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A decade lost: does educational success mitigate the increased risks of premature death among children with experience of out-of-home care?

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Received 17 January 2018
Revised 14 June 2018
Accepted 19 June 2018
Published Online First 17 July 2018

To cite: Almquist YB, Jackisch J, Forsman H, *et al*. *J Epidemiol Community Health* 2018;**72**:997–1002.

ABSTRACT

Background Past research has consistently identified children with out-of-home care (OHC) experience as a high-risk group for premature mortality. While many have argued that educational success is a key factor in reducing these individuals' excessive death risks, empirical evidence has hitherto been limited. The aim of the current study was therefore to examine the potentially mitigating role of educational success in the association between OHC experience and premature mortality.

Methods Drawing on a Stockholm cohort born in 1953 (n=15 117), we analysed the associations among placement in OHC (ages 0–12), school performance (ages 13, 16 and 19) and premature all-cause mortality (ages 20–56) by means of Cox and Laplace regression analyses.

Results The Cox regression models confirmed the increased risk of premature mortality among individuals with OHC experience. Unadjusted Laplace regression models showed that, based on median survival time, these children died more than a decade before their majority population peers. However, among individuals who performed well at school, that is, those who scored above-average marks at the age of 16 (grade 9) and at the age of 19 (grade 12), the risks of premature mortality did not significantly differ between the two groups.

Conclusion Educational success seems to mitigate the increased risks of premature death among children with OHC experience.

INTRODUCTION

Out-of-home care (OHC) is a social intervention where the child is either temporarily or permanently placed in a foster family or residential care. From the society's point of view, the intention is to provide the child with significantly improved opportunities for growing and learning in cases where the family of origin has failed.[1 2] OHC thus has the potential to ameliorate the child's opportunities and outcomes, which would ultimately prevent the parental generation's disadvantages from persisting into the child's generation.[2] Yet empirical studies paint a dismal picture of the health situation among children in OHC. Their health problems have been shown to carry on into young adulthood and early mid-life: for example, individuals with OHC experience have higher risks of mental and behavioural disorders,[3 4] depression and low self-efficacy,[5] receipt of disability pension,[6 7] as well as chronic health problems such as asthma, diabetes, hypertension, stroke, heart disease, cancer and epilepsy.[8] They also have increased risks of premature all-cause and cause-specific (eg, suicide, accidents and violence) mortality,[9–13] which appear to persist across the entire span of adulthood.[14]

How come early life circumstances such as placement in OHC have such a seemingly robust influence on health and life expectancy? This finding may be understood from the perspective of the cumulative inequality theory,[15] which maintains that even before a child comes into the world, her conception, fetal growth and birth are formed by social forces. Early conditions are in turn important to how adult living conditions are shaped. This is particularly the case for conditions related to family lineage, in terms of both genetic transmission and the shared environment. OHC can thus be seen as part of a broader clustering of family-related disadvantages that accumulates over an individual's life course and that 'get under the skin', causing poor health and ultimately premature mortality. Accordingly, this theory not only explains how individual lives develop over time, but illustrates how a cohort becomes differentiated and thereby contribute to the overall patterns of inequality at the societal level.[16]

As high mortality rates among individuals with OHC experience have caused political concerns, an important goal of child welfare interventions is to improve the chance of survival into adulthood. Prior research into the link between education and life expectancy opens a window of opportunity for intervention.[17] Given that children involved in the child welfare system appear to underperform at school due to their cognitive ability,[18] it seems reasonable to expect that an improvement in their school performance presents a viable intervention path. However, the importance of improving educational outcomes has not received sufficient attention in child welfare policy and practice.[19] Using Swedish longitudinal prospective data from the Stockholm Birth Cohort (SBC) study, we have earlier reported increased risks of premature mortality in adults with a history of child welfare involvement.[14] The current study presents new findings on the hypothesised mitigating role of educational success in narrowing the mortality gap between disadvantaged individuals and their majority population peers, using a time-based risk measure that allows for direct interpretation of

the exposure–outcome association in terms of years gained or lost.[20]

METHODS

Data and materials

Data were derived from the SBC, defined as individuals who were born in 1953 and were residents in the greater Stockholm metropolitan area in 1963 (n=15 117). The SBC contains a wealth of survey and register data.[21] Three main types of information were used in the present study. The first was detailed data about the cohort members' placement in OHC, derived from the social registers kept by the municipalities of Stockholm. The second was the Causes of Death Register, containing mortality data at the national level. The third was local school records, administered by Stockholm City and Stockholm County.

