

Exceptional Longevity: Are Socioeconomic Conditions in Childhood Important?

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Study Background

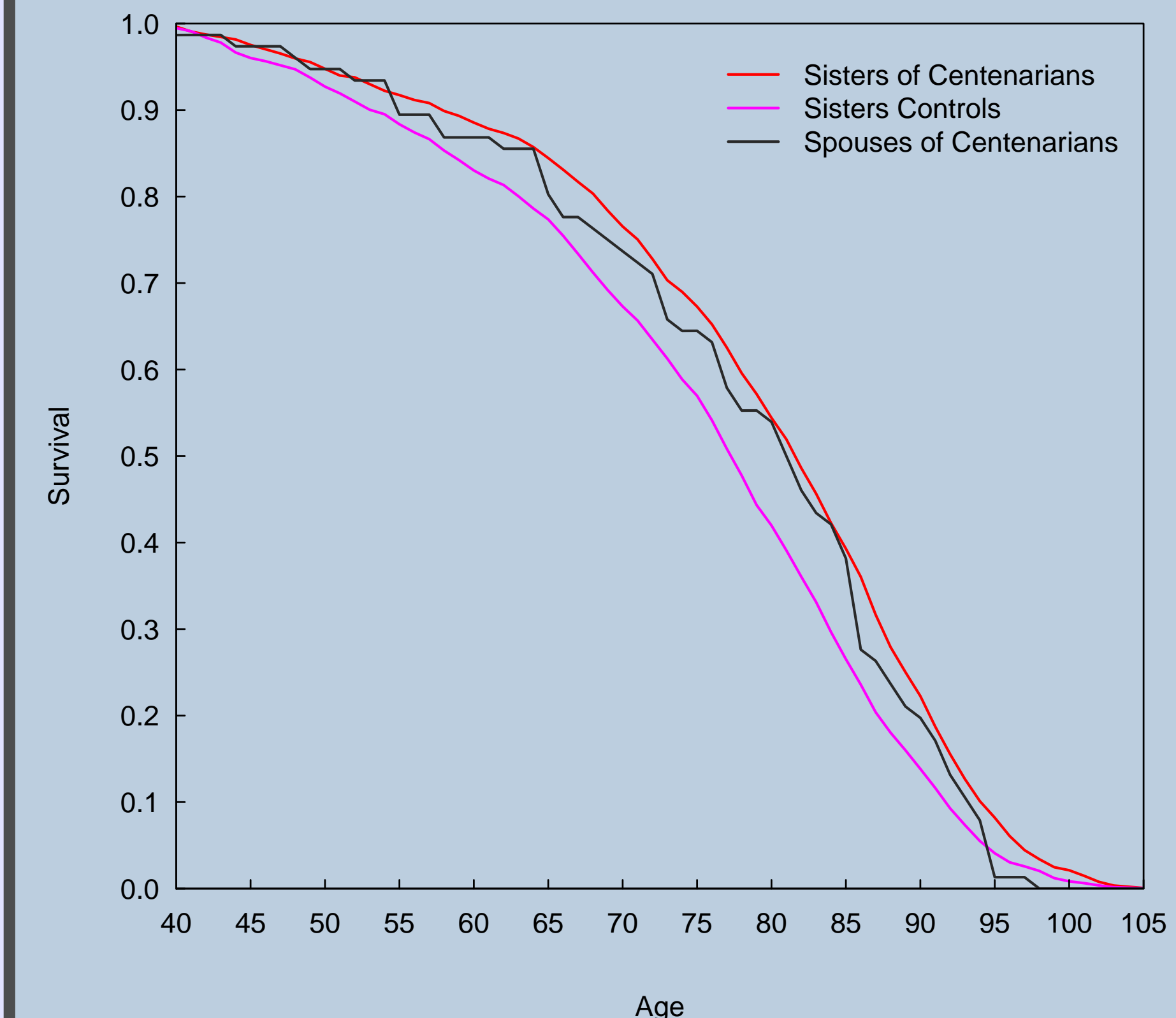
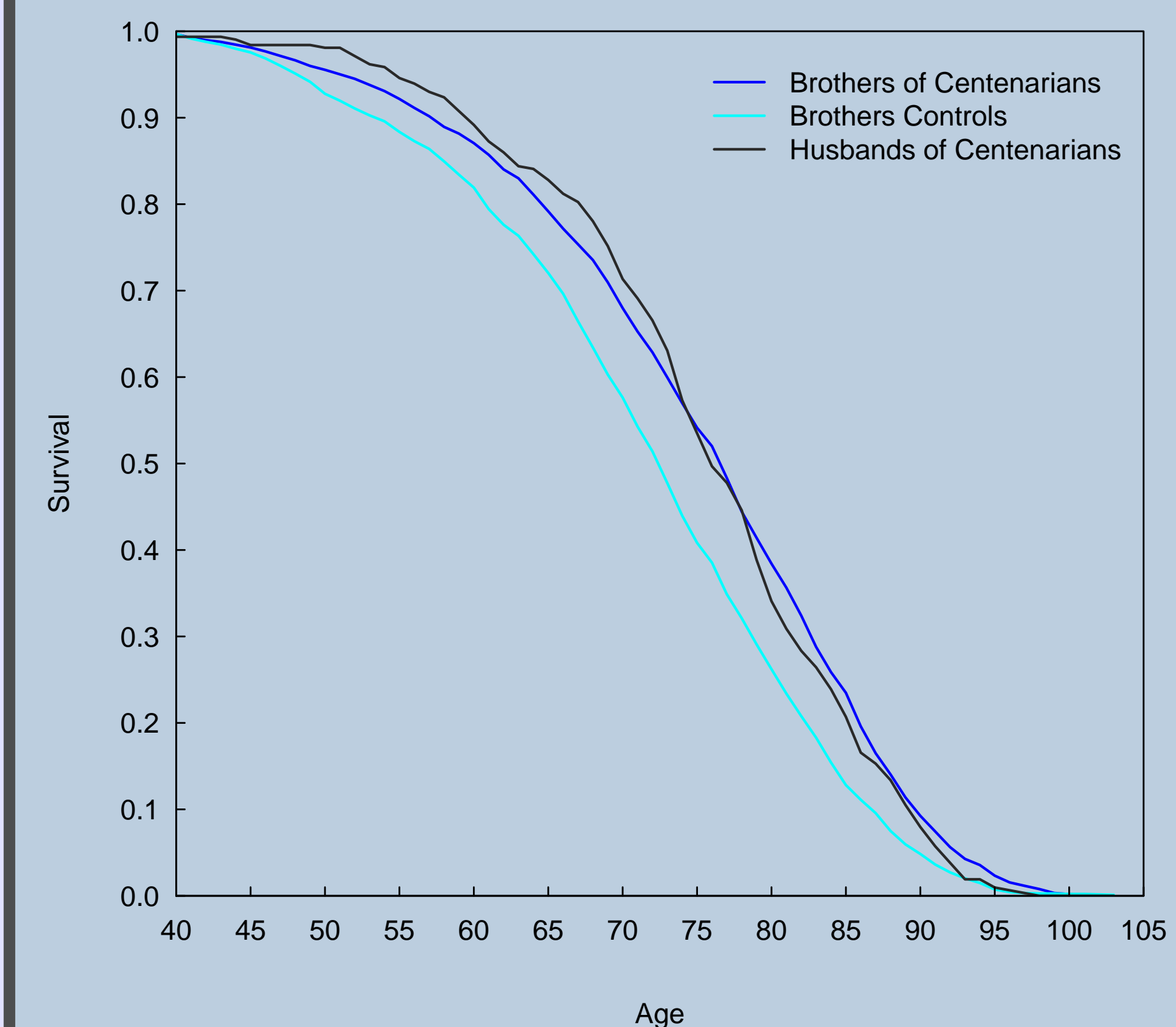
Longevity has a strong **familial component** that can be attributed in part to **genetic background** and to the **shared** environment early in life. There are multiple mechanisms through which conditions in early life may affect one's health and mortality.

