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Childhood out-of-home placement and pathways to adult socioeconomic outcomes

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Abstract

Background: We aimed to first, estimate the association of early childhood out-of-home placement with adult income and reliance on social welfare, and second, to test whether, and to what extent, mental health problems in adolescence/young adulthood and primary school grade point average (GPA) explain these associations.

Method: We used linked registers of all 59,476 births in Finland in 1987. Children who were first placed between the ages 2-6 years were selected as our exposure-group. Outcomes measured in adulthood (26-28 years) were low income (i.e. <11,000US\$ annual income during ≥ 2 of 3 years) and social welfare use (i.e. >3 months of annual social welfare during ≥ 2 of 3 years). Putative mediators were mental health problems (i.e., psychiatric diagnoses from inpatient/outpatient visits) at ages 18-25 years, and Grade Point Average (GPA). To account for background differences, we matched placed to non-placed children using propensity score matching on parental (e.g., psychiatric diagnoses, education) and child characteristics (e.g., neurodevelopmental problems, prematurity).

Results: Of 54,814 children with complete data, 386 (0.71%) experienced placement (384 were matched). At ages 26-28, placed children had greater odds than never-placed children of low income (OR, 1.74; CI, 1.31-2.32) and social welfare (OR, 2.09; CI, 1.34-3.04). We found significant indirect effects of out-of-home placement on social welfare use via mental health problems (proportion mediated, 22%) and GPA (proportion mediated 11%), and on low income via mental health problems only (proportion mediated, 34%).

Conclusions: Prevention of mental health problems and increased school support for children who experienced out-of-home placement may effectively reduce poor adult socioeconomic outcomes associated with placement.

Keywords: out-of-home placement, foster care, socioeconomic outcome, mental health, mediation

Introduction

Placement in out-of-home care is an extreme measure taken by child protection agencies to safeguard children's wellbeing where parents are deemed unsuitable to provide a safe and nourishing environment.. Although rare, out-of-home placement concerns a significant number of children. For example, in Europe, more than a million children are placed out-of-home, including residential care institutions, foster homes, and kinship care.¹ In Finland, a country with a strong family support orientation in which placement is used as a last-resort measure, 6% of children born in 1999 experiences out-of-home placement – i.e., twice as much as the children born one decade earlier.² Reasons for placing children out-of-home are diverse and vary across countries, and often are related to child abuse or neglect.³ In Finland the main reason for placement is not abuse, but some level of neglect or inability to care for the child as a result of parental poor mental health, financial difficulties, and the accumulation of problems.

Despite placing a child in out-of-home care aims to reduce exposure to a negative environment, the effect of this action may have negative consequence for the child. Specifically, children's dependence and attachment to the family is fundamental in early childhood, and disrupting attachment via out of home placement may have a negative impact on future outcomes. Indeed, to date, several studies have shown that children placed out-of-home have poorer socioeconomic outcomes (e.g., earnings, employment, and education) in adulthood compared to non-placed children in the general population.⁴⁻¹⁰ For example, results of the Northwest Foster Care Alumni Study has shown that one third of the young adults formerly in foster care had household incomes at or below the poverty level, one third had no health insurance, and more than one in five experienced homelessness after leaving foster care.¹¹ Similar results were reported in other studies across several countries.⁸

However, the mechanisms leading to such negative socioeconomic outcomes are not yet understood. Identifying such mechanisms is a key step to find potential target for preventive

interventions aiming to reduce negative socioeconomic outcomes for children placed out-of-home. Previous studies have shown that children placed out-of-home are more likely to experience mental health problems in adolescence and adulthood (including both affective and behavioral problems, including depression and anxiety, substance-related, psychotic, and bipolar disorders) compared with non-placed children.^{12,13} Similarly, previous studies have shown that children experiencing out-of-home placement have lower education-related outcomes, such as lower rates for post-secondary education completion, higher rates of school drop-out, lower access to college education.^{11,14,15} Evidence from studies using propensity score based designs suggest that this higher risk of mental health problems and low educational attainment is not explained by pre-existing family and parental characteristics such as parents mental health, young parental age, or low family socioeconomic status.^{12,16,17} Both mental health problems and low childhood educational attainment are known risk factors for a wide range of negative social outcomes including low earnings and welfare use.^{18–20} However, it is unclear whether and to what extent mental health and educational problems explain the poorer socioeconomic outcomes of children placed out-of-home. Answering this question could provide information about whether potential interventions preventing mental health problems and enhancing educational-related outcomes among placed children may contribute to reduce long-term negative socioeconomic consequences of placement.

