Causal mechanisms behind the association of education and mortality in men: insights from a natural experiment
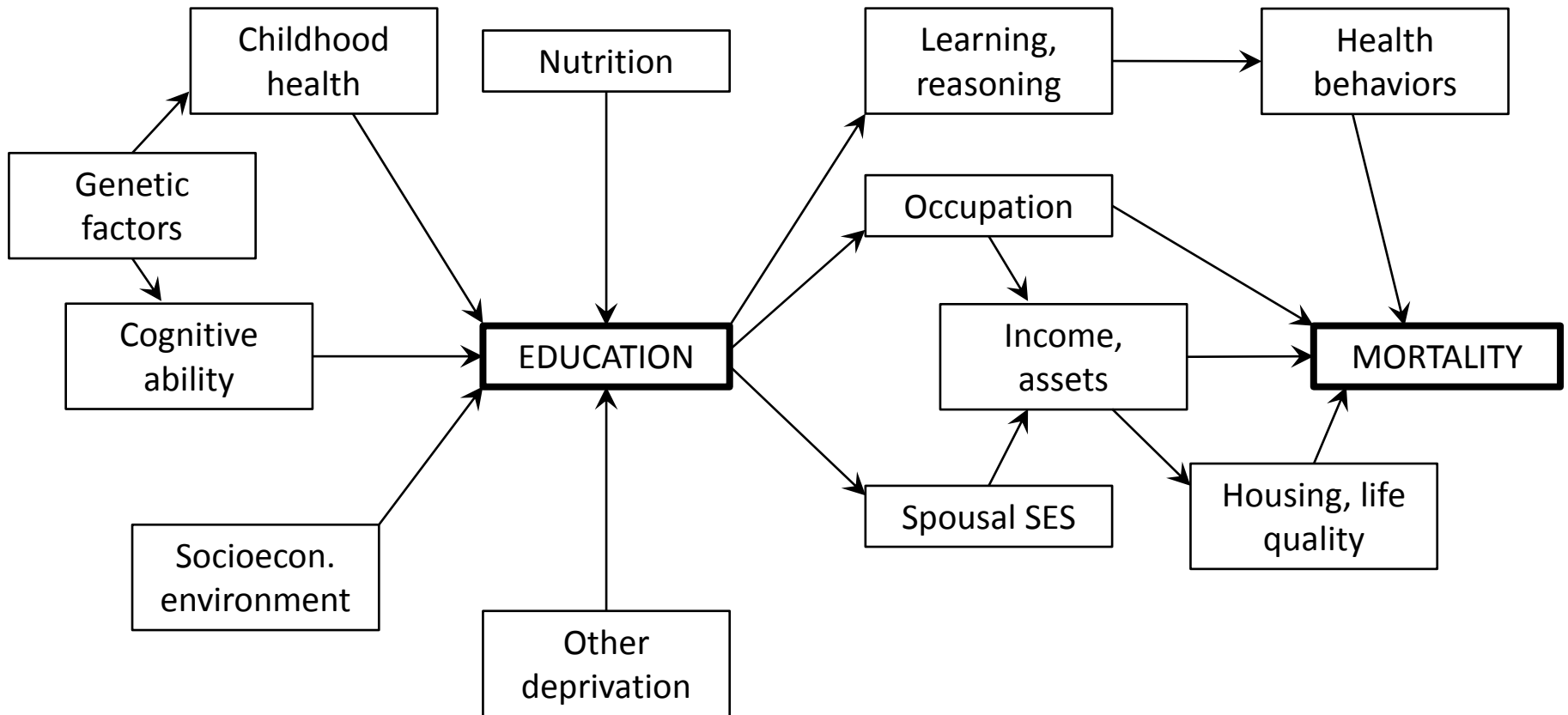
Marc Luy, Christian Wegner-Siegmundt & Paola Di Giulio

26th REVES Conference, Edinburgh, 28-30 May 2014
"Healthy longevity–Where you live or how you live?"

