

# **Risk Factor of Mortality for Siblings of Centenarians: The Relationship between Season of Birth and Lifespan**

Georgios Fthenos & Alain Gagnon  
The University of Western Ontario

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# Introduction

- Early life conditions and the effect on adult health and longevity
- The emergence of centenarians holds major implications for our society
- Conditions predisposing individuals to exceptional survival
- Knowledge of the factors depressing or aggravating old age survival remain limited

# Rationale of the Study

- Research conducted primarily in the United States and Northern Europe.
- Few Canadian studies have addressed the issue of longevity.
- Merging two bodies of literature into an integrated approach: life effects and the familial clustering of longevity

# Purpose of the Study

- The study examines whether the survival advantage of siblings of centenarians can be explained by the sharing of childhood circumstances.
- The study will compare the mortality of the siblings of centenarians to that of individuals born between the years of 1885 and 1901, assessing whether they share similar survival chances to old ages mediated by the effect of early life conditions.



# Purpose of the Study

- The study will analyze the role of the environment early in life as a risk factor of mortality.
- In particular, the season of birth will be used as an indicator of seasonal changes in the environment around the time of birth.
- The study hypothesizes:
  - Individuals born in autumn (Sept-November) will live longer than those born in the spring (Mar-May);
  - Siblings of centenarians will have a survival advantage; they will be less effected by season of birth then the rest of the population.

# Theoretical Framework

- Critical Period Model
  - Specific windows of time have irreversible effects on health
  - Season of Birth = Critical Period Indicator
- Cumulative Adversity Model
  - Detrimental effects add up to influence health development throughout life
- Often times, it is difficult to separate the effects of cumulative adversity and critical period.

# Methodology

- Data derived from the 5% sample of the 1901 Canadian Census collected by the Canadian Families Project (CFP)
- Further sample derived from the province of Quebec at 5% of the CFP sample
  - Children included in the sample were born in the province of Quebec (between the years of 1885 and 1901), and were of French ethnicity and Roman Catholic Religious affiliation

# Methodology

- An event-history database links the Canadian Families Project 5% 1901 Canadian census sample to the Institut de la Statistique du Quebec death register records.
- This event history consists of two points in time: April 1st, 1901 and the date of death of each individual.
- Special thanks to the University of Montreal research team for making these linkages



# Methodology

## Control Sample

Children (between ages 0-14) enumerated in the CFP 5% sample of households randomly selected in the 1901 census

## Siblings of Centenarians Sample

The siblings of a group of approximately 900 centenarians who died between 1985 and 2005, also enumerated as children in the 1901 census

# Methodology

The Cox Proportional Hazard model is utilized to examine whether early life conditions produce a significant difference in the overall hazard, or risk, of death after age 50

All analyses will be run on the full sample (males and females together), as well as separately, by sex, to examine possible sex differences

Analysis will also be separated by urban/rural status

# Variables

Age at Death - Dependant Variable

Season of Birth

In addition to focusing on the exposure of adverse conditions in early life through season of birth, the study will control for the effect of:

Birth Cohort

Birth Order

Urban/Rural Status

# RESULTS

<b>Females</b>	<b>Control Sample</b>		<b>Centenarian Sample</b>	
	Rural	Urban	Rural	Urban
Winter	1	1	1	1
Spring	0.775	1.243	1.035	1.088
Summer	1.061	1.596**	0.97	1.327
Fall	0.956	1.53	1.37	1.231
Birth Rank	1.04	1.08	1.022	1.092
Birth Year	0.876	0.793	0.892	0.826
N	1627	649	783	173

<b>Males</b>	<b>Control Sample</b>		<b>Centenarian Sample</b>	
	Rural	Urban	Rural	Urban
Winter	1	1	1	1
Spring	0.827	1.038	1.022	0.564
Summer	1.017	.558***	0.897	0.472
Fall	.745**	.554***	0.997	0.751
Birth Rank	1.059	0.901	0.964	1.003
Birth Year	0.912	1.3	1.085	0.885
N	1725	596	911	143



# Stratified Model vs. Cox Model

Urban Males - Control Sample		
	<i>Strata Model</i>	<i>Raw Cox Model</i>
Winter	1	1
Spring	1.03	0.966
Summer	0.