This study aimed to clarify the association between placement out-of-home during early childhood and adult socioeconomic outcomes. It had three objectives. First, to estimate associations of early childhood out-of-home placement with income and social welfare use in adulthood using linked registries data from a 30-year longitudinal cohort in Finland. Second, to test whether background differences between placed and non-placed children in terms of family and individual characteristics can explain the difference in income and social welfare use relying on a strong design –propensity score matching. Third, to establish whether, and to what extent, mental health problems in adolescence/young

adulthood and high school educational attainment explain the association between out-of-home placement and adult income and social welfare use by conducting mediation analysis.

Methods

Study sample

Data came from the 1987 Finnish Birth Cohort (FBC-87), a birth cohort including all Finnish children born in Finland in 1987 who survived the perinatal period and is composed by linked administrative nationwide databases (N=59,476). Detailed information about the cohort are described elsewhere.²¹ Data covered the period 1987 to 2015 (i.e., birth to age 28 years). For the present study, we used information on all children having data on placement, outcomes (income and social welfare), and mediator variables (school grades and mental health problems), resulting in an analysis sample of N=54,724. Prior to listwise deletion, 7.0% of the subjects who were placed had missing primary school grade point averages, compared to 3.9% among those who were not placed, suggesting that missingness in this measure may not be independent of placement status.

The FBC-87 study was approved by the ethics committee of the Finnish National Institute for Health and Welfare (Ethical committee §28/2009) and all persons with access to data obtained the necessary permissions from each administrative registry. Data were handled in accordance with Finnish data privacy laws.

Exposure: out-of-home placement

The exposure variable was placement in out-of-home care for the first time between 2 and 6 years of age (vs. not placed in this period). In the context of the present research, out-of-home placement includes voluntary care agreements and placements in residential, foster, and community or kinship care. Because reasons for placement vary with age¹¹ and because we wanted to investigate the role of early childhood

placement, we focused on the preschool period. Additionally, children's exposure to and dependence on family environment is fundamental in early childhood, potentially intensifying the impact of placement. Methodologically, placement prior to school entry is more likely to be associated with family characteristics than with mental health issues in the child,⁶ suggesting that propensity score matching on the basis of family characteristics is more likely to yield comparable groups at younger than older ages. Information on placement was extracted from the Child Welfare Register of the Finnish National Institute of Health and Welfare. Children were classified as "placed" if they were placed outside the home at least once, the first time being between ages 2 and 6 years. No restrictions were set for placement after this age for both children classified as placed and those classified as nonplaced.

Outcomes: adult low income and social welfare use

Annual income (in Euros; converted in US\$) and welfare use (i.e., social assistance receipts, a means-tested last-resort form of income protection in Finland, granted only if the applicant has no other source of income, or the income is inadequate to meet the individual's or family's basic needs such as food, shelter and medicine)²² were considered in 2013, 2014, 2015 (age 26, 27, and 28, respectively). Social assistance receipts are 'We consider outcomes at this age to maintain a chronological order between exposure, mediators (see below) and outcomes. Two outcomes were defined. First, *low income*, defined as reporting an outcome below 10,000 Euros for 2 out of 3 years (coded 1 vs. 0). Second, *social welfare use*, defined as having received >3 months of social welfare in at least 2 out of 3 years (coded 1 vs. 0).

Mediators: primary school grade point average and mental health problems

Primary school grade point average (GPA) at age 16 years was extracted from the National Board of Education register and measured as a continuous variable (range 4-10). The variable was scaled and cantered using the mean and standard deviation from the entire cohort with GPA data available. Mental

health information was obtained from the Finnish Health Information System, which includes all information on inpatient and outpatient visits at public hospitals, as submitted to the Finnish Hospital Discharge Register. We considered all psychiatric diagnoses made during inpatient or outpatient visits to specialized hospital units in accordance with the International Statistical Classification of Diseases and Related Health Problems (ICD; 10th Revision codes F00–F99 and ICD 9th revision codes 290–319) between 2005 and 2012 (ages 18 to 25).