Education and mortality: simple theoretical framework

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Education as proxy for other causal elements of SEP
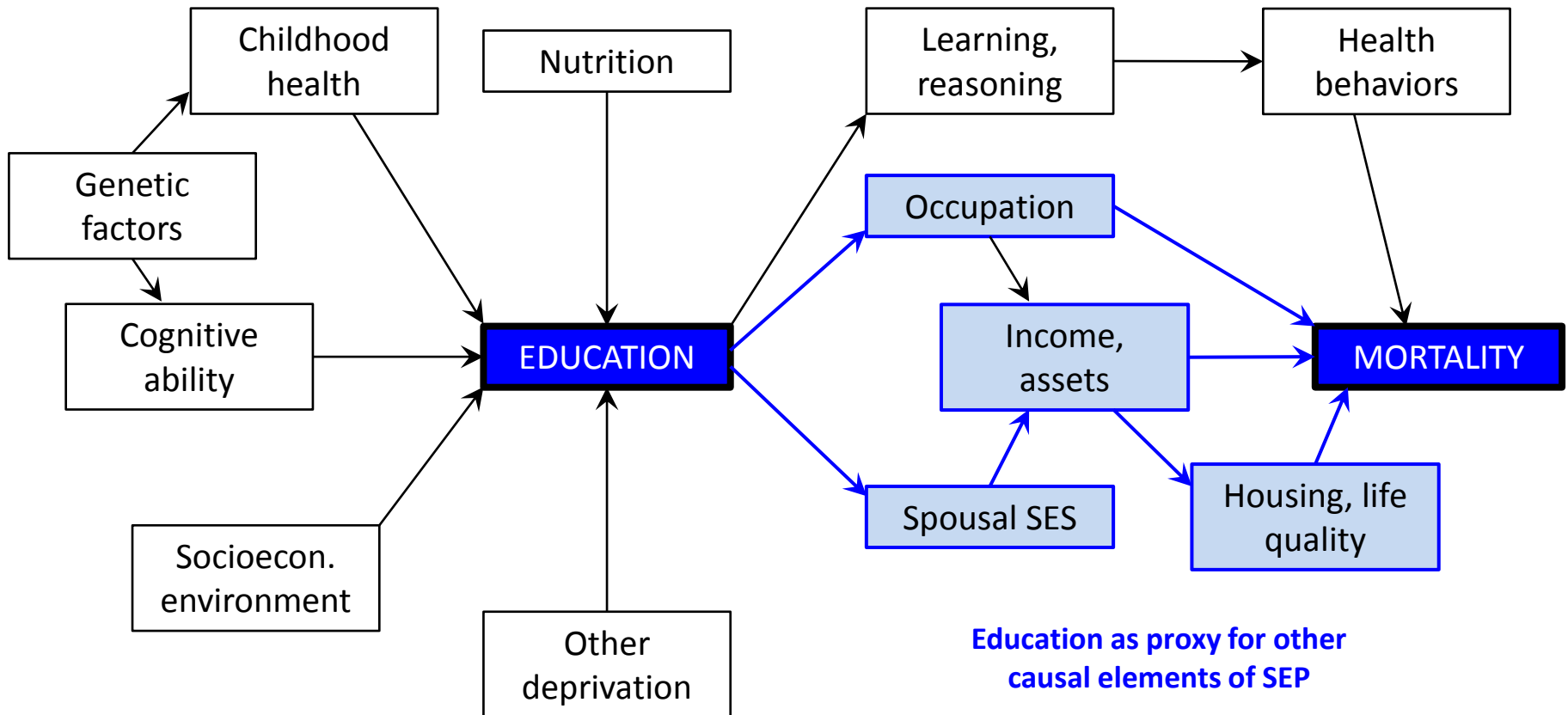