Variables

OHC experience was indicated through at least one record of being placed in a family foster care or residential care between 1953 and 1965 (ages 0–12) due to family-related problems or own behaviour.

Premature mortality was defined as death from any cause occurring between 1 January 1973 and 28 February 2009 (ages 20–56). The most prevalent causes of death were cancer, alcohol and drug dependence, circulatory diseases, injuries, and suicide. However, the numbers were not large enough to examine cause-specific mortality.

Information about grade 6 marks in 1966 (age 13), grade 9 marks in 1969 (age 16) and grade 12 marks in 1972 (age 19) was based on the average performance in all subjects except physical education. In the 1960s and 1970s, school marks were given according to a 5-point scale, with 1 being the lowest possible mark and 5 being the highest possible mark. The grading system was relative, meaning that the marks were given in proportion to the performance of all students taking the course during a given year. The distribution of marks was thus intended to follow a normal distribution at the national level, with the average value fixed at 3. For the purposes of the current study, three categories were formed, reflecting those who scored above the national average, at or below the average, or had no marks registered. This last category primarily contains cases of individuals who dropped out of school and, to a smaller extent, individuals with missing data. However, due to data limitations, we cannot distinguish clearly between these groups.

In line with previous studies focusing on the association between OHC and later life outcomes in the SBC,[14 22 23] five control variables were included. Sex reflects the biological sex of the cohort member. Household occupational class indicates the position of the head of the household in 1953 (age 0), whereas household economic poverty refers to the number of years that the parents received social assistance in 1953–1965 (ages 0–6). Finally, variables reflecting maternal age and maternal marital status in 1953 (age 0) were incorporated.

Study sample

In the current study, cohort members who had their first placement as teenagers (n=353) were excluded from the analytical sample, since this would succeed the measurement of school marks. For the same reason, cohort members who died before 1973 were also excluded (n=67). The number of individuals who remained eligible for analysis was 14 697 (97.2%). Descriptive statistics for this sample are presented in table 1.

Statistical analysis

Associations between OHC experience (ages 0–12) and premature mortality (ages 20–56) were examined in two steps. First, Cox regression analysis was used to calculate the risk of premature mortality (expressed in HRs) among individuals with OHC experience as compared with their majority population peers. Subjects entered on 1 January 1973 and were censored in the event of death or at the end of follow-up on 28 February 2009. Since the data only contained information on the year of death, day and month were set on June 15 of a given year. There were no problems with tied failure times or violations against the proportional hazards assumption (data not presented). Second, Laplace regression was used to analyse the absolute differences in survival time (expressed in years) between the two groups.[20] In the absence of censoring, Laplace regression is equivalent to ordinary quantile regression.[24] Assuming that the error term follows an asymmetric Laplace distribution, Laplace regression establishes a linear association between a predictor and the survival percentile (the time point by which a specific proportion of events is achieved) of the time variable. In the absence of covariates, Laplace regression provides estimates of survival percentiles similar to the usual non-parametric Kaplan-Meier method.[20 25 26] The analysis in this study is based on 500 bootstrap replications and reported for the 50th percentile, that is, the median age at event (survival at other percentiles yielded similar results).[27] For each step, one set of unadjusted models and one set of adjusted models (controlling for sex, household occupational class, household economic poverty, maternal age and maternal marital status) were produced. Sex-stratified analyses showed that the results were largely the same for men and women (data not presented).

It should be emphasised that Cox regression and Laplace regression are two different methods. While the former estimates the risk of experiencing an event, the latter looks at absolute survival differences. This means that the HR and the absolute survival difference at the median age at event are two different ways of describing the association between an exposure and an outcome. Information on survival percentiles may therefore complement the information provided by ordinary HR, facilitating the interpretation and communication of results.

RESULTS

Table 2 shows the results from the Cox and Laplace regression analyses. The findings are presented in the text below as differences in relative risks, with the estimates reflecting differences in survival time shown within brackets.

