

The Causal Effects of Education on Family Health

Evidence from Expanding Access to Higher Education

Thang Dang¹ Mika Haapanen² Tuomo Suhonen³

¹Centre for Fertility and Health, Norwegian Institute of Public Health

²University of Jyväskylä

³Labour Institute for Economic Research LABORE

EEA-ESEM Barcelona,
August 30, 2023

Background

- Health disparities by education level remain substantial in both developed and developing countries
- A policy-relevant question is whether the relationship between education and health is causal
 - Inconclusive empirical evidence: education found to affect individuals' own health outcomes, including mortality, obesity, and health behaviors, only in some contexts (see Galama et al., 2018; Xu et al., 2021)

Background

- However, even in the absence of direct health effects, society could benefit from its members' educational attainment through the spillover effects on others' health
 - Recent evidence on a causal relationship between individuals' education and their parents' later-life health (Lundborg and Majlesi, 2018; De Neve and Fink, 2018; Ma, 2019; Cornelissen and Dang, 2022).

This study

- We aim to ‘kill two birds with one stone’ by presenting quasi-experimental evidence on:
 - Direct health effects of years of education
 - Upward intergenerational effects of education on parental health
- Finnish full-population register data containing information on individuals’ mortality and mental health problems and those of their mothers and fathers

This study

- Plausibly exogenous variation in years of education due to the opening of new universities and the geographical expansion of the Finnish university system between the late 1960s and the late 1970s
 - Two alternative instruments previously used by Suhonen & Karhunen (2019)
 - Distance to university
 - Gravity-model measure of access to university

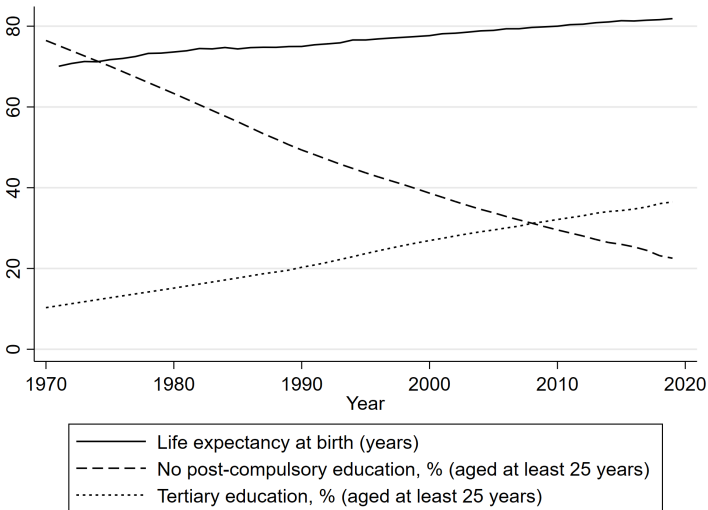
This study

- Main takeaway: education found to have positive effects on individuals' mental health and their parents' longevity
- Main contribution: previous quasi-experimental evidence mainly from compulsory schooling reforms, whereas we present evidence on the health consequences of education induced through establishing and expanding regional universities

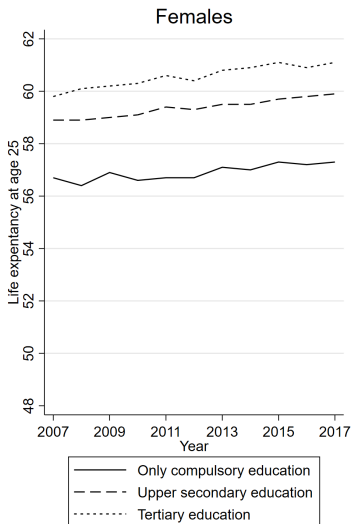
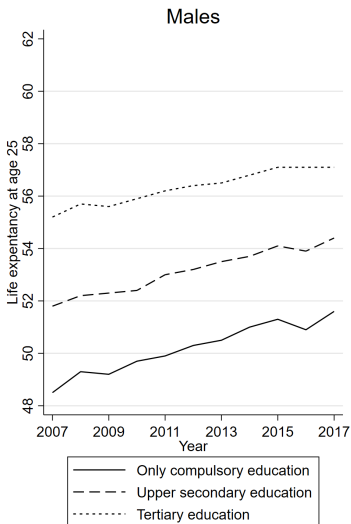
Outline

- 1 Introduction
- 2 Institutional background**
- 3 Data
- 4 Event study analysis
- 5 IV analysis
- 6 Conclusions