Family and individual background characteristics

Potential individual and family characteristics before the child's age 2 years representing confounding variables were obtained from registers.^{23,24} Family variables included the following: parental teen age at birth of the child (mother or father under age 20 years), low parental education (either parent did not complete high school), use of social welfare (either parent received social welfare benefits at any time), and diagnosed parental psychiatric disorders (at least one), divorced marital status, death of a parent, child's birth order (first-born vs. other), and maternal smoking during pregnancy (yes vs. no). Child variables included preterm birth (gestational age < 37 weeks), diagnosed intellectual disability, and diagnosed neurodevelopmental disorder at age ≤ 2 years.

Statistical analysis

Analyses were performed with R, version 3.4.0 (R Foundation for Statistical Computing).

Baseline characteristics and matching. Individual and family background characteristics differentiating the placed and non-placed groups were used to predict the likelihood of exposure to out-of-home placement using a logistic regression model. The fitted values of this model constituted the propensity score. Cases (child placed out-of-home) and control (child not placed out-of-home) were matched using the propensity score as matching criterion. If no suitable matched control could be found, the case was discarded from further analysis. Covariate balance was assessed by computing the success rate

difference (i.e., difference in proportion of individuals having the risk factor in placed vs. non-placed groups) before and after matching.

Direct and indirect effect of out-of-home placement with adult outcomes. First, differences in adult outcomes between children placed and non-placed out-of-home were assessed using binary logistic regression. The ORs from these regressions estimate the total association between exposure and outcome. Second, for each outcome and potential mediator, we used a model-based counterfactual approach to mediation analysis to estimate the average causal mediation effect (ACME; i.e., the effect of placement on the outcomes that is carried through the selected mediators) and the average direct effect (ADE; the remaining effect of placement that is not explained via the selected mediator).²⁵ This approaches generally lies in the potential outcome framework,²⁶ whose assumptions (such as ignorable treatment assignment and stable unit treatment value) are detailed elsewhere.^{27–29} Two models were therefore estimated: the mediator model, having placement status as the independent variable and the mediator as the dependent variable, and the outcome model, having placement status and the mediator as independent variables, and the outcome as the dependent variable. We estimated these models for each mediator and outcome. Analyses were performed in both unmatched and matched samples.

Sensitivity analyses. To understand whether unmeasured factors might explain the observed associations between placement and outcomes, we calculated the E-value, defined as the minimum strength of association, on the risk ratio (RR) scale, that an unmeasured confounder would need to have with both the treatment and the outcome to fully explain away a specific exposure–outcome association ³⁰.

Results

Baseline characteristics of the sample

A total of 59,476 children were born in Finland in 1987. After excluding children who died before age 2, children placed out-of-home before age 2, and children with missing data on the variables of interest, our study sample was composed by 54,338 individuals (**Figure 1**). Of those, 386 (0.71%) children were placed in out-of-home care between ages 2 and 6 years for the first time. At time of first placement, most of these children (n=249; 65%) were placed in foster care, while the remaining were placed in institutions or experienced other forms of placement. The average length of lifetime placement was 7.3 years. Characteristics of placed and non-placed children are presented in **Table 1**. There were no significant differences between placed and non-placed groups in terms of sex ratio, birth order, intellectual disability, or psychiatric or neurodevelopmental disorders before age 2 years. However, placed children were more likely than non-placed children to be born preterm and to have low-income families, teenage parents at childbirth, parents with lower levels of education, parents who smoked during pregnancy, divorced parents, and parents who have a psychiatric diagnosis.

Propensity score matching

We matched 384 placed children with 384 non-placed children using propensity score matching. We discarded 2 cases because no suitable control was found. Matching was effective in reducing background differences between placed and non-placed children for all variables (**Table 1**). For example, before matching the rates of nicotine exposure during gestation was 14.9% for non-placed children and 57.7% for placed children (SRD = 0.426), while after matching these rates were 54.4% for non-placed children and 57.3% for placed children (SRD = 0.029), suggesting that the procedure was successful in creating a comparable control group.