Education and mortality: simple theoretical framework
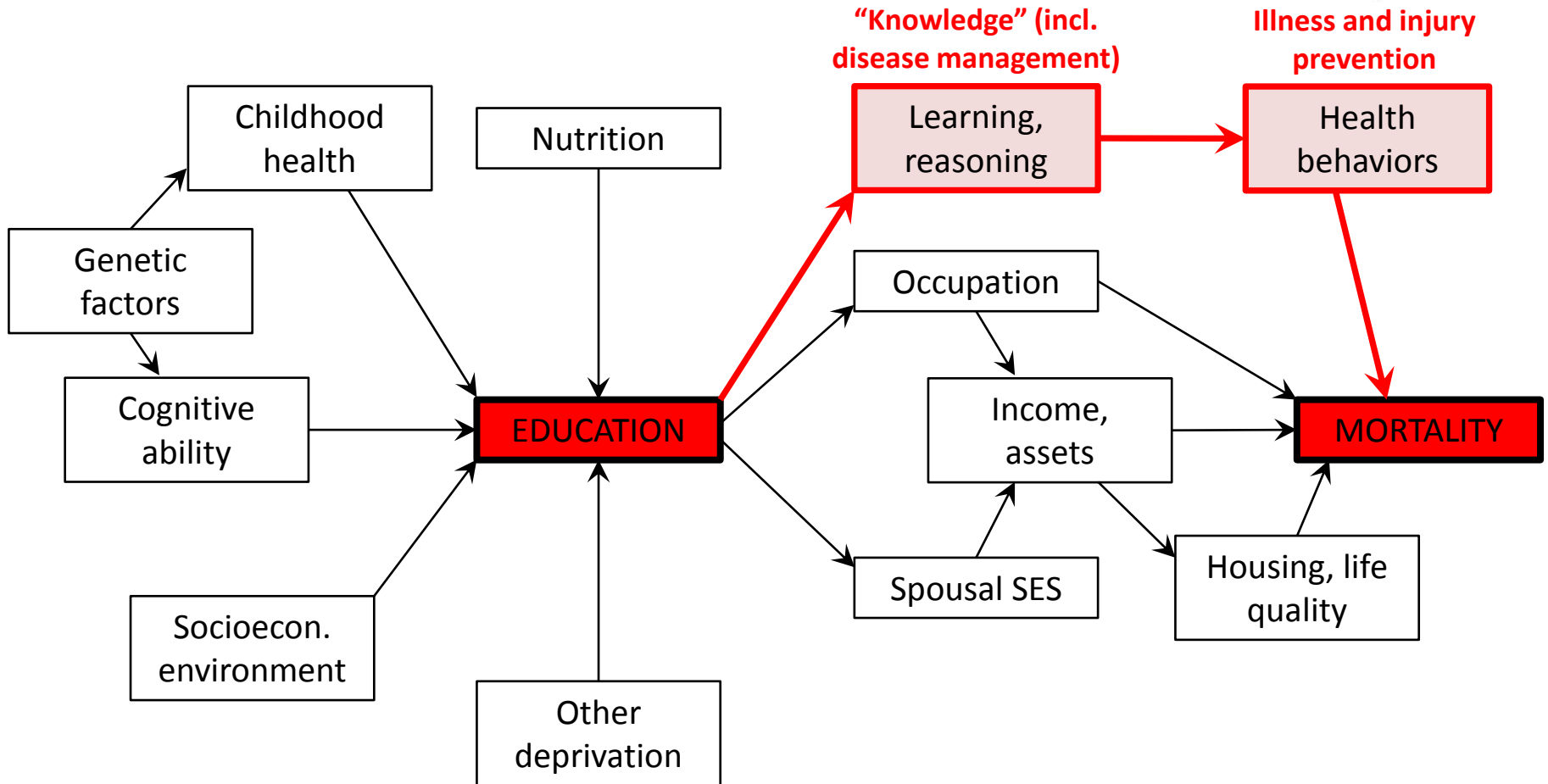
Catholic order members as "natural experiment"
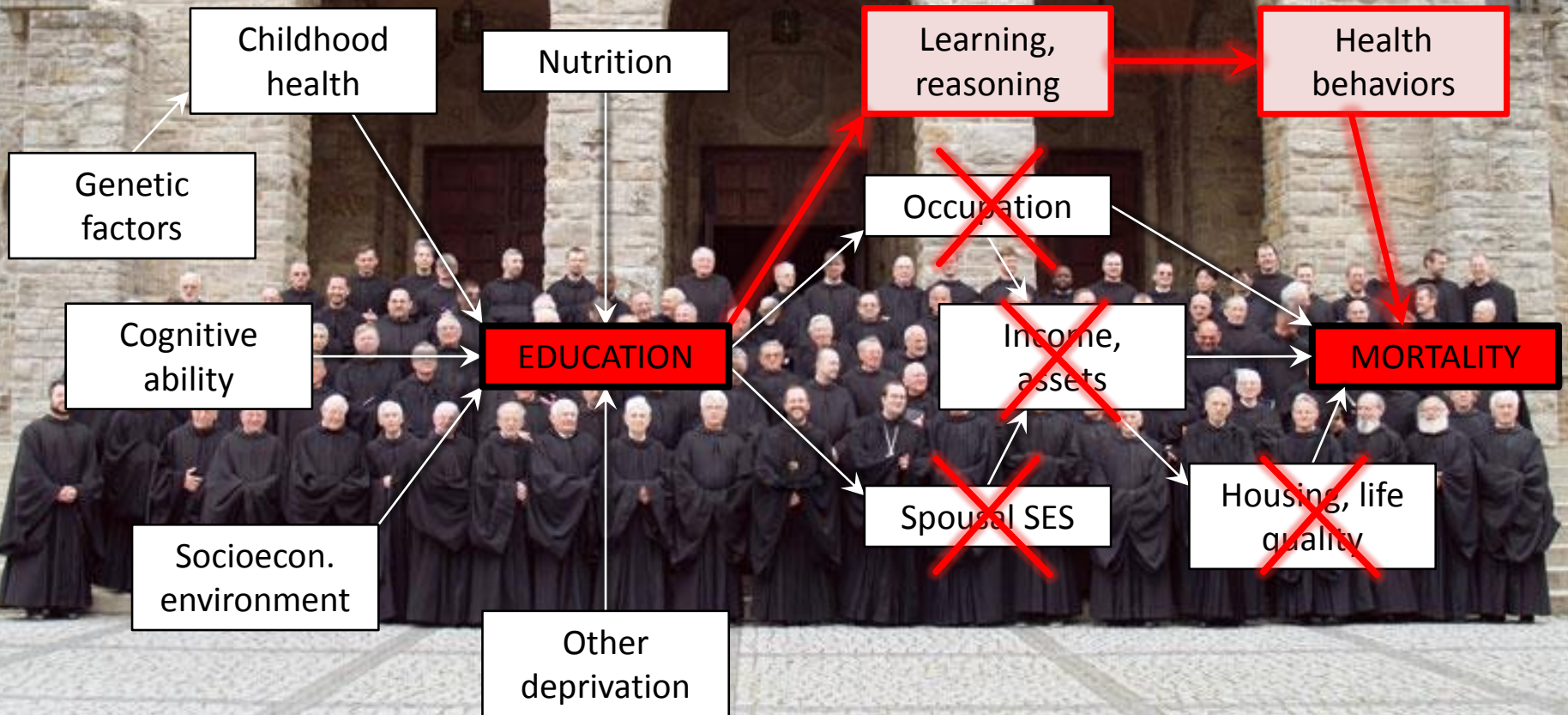
Data (1): Catholic monks