Life expectancy and education



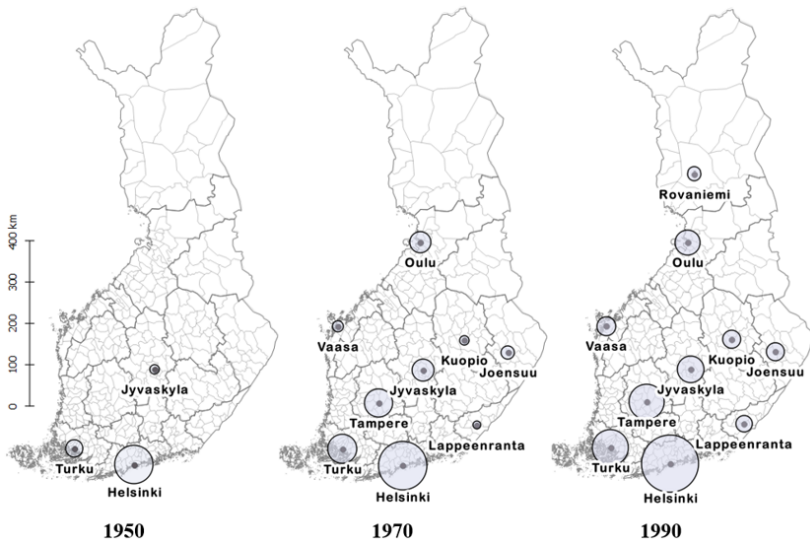
Life expectancy by level of education and gender



University expansion in Finland

- In the 1950s, Finnish university system was small and geographically concentrated
- Growing demand for higher education and decentralization policies led to expansion and university openings in 1959–79
- The university openings had significant positive impacts on educational attainment close to the new university sites (Suhonen & Karhunen, 2019)
 - Men's educational attainment increased only through a higher participation in VET, likely because of local spillovers across the educational sectors
- We focus on the later wave of university openings: Vaasa (1968), Joensuu (1969), Lappeenranta (1969), Kuopio (1972) and Rovaniemi (1979)

University expansion in Finland



Outline

- 1 Introduction
- 2 Institutional background
- 3 Data**
- 4 Event study analysis
- 5 IV analysis
- 6 Conclusions

Data

- Full-population data on Finnish children born in 1948-61
 - Larger number of cohorts (1946–63) used in event study analyses
 - Parent-child link fully representative for most cohorts
- Health data over the period 1970-2018
 - Dates and causes of death
 - Finnish Institute for Health and Welfare (THL): inpatient hospitalization spells due to dementia, schizophrenia, other non-effective psychosis, bipolar disorder, depressive disorder, anxiety/stress-related/neurotic disorder, alcohol-use- or substance-use-related MH problem
 - Social Insurance Institution of Finland (KELA): reimbursed purchases of psycholeptics, antipsychotics, antipanic agents, sleeping pills, psychoanaleptics and antidepressants

Instruments

- Access to university at age 19 based on parent's municipality of residence in 1970 (cohorts 1948–52) or in the year of the individual's 18th birthday (cohorts 1953–61)
- Primary instrument based on reductions in distance to the nearest university in 1968, 1969, 1972 and 1979 due to the university openings
- For more precise estimates, we use a gravity-model measure for access to university (Suhonen & Karhunen, 2019):

$$Access_{m,t} = \sum_{k=1}^{K_t} \frac{S_{k,t}}{C_{k,t} d_{km}^{1/2}}, C_{k,t} = \sum_{l=1}^L \frac{N_{l,t}}{d_{kl}^{1/2}} \quad (1)$$

Summary statistics: Individuals

Table 1. Summary statistics. Mean outcomes by education level.

Outcome	Women, by education				Men, by education			
	Primary	Secondary	Lower tertiary	Higher tertiary	Primary	Secondary	Lower tertiary	Higher tertiary
Survival, age 55	0.949	0.973	0.982	0.986	0.891	0.928	0.965	0.977
MH-related hospitalization, by age 55	0.121	0.083	0.050	0.043	0.180	0.135	0.067	0.050
MH-related drug purchase, by age 55	0.424	0.430	0.415	0.431	0.322	0.316	0.290	0.297
Income, age 55	24 065	27 797	38 701	64 026	30 391	35 081	56 197	91 304
N	104 834	201 504	139 450	43 834	143 908	229 403	106 718	46 278
% share	21 %	41 %	28 %	9 %	27 %	44 %	20 %	9 %

Summary statistics: Parents

Table 2. Summary statistics. Mean parental outcomes by the child's education level.