Association of out-of-home placement with GPA and mental health problems

We found that children exposed to out-of-home placement showed lower primary school GPA compared with non-placed children: the observed mean GPA was 7.84 (SD, 0.91) among non-placed children, and

7.26 (SD, 0.82) among placed children. The difference in GPA units was statistically significant (0.58, CI, 0.49-0.67). In the matched sample, the mean GPA was 7.43(SD, 0.89) among non-placed children and 7.24(SD, 0.82) among placed children. The mean GPA difference was attenuated if compared to the unmatched sample, but still significantly different (0.19; CI, 0.07-0.31). Similarly, placed children were more likely to have a psychiatric diagnosis in both the unmatched (n=6148, 11.3% among non-placed children vs. n=129, 33.4%, among placed children; OR, 2.95, CI, 2.42-3.61) and matched (n=63, 16.4%, among non-placed children vs. n=128, 33.3% among placed children; OR, 2.03, CI, 1.46-2.84) samples. Differences between placed and non-placed children on specific mental health problems can be found elsewhere.¹²

Association of out-of-home placement with low income

Among placed children, 54.9% had a low income in adulthood, compared to 31.3% of their peers in the control group, corresponding OR of 2.67 (CI, 2.18-3.27; **Table 2**). This difference was reduced in the matched sample (55.2% vs. 41.4%; OR, 1.74; CI, 1.31-2.32). In the unmatched sample, mediation analysis found a significant indirect effect of out-of-home placement on low income via both GPA (proportion mediated, 9%; CI, 7-12%) and mental health problems (proportion mediated, 30%, CI, 23-38%; **Table 3**). However, in the matched sample, only the mediation pathway via mental health problems remained statistically significant (proportion mediated, 33%; CI, 16-59%).

Association of out-of-home placement with social welfare use

Among placed children, 24.1% used social welfare in adulthood, compared with 4.9% non-placed children (OR, 6.16; CI, 4.87-7.81; **Table 2**). When analyses were restricted to the matched sample, we observed a reduction of these differences (24.2% placed children vs. 13.3% matched non-placed children; OR, 2.09; CI, 1.43-3.04). We found that both GPA (proportion mediated, 27%; CI, 22-31%) and mental health problems (proportion mediated, 29%; CI, 24-33%) mediated the association between

out-of-home placement and social welfare use in the unmatched sample, as well as in the matched sample (GPA: proportion mediated, 11%; CI, 3-33%; mental health problems: proportion mediated, 22%; CI, 9%-48%; **Table 3**).

Sensitivity analysis

For the association of placement with low income and social welfare use, the E-values were 2.87 and 3.60, respectively (matched sample). That is, to explain away the placement-outcome associations in the matched sample, a potential unmeasured confounder should be very strongly associated (~1.5 times more strongly than the placement-outcome associations) with both placement and the outcome.

Discussion

The aim of this study was to test the association of out-of-home placement between 2 and 6 years of age with low income and social welfare use at 26-30 years of age, and the putative mediation role of primary school GPA and mental health problems. We relied on a robust research design –propensity score matching– to account for a range of background factors that may confound the associations. Although causality cannot be definitely established with observational designs, quasi-experimental designs, such as propensity score matching, can offer an approximation for a maximum of ecological validity when randomized trials are unfeasible. In particular, an important feature of propensity score matching is that the compared groups (placed and matched non-placed children) are determined by design with no reference to the outcome,¹⁷ which allows the separation of the design of the study from the outcome analysis in a similar way as a randomized trial.³¹

We found that placed children showed 2.67-fold higher odds of low income and 6.16-fold higher odds of social welfare use in their adulthood, compared with non-placed children. This risk was

substantially reduced (to 1.74-fold and 2.09-fold higher, respectively) when placed children were compared to non-placed children with similar background characteristics using propensity score matching, but still remained significantly higher. This suggests that family background factors (e.g., parental mental health disorders, low parental income and education) explained part but not all of the associations. This finding, based on a robust propensity score matching approach, is in line with previous studies conducted in North America and Europe.⁴⁻¹⁰ Our sensitivity analyses reinforce these results, suggesting that a hypothetical unmeasured confounding variable would need very strong associations with both placement and outcomes to explain away the associations after controlling for the measured confounding variables. The main unmeasured confounding variable in our study is child maltreatment or neglect. The prevalence of maltreatment/neglect in the placed children in Finland was 45-55% in 1987,³² and is likely to be higher than the general population (i.e., ranging from ~5% according to child-protection agencies statistics to 5-35% according to victims or parents self-report).³³ However, (1) evidence showed that maltreatment is under-reported in official statistics, suggesting that prevalence can be higher in the general population;³⁴ (2) the prevalence of maltreatment/neglect among matched non-placed children is likely to be closer to the prevalence among placed children than to the prevalence among the general population.

