenage mother at birth	13 953 (1.6)	2164 (7.2)
Teenage father at birth	3309 (0.4)	645 (2.1)
Single-parent household	48 560 (5.7)	6836 (22.7)
Highest parental educational attainment		
Primary	59 368 (6.9)	8515 (28.3)
Secondary	604 362 (70.6)	19 884 (66.0)
Tertiary	191 765 (22.4)	1728 (5.7)
Family income in the bottom quintile	159 904 (18.7)	15 653 (52.0)
Social assistance benefits	107 903 (12.6)	16 034 (53.2)
Disability pension	5560 (0.6)	1461 (4.8)
Lifetime parental history of psychiatric disorders		
Severe mental illness	38 899 (4.5)	7143 (23.7)
Depression	124 219 (14.5)	13 947 (46.3)
Anxiety	65 140 (7.6)	7552 (25.1)
Personality disorder	31 059 (3.6)	8221 (27.3)
Lifetime parental history of injury and experiencing violence		
Motor vehicle-related injury	102 853 (12.0)	6500 (21.6)
Fall-related injury	297 527 (34.8)	14 976 (49.7)
Unintentional poisoning injury	13 327 (1.6)	2174 (7.2)
Experiencing violence	24 742 (2.9)	5445 (18.1)
Lifetime parental history of antisocial behaviors and suicidality		
Violent crime arrest	98 537 (11.5)	15 636 (51.9)
Substance misuse	81 466 (9.5)	15 006 (49.8)
Suicidal behavior	39 869 (4.7)	8102 (26.9)
Offspring neurodevelopmental disorders and behavioral problems, birth to age 15 y		
Attention-deficit/hyperactivity disorder	12 297 (1.4)	3088 (10.2)
Intellectual disability	4771 (0.6)	654 (2.2)
Autism spectrum disorder	5570 (0.7)	944 (3.1)

(continued)

Table 1. Sociodemographic Characteristics of the Study Population (N = 885 622) (continued)

Characteristic	No. (%)	
	Never placed in out-of-home care (n = 855 495)	Placed in out-of-home care at least once by age 15 y (n = 30 127)
Communication disorders	20 100 (2.3)	1741 (5.8)
Learning disorders	11 681 (1.4)	1492 (5.0)
Motor disorders	8502 (1.0)	804 (2.7)
Other neurodevelopmental disorders	2267 (0.3)	354 (1.2)
Any neurological condition	31 738 (3.7)	1887 (6.3)
Conduct disorder or oppositional defiant disorder	7253 (0.8)	6138 (20.4)
Offspring history of injury and experiencing violence, birth to age 15 y		
Motor vehicle-related injury	14 883 (1.7)	902 (3.0)
Fall-related injury	64 723 (7.6)	3302 (11.0)
Unintentional poisoning injury	5572 (0.7)	1153 (3.8)
Experiencing violence	668 (0.1)	278 (0.9)

lowed us to account for all time-invariant unmeasured familial confounders. We additionally adjusted these models for several measured sociodemographic confounders, such as parental age or family income at birth, that varied between the siblings. In these analyses, we found that those who were placed in out-of-home care remained between 1.4 times (aHR for those with a fall-related injury, 1.40; 95% CI, 1.25-1.57) and 5 times (aHR for those with an unintentional poisoning injury, 4.79; 95% CI, 3.56-6.43) more likely than their siblings to meet criteria for the outcomes (Figure). The highest relative risks were observed for those with violent crime arrests (aHR, 4.16; 95% CI, 3.74-4.62; cumulative incidence, 24.6% in individuals who had been placed in out-of-home care vs 5.1% in those who had not), substance misuse (aHR, 4.75; 95% CI, 4.25-5.30; cumulative incidence, 23.2% vs 4.6%), and unintentional poisoning injury (aHR 4.79; 95% CI, 3.56-6.43; cumulative incidence, 3.1% vs 0.6%). In complementary sensitivity analyses, we found no evidence of systematic differences by sex (eFigure 2 in the Supplement). We obtained consistent results when we restricted the study group to cohorts born after 1990 for whom data on out-of-home placement covered all childhood years (eFigure 3 in the Supplement), used alternative outcome definitions (eFigure 4 in the Supplement), and measured out-of-home care placement up to age 21 years instead of age 15 years (eFigure 5 in the Supplement). Further adjustments for measured confounders and mediators, such as perinatal risks, neurodevelopmental disorders, problem behaviors, and injuries at birth to age 15 years, did not materially alter the presented findings (eFigure 6 in the Supplement). Although psychosocial and behavioral profiles varied between children who had been placed in out-of-home care and who were included in the sibling comparison models and those who were not (eTable 5 in the Supplement), we found that the crude associations were similar in the sibling and single-child family subsets (eFigure 7 in the Supplement), and we obtained commensurate results when we compared all children who had been placed in out-of-home care with their cousins who had not to account for unmeasured familial confounding in extended families (eFigure 8 in the Supplement).