- Augustinian, Benedictine, Carmelite and Cistercian communities from western Germany (semi-contemplative orders)

- Life data from profession books (complete population) → Dec 31, 2006

- Education level approximated from monks' order titles (fathers = tertiary education; brothers = lower; information available for 97.3%)

- Birth cohorts 1840-1959; N = 2,790 (47.0% high and 53.0% low educated); 105,976.9 person years; 1,965 deaths

Data (2): General population men

- German Life Expectancy Survey (western German sample)

- 2-panel survey of cohorts 1914-52: first wave in 1984/86, second wave in 1998 (wave 1 representative for western Germany)

- 14-years survival is representative for the total western German population (Luy & Di Giulio 2005; Salzmann & Bohk 2008)

- Education level from self reports (high education = tertiary; low education = lower; information available for 93.4 percent)

- N = 3,221 (11.8% high and 88.2% low educated), 613 deaths

Methods

1. Analysis of monks' mortality by education level by Kaplan-Meier product limit estimation from age 30 on the basis of person years at risk (20 years birth cohorts: 1840-59, 1860-79, …, 1940-59); 245 war victims right censored at time of death

2. Comparison of mortality by education level among monks and men of the western German general population by Kaplan-Meier product limit estimation between 01 January 1984 and 02 May 1998 (monks' cohorts 1914-52, n = 671)

3. Multivariate analysis of the impact of characteristics of monastic life and SES on the effect of education on mortality among men of the general population by Cox proportional hazard modeling (n = 2,216)