The reduction of the association between unmatched and matched analyses also suggests that ~35% and ~66% of the increased risk of low income and social welfare use of placed children were attributable to pre-existing family and individual characteristics, including parental mental health problems and family socioeconomic difficulties. This finding, which is in line with the literature,^{4,5,13,33,34} suggests that these factors are main contributors to the observed socioeconomic disadvantage of placed children compared to children in the general population. Preventive strategies targeting at-risk families may therefore substantially contribute to reduce negative socioeconomic

outcomes for placed children. It is worth noting that increasing international comparisons between child protection practices are important to understand how to reduce negative social outcomes in children placed in out-of-home care, as important variations of those outcomes are reported across studies conducted in different countries.³⁵ In line, qualitative research based on in-depth interviews with practitioners in the field and families would be useful to better understand our associations and potentially uncover factors that have not been considered in quantitative research based on large samples.

Consistent with the literature placed children in our sample have higher rates of mental health problems and lower school performance compared to non-placed children.^{5,6,8,12,13} However, a strength of this study is the investigation of the putative role of mental health problems and educational indicators in the association between out-of-home placement and adult socioeconomic outcomes. We found that mental health problems mediate a substantial part of the association between placement and both low income and use of social welfare (respectively 34% and 22% in the matched sample); however, GPA mediated the association between placement and social welfare use (11%) but not the association between placement and low income. These results, based on causally-defined (counterfactual) mediation models, suggest that interventions aiming at reducing the burden of mental health problems and offering school support among placed children may reduce socioeconomic disadvantages later in life. It is worth noting that mental health problems mediate a larger proportion of the associations compared to GPA, and then the latter only mediated the association between placement and social welfare use. These findings suggest that reducing mental health problems might be more effective than improving GPA in the prevention of socioeconomic disadvantage. Nevertheless, school support interventions may still contribute to the prevention of severe negative outcomes (i.e., entering the welfare system). Finally, it is important to note that, in our study, we did not consider the role of mental health before age 18, as well

as potential mechanisms (such as IQ or cognitive skills) that can underlying both mental health problems and school performance. Future studies should be conducted to obtain a finer-grained understanding of the processing linking early childhood placement and adult social and economic outcomes.

Strengths and limitations

This study has some notable strengths, including the use of a large representative sample with data from birth to 28 years of age, the reliance on data from high-quality linked population registers, and the use of propensity score matching. These factors allowed us to investigate a rare phenomenon, test long-term associations, and find suitable matches for the placed children among a very large pool of potential non-placed controls. Despite those strengths, the following limitations must be acknowledged. First, due to reliance on administrative databases, we were unable to distinguish between missingness caused by incomplete registration of events from missingness due to an absence of events, therefore we could not estimate the effect of missingness on the results. For example, the difference in missing data on school grades between children placed vs not placed may not be completely at random, which could introduce bias results. Second, mental health problems were measured using hospital records, which only reflects service use among patients with mental health problems severe enough to warrant a diagnosis. Lack of consideration of less severe problems might have resulted in a biased estimate of the mediating role of mental health problems. Third, propensity score enables to balance participants only on measured confounders, therefore bias for potentially unmeasured confounders cannot be excluded. Specifically, we have no data on maltreatment and neglect, which are more likely to be overrepresented in the placed groups compared to the non-placed groups. Fourth, reasons for placement were not available in our data, therefore we were not able to take this potential source of variability into account in our analysis. Similarly, we were unable to distinguish between different forms of placement (e.g., foster home vs institution). Fifth, the more important mediation role of mental health problems compared to GPA may

be partially explained by the temporal proximity between mental health problems and the measured outcomes. Finally, given that income usually stabilizes after age 30, our associations with income measured at ages 26-28 may not be generalizable to other periods of adult life. This calls for replication of our findings with studies with longer follow-ups.

Conclusions

Based on population data from linked Finnish registers, we found that children placed out-of-home during early childhood (2 to 6 years of age) were more likely than non-placed counterparts with similar background characteristics to experience low income and social welfare use as adults. Importantly, this association was not explained by background variables, including family characteristics and parental mental health. We identified mental health problems and (to a less extent) school performance as mediators of these associations, suggesting that interventions for the prevention of mental health problems and school difficulties among placed children may potentially contribute to reduce socioeconomic disadvantages of children placed in out-of-home care in the long-term.