A total of 11 092 children who were placed in out-of-home care had siblings who had all been placed in out-of-home care. Within this sample, we found that children who were primarily placed in institutional care settings had, compared with their siblings who were placed in foster care settings, a 1.3- to 2.3-fold increase in risk of being diagnosed with a severe mental illness or depression, having low educational attainment, receiving welfare benefits, and being arrested for violent crime (aHRs or adjusted rate ratio range, 1.29-2.33) (Table 3). We also found that each additional placement episode was associated with a 7% to 18% increased rate of being diagnosed with a severe mental illness or depression, having a fall-related injury, receiving welfare benefits, and engaging in antisocial or suicidal behaviors (aHRs or adjusted rate ratio, 1.07-1.18) (Table 3), whereas the duration of placement was not associated with any of the outcomes. Age 12 to 15 years at first placement was associated with a 2-fold increased risk of a subsequent motor vehicle-related injury (aHR, 1.98; 95% CI, 1.21-3.23) but none of the other outcomes. We found similar results when we restricted these analyses to those born after 1990 to account for left-truncation bias (eTable 6 in the Supplement).

## Discussion

In this nationwide cohort study more than 885 000 Finnish children, we examined the associations between being in out-of-home care at any time from birth until age 15 with a range of adverse health and social outcomes in adulthood. We monitored individuals for an average of nearly a decade from their 15th birthdays and examined differentially exposed full siblings to account for various sources of confounding. We report 3 principal findings.

First, we found that being placed in out-of-home care was associated with all examined outcomes, including important morbidities, such as common psychiatric disorders, suicidality, and injury, as well as premature mortality. In addition, risks of behavioral outcomes, such as experiencing violence and

Table 2. Person-Time at Risk, Number of Individuals, Cumulative Incidence Rate, and Incidence Rates per 1000 Person-Years Across Children Placed and Never Placed in Out-of-Home Care