Kaplan-Meier survivorship curves for Catholic monks by education level, birth cohorts 1840-1959
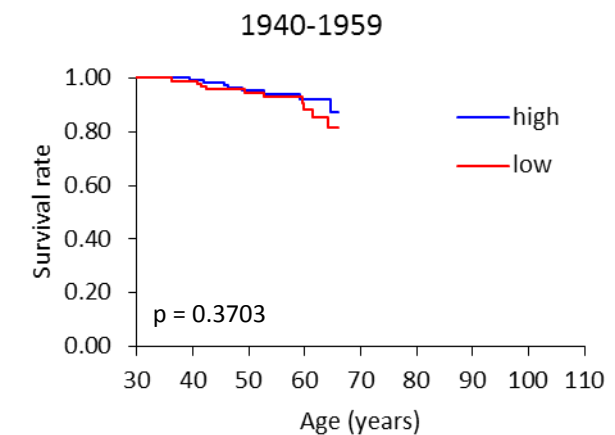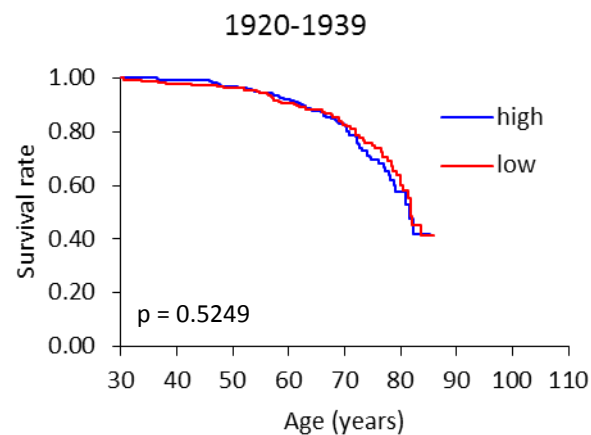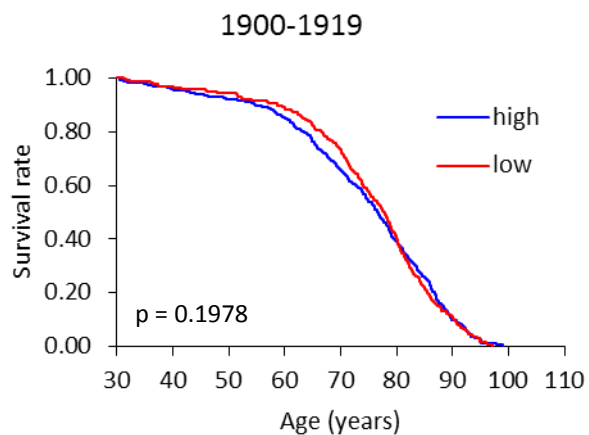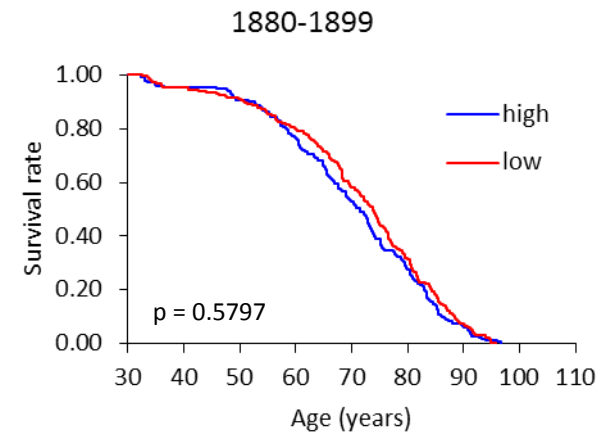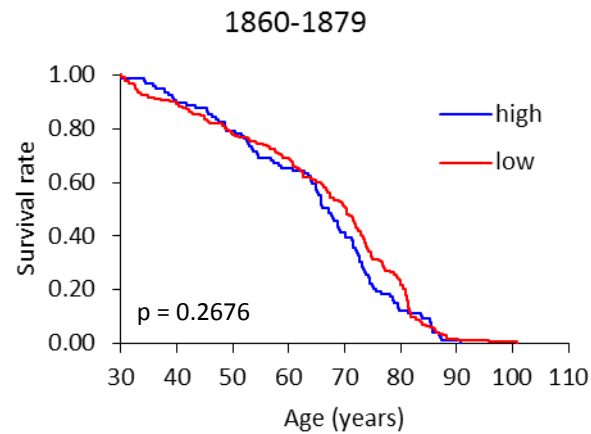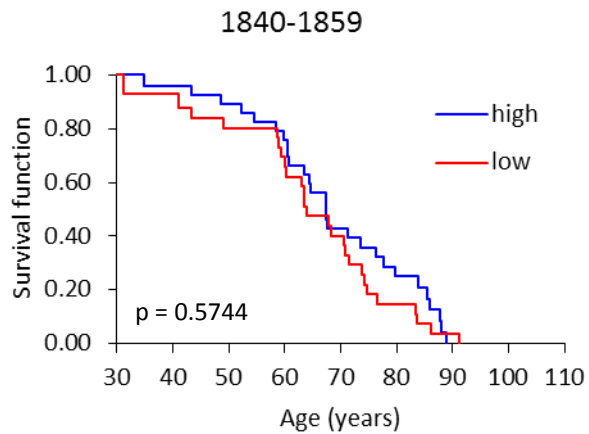
Kaplan-Meier survivorship curves for Catholic monks and men of the general population by education level from 1984 to 1998, birth cohorts 1914-52