References

1. Eurochild. *Children in Alternative Care: National Surveys (2nd Edition)*.; 2010.
2. Laine S, Pösö T, Ujula T. Adoptio lastensuojelussa–lukumääristä ja ominaispiirteistä [Adoption within childprotection- numbers and characteristics]. *YHTEISKUNTAPOLITIikka*. 2018;83(2):199-207.
3. Children and Family Court Advisory and Support Service (Cafcass). Children and Family Court Advisory and Support Service. Children and Family Court Advisory and Support Service. Accessed April 10, 2018. <https://www.cafcass.gov.uk/>
4. Lindquist MJ, Santavirta T. Does placing children in foster care increase their adult criminality? *Labour Econ*. 2014;31(Supplement C):72-83. doi:10.1016/j.labeco.2014.10.001
5. Zlotnick C, Tam TW, Soman LA. Life Course Outcomes on Mental and Physical Health: The Impact of Foster Care on Adulthood. *Am J Public Health*. 2012;102(3):534-540. doi:10.2105/AJPH.2011.300285
6. Pecora PJ, White CR, Jackson LJ, Wiggins T. Mental health of current and former recipients of foster care: a review of recent studies in the USA. *Child Fam Soc Work*. 2009;14(2):132-146. doi:10.1111/j.1365-2206.2009.00618.x
7. Vinnerljung B, Hjern A, Lindblad F. Suicide attempts and severe psychiatric morbidity among former child welfare clients--a national cohort study. *J Child Psychol Psychiatry*. 2006;47(7):723-733. doi:10.1111/j.1469-7610.2005.01530.x
8. Gypen L, Vanderfaeillie J, De Maeyer S, Belenger L, Van Holen F. Outcomes of children who grew up in foster care: Systematic-review. *Child Youth Serv Rev*. 2017;76(C):74-83.
9. Kessler RC, Pecora PJ, Williams J, et al. Effects of enhanced foster care on the long-term physical and mental health of foster care alumni. *Arch Gen Psychiatry*. 2008;65(6):625-633. doi:10.1001/archpsyc.65.6.625
10. Stewart CJ, Kum HC, Barth RP, Duncan DF. Former foster youth: Employment outcomes up to age 30. *Child Youth Serv Rev*. 2014;36:220-229. doi:10.1016/j.childyouth.2013.11.024
11. Pecora PJ, Kessler RC, O'Brien K, et al. Educational and employment outcomes of adults formerly placed in foster care: Results from the Northwest Foster Care Alumni Study. *Child Youth Serv Rev*. 2006;28(12):1459-1481. doi:10.1016/j.childyouth.2006.04.003
12. Côté SM, Orri M, Marttila M, Ristikari T. Out-of-home placement in early childhood and psychiatric diagnoses and criminal convictions in young adulthood: a population-based propensity score-matched study. *Lancet Child Adolesc Health*. 2018;0(0). doi:10.1016/S2352-4642(18)30207-4