To begin with, the 'unadjusted' columns show that those with OHC experience have 2.28 times higher risk of premature mortality (corresponding to living 10.50 years shorter, based on the median survival time) compared with their majority population peers. Examining the impact of grade 6 marks, it is shown that those who are at or below the average marks have 1.61 times higher risk (−6.19 years) of premature mortality if they do not have any OHC experience and 3.29 times higher risk (−15.2 years) if they do, as compared with individuals without OHC experience and with above-average marks. Individuals who were placed in OHC but had above-average marks also show an increased risk of 1.87 (−8.10 years). An even higher HR is found for individuals with OHC experience and missing marks: 3.55 (−16.1 years). Similar patterns are repeated for grade 9 and grade 12 marks—with the important difference that while the above-average-performing individuals with OHC experience have slightly elevated risks of premature

Table 1 Descriptive statistics for the study variables (N=14 697)

	n	%	Prevalence (%) of out-of-home care (ages 0–12)	Cases (%) of premature mortality (ages 20–56)
All			7.14	4.83
Sex				
Male	7484	50.92	7.76	6.20
Female	7213	49.08	6.49	3.41
Grade 6 marks (age 13)				
Above average	8336	56.72	4.68	3.71
At or below average	5472	37.23	9.89	6.16
No marks	889	6.05	13.27	7.20
Grade 9 marks (age 16)				
Above average	7560	51.44	4.29	3.32
At or below average	5613	38.19	8.39	5.81
No marks	1524	10.37	16.67	8.73
Grade 12 marks (age 19)				
Above average	4514	30.71	3.17	2.97
At or below average	2364	16.08	4.10	3.26
No marks	7819	53.20	10.35	6.38
Household occupational class (age 0)				
Upper and upper-middle class	1989	13.53	1.56	4.12
Middle class	5453	37.10	5.52	4.57
Skilled working class	3990	27.15	9.02	5.31
Unskilled working class	2707	18.42	11.30	5.25
Other	558	3.80	9.14	4.48
Household economic poverty (ages 0–6)	Minimum=0 year, maximum=7 years, mean=0.39 year		28.32*	7.47*
Maternal age (age 0)				
19 years or younger	451	3.07	19.73	7.10
20–39 years	11 160	75.93	7.42	5.00
40 years or older	515	3.50	7.57	4.08
Missing information	2571	17.49	3.62	3.85
Maternal marital status (age 0)				
Married	12 870	87.57	5.48	4.70
Unmarried	1827	12.43	18.83	5.75

*Refers to those with household economic poverty registered for at least 1 year.

mortality, these estimates do not reach statistically significant levels.

The 'adjusted' columns show the results controlled for sex, household occupational class, household economic poverty, maternal age and maternal marital status. This leads to a reduction of most estimates, but the overall conclusion remains the same. While not shown in the table, it should also be mentioned that when the association between OHC and premature mortality is additionally adjusted for marks in grades 6, 9 and 12, the HR decreases to 1.54 but remains statistically significant (95% CI 1.17 to 2.03). In terms of absolute differences in the median survival time, the results show that individuals with OHC experience live 5.64 years shorter (95% CI −2.42 to −8.85).

DISCUSSION

In line with past research,[9 14] the current investigation showed that children with OHC experience had more than a twofold risk of premature all-cause mortality compared with majority population peers. This may not seem as much, but when we instead focused on differences in survival time it corresponded to more than a decade of life lost. The overall picture was also dismal with regard to educational success: children with experience of placement in OHC were less likely to succeed at school compared with those without this experience, and this gap increased with age. However, the results also show that elevated mortality risks are not an inevitable fact among children with OHC experience. In grade 6, they had to perform above average to reach the same mortality risks as children without OHC experience who are at or below average or have missing marks. Above-average performance in grades 9 and 12, however, was linked to relatively low mortality risks among children with and without OHC experience alike. These findings are in line with previous studies pointing towards the great potential of educational success in reducing hazards among an exceptionally vulnerable population.[19]

Recent systematic reviews of educational interventions among children in OHC have concluded that most interventions have tentative impacts,[28] and that the evidence on mechanisms underlying educational success is inconclusive.[29] However, reviews in this area suffer from the many methodological limitations of available research, highlighting the need for large-sample studies with longitudinal designs.[28 29] The unique qualities of the SBC will render it possible for future empirical work to extend this first explorative study of the associations between

Table 2 Associations between OHC experience (ages 0–12), school performance (ages 13, 16 and 19) and premature mortality (ages 20–56) (N=14 697)

