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The association between childhood relocations and subsequent risk of suicide attempt, psychiatric problems, and low academic achievement

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Online Supplementary Material - Appendix
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Appendix A.

Description of the population and healthcare registers and the International Classification of Disease *(*ICD*) codes used to measure offspring and parental adverse outcomes*.

ICD-8, *ICD-9*, and *ICD-10* codes were used to identify suicide attempt, severe mental illness (i.e., diagnosis of either schizophrenia or bipolar disorder), and inpatient hospitalization for substance abuse. *ICD* codes are not applicable for criminal convictions or academic achievement.

Outcome	Data Source	Offspring Risk Period Start and End Dates	ICD Version	ICD Code	Description
Main Analyses					
Suicide Attempt (parental and offspring)	National Patient Register (NPR)	January 1, 1995-December 31, 2009	8, 9, 10	E950-E959, E980-E989, X60-X84, Y10-Y34, Y870, Y872	Certain and uncertain attempts including violent, non-violent, and other[a]
Severe Mental Illness (parental and offspring)	NPR	January 1, 1995-December 31, 2009	8, 9, 10	295, F20; 296.1, 296.3, 296.8, 296A-296E, 296W, F30-F31	Inpatient or outpatient primary diagnoses of schizophrenia or bipolar disorder, respectively
Inpatient Substance Abuse (parental and offspring)	NPR	January 1, 1995-December 31, 2009	8, 9, 10	303, 304, 305A, 305X, F10-F16 (except x.5), F18-19 (except x.5)	Alcohol or drug use (excluding nicotine) diagnosis
Criminal Convictions (parental and offspring)	National Crime Register	January 1, 1998-December 31, 2009	N/A	N/A	All violent and nonviolent criminal convictions 15 years and older
Low GPA (offspring)	National School Register	1999-2009[b]	N/A	N/A	The sum of standardized scales (i.e., pass, pass with distinction, and pass with honors) over 16 subjects in 9th grade

[a] All suicide attempts in the main analyses occurred after age 12 after exclusions.
[b] Given that our cohort starts in 1983 and GPA assessment occurs in the 9th grade, the risk period begins approximately in 1999.

Appendix B.

Tetrachoric correlations among the main outcomes.

In order to demonstrate that the outcomes often co-occur, we estimated the pairwise tetrachoric correlations among the four (0/1) coded status variables on the survival outcomes and the binary response variable indexing low GPA. All correlations $p<0.05$ for the test H_o: $\varrho = 0$ (no correction for multiple testing). The outcomes that are most highly correlated are suicide attempt with severe mental illness and inpatient substance abuse.

Outcome	Suicide Attempt	Severe Mental Illness	Inpatient Substance Abuse	Criminal Convictions	Low GPA
Suicide Attempt	1.00	-	-	-	-
Severe Mental Illness	0.50	1.00	-	-	-
Inpatient Substance Abuse	0.56	0.41	1.00	-	-
Criminal Convictions	0.28	0.18	0.42	1.00	-
Low GPA	0.26	0.18	0.34	0.46	1.00

Appendix C.

Kaplan-Meier estimates of all the survival outcomes analyzed in the study.

This table presents Kaplan-Meier estimates at ages 15, 20, and 25 separately for the population and in the cohort stratified by the number of childhood relocations. In general, the base rates for the survival outcomes increase with age and relocations. As stated in the text, the population prevalence for low GPA in the cohort is 9.44%. Among those who did not move 4.85% had low GPA, among those who moved 1-2 times 6.23% had low GPA, and among those who moved 3 or more times 3.52% had low GPA.

Outcome	Suicide Attempt N (%)[a]	Severe Mental Illness N (%)[a]	Inpatient Substance Abuse N (%)[a]	Criminal Convictions N (%)[a]	Death by Suicide N (%)[a]
Population					
15	5,741 (0.43)	259 (0.02)	4,213 (0.33)	0 (0)[b]	46 (0.00)
20	21,283 (2.06)	2,055 (0.23)	19,017 (1.92)	104,472 (10.70)	308 (0.03)
25	27,855 (3.57)	4,191 (0.81)	24,019 (3.13)	123,911 (15.28)	510 (0.08)
0 Relocations					
15	2,080 (0.35)	84 (0.01)	1,291 (0.23)	0 (0)[b]	15 (0.00)
20	7,547 (1.66)	691 (0.17)	6,078 (1.39)	35,394 (8.26)	115 (0.03)
25	9,971 (2.89)	1,470 (0.64)	7,655 (2.23)	42,812 (12.14)	181 (0.06)
1-2 Relocations					
15	2,435 (0.42)	122 (0.02)	1,848 (0.34)	0 (0)[b]	22 (0.00)
20	9,048 (2.06)	899 (0.24)	8,487 (2.02)	45,542 (10.99)	123 (0.03)
25	11,888 (3.63)	1,801 (0.82)	10,661 (3.28)	54,055 (15.79)	213 (0.08)
>3 Relocations					
15	1,226 (0.67)	53 (0.03)	1,074 (0.62)	0 (0)[b]	9 (0.00)
20	4,688 (3.39)	465 (0.40)	4,452 (3.36)	23,536 (17.80)	70 (0.06)
25	5,996 (5.70)	920 (1.38)	5,703 (5.76)	27,044 (24.27)	116 (0.13)