13. von Borczyskowski A, Vinnerljung B, Hjern A. Alcohol and drug abuse among young adults who grew up in substitute care — Findings from a Swedish national cohort study. *Child Youth Serv Rev.* 2013;35(12):1954-1961. doi:10.1016/j.childyouth.2013.09.024
14. Day A, Dworsky A, Fogarty K, Damashek A. An examination of post-secondary retention and graduation among foster care youth enrolled in a four-year university. *Child Youth Serv Rev.* 2011;33(11):2335-2341. doi:10.1016/j.childyouth.2011.08.004
15. Jones LP. The educational experiences of former foster youth three years after discharge. *Child Welfare.* 2010;89(6):7-22.
16. Berzin SC. Difficulties in the Transition to Adulthood: Using Propensity Scoring to Understand What Makes Foster Youth Vulnerable. *Soc Serv Rev.* 2008;82(2):171-196. doi:10.1086/588417
17. Berger LM, Bruch SK, Johnson EI, James S, Rubin D. Estimating the “impact” of out-of-home placement on child well-being: approaching the problem of selection bias. *Child Dev.* 2009;80(6):1856-1876. doi:10.1111/j.1467-8624.2009.01372.x
18. Vergunst F, Tremblay RE, Nagin D, et al. Association of Behavior in Boys From Low Socioeconomic Neighborhoods With Employment Earnings in Adulthood. *JAMA Pediatr.* 2019;173(4):334-341. doi:10.1001/jamapediatrics.2018.5375
19. Raut L. Long-term Effects of Preschool on School Performance, Earnings and Social Mobility. *Stud Microecon.* 2018;6(1-2):24-49. doi:10.1177/2321022218802023
20. Acacio-Claro PJ, Doku DT, Koivusilta LK, Rimpelä AH. How socioeconomic circumstances, school achievement and reserve capacity in adolescence predict adult education level: a three-generation study in Finland. *Int J Adolesc Youth.* 2018;23(3):382-397. doi:10.1080/02673843.2017.1389759
21. Paananen R, Gissler M. Cohort Profile: The 1987 Finnish Birth Cohort. *Int J Epidemiol.* 2012;41(4):941-945. doi:10.1093/ije/dyr035
22. Ristikari T, Merikukka M, Hakovirta MK. Timing and duration of social assistance receipt during childhood on early adult outcomes. *Longitud Life Course Stud.* 2018;9(3):312-326. doi:10.14301/llcs.v9i3.471
23. Sund R. Quality of the Finnish Hospital Discharge Register: a systematic review. *Scand J Public Health.* 2012;40(6):505-515. doi:10.1177/1403494812456637
24. Gissler J, Haukka J. Finnish health and social welfare registers in epidemiological research. *Nor Epidemiol.* 2009;14(1). Accessed February 12, 2018. <https://www.ntnu.no/ojs/index.php/norepid/article/view/284>
25. Imai K, Keele L, Tingley D. A general approach to causal mediation analysis. *Psychol Methods.* 2010;15(4):309-334. doi:10.1037/a0020761

26. Rubin DB. Causal Inference Using Potential Outcomes. *J Am Stat Assoc.* 2005;100(469):322-331. doi:10.1198/016214504000001880
27. Höfler M. Causal inference based on counterfactuals. *BMC Med Res Methodol.* 2005;5(1):28. doi:10.1186/1471-2288-5-28
28. VanderWeele TJ. Commentary: On Causes, Causal Inference, and Potential Outcomes. *Int J Epidemiol.* 2016;45(6):1809-1816. doi:10.1093/ije/dyw230
29. Imai K, Keele L, Tingley D. A general approach to causal mediation analysis. *Psychol Methods.* 2010;15(4):309-334. doi:10.1037/a0020761
30. VanderWeele TJ, Ding P. Sensitivity Analysis in Observational Research: Introducing the E-Value. *Ann Intern Med.* 2017;167(4):268. doi:10.7326/M16-2607
31. Austin PC. An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies. *Multivar Behav Res.* 2011;46(3):399-424. doi:10.1080/00273171.2011.568786
32. Pösö T. Finland. Child abuse as a family problem. In: *Combatting Child Abuse: International Perspectives and Trends.* Gilbert N. Oxford University Press; 1997:143-163.
33. Gilbert R, Widom CS, Browne K, Fergusson D, Webb E, Janson S. Burden and consequences of child maltreatment in high-income countries. *The Lancet.* 2009;373(9657):68-81. doi:10.1016/S0140-6736(08)61706-7
34. Gilbert R, Kemp A, Thoburn J, et al. Recognising and responding to child maltreatment. *The Lancet.* 2009;373(9658):167-180. doi:10.1016/S0140-6736(08)61707-9
35. Sebba J, Berridge D, Luke N, Fletcher J, Sinclair I, O'Higgins A. The Educational Progress of Looked After Children in England: Linking Care and Educational Data. Published online 2015. Accessed May 21, 2021. <https://www.nuffieldfoundation.org/project/the-educational-progress-of-looked-after-children>

Table 1. Characteristics of placed and non-placed children before and after propensity score matching