			Cox regression analysis Relative risks (HR) of premature mortality with 95% CI		Laplace regression analysis Absolute differences (years) in survival time with 95% CI	
	n	Deaths (n)	Unadjusted	Adjusted*	Unadjusted	Adjusted*
OHC						
No OHC (ref)	13 648	607	1	1	0	0
OHC	1049	103	**2.28** (1.85 to 2.81)	**1.82** (1.43 to 2.32)	**−10.50** (−13.2 to -7.78)	**−7.45** (−10.7 to −4.19)
Grade 6 marks (age 13)						
No OHC + marks above average (ref)	7946	280	1	1	0	0
No OHC + marks at or below average	4931	277	**1.61** (1.37 to 1.90)	**1.46** (1.23 to 1.73)	**−6.19** (−8.33 to -4.05)	**−4.88** (−7.06 to −2.70)
No OHC + no marks	771	50	**1.87** (1.38 to 2.52)	**1.85** (1.36 to 2.51)	**−8.10** (−12.0 to -4.19)	**−7.92** (−11.9 to −3.94)
OHC + marks above average	390	29	**2.16** (1.47 to 3.17)	**1.90** (1.29 to 2.81)	**−9.92** (−14.6 to -5.26)	**−8.25** (−13.2 to −3.32)
OHC + marks at or below average	541	60	**3.29** (2.49 to 4.34)	**2.48** (1.80 to 3.40)	**−15.2** (−19.0 to -11.5)	**−11.5** (−15.8 to −7.15)
OHC + no marks	118	14	**3.55** (2.07 to 6.09)	**2.81** (1.59 to 4.97)	**−16.1** (−23.1 to -9.15)	**−12.9** (−20.1 to −5.70)
Grade 9 marks (age 16)						
No OHC + marks above average (ref)	7236	236	1	1	0	0
No OHC + marks at or below average	5142	277	**1.67** (1.40 to 1.99)	**1.61** (1.35 to 1.93)	**−6.64** (−8.88 to -4.41)	**−6.12** (−8.42 to −3.81)
No OHC + no marks	1270	94	**2.31** (1.82 to 2.93)	**2.28** (1.79 to 2.90)	**−10.9** (−14.0 to -7.72)	**−10.5** (−13.7 to −7.35)
OHC + marks above average	324	15	1.42 (0.85 to 2.39)	1.23 (0.72 to 2.10)	−4.63 (−11.9 to 2.63)	−2.75 (−10.2 to 4.70)
OHC + marks at or below average	471	49	**3.33** (2.44 to 4.53)	**2.76** (1.96 to 3.89)	**−15.4** (−19.2 to -11.5)	**−12.8** (−17.2 to −8.39)
OHC + no marks	254	39	**5.07** (3.60 to 7.12)	**4.08** (2.82 to 5.90)	**−20.5** (−25.1 to -16.0)	**−17.4** (−22.3 to −12.5)
Grade 12 marks (age 19)						
No OHC + marks above average (ref)	4371	128	1	1	0	0
No OHC + marks at or below average	2267	69	1.04 (0.78 to 1.39)	0.94 (0.70 to 1.26)	0.43 (−4.21 to 3.35)	0.77 (−3.04 to 4.57)
No OHC + no marks	7010	410	**2.02** (1.66 to 2.47)	**2.01** (1.64 to 2.47)	**−9.00** (−11.6 to -6.42)	**−9.01** (−11.7 to −6.32)
OHC + marks above average	143	6	1.45 (0.64 to 3.29)	1.32 (0.58 to 3.04)	−4.63 (−18.2 to 8.98)	−3.63 (−17.4 to 10.1)
OHC + marks at or below average	97	8	**2.91** (1.42 to 5.98)	**2.46** (1.17 to 5.18)	**−13.5** (−23.4 to -3.66)	**−11.4** (−21.5 to −1.22)
OHC + no marks	809	89	**3.93** (2.99 to 5.15)	**3.37** (2.48 to 4.59)	**−17.3** (−20.8 to -13.8)	**−15.4** (−19.5 to −11.3)
Total	14 697	710				

Statistically significant (p<0.05) estimates are in bold.
*Adjusted for sex, household occupational class, household economic poverty, maternal age and maternal marital status.
OHC, out of-home care; ref, reference group.