Variable	Person-time at risk, y		Individuals, No.	Cumulative incidence rate, % (95% CI)	Incidence rate per 1000 person-years (95% CI)
	Total, No.	Mean (SD) per person			
<b>Psychiatric disorder</b>					
<b>Severe mental illness</b>					
All individuals	8 334 509	9.4 (4.3)	17 619	1.99 (1.96-2.02)	2.11 (2.08-2.15)
Never placed	8 087 744	9.5 (4.3)	15 220	1.78 (1.75-1.81)	1.88 (1.85-1.91)
Placed	246 765	8.2 (4.2)	2399	7.96 (7.66-8.27)	9.72 (9.34-10.12)
<b>Depression</b>					
All individuals	8 051 027	9.1 (4.4)	68 592	7.75 (7.69-7.80)	8.52 (8.46-8.58)
Never placed	7 833 007	9.2 (4.4)	61 571	7.20 (7.14-7.25)	7.86 (7.80-7.92)
Placed	218 020	7.2 (4.5)	7021	23.30 (22.83-23.79)	32.20 (31.45-32.97)
<b>Anxiety</b>					
All individuals	8 193 183	9.3 (4.3)	49 923	5.64 (5.59-5.69)	6.09 (6.04-6.15)
Never placed	7 956 497	9.3 (4.3)	44 957	5.26 (5.21-5.30)	5.65 (5.60-5.70)
Placed	236 686	7.9 (4.4)	4966	16.48 (16.07-16.91)	20.98 (20.40-21.57)
<b>Personality disorder</b>					
All individuals	8 369 072	9.4 (4.3)	12 701	1.43 (1.41-1.46)	1.52 (1.49-1.54)
Never placed	8 118 380	9.5 (4.3)	10 922	1.28 (1.25-1.30)	1.35 (1.32-1.37)
Placed	250 691	8.3 (4.1)	1779	5.91 (5.64-6.18)	7.10 (6.77-7.43)
<b>Injuries and experiencing violence</b>					
<b>Motor vehicle-related injury</b>					
All individuals	8 177 305	9.2 (4.4)	43 873	4.95 (4.91-5.00)	5.37 (5.32-5.42)
Never placed	7 929 272	9.3 (4.4)	41 591	4.86 (4.82-4.91)	5.25 (5.19-5.30)
Placed	248 032	8.2 (4.3)	2282	7.57 (7.28-7.88)	9.20 (8.83-9.59)
<b>Fall-related injury</b>					
All individuals	8 004 936	9.0 (4.4)	80 455	9.08 (9.02-9.14)	10.05 (9.98-10.12)
Never placed	7 763 262	9.1 (4.4)	76 663	8.96 (8.90-9.02)	9.88 (9.81-9.95)
Placed	241 674	8.0 (4.2)	3792	12.59 (12.21-12.97)	15.69 (15.20-16.20)
<b>Unintentional poisoning injury</b>					
All individuals	8 396 751	9.5 (4.3)	5619	0.63 (0.62-0.65)	0.67 (0.65-0.69)
Never placed	8 141 948	9.5 (4.3)	4693	0.55 (0.53-0.56)	0.58 (0.56-0.59)
Placed	254 803	8.5 (4.2)	926	3.07 (2.88-3.27)	3.63 (3.40-3.88)
<b>Experiencing violence</b>					
All individuals	8 366 590	9.4 (4.3)	12 094	1.37 (1.34-1.39)	1.45 (1.42-1.47)
Never placed	8 113 670	9.5 (4.3)	10 547	1.23 (1.21-1.26)	1.30 (1.28-1.32)
Placed	252 920	8.4 (4.1)	1547	5.13 (4.89-5.39)	6.12 (5.82-6.43)
<b>Low socioeconomic status</b>					
<b>Low education</b>					
All individuals	NA	NA	96 401	11.59 (11.52-11.66)	NA
Never placed	NA	NA	83 804	10.42 (10.36-10.49)	NA
Placed	NA	NA	12 597	45.30 (44.72-45.89)	NA
<b>Welfare benefits</b>					
All individuals	7 962 682	9.0 (4.4)	239 763	27.07 (26.98-27.17)	30.11 (29.99-30.23)
Never placed	7 809 323	9.1 (4.4)	216 421	25.30 (25.21-25.39)	27.71 (27.60-27.83)
Placed	153 358	5.1 (3.0)	23 342	77.48 (77.00-77.95)	152.21 (150.26-154.17)
<b>Long-term unemployment</b>					
All individuals	8 382 883	9.5 (4.2)	201 325	22.73 (22.65-22.82)	24.02 (23.91-24.12)

(continued)

**Table 2. Person-Time at Risk, Number of Individuals, Cumulative Incidence Rate, and Incidence Rates per 1000 Person-Years Across Children Placed and Never Placed in Out-of-Home Care (continued)**