	Before matching			After matching		
	Not Placed (n = 54,338)	Placed (n = 386)	SRD	Not Placed (n = 384)	Placed (n = 384)	SRD
Child characteristics						
Male sex	27801 (51.2)	196 (50.8)	0.004	196 (51.0)	196 (51.0)	0
First-born	32750 (60.3)	239 (61.9)	0.016	231 (60.2)	237 (61.7)	0.015
Preterm birth	2608 (4.8)	33 (8.5)	0.037	38 (9.9)	32 (8.3)	0.016
Nicotine exposure during gestation	8071 (14.9)	222 (57.5)	0.426	209 (54.4)	220 (57.3)	0.029
Disability prior to age 2 years ^b	5 (<0.1)	0 (0)	0	0 (0)	0 (0)	0
Neurodevelopmental disorder ^c	74 (0.1)	2 (0.5)	0.004	2 (0.5)	2 (0.5)	0
Parent/family characteristics						
One or both parents did not finish high school	5169 (9.5)	163 (42.2)	0.327	155 (40.4)	163 (42.4)	0.020
Received social assistance benefits at any time	7094 (13.1)	312 (80.8)	0.677	309 (80.5)	310 (80.7)	0.002
Parent age < 20 years at birth of index child	1806 (3.3)	56 (14.5)	0.112	53 (13.8)	56 (14.6)	0.008
Parent psychiatric diagnosis	734 (1.4)	56 (14.5)	0.131	57 (14.8)	54 (14.1)	0.007
Parent(s) died	135 (0.2)	4 (1.0)	0.008	1 (0.3)	3 (0.8)	0.005
Parents divorced	546 (1.0)	18 (4.7)	0.037	14 (3.6)	18 (4.7)	0.011

All characteristics are presented as number (%).

^a Propensity score matching: Using the R package MatchIt, we performed nearest neighbour matching—without replacement—using a caliper of 0.1 times the standard deviation of the logit-transformed propensity scores, and exact matching on sex. The chosen caliper represents the maximum permitted difference between matched subjects.

^b ICD-10: F70-F79; ICD-9: 317–319.

^c ICD-10: F00-F69, F80-F99; ICD-9: 290–319.

SRD, Success Rate Difference (absolute difference between the proportion of each variable in the placed and not placed groups)

Table 2. Association of out-of-home placement with low income and social welfare use

	Before matching			After matching		
	Not Placed (n = 54,338)	Placed (n = 386)	OR (95 % CI)	Not Placed (n = 384)	Placed (n = 384)	OR (95 % CI)
Low income	17020 (31.3)	212 (54.9)	2.67 (2.18-3.27)	159 (41.4)	212 (55.2)	1.74 (1.31-2.32)
Social welfare use	2661 (4.9)	93 (24.1)	6.16 (4.87-7.81)	51 (13.3)	93 (24.2)	2.09 (1.43-3.04)

Descriptive statistics are reported and n (%).

Table 3. Total, direct, and indirect effect of out-of-home placement with low income and social welfare use

	Before matching Estimate (95%CI)	After matching Estimate (95%CI)
Outcome: Low income		
Mediation via GPA		
Total effect	0.24 (0.18 to 0.28)	0.14 (0.07 to 0.20)
Average causal mediation (indirect) effect	0.02 (0.02 to 0.03)	0.01 (-0.001 to 0.02)
Average direct effect	0.21 (0.16 to 0.26)	0.13 (0.06 to 0.19)
Proportion mediated	0.09 (0.07 to 0.12)	0.05 (-0.01 to 0.16)
Mediation via mental health		
Total effect	0.23 (0.18 to 0.28)	0.13 (0.07 to 0.19)
Average causal mediation (indirect) effect	0.07 (0.05 to 0.08)	0.04 (0.02 to 0.07)
Average direct effect	0.16 (0.12 to 0.21)	0.09 (0.03 to 0.16)
Proportion mediated	0.30 (0.23 to 0.38)	0.34 (0.16 to 0.59)
Outcome: Social welfare use		
Mediation via GPA		
Total effect	0.20 (0.16 to 0.24)	0.11 (0.06 to 0.16)
Average causal mediation (indirect) effect	0.05 (0.04 to 0.07)	0.01 (0.003 to 0.03)
Average direct effect	0.14 (0.11 to 0.18)	0.10 (0.04 to 0.15)
Proportion mediated	0.27 (0.22 to 0.31)	0.11 (0.03 to 0.33)
Mediation via mental health		
Total effect	0.19 (0.15 to 0.24)	0.11 (0.06 to 0.17)
Average causal mediation (indirect) effect	0.05 (0.04 to 0.07)	0.03 (0.01 to 0.05)
Average direct effect	0.14 (0.10 to 0.18)	0.09 (0.03 to 0.15)
Proportion mediated	0.29 (0.24 to 0.33)	0.22 (0.09 to 0.48)

Figure 1. Flowchart of the study population