OHC experience, educational success and premature mortality to include pathways to educational success among children with OHC experience and how these pathways are intertwined with health development. This could be achieved by, for example, structural equation modelling that enables enquiry into direct and indirect effects. Furthermore, as the cohort ages and the number of deaths increases, analyses of cause-specific mortality could provide additional insight into issues of disease aetiology.

Based on previous literature, there are as good reasons to view school performance as part of the pathway between OHC experience and later life outcomes[30] as there are to treat it as a modifying factor. It does not have to be one or the other: school performance could be both a mediator and a moderator. The focus of the current study was, however, on the latter. There are ways of statistically separating between mediation and moderation, and as a sensitivity analysis we chose to conduct four-way decomposition analysis.[31] The results of the analysis should be treated with caution since the method relies on assumptions that cannot be tested. Moreover, the use of categorical mediators or moderators (such as school performance) in this study adds greatly to the complexity. We therefore decided to exclude the category 'No marks' from the sensitivity analysis. The findings (details are available on request) nevertheless suggest that school performance—at least in grades 9 and 12—operates as a moderator to a greater extent than as a mediator. An important task for future research is to extend this statistical model to include categorical variables, as well as multiple mediators and interactions.[32]

It should be emphasised that the current study is based on observational data, which inhibits the ability to make strong causal inferences. On the one hand, there are empirical findings indicating that the link between educational outcomes and mortality is confounded by health status in early life.[33] This is highly relevant to consider in the context of this study since it suggests that efforts to reduce mortality by improving educational outcomes would have limited impact. On the other hand, there are studies that demonstrate a causal effect of schooling on mortality risks.[34] Thus, the associations are most likely reciprocal and mutually non-exclusive, which for this study would imply that the promotion of educational success could decrease the risks of premature mortality, as would the prevention of early life health problems, particularly among individuals with OHC experience.

In many ways, the lives of the 1953 cohort studied here differ from recent cohorts. For example, the scope of the Swedish welfare state expanded substantially in the 1950s and 1960s.[35] As part of the social engineering ambitions of the state, OHC was considered an effective tool for prevention, resulting in

a high prevalence of OHC experience among children being born at that time.[36] The culturally and ethnically homogeneous child welfare population has gradually been transformed by inflows of immigrants and refugees over the past decades.[37] The educational system has also changed since the 1950s. Like many other parts of the Western world, a larger share of the Swedish population is reaching higher levels of education.[38] While this, in many ways, is a positive development, it may also suggest that vulnerable groups are being increasingly left behind.[39]

To conclude, our findings highlight the vast mortality gap between children with and without OHC experience, and show that the size of this gap varies according to school performance. The issue of how much these results can be attributed to selection effects and factors that can be influenced by interventions is outside the scope of this study. Nevertheless, since children in OHC typically tend to perform in school substantially below their cognitive capacity compared with peers,[18] and that a recent study[30] found causal links between poor school performance and negative long-term outcomes, it seems reasonable to assume that the dismal lag in life expectancy—corresponding to a decade—can be reduced.

What is already known on this subject

- Past research has consistently demonstrated increased risks of premature mortality among children with out-of-home care (OHC) experience.
- It has been suggested that educational success may mitigate these mortality risks, but there is a lack of empirical findings.

What this study adds

- This study showed that children with OHC experience died, based on a median survival time, more than a decade before their majority population peers.
- However, this gap was almost closed among those who performed above average at school, highlighting the important role of educational success in this association.

Contributors YBA designed the study, drafted the manuscript and conducted the main parts of the analysis. JJ assisted in the data analysis and interpretation of the results. HF contributed to the study design and revised the manuscript. KG participated in the interpretation of the results and revised the manuscript. BV and AH took part in designing the study and revised the manuscript for important intellectual content. LB designed the study and drafted parts of the manuscript. All authors approved the final version of the manuscript.

Funding This study was financially supported by the Swedish Research Council for Health, Working Life and Welfare (grant no 2012-0201) and the Swedish Research Council (grant no 2017-01746).

Competing interests None declared.

Patient consent Not required.

Ethics approval Ethical permission for the current study was obtained from the Stockholm Regional Ethics Committee (no 2016/481-31/5).

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement Due to ethical regulations regarding the Stockholm Birth Cohort (SBC) study, access to the data is restricted. If there is interest in the unpublished data from this research article, a request can be made to the main author, who will forward it to the steering committee of the SBC.

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