Outcome	Mothers, by child's education				Fathers, by child's education			
	Primary	Secondary	Lower tertiary	Higher tertiary	Primary	Secondary	Lower tertiary	Higher tertiary
Survival, age 70	0.831	0.857	0.882	0.894	0.629	0.674	0.723	0.762
Survival, age 75	0.724	0.768	0.807	0.829	0.478	0.537	0.596	0.646
Survival, age 80	0.580	0.642	0.694	0.725	0.324	0.386	0.449	0.503
MH-related hospitalization, by age 70	0.066	0.061	0.050	0.047	0.081	0.073	0.059	0.052
Years of education	9.33	9.57	10.03	11.16	9.47	9.76	10.54	12.20
Income, age 55	9 759	11 332	13 734	17 353	18 449	20 652	27 123	37 975
Income, age 60	9 729	11 255	13 566	17 257	16 259	18 377	24 590	35 509
Income, age 65	10 119	11 295	13 168	16 577	15 131	17 069	22 285	32 070
Child living in same sub-region, age 55	0.819	0.758	0.678	0.606	0.822	0.771	0.703	0.659
Child living in same sub-region, age 60	0.793	0.721	0.619	0.503	0.795	0.731	0.637	0.536
Child living in same sub-region, age 65	0.775	0.695	0.584	0.441	0.773	0.700	0.594	0.465
N	233 623	412 252	238 543	87 576	192 327	360 013	215 556	80 429

Outline

- 1 Introduction
- 2 Institutional background
- 3 Data
- 4 Event study analysis**
- 5 IV analysis
- 6 Conclusions

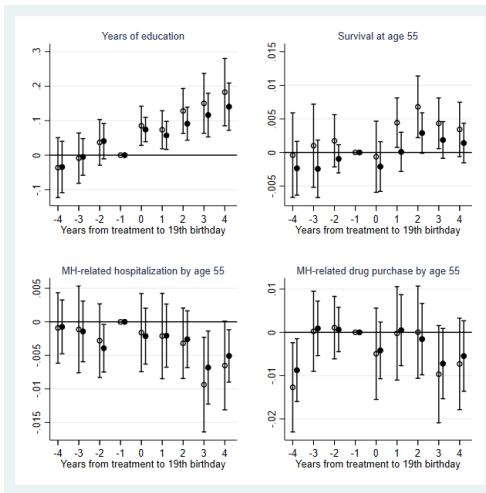
Event study analysis

- TWFE event study specification: the effect of a decrease in distance to university r years since the 19th birthday of individual i with parent j , municipality m and cohort c :

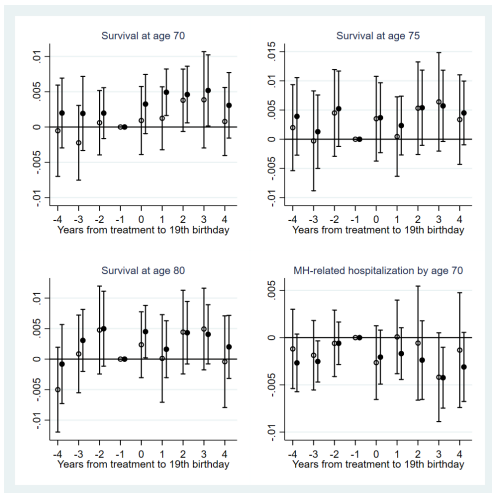
$$y_{ijmc} = \alpha + \sum_{r=\underline{r}}^{\bar{r}} \beta_r d_{m,c+19-r} + \gamma_m + \delta_c + \epsilon_{ijmc} \quad (2)$$

- Two alternative treatment indicators based on the university openings in 1968–79
 - Binary: distance to university decreases to < 100 km
 - Continuous: any decrease in distance to university assuming a linear relationship
- Results highly similar when using the non-parametric approach of Callaway & Sant'Anna (2021) instead of TWFE

Event study results: Individuals



Event study results: Parents



Outline

- 1 Introduction
- 2 Institutional background
- 3 Data
- 4 Event study analysis
- 5 IV analysis**
- 6 Conclusions

Instrumental variables estimation

- We estimate the effect of individual's years of education on her or her parent's outcome y_{ijmc} using

$$Health_{ijmc} = \beta_0 + \beta_1 Educ_{ijmc} + \theta_m + \mu_c + \epsilon_{ijmc} \quad (3)$$

$$Educ_{ijmc} = \alpha_0 + \alpha_1 Access_{m,c+19} + \gamma_m + \delta_c + \vartheta_{ijmc} \quad (4)$$

- In robustness and validity checks parents' education and income used as covariates and placebo outcomes

First-stage results

Table 3. First-stage results. The effect of access to university at age 19 on educational attainment.