Variable	Person-time at risk, y		Individuals, No.	Cumulative incidence rate, % (95% CI)	Incidence rate per 1000 person-years (95% CI)
	Total, No.	Mean (SD) per person			
Never placed	8 151 165	9.5 (4.2)	188 211	22.00 (21.91-22.09)	23.09 (23.99-23.19)
Placed	231 719	7.7 (3.6)	13 114	43.53 (42.97-44.09)	56.59 (55.63-57.57)
Disability pension					
All individuals	9 165 601	10.3 (4.3)	20 634	2.33 (2.30-2.36)	2.25 (2.22-2.28)
Never placed	8 888 410	10.4 (4.3)	18 512	2.16 (2.13-2.19)	2.08 (2.05-2.11)
Placed	277 191	9.2 (4.2)	2122	7.04 (6.76-7.34)	7.66 (7.33-7.99)
Antisocial behaviors, suicidality, and premature mortality					
Violent crime arrest					
All individuals	8 099 044	9.1 (4.3)	50 676	5.72 (5.67-5.77)	6.26 (6.20-6.31)
Never placed	7 885 955	9.2 (4.3)	43 252	5.06 (5.01-5.10)	5.48 (5.43-5.54)
Placed	213 089	7.1 (4.4)	7424	24.64 (24.16-25.13)	34.84 (34.05-35.64)
Substance misuse					
All individuals	9 015 945	10.2 (4.4)	46 040	5.20 (5.15-5.25)	5.11 (5.06-5.15)
Never placed	8 768 714	10.2 (4.3)	39 063	4.57 (4.52-4.61)	4.45 (4.41-4.50)
Placed	247 230	8.2 (4.5)	6977	23.16 (22.68-23.64)	28.22 (27.56-28.89)
Suicidal behavior					
All individuals	8 363 776	9.4 (4.3)	13 457	1.52 (1.49-1.55)	1.61 (1.58-1.64)
Never placed	8 114 516	9.5 (4.3)	11 311	1.32 (1.30-1.35)	1.39 (1.37-1.42)
Placed	249 260	8.3 (4.2)	2146	7.12 (6.84-7.42)	8.61 (8.25-8.98)
Premature mortality					
All individuals	8 425 900	9.5 (4.3)	3901	0.44 (0.43-0.45)	0.46 (0.45-0.48)
Never placed	8 166 370	9.5 (4.3)	3494	0.41 (0.40-0.42)	0.43 (0.41-0.44)
Placed	259 530	8.6 (4.1)	407	1.35 (1.22-1.49)	1.57 (1.42-1.73)

Abbreviation: NA, not applicable.