Research Questions

1. Do early-life socioeconomic conditions influence longevity in the general population as well as in families of centenarians?
2. Does the effect of socioeconomic conditions in childhood **change over the lifespan**?

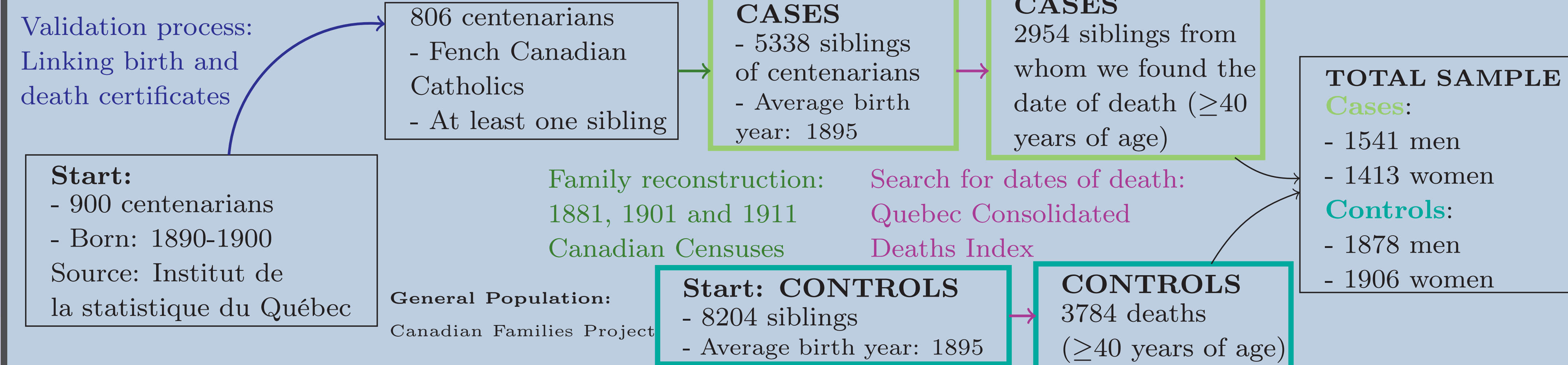
Family Connexion to Longevity

Survival advantage of **siblings** and **spouses** of centenarians



Data Collection and Sample Selection

This research project relies on **806 centenarians** and their siblings.



Modeling Strategies

We modeled the risk of mortality after age 40 in which our estimated hazard is:

$$\mu(t, Z_i, X_{ij}) = Z_i \mu_0(t) e^{\beta X_{ij}} \quad (1)$$

where X_{ij} is a vector of variables and $\mu_0(t)$ is the baseline hazard which is of the Gompertz form. The frailties ($Z_i (i = 1, \dots, n)$), represent combined effects of genetic or environmental unobserved characteristics at the family scale and follow a gamma distribution.

We also ran logit models that measured the effect of **father's literacy**, **father's occupation** and **urban/rural status**, on the odds of surviving, first from age 40 to age 75 and then, from age 75 to age 90.

Results: Long-livers are less sensitive to familial background

Gompertz Proportional Hazards Models of Mortality Risks after Age 40 Accounting for Unobserved Heterogeneity

Gompertz model	General Population		Siblings of Centenarians	
	Men	Women	Men	Women
Father's literacy				
Father illiterate	0.925	1.144 [†]	1.068	1.055
Father literate	ref	ref	ref	ref
Father's occupation				
Urban worker	1.398***	1.180**	1.422***	1.029
Rural worker	1.307***	0.991	1.081	0.969
Urban white collar	1.529***	1.097	1.215	0.951
Rural white collar	1.381	1.517 [†]	1.284	1.156
Farmer	ref	ref	ref	ref
Gamma	0.093***	0.079***	0.094***	0.088***
Theta	0.128***	2.89e-07	0.056 [†]	5.91e-08
N	1878	1906	1541	1413

Random Effects Logit Models of Mortality Risks for Men and Women, Controls and Siblings of Centenarians

	General Population (Controls)				Siblings of Centenarians (Cases)			
	Survival age 40 to 75		Survival age 75 to 90		Survival age 40 to 75		Survival age 75 to 90	
	Men	Women	Men	Women	Men	Women	Men	Women
Father's literacy								
Father illiterate	1.268	0.730 [†]	0.870	0.688	0.929	1.073	0.889	0.748
Father literate	ref	ref	ref	ref	ref	ref	ref	ref
Father's occupation								
Urban worker	0.531***	0.652***	0.532 [†]	0.870	0.510***	0.956	1.017	0.786
Rural worker	0.652**	1.005	0.505 [†]	0.781	0.766 [†]	1.166	1.012	0.920
Urban white collar	0.414***	0.664 [†]	0.721	1.057	0.647	0.719	0.863	1.760
Rural white collar	0.578	0.821	0.934	0.176	0.625	1.495	0.157	0.554
Farmer	ref	ref	ref	ref	ref	ref	ref	ref
N	1878	1906	825	1122	1541	1413	877	974

Controlling for Year of Birth and Family Size - $p < 0.001$ ***, $p < 0.005$ **, $p < 0.01$ *, $p < 0.05$ [†]

Key Findings

There is a **protective effect** of farming, mainly experienced by men of the general population

- In the Gompertz models, **men** whose father was not a farmer experienced an overall higher risk of mortality after age 40. The effect is stronger for controls than for siblings of centenarians.

- Having a father who was a farmer increases the odds of reaching age 75 for people aged ≥ 40 years.

Effects are less important at **very old age**

- When looking at the odds of achieving age 90, the influence of early-life conditions vanishes in the centenarian sample, while it remains present, although less important, in the control group.

Effects are **less important for women**

- For **women**, having a father who was illiterate, an urban worker or an urban white collar reduces the chance to achieve age 75 in the general population. These variables are no longer influent beyond that age nor for sisters of centenarians.

Conclusions and Outlook

- Socioeconomic conditions in childhood are associated with mortality in later life.
- However, the effect of these factors on longevity is **not equal** for all individuals. The association of early life conditions and longevity is greater for men compared to women, for individual of the general population (controls) compared to siblings of centenarians and for people reaching the average age at death (40 to 75) compared to those achieving the oldest age (75 to 90).
- Siblings of centenarians may be less vulnerable to adverse conditions because of **favorable genetic background**, **biological robustness** or a more homogenous sample.

Acknowledgements

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