	Effect of distance to university (/100 km)		Effect of gravity-model measure	
	Women	Men	Women	Men
	(1)	(2)	(3)	(4)
Years of education	-0.1083** (0.0416) F=6.8	-0.1476*** (0.0377) F=15.3	0.4385*** (0.0355) F=152.7	0.5492*** (0.0382) F=206.9
Level of education				
Primary	0.0145* (0.0083)	0.0287*** (0.0079)	-0.0774*** (0.0083)	-0.1089*** (0.0069)
Secondary	0.0058 (0.0054)	-0.0118** (0.0052)	0.0029 (0.0105)	0.0548*** (0.0060)
Lower tertiary	-0.0195*** (0.0057)	-0.0143*** (0.0038)	0.0725*** (0.0049)	0.0423*** (0.0047)
Higher tertiary	-0.0008 (0.0026)	-0.0026 (0.0020)	0.0020 (0.0053)	0.0118*** (0.0023)
N	489 622	526 307	489 622	526 307

Notes: Standard errors in parentheses are clustered at the sub-region level (70 clusters).
Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Individuals' long-term outcomes

Table 4. Effects of years of education on an individual's long-term outcomes. OLS estimates and IV estimates using two alternative instruments.

	OLS	IV: distance to university		IV: gravity-model measure	
	(1)	(2)	(3)	(4)	(5)
A. Survival, age 55					
Women	0.0044*** (0.0001)	0.0121 (0.0128)	0.0119 (0.0122)	-0.0008 (0.0030)	-0.0009 (0.0036)
Men	0.0096*** (0.0003)	-0.0002 (0.0118)	-0.0004 (0.0111)	0.0154*** (0.0047)	0.0155*** (0.0046)
B. MH-related hospitalization, by age 55					
Women	-0.0101*** (0.0003)	-0.0275** (0.0134)	-0.0257** (0.0126)	-0.0043 (0.0046)	-0.0037 (0.0055)
Men	-0.0156*** (0.0004)	-0.0373* (0.0204)	-0.0351* (0.0197)	-0.0270*** (0.0099)	-0.0264** (0.0104)
C. MH-related drug purchase, by age 55					
Women	-0.0051*** (0.0006)	-0.0400 (0.0385)	-0.0379 (0.0323)	-0.0305*** (0.0117)	-0.0399*** (0.0129)
Men	-0.0068*** (0.0006)	-0.0417** (0.0191)	-0.0386** (0.0176)	-0.0339*** (0.0087)	-0.0352*** (0.0084)
D. Income, age 55					
Women	3687.22*** (73.37)	2173.46 (2071.85)	2284.12 (1903.55)	2357.02* (1212.17)	2248.53** (874.75)
Men	5315.39*** (124.95)	11189.36*** (2571.27)	10637.15*** (2263.36)	9373.04*** (2722.40)	8398.93*** (1929.42)
Additional covariates	Yes	No	Yes	No	Yes

Notes: The estimates are from regression models controlling for cohort and municipality fixed effects. The additional covariates include the individual's first language and parental education and income. Standard errors in parentheses are clustered at the sub-region level (70 clusters). Statistical significance: * p<0.1, ** p<0.05, *** p<0.01.

Parents' survival and mental health

Table 5. Effects of a child's years of education on parental survival and mental health. OLS estimates and IV estimates using two alternative instruments.

	OLS	IV: distance to university		IV: gravity-model measure	
	(1)	(2)	(3)	(4)	(5)
A. Survival, age 70					
Mothers	0.0056*** (0.0003)	0.0281*** (0.0098)	0.0270*** (0.0093)	0.0188*** (0.0043)	0.0172*** (0.0045)
Fathers	0.0109*** (0.0002)	0.0157 (0.0165)	0.0148 (0.0166)	0.0321*** (0.0072)	0.0286*** (0.0073)
B. Survival, age 75					
Mothers	0.0086*** (0.0002)	0.0266** (0.0110)	0.0258** (0.0107)	0.0279*** (0.0044)	0.0242*** (0.0051)
Fathers	0.0130*** (0.0002)	0.0027 (0.0204)	0.0015 (0.0205)	0.0248** (0.0098)	0.0184** (0.0092)
C. Survival, age 80					
Mothers	0.0111*** (0.0003)	0.0194* (0.0105)	0.0200* (0.0103)	0.0252*** (0.0048)	0.0196*** (0.0056)
Fathers	0.0133*** (0.0002)	-0.0016 (0.0189)	-0.0024 (0.0178)	0.0188 (0.0127)	0.0112 (0.0104)
D. MH-related hospitalization, by age 70					
Mothers	-0.0022*** (0.0001)	0.0007 (0.0107)	0.0008 (0.0096)	-0.0072 (0.0088)	-0.0054 (0.0084)
Fathers	-0.0037*** (0.0001)	0.0037 (0.0152)	0.0050 (0.0151)	-0.0078 (0.0099)	-0.0044 (0.0095)
Additional covariates	Yes	No	Yes	No	Yes

Notes: The estimates are from regression models controlling for cohort and municipality fixed effects. The additional covariates include the child's first language and parental education and income. Standard errors in parentheses are clustered at the sub-region level (70 clusters). Statistical significance: * p<0.1, ** p<0.05, *** p<0.01.