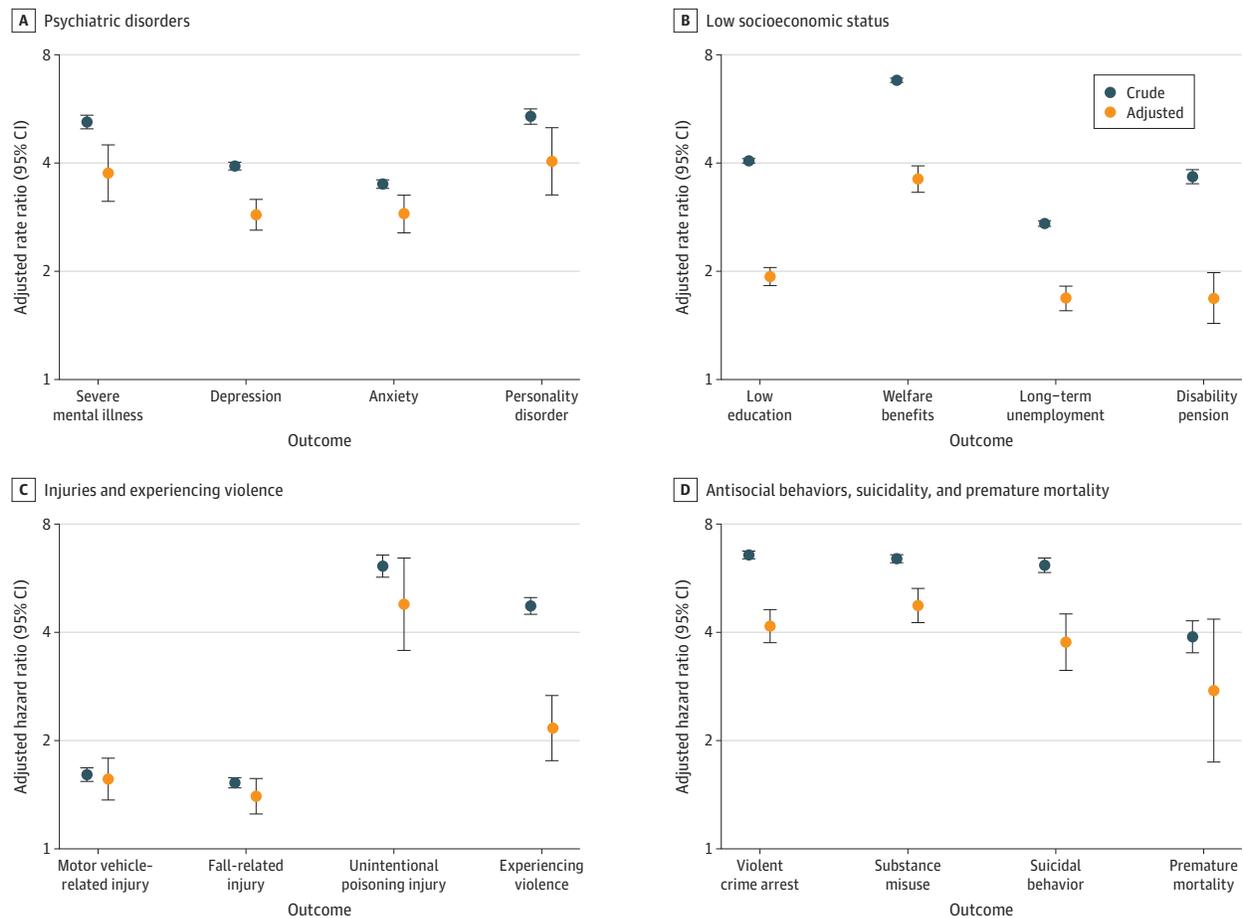
antisocial behaviors, were increased. We confirmed and replicated these findings by examining siblings who had never been placed in out-of-home care as comparators, which allowed us to account for an aggregate of all familial confounders that were shared between the siblings (eg, early family environments and genetic risks). These analyses indicated that out-of-home placement was associated with a 1.4- to 5-fold increased risk of the outcomes with the largest effect sizes being observed for violent crime arrests and poisoning injuries. In terms of absolute risks, those placed in out-of-home care had cumulative incidence rates of 24.6% for violent crime arrests and 3.1% for poisoning injuries compared with 5.1% and 0.6% among those who had never been placed in out-of-home care. Various sensitivity analyses ruled out common sources of bias and suggested that the main findings were consistent over varying economic periods.

Two previous studies, based on a total of 1384 siblings and examining within-family associations between long-term foster care placement and social and health outcomes in adulthood, found that those who were placed either did not differ from their siblings or had worse outcomes.<sup>17,18</sup> However, the limited statistical power in these studies likely explains the lack of associations. Investigations using other natural experimental approaches, such as child welfare policy reforms<sup>19</sup> and ro-

tationally assigned child welfare investigators,<sup>20,28,29</sup> have reported mixed results. An advantage of our study compared with these is that we were able to study the placement trajectories of the individuals in our sample throughout their entire childhood and adolescence to obtain more precise estimates of the associations with a large number of health and social outcomes in adulthood.

Second, children who were primarily placed in institutional care were around twice as likely as their siblings who were placed in foster care settings to experience 5 of the tested long-term outcomes. Although consistent with the literature,<sup>30</sup> our study was also able to replicate the findings with careful adjustments for preplacement behavioral problems and traumatic injuries in addition to duration of care, placement instability, age at first placement, and familial confounders. The increased rates of adverse outcomes observed in children placed in institutionalized care cannot therefore be solely attributed to their preplacement behavioral problems. Instead, our findings suggest that environmental factors within the institutions may contribute to the risk increases, which could include peer influences, child-to-caregiver ratio, staff turnover, and training.<sup>31,32</sup> The specific etiological relevance of these factors needs clarification in large-scale quasiexperimental studies to inform the development of effective inter-

Figure. Associations Between Any Out-of-Home Placement Episode (Birth to Age 15 Years) and Poor Functioning in Adulthood



All models were adjusted for sex, birth year, and birth order. The crude models were fitted to the entire sample (N = 885 622). The adjusted models refer to within-family estimates comparing differentially exposed siblings (eg, families in which at least 1 sibling was placed and any of their cosiblings were not;

n = 16 774). The latter models were further adjusted for parental age at birth, urbanicity, single-parent household, family income, parental welfare benefits, and disability pension.

ventions. Although we did not have access to data on the reasons for institutional placement, a US-based study<sup>33</sup> found that nearly one-third of children who had been placed in restrictive care were placed there for reasons unrelated to their behavior. Our findings therefore emphasize that foster care placement should be prioritized and the quality of care improved.