Cox regressions on the impact of education on the survival of worldly men between 1984 and 1998, 1914-52

	Model 1 (age)		Model 2 (monastic life characts.)		Model 3 (SES characteristics)	
	RR	Pr(>|z|)	RR	Pr(>|z|)	RR	Pr(>|z|)
High educated	1.00		Model 1 + child-lessness, living with more than 1 person in household, Catholic, being member of a charitable association, high educ. partner		Model 2 + employment, psychological job stress (Kroll 2011), physical job stress (Kroll 2011), household net income (3 groups)	
Low educated	2.00***	0.0000				
Individuals	2,216					
Deaths	497					
R²	0.15					
LR Test						

* p < 0.05, ** p < 0.01, *** p < 0.001

Cox regressions on the impact of education on the survival of worldly men between 1984 and 1998, 1914-52

	Model 1 (age)		Model 2 (monastic life characts.)		Model 3 (SES characteristics)	
	RR	Pr(>|z|)	RR	Pr(>|z|)	RR	Pr(>|z|)
High educated	1.00		1.00		Model 2 + employment, psychological job stress (Kroll 2011), physical job stress (Kroll 2011), household net income (3 groups)	
Low educated	2.00***	0.0000	1.82***	0.0009		
Individuals	2,216		2,216			
Deaths	497		497			
R²	0.15		0.16			
LR Test			26.3*** (df = 5)			

* p < 0.05, ** p < 0.01, *** p < 0.001

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Conclusions and limitations

Cox regressions on the impact of education on the survival of worldly men between 1984 and 1998, 1914-52

	Model 1 (age)		Model 2 (monastic life characts.)		Model 3 (SES characteristics)	
	RR	Pr(>|z|)	RR	Pr(>|z|)	RR	Pr(>|z|)
High educated	1.00		1.00		1.00	
Low educated	2.00***	0.0000	1.82***	0.0009	1.42	0.0744
Individuals	2,216		2,216		2,216	
Deaths	497		497		497	
R²	0.15		0.16		0.19	
LR Test			26.3*** (df = 5)		65.8*** (df = 5)	

* p < 0.05, ** p < 0.01, *** p < 0.001

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Background

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Conclusions

- Under the conditions of monastic life, education does not have any impact on men's mortality

- The well-known education gradient in longevity is predominantly due to the high mortality of low educated men

- Most likely causes for low mortality of low educated monks: health behaviors, risk factors related to occupation

- Health behaviors are not inevitably linked to education (central idea of direct education effect)

- Occupation-related risk factors appear to be more relevant drivers of the SES-mortality relationship than education

Limitations

- Assignment of monks' education levels on the basis of order titles might be erroneous in few cases

- Different data types in the comparison of order members and general population: archive data vs. survey data

- No information about order members' health behaviors

- Interpretations are based on the assumption that Catholic monks are not selected toward characteristics that are linked to the association between educational attainment and mortality

Acknowledgments

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