[a] Indicates the number and percentage of individuals who experienced the outcome in the study cohort (n=1.510.463).
[b] Individuals must be age 15 and older to be included in the National Crime Register.
Note: the total number of suicide attempts is 28,288, cases of severe mental illness is 4,389, cases substance abuse is 24,344, criminal convictions is 124,870, and deaths by suicide is 516.

Appendix D.

Main analysis measuring the association between continuous relocations (SSRS) and suicide attempt, severe mental illness, substance abuse, criminal convictions and low academic achievement (HR/OR, 95% CI) for Models 1-4.

The precise results from Figure 1 are presented the form of HRs and 95% CI (except for low GPA which is in the form of ORs). Individuals are at an increased risk for adverse outcomes according to Model 1 (i.e., general population model), although all HRs progressively attenuate in Model 2 (i.e., adjusted model), Model 3 (i.e., cousin comparison model), and Model 4 (i.e., sibling comparison model).

	Model							
Outcome	1[a]		2[a]		3[b]		4[a]	
	HR	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*
Suicide Attempt	1.19	1.19-1.20	1.08	1.07-1.09	1.07	1.05-1.09	1.00	0.97-1.04
Severe Mental Illness	1.20	1.18-1.23	1.12	1.10-1.14	1.07	1.01-1.13	0.97	0.87-1.09
Inpatient Substance Abuse	1.24	1.23-1.25	1.10	1.09-1.10	1.08	1.07-1.10	1.02	0.98-1.06
Criminal Convictions	1.22	1.22-1.23	1.09	1.08-1.09	1.07	1.06-1.08	1.00	0.98-1.02
	1[c]		2[c]		3[d]		4[c]	
	OR	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Low GPA	1.35	1.34-1.35	1.15	1.15-1.16	1.10	1.09-1.11	0.98	0.96-0.99

[a] Based off cohort size of 1,510,463. [b] Based off cohort size of 1,271,618. [c] Based off cohort size of 974,008. [d] Based off cohort size of 865,983.

Appendix E.

The parameter estimates and standard errors of the covariates included in Model 2 and 4.

In order to determine which covariates are statistically significant in the final model, parameter estimates and standard errors are presented for Model 2 (i.e., adjusted population model) and Model 4 (i.e., sibling comparison model) for all main outcomes. Note that maternal- and paternal-specific covariates were not estimated for Model 4, as these variables do not differ between siblings.

	Suicide Attempt		Severe Mental Illness		Inpatient Substance Abuse	
	Model 2	Model 4	Model 2	Model 4	Model 2	Model 4
Offspring-Specific Covariates	*b (SE)*	*b (SE)*	*b (SE)*	*b (SE)*	*b (SE)*	*b (SE)*
Female Sex	0.40 (0.01)	0.45 (0.02)	0.66 (0.03)	0.64 (0.07)	0.03 (0.01)	0.10 (0.03)
Birth Order						
First[a]	-	-	-	-	-	-
Second	0.20 (0.01)	0.20 (0.03)	-0.001 (0.04)	0.18 (0.08)	0.23 (0.02)	0.36 (0.03)
Third	0.30 (0.02)	0.30 (0.05)	0.10 (0.05)	0.51 (0.15)	0.28 (0.02)	0.45 (0.06)
Fourth or Higher	0.43 (0.03)	0.48 (0.08)	0.27 (0.07)	0.82 (0.24)	0.35 (0.03)	0.63 (0.09)
Mother's Age at Childbearing						
≤19	0.19 (0.03)	-0.20 (0.10)	0.14 (0.09)	-0.44 (0.30)	0.18 (0.03)	-0.01 (0.10)
20-24	0.10 (0.02)	-0.09 (0.04)	0.04 (0.04)	-0.41 (0.15)	0.09 (0.02)	-0.003 (0.05)
25-29[a]	-	-	-	-	-	-
30-34	-0.08 (0.02)	0.05 (0.05)	-0.01 (0.04)	0.26 (0.14)	-0.02 (0.02)	0.04 (0.05)
35-39	-0.10 (0.03)	0.23 (0.09)	0.01 (0.06)	0.37 (0.26)	-0.07 (0.03)	-0.002 (0.10)
40-44	-0.10 (0.05)	0.17 (0.19)	0.24 (0.11)	0.26 (0.50)	-0.03 (0.06)	0.09 (0.19)
≥45	0.05 (0.24)	-9.88 (132.36)	0.91 (0.38)	-	-0.04 (0.27)	0.72 (0.95)
Father's Age at Childbearing						
≤19	0.16 (0.06)	-0.17 (0.18)	-0.26 (0.17)	-0.65 (0.93)	0.19 (0.06)	0.23 (0.18)
20-24	0.08 (0.02)	-0.04 (0.05)	-0.06 (0.05)	-0.28 (0.17)	0.11 (0.02)	0.04 (0.06)
25-29[a]	-	-	-	-	-	-
30-34	-0.02 (0.02)	0.12 (0.04)	-0.01 (0.04)	0.05 (0.13)	-0.03 (0.02)	-0.03 (0.05)
35-39	-0.01 (0.02)	0.25 (0.08)	0.11 (0.05)	0.21 (0.24)	-0.002 (0.02)	-0.08 (0.08)
40-44	0.09 (0.03)	0.39 (0.12)	0.19 (0.07)	-0.06 (0.37)	0.06 (0.03)	-0.19 (0.13)
≥45	0.14 (0.04)	0.71 (0.20)	0.40 (0.10)	0.42 (0.61)	0.23 (0.04)	-0.19 (0.21)
Missing	-0.003 (0.09)	-	-0.44 (0.25)	-	0.05 (0.09)	-
Maternal Smoking During Pregnancy	0.19 (0.01)	-0.004 (0.05)	0.12 (0.04)	-0.06 (0.15)	0.35 (0.01)	0.01 (0.05)
Missing	0.04 (0.03)	0.06 (0.06)	0.05 (0.06)	0.04 (0.16)	0.16 (0.03)	0.04 (0.06)
Mother's Cohabitation Status at Time of Offspring Birth	0.16 (0.02)	-0.01 (0.07)	0.12 (0.06)	-0.12 (0.22)	0.27 (0.02)	0.12 (0.07)
Missing	0.07 (0.03)	0.01 (0.06)	0.09 (0.07)	-0.04 (0.18)	0.13 (0.03)	0.01 (0.06)

Appendix E.

The parameter estimates and standard errors of the covariates included in Model 2 and 4 (continued).

Maternal-Specific Covariates						
Highest Level of Education						
Primary/Lower (<9 yrs)[a]	-	-	-	-	-	-
Primary/Lower (9 yrs)	0.20 (0.05)	-	0.30 (0.12)	-	0.23 (0.05)	-
Upper/Secondary (1-2 yrs)	0.20 (0.04)	-	0.43 (0.12)	-	0.19 (0.05)	-
Upper/Secondary (3 yrs)	0.20 (0.05)	-	0.65 (0.12)	-	0.17 (0.05)	-
Post-Secondary (<3 yrs)	0.20 (0.05)	-	0.61 (0.12)	-	0.15 (0.05)	-
Post-Secondary (3+yrs)/Post-Graduate	0.23 (0.05)	-	0.73 (0.12)	-	0.17 (0.05)	-
Missing	-0.48 (0.15)	-	0.10 (0.38)	-	0.26 (0.14)	-
Born in Sweden	0.18 (0.02)	-	0.002 (0.05)	-	-0.03 (0.02)	-
Suicide Attempt	0.46 (0.03)	-	0.46 (0.07)	-	0.34 (0.03)	-
Suicide	0.21 (0.11)	-	0.52 (0.21)	-	0.27 (0.11)	-
Severe Mental Illness	0.20 (0.04)	-	0.03 (0.08)	-	0.23 (0.04)	-
Inpatient Substance Abuse	0.19 (0.03)	-	0.03 (0.08)	-	0.33 (0.03)	-
Criminal Conviction	0.18 (0.02)	-	0.08 (0.04)	-	0.26 (0.02)	-
Paternal-Specific Covariates						
Highest Level of Education						
Primary/Lower (<9 yrs)[a]	-	-	-	-	-	-
Primary/Lower (9 yrs)	0.10 (0.03)	-	0.18 (0.08)	-	0.15 (0.03)	-
Upper/Secondary (1-2 yrs)	0.14 (0.03)	-	0.27 (0.08)	-	0.14 (0.03)	-
Upper/Secondary (3 yrs)	0.05 (0.03)	-	0.30 (0.08)	-	0.13 (0.04)	-
Post-Secondary (<3 yrs)	0.05 (0.03)	-	0.37 (0.08)	-	0.11 (0.04)	-
Post-Secondary (3+yrs)/Post-Graduate	-0.02 (0.03)	-	0.50 (0.08)	-	0.14 (0.04)	-
Missing	0.06 (0.07)	-	0.29 (0.17)	-	0.40 (0.07)	-
Born in Sweden	0.05 (0.02)	-	-0.09 (0.05)	-	-0.07 (0.02)	-
Suicide Attempt	0.28 (0.03)	-	0.14 (0.08)	-	0.18 (0.03)	-
Suicide	0.33 (0.06)	-	0.56 (0.14)	-	0.33 (0.07)	-
Severe Mental Illness	0.18 (0.05)	-	1.26 (0.08)	-	0.21 (0.06)	-
Inpatient Substance Abuse	0.28 (0.02)	-	0.23 (0.06)	-	0.48 (0.02)	-
Criminal Conviction	0.27 (0.01)	-	0.20 (0.03)	-	0.38 (0.01)	-
Family-Specific Covariates						
Average familial income 1st quartile[a]	-	-	-	-	-	-
Average familial income 2nd quartile	-0.04 (0.02)	-0.17 (0.07)	-0.19 (0.04)	-0.34 (0.23)	-0.07 (0.02)	-0.04 (0.07)
Average familial income 3rd quartile	-0.24 (0.02)	-0.12 (0.09)	-0.32 (0.05)	-0.52 (0.30)	-0.13 (0.02)	0.08 (0.10)
Average familial income 4th quartile	-3.08 (0.02)	-0.17 (0.11)	-0.50 (0.05)	-0.68 (0.36)	-0.68 (0.02)	0.05 (0.12)
Missing	-3.08 (0.71)	-	2.40 (0.77)	-	0.07 (0.72)	-

Note: Based off cohort size of 1,510,463. [a] Indicates the reference group.

Appendix E.

The parameter estimates and standard errors of the covariates included in Model 2 and 4 (continued).

	Criminal Convictions		Low Grades	
	Model 2	Model 4	Model 2	Model 4
Offspring-Specific Covariates	*b (SE)*	*b (SE)*	*b (SE)*	*b (SE)*
Female Sex	-0.89 (0.01)	-0.85 (0.01)	-0.49 (0.01)	-0.64 (0.01)
Birth Order				
First[a]	-	-	-	-
Second	0.19 (0.01)	0.20 (0.01)	0.43 (0.01)	0.35 (0.02)
Third	0.26 (0.01)	0.22 (0.03)	0.75 (0.01)	0.55 (0.04)
Fourth or Higher	0.36 (0.01)	0.28 (0.04)	1.07 (0.01)	0.74 (0.05)
Mother's Age at Childbearing				
≤19	0.26 (0.02)	0.09 (0.05)	0.49 (0.02)	-0.10 (0.05)
20-24	0.13 (0.01)	0.04 (0.02)	0.23 (0.01)	-0.01 (0.03)
25-29[a]	-	-	-	-
30-34	-0.09 (0.01)	0.01 (0.02)	-0.14 (0.01)	0.05 (0.03)
35-39	-0.15 (0.01)	0.05 (0.04)	-0.24 (0.01)	0.06 (0.06)
40-44	-0.24 (0.03)	-0.02 (0.09)	-0.30 (0.03)	0.09 (0.11)
≥45	-0.07 (0.12)	-0.14 (0.42)	-0.36 (0.13)	0.01 (0.53)
Father's Age at Childbearing				
≤19	0.14 (0.03)	0.01 (0.08)	0.35 (0.03)	0.03 (0.09)
20-24	0.09 (0.01)	0.03 (0.02)	0.17 (0.01)	-0.06 (0.03)
25-29[a]	-	-	-	-
30-34	-0.03 (0.01)	-0.01 (0.02)	-0.05 (0.01)	-0.01 (0.03)
35-39	-0.02 (0.01)	-0.01 (0.04)	0.002 (0.01)	0.07 (0.05)
40-44	0.02 (0.02)	-0.01 (0.06)	0.10 (0.02)	0.16 (0.08)
≥45	0.06 (0.02)	0.04 (0.10)	0.18 (0.02)	0.11 (0.12)
Missing	0.03 (0.04)	-	0.14 (0.05)	-
Maternal Smoking During Pregnancy	0.28 (0.01)	-0.01 (0.02)	0.45 (0.01)	-0.03 (0.03)
Missing	0.11 (0.01)	-0.06 (0.03)	0.22 (0.01)	0.02 (0.03)
Mother's Cohabitation Status at Time of Offspring Birth	0.18 (0.01)	0.004 (0.03)	0.24 (0.01)	0.01 (0.04)
Missing	0.06 (0.01)	0.01 (0.03)	0.05 (0.01)	0.02 (0.03)

Appendix E.

The parameter estimates and standard errors of the covariates included in Model 2 and 4 (continued).

Maternal-Specific Covariates				
Highest Level of Education				
Primary/Lower (<9 yrs)[a]	-	-	-	-
Primary/Lower (9 yrs)	0.04 (0.02)	-	0.04 (0.02)	-
Upper/Secondary (1-2 yrs)	-0.03 (0.02)	-	-0.25 (0.02)	-
Upper/Secondary (3 yrs)	-0.08 (0.02)	-	-0.51 (0.02)	-
Post-Secondary (<3 yrs)	-0.13 (0.02)	-	-0.79 (0.02)	-
Post-Secondary (3+yrs)/Post-Graduate	-0.15 (0.02)	-	-0.93 (0.02)	-
Missing	0.21 (0.06)	-	0.23 (0.08)	-
Born in Sweden	-0.09 (0.01)	-	-0.01 (0.01)	-
Suicide Attempt	0.14 (0.02)	-	0.20 (0.02)	-
Suicide	0.19 (0.06)	-	-0.09 (0.08)	-
Severe Mental Illness	0.04 (0.02)	-	-0.01 (0.03)	-
Inpatient Substance Abuse	0.11 (0.02)	-	0.09 (0.02)	-
Criminal Conviction	0.35 (0.01)	-	0.30 (0.01)	-
Paternal-Specific Covariates				
Highest Level of Education				
Primary/Lower (<9 yrs)[a]	-	-	-	-
Primary/Lower (9 yrs)	0.04 (0.01)	-	0.01 (0.02)	-
Upper/Secondary (1-2 yrs)	0.01 (0.01)	-	-0.16 (0.01)	-
Upper/Secondary (3 yrs)	-0.09 (0.02)	-	-0.48 (0.02)	-
Post-Secondary (<3 yrs)	-0.14 (0.02)	-	-0.68 (0.02)	-
Post-Secondary (3+yrs)/Post-Graduate	-0.18 (0.02)	-	-0.78 (0.02)	-
Missing	0.08 (0.03)	-	0.01 (0.04)	-
Born in Sweden	-0.19 (0.01)	-	-0.12 (0.01)	-
Suicide Attempt	0.11 (0.02)	-	0.19 (0.02)	-
Suicide	0.16 (0.04)	-	0.13 (0.04)	-
Severe Mental Illness	0.06 (0.03)	-	-0.01 (0.04)	-
Inpatient Substance Abuse	0.22 (0.01)	-	0.31 (0.01)	-
Criminal Conviction	0.44 (0.01)	-	0.38 (0.01)	-
Family-Specific Covariates				
Average familial income 1st quartile[a]	-	-	-	-
Average familial income 2nd quartile	-0.10 (0.01)	0.02 (0.03)	-0.16 (0.01)	-0.01 (0.04)
Average familial income 3rd quartile	-0.15 (0.01)	0.08 (0.04)	-0.32 (0.01)	-0.04 (0.05)
Average familial income 4th quartile	-0.19 (0.01)	0.05 (0.06)	-0.52 (0.01)	-0.10 (0.06)
Missing	-1.24 (0.35)	-	-0.18 (0.25)	0.001 (1.09)

Note: Based off cohort size of 1,510,463 [a] Indicates the reference group.

Appendix F.

Results for the tests of the proportional-hazards assumptions for Models 1-2 with relocation x time interaction parameter estimates.

To test the proportionality assumption for inpatient substance abuse and criminal convictions, we included two additional parameters representing the interaction of relocations with offspring age at first diagnosis/criminal conviction. Despite the violation in the proportionality assumption, the hazard ratios differ little from models that included the relocation x time interaction and those that did not.

Outcome	Model 1[a]			Model 2[a]		
	b	*HR*	*95% CI*	*b*	*HR*	*95% CI*
Inpatient Substance Abuse						
Without interactions	0.22*	1.24	1.23-1.25	0.09*	1.10	1.09-1.10
With interactions	0.20*	1.23	1.22-1.24	0.08*	1.08	1.07-1.09
Relocations x Age(≤19)	REF	-	-	REF	-	-
Relocations x Age(20-23)	0.05*	-	-	0.04*	-	-
Relocations x Age(≥24)	0.02*	-	-	0.02*	-	-
Criminal Convictions						
Without interactions	0.20*	1.22	1.22-1.23	0.08*	1.09	1.08-1.09
With interactions	0.20*	1.23	1.22-1.23	0.08*	1.09	1.08-1.09
Relocations x Age(≤19)	REF	-	-	REF	-	-
Relocations x Age(20-23)	-0.02*	-	-	-0.02*	-	-
Relocations x Age(≥24)	-0.06*	-	-	-0.06*	-	-

[a] Based off cohort size of 1,510,463.
[b] Based off cohort size of 1,271,618.
* Indicates significant at $p<0.05$.

Appendix G.

Sensitivity analysis measuring the association between continuous relocations (SSRS) and suicide attempt, severe mental illness, substance abuse, criminal convictions, and low academic achievement excluding individuals with missing maternal grandmother identification numbers.

We also estimated Model 2 (i.e., model adjusted by all individual and parental covariates) on the cohort without missing maternal grandmother identification numbers. This model yielded parameter estimates based on the same subset of the data used for the cousin comparison model. Results are similar to Model 2 in Appendix D.

Outcome	*HR*[a]	*95% CI*
Suicide Attempt	1.01	0.97-1.15
Severe Mental Illness	1.00	0.88-1.12
Inpatient Substance Abuse	1.15	1.14-1.16
Criminal Convictions	1.13	1.13-1.14
	OR[b]	*95% CI*
Low GPA	0.98	0.96-1.00

[a] Based off cohort size of 1,271,618.
[b] Based off cohort size of 865,983.

Appendix H.

Sensitivity analysis measuring the association between continuous relocations (SSRS) and additional outcomes (i.e., suicide and academic achievement) for Models 1-3.

Because a large body of research has focused on relocation and suicide specifically, we performed sensitivity analyses examining suicide. To provide an additional measurement of academic achievement and further assess the main outcome of low GPA, we ran sensitivity analyses on continuous academic outcomes. The results were consistent with the finding that an individual's risk for adverse outcomes decreased when accounting for covariates and environmental and genetic confounds shared by cousins. The sibling comparison model was not included due to insufficient observations.

Outcome	Model 1		Model 2		Model 3	
	HR	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*
Suicide	1.22[a]	1.16-1.28	1.11[a]	1.05-1.18	1.00[b]	0.84-1.18
	b	*SE*	*b*	*SE*	*b*	*SE*
GPA	-0.14[c]	<0.01	-0.06[c]	<0.01	-0.05[d]	<0.01
Achievement Swedish Test	-0.06[e]	<0.01	-0.02[e]	<0.01	-0.01[f]	<0.01
Achievement Math Test	-0.08[g]	<0.01	-0.04[g]	<0.01	-0.02[h]	<0.01
Achievement English Test	-0.03[i]	<0.01	-0.003[i]	<0.01	-0.003[j]	<0.01

[a] Based off cohort size of 1,510,463.
[b] Based off cohort size of 1,271,618.
[c] Based off cohort size of 974,008.
[d] Based off cohort size of 865,983.
[e] Based off cohort size of 499,116.
[f] Based off cohort size of 445,443.
[g] Based off cohort size of 631,908.
[h] Based off cohort size of 566,561.
[i] Based off cohort size of 498,854.
[j] Based off cohort size of 444,724.

Appendix I.

Sensitivity analysis measuring the association between continuous relocations (LISA) and suicide attempt, severe mental illness, substance abuse, criminal convictions, and low academic achievement for Models 1-3.

In order to validate our primary measurement of relocations (SSRS), we introduced a second measurement of relocations (LISA). Despite reduced statistical precision due to fewer relocation cases, the results lend support to the lack of an independent association from Model 1 to Model 3. The sibling comparison model was not included due to insufficient observations.

Outcome	Model 1[a]		2[a]		3[b]	
	HR	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*
Suicide Attempt	1.12	1.11-1.12	1.05	1.04-1.07	1.05	1.02-1.08
Severe Mental Illness	1.13	1.10-1.16	1.06	1.03-1.09	1.17	1.03-1.33
Inpatient Substance Abuse	1.15	1.14-1.15	1.09	1.08-1.10	1.09	1.05-1.12
Criminal Convictions	1.14	1.14-1.15	1.08	1.08-1.09	1.05	1.04-1.07
	1[c]		2[c]		3[d]	
	OR	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Low GPA	1.26[a]	1.25-1.26	1.11[a]	1.10-1.11	1.08[b]	1.06-1.10

[a] Based off cohort size of 836,074. [b] Based off cohort size of 679,069.
[c] Based off cohort size of 329,608. [d] Based off cohort size of 295,707.

Appendix J.

Sensitivity analysis measuring the association between continuous relocations (LISA) and additional outcomes (i.e., suicide and academic achievement) for Models 1-3.

We analyzed suicide and academic achievement using our second measurement of relocation (LISA). The risks for the outcomes decreased over the three models, paralleling previous conclusions. The sibling comparison model was not included due to insufficient observations.

Outcome	Model 1[a]		2[a]		3[b]	
	HR	*95% CI*	*HR*	*95% CI*	*HR*	*95%*
Suicide	1.12[a]	1.05-1.19	1.07[a]	0.99-1.05	-[b]*	-*

	1[c]		2[c]		3[d]	
	b	*SE*	*b*	*SE*	*b*	*SE*
GPA	-0.11[c]	<0.01	-0.11[c]	<0.01	-0.04[d]	0.01
Achievement Swedish Test	-0.05[e]	<0.01	-0.02[e]	<0.01	-0.01[f]	<0.01
Achievement Math Test	-0.07[g]	<0.01	-0.03[g]	<0.01	-0.02[h]	<0.01
Achievement English Test	-0.03[i]	<0.01	-0.002[i]	<0.01	0.003[j]	<0.01

[a] Based off cohort size of 836,074.
[b] Based off cohort size of 679,069.
[c] Based off cohort size of 329,608.
[d] Based off cohort size of 295,707.
[e] Based off cohort size of 409,893.
[f] Based off cohort size of 360,641.
[g] Based off cohort size of 400,734.
[h] Based off cohort size of 351,508.
[i] Based off cohort size of 408,362.
[j] Based off cohort size of 358,829.
[*] Indicates that the model could not be estimated.

Appendix K.

Sensitivity analysis measuring the association between categorical relocations (SSRS) and suicide attempt, severe mental illness, substance abuse, criminal convictions, and low academic achievement for Models 1-3.

We categorized continuous relocations measured by SSRS into three groups (i.e., 0 moves, 1-2 moves, 3 or more moves). Those who moved one or more times were at an elevated risk in Model 1 for all outcomes, although the risks attenuated in Model 2 and even further in Model 3. The sibling comparison model was not included due to insufficient observations.

Outcome	Model 1[a] HR, 95% CI	2[a] HR, 95% CI	3[b] HR, 95% CI
Suicide Attempt			
0 moves	REF	REF	REF
1-2 moves	1.29 (1.25-1.32)	1.16 (1.13-1.19)	1.18 (1.12-1.25)
≥3 moves	2.10 (2.03-2.17)	1.42 (1.37-1.47)	1.39 (1.29-1.49)
Severe Mental Illness			
0 moves	REF	REF	REF
1-2 moves	1.33 (1.24-1.42)	1.20 (1.12-1.29)	1.08 (0.90-1.29)
≥3 moves	2.23 (2.06-2.42)	1.63 (1.49-1.79)	1.27 (0.99-1.61)
Inpatient Substance Abuse			
0 moves	REF	REF	REF
1-2 moves	1.52 (1.48-1.57)	1.30 (1.26-1.34)	1.18 (1.11-1.25)
≥3 moves	2.64 (2.55-2.73)	1.58 (1.52-1.64)	1.46 (1.35-1.57)
Criminal Convictions			
0 moves	REF	REF	REF
1-2 moves	1.39 (1.38-1.41)	1.20 (1.19-1.22)	1.13 (1.10-1.16)
≥3 moves	2.35 (2.31-2.38)	1.45 (1.43-1.48)	1.35 (1.30-1.40)
	1[c] OR, 95% CI	2[c] OR, 95% CI	3[d] OR, 95% CI
Low GPA			
0 moves	REF	REF	REF
1-2 moves	1.54 (1.52-1.56)	1.33 (1.31-1.35)	1.25 (1.21-1.29)
≥3 moves	3.36 (3.30-3.41)	1.83 (1.80-1.87)	1.54 (1.47-1.61)

[a] Based off cohort size of 1,510,463. [b] Based off cohort size of 1,271,618.
[c] Based off cohort size of 974,008. [d] Based off cohort size of 865,983.

Appendix L.

Sensitivity analysis measuring the association between relocations (SSRS) and suicide attempt, mental illness, substance abuse, criminal convictions, and low academic achievement and a predictor based on more broadly-defined geographic areas (municipal districts) for Models 1-4.

When defining relocations as a change in municipality, as compared to a change in a SAMS area in the main analysis, the risk for adverse outcomes follows a similar pattern of attenuation from Model 1-4. When accounting for environmental and genetic factors shared by cousins and siblings, the risk for adverse outcomes decreases irrespective of defining relocations as a change in SAMS or municipal district.

	Model							
Outcome	1[a]		2[a]		3[b]		4[a]	
	HR	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*
Suicide Attempt	1.21	1.19-1.22	1.08	1.07-1.10	1.07	1.04-1.10	0.96	0.91-1.01
Severe Mental Illness	1.26	1.22-1.30	1.14	1.11-1.18	1.08	1.00-1.18	1.00	0.84-1.18
Inpatient Substance Abuse	1.26	1.25-1.28	1.08	1.07-1.10	1.07	1.04-1.10	0.94	0.89-0.99
Criminal Convictions	1.23	1.23-1.24	1.08	1.07-1.08	1.07	1.06-1.09	1.00	0.98-1.03
	1[c]		2[c]		3[d]		4[c]	
	OR	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Low GPA	1.33	1.32-1.34	1.14	1.13-1.15	1.09	1.07-1.11	0.95[*]	0.92-0.98

[a] Based off cohort size of 1,510,463. [b] Based off cohort of 1,271,618. [c] Based off cohort size of 974,008.
[d] Based off cohort of 865,983. [*] Indicates model did not complete Quasi-Newtonian optimization.

Appendix M.

Sensitivity analysis measuring the association between relocations (SSRS) and suicide attempt, mental illness, substance abuse, criminal convictions, and low academic achievement separating childhood into sensitive age periods for Model 1-4.

With the separation of childhood into two distinct age groups, children who relocated from age 6-11 were at an increased risk compared to relocations from birth to age 5. The risk of adverse outcomes after moving from age 6-11 followed a similar pattern of attenuation as the main analyses.

Outcome	Model 1[a]		2[a]		3[b]		4[a]	
	HR	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*	*HR*	*95% CI*
Suicide Attempt								
0-5	1.15	1.14-1.17	1.05	1.04-1.06	1.03	1.01-1.05	0.94	0.91-0.97
6-11	1.23	1.21-1.24	1.11	1.10-1.13	1.10	1.07-1.13	0.97	0.93-1.01
Severe Mental Illness								
0-5	1.18	1.14-1.21	1.10	1.07-1.14	1.14	1.05-1.23	0.91	0.81-1.02
6-11	1.24	1.20-1.28	1.15	1.11-1.19	1.03	0.94-1.13	0.95	0.83-1.10
Inpatient Substance Abuse								
0-5	1.20	1.19-1.22	1.06	1.05-1.08	1.05	1.03-1.08	0.96	0.92-0.99
6-11	1.28	1.27-1.30	1.12	1.11-1.14	1.11	1.08-1.14	0.97	0.93-1.01
Criminal Convictions								
0-5	1.18	1.17-1.19	1.06	1.05-1.06	1.06	1.05-1.07	0.97	0.95-0.99
6-11	1.26	1.25-1.27	1.11	1.10-1.11	1.08	1.06-1.09	0.99	0.97-1.01
	1[c]		2[c]		3[d]		4[c]	
	OR	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Low GPA								
0-5	1.27	1.26-1.28	1.12	1.11-1.12	1.08	1.07-1.10	0.97*	0.95-0.99
6-11	1.41	1.40-1.42	1.18	1.17-1.19	1.11	1.09-1.13	0.98*	0.96-1.01

[a] Based off cohort size of 1.510.463. [b] Based off cohort size of 1.271.618. [c] Based off cohort size of 974.008.
[d] Based off cohort size of 865,983. * Indicates model did not complete Quasi-Newtonian optimization.