Each additional placement episode was associated with an increased risk of many of the examined outcomes, whereas the duration of placement was not. To our knowledge, this is the first study that has demonstrated that the associations between placement instability and long-term outcomes remain following adjustments for shared unmeasured familial confounding. This finding is potentially important as children placed in out-of-home care had experienced a median of 2 different placements before reaching age 15 years. Reducing the risks of placement instability should therefore be considered, and could include the following strategies: comprehensive assessments of the needs of the children in care (eg, symptoms of posttraumatic stress and behavioral problems) to inform early interventions, improved strategies to match children with

placement settings that meet the needs of the child at the outset, and improved training for caregivers to reduce the risks of conflicts.<sup>34</sup>

The strengths of our study included the use of Finnish national registers that allowed us to study 16 objectively measured outcomes in adulthood among more than 885 000 individuals, of whom approximately 30 000 had been placed in out-of-home care. To our knowledge, this is the first study to adjust for unmeasured familial confounding by adopting the full-sibling comparison design in a sample with negligible selection bias. Importantly, we were able to estimate the relative contributions of placement characteristics, including care settings, the number of placement episodes, duration of care, and age at first placement.

**Limitations**

This study has limitations. First, we cannot rule out the impact of residual genetic confounding as biological full siblings only share, on average, half of their cosegregating genes.<sup>16</sup> However, even if we were to assume that such confounders

**Table 3. Out-of-Home Care Placement Characteristics on Poor Adulthood Functioning Among Siblings in Families Where All Children Had Been Exposed to at Least 1 Placement Episode (n = 11 092)**

Characteristic	aHR/aRR (95% CI) <sup>a</sup>			
	Institutional care vs foster care	No. of episodes	Long-term placement	Age at first placement (12-15 y vs 0-11 y)
<b>Psychiatric disorders</b>				
Severe mental illness	2.33 (1.38-3.94) <sup>b</sup>	1.09 (1.02-1.16) <sup>b</sup>	1.58 (1.00-2.48)	1.51 (0.98-2.34)
Depression	1.54 (1.14-2.09) <sup>b</sup>	1.07 (1.03-1.12) <sup>b</sup>	0.84 (0.62-1.13)	0.92 (0.70-1.21)
Anxiety	1.50 (1.04-2.16)	1.02 (0.97-1.08)	0.94 (0.66-1.34)	1.12 (0.80-1.59)
Personality disorder	1.96 (0.96-3.99)	1.10 (1.01-1.20)	1.10 (0.60-2.02)	1.16 (0.65-2.06)
<b>Injuries and violence</b>				
Motor vehicle-related injury	1.41 (0.87-2.30)	0.99 (0.91-1.07)	0.82 (0.48-1.40)	1.98 (1.21-3.23) <sup>b</sup>
Fall-related injury	1.03 (0.69-1.53)	1.12 (1.05-1.20) <sup>b</sup>	0.80 (0.55-1.18)	1.12 (0.77-1.62)
Unintentional poisoning injury	1.62 (0.65-4.06)	1.09 (0.96-1.24)	1.44 (0.51-4.10)	0.80 (0.31-2.09)
Experiencing violence	1.35 (0.71-2.57)	1.07 (0.99-1.16)	1.10 (0.60-2.01)	1.07 (0.60-1.91)
<b>Socioeconomic status</b>				
Low education	1.29 (1.08-1.54) <sup>b</sup>	1.02 (1.00-1.05)	0.96 (0.81-1.14)	1.03 (0.88-1.21)
Welfare benefits	1.94 (1.37-2.75) <sup>b</sup>	1.09 (1.03-1.15) <sup>b</sup>	0.89 (0.63-1.27)	1.17 (0.87-1.56)
Long-term unemployment	1.21 (0.93-1.58)	1.03 (1.00-1.07)	0.93 (0.72-1.21)	0.90 (0.71-1.14)
Disability pension	1.35 (0.79-2.33)	1.06 (0.97-1.15)	1.51 (0.88-2.58)	1.04 (0.60-1.80)
<b>Antisocial behaviors and suicidality</b>				
Violent crime arrest	2.23 (1.59-3.13) <sup>b</sup>	1.18 (1.11-1.24) <sup>b</sup>	1.05 (0.77-1.44)	1.27 (0.94-1.72)
Substance misuse	1.44 (1.05-1.99)	1.13 (1.07-1.19) <sup>b</sup>	1.13 (0.84-1.54)	1.09 (0.81-1.46)
Suicidal behavior	1.34 (0.78-2.31)	1.11 (1.03-1.19) <sup>b</sup>	1.32 (0.77-2.27)	1.21 (0.73-2.02)

Abbreviations: aHR, adjusted hazard ratio; aRR, adjusted rate ratio.

<sup>a</sup> The estimates refer to within-family estimates comparing siblings who had been placed in care but were differentially exposed to placement characteristics. The estimates were further adjusted for sex, birth year, birth order, parental age at birth, urbanicity, single-parent household, family income, parental welfare benefits, and disability pension in addition to the following preplacement confounders: attention-deficit/hyperactivity disorder; autism spectrum disorder; intellectual disability; communication disorder; learning disorder; motor disorder; other neurodevelopmental disorders; any neurological disorder, conduct disorder, or oppositional defiant disorder; motor vehicle-related injury, fall-related injury, unintentional poisoning injury, and experiencing violence. The estimates for premature mortality as outcome lacked sufficient statistical power to be presented.

<sup>b</sup> Estimates with false discovery rate-corrected *P* values below .05.

would have attenuated the reported sibling estimates by half, the magnitude of the associations would remain large. Second, despite our large sample size, we were underpowered to examine premature mortality as an outcome in some of the analyses. Third, although we carefully attempted to account for behavioral problems by adjusting for clinical diagnoses of conduct and oppositional defiant disorders in addition to neurodevelopmental disorders, we were unable account for less severe problems that did not meet clinical criteria for such conditions. Given the negligible attenuation of the reported associations following adjustments for severe behavioral problems, it seems unlikely that less severe measures would have stronger explanatory power. Although clinical studies are warranted to explore this possibility, we note that alternative approaches to measuring behavioral traits, such as self-reporting, commonly result in selection bias and measurement error, the latter of which further inflates in sibling comparison designs and typically causes artificial reductions of the associations.<sup>35</sup>

The generalizability of our findings is an important consideration. The cumulative exposure to out-of-home care placement up to age 18 years is similar between Finland (5.8%)<sup>36</sup> and the US (5.9%),<sup>37</sup> but lower estimates have been reported in other high-income countries.<sup>38</sup> Although direct cross-country comparisons remain challenging owing to large differences in selection factors into out-of-home care and the specific services offered in care,<sup>39</sup> the weight of the evidence

suggests that being placed in out-of-home care is associated with poorer long-term outcomes in high-income countries.<sup>5,6,40</sup> Large-scale and genetically informative replication efforts in other countries are nevertheless warranted to investigate whether the magnitude of these associations vary between countries.

## Conclusions

In this nationwide Finnish cohort study, we found that children who were placed in out-of-home care were more likely than their siblings who had never been placed to meet criteria for multiple adverse health and social outcomes in adulthood, even after adjustments for preplacement behavioral problems, traumatic incidents, and family background. Institutionalization and placement instability further contributed to the risks of many of the outcomes. While children who have been placed in out-of-home care have, on average, considerably worse outcomes in adulthood than their peers and siblings, it is important to bear in mind that many children lead better lives as a result of having been placed in out-of-home care. Our findings therefore suggest that out-of-home care placement should remain a last resort intervention, and efforts should be directed toward to improving the quality of care and reducing institutional placement and placement instability.

## ARTICLE INFORMATION

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