Results by parent's and child's gender

Table 6. Effects of a child's years of education on parental survival and mental health by parent's and child's gender. IV estimates using two alternative instruments.

	Mother-daughter	Mother-son	Father-daughter	Father-son
A. Survival, age 70				
IV: distance to university	0.0508** (0.0200)	0.0141 (0.0172)	0.0447 (0.0297)	-0.0027 (0.0238)
IV: gravity-model measure	0.0400*** (0.0087)	0.0042 (0.0043)	0.0320*** (0.0103)	0.0328*** (0.0090)
B. Survival, age 75				
IV: distance to university	0.0203 (0.0263)	0.0318 (0.0213)	0.0347 (0.0306)	-0.0184 (0.0267)
IV: gravity-model measure	0.0470*** (0.0088)	0.0149** (0.0069)	0.0289*** (0.0109)	0.0224* (0.0125)
C. Survival, age 80				
IV: distance to university	0.0170 (0.0257)	0.0208 (0.0188)	-0.0020 (0.0324)	-0.0028 (0.0265)
IV: gravity-model measure	0.0468*** (0.0095)	0.0102 (0.0077)	0.0176 (0.0127)	0.0191 (0.0148)
D. MH-related hospitalization, by age 70				
IV: distance to university	-0.0053 (0.0167)	0.0045 (0.0127)	-0.0092 (0.0181)	0.0124 (0.0171)
IV: gravity-model measure	-0.0073 (0.0122)	-0.0072 (0.0073)	-0.006 (0.0090)	-0.0091 (0.0114)

Notes: The estimates are from regression models controlling for cohort and municipality fixed effects. Standard errors in parentheses are clustered at the sub-region level (70 clusters).

Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Additional parental outcomes

Table 7. Effects of a child's access to university at age 19 on additional parental outcomes.

	Effect of distance to university (/100 km)		Effect of gravity-model measure	
	Mothers (1)	Fathers (2)	Mothers (3)	Fathers (4)
Years of education	-0.0070 (0.0120)	0.0052 (0.0168)	-0.0692** (0.0264)	0.0080 (0.0819)
Income, age 55	48.76 (68.55)	41.17 (138.30)	-619.54*** (106.69)	159.31 (507.03)
Income, age 60	107.22 (91.02)	-30.99 (160.75)	-805.77*** (128.60)	69.98 (356.25)
Income, age 65	51.37 (80.22)	216.88 (133.65)	-845.01*** (193.30)	-1117.17*** (224.63)
Child living in same sub-region, age 55	-0.0196** (0.0084)	-0.0281** (0.0108)	0.0958*** (0.0092)	0.1220*** (0.0114)
Child living in same sub-region, age 60	-0.0131** (0.0060)	-0.0177** (0.0074)	0.0602*** (0.0075)	0.0869*** (0.0092)
Child living in same sub-region, age 65	-0.0069 (0.0054)	-0.0137** (0.0068)	0.0367*** (0.0064)	0.0623*** (0.0079)

Notes: The estimates are from regression models controlling for cohort and municipality fixed effects. Standard errors in parentheses are clustered by child's sub-region of birth (70 clusters). Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Outline

- 1 Introduction
- 2 Institutional background
- 3 Data
- 4 Event study analysis
- 5 IV analysis
- 6 Conclusions**

Conclusions

- Two types of evidence on the health effects of education:
 - Positive cumulative effects on individuals' mental health by middle age, while mainly insignificant effects on their early mortality
 - Positive effects on parents' longevity, while no significant impact on parents' mental health
- Daughter's education found to have stronger effects on parental survival than son's education
- Possible mechanisms: remaining geographically close to parents and later-life earnings
 - Unclear whether the negative effect on mobility holds more generally

Conclusions

- Effects smaller in compulsory schooling reforms → higher education expansion might have larger overall health benefits than expansion at the lower levels
- Spillover effects of education on others' health an important factor to be accounted for in educational policy
- Offspring's education seems to matter even in a country with supportive social security and services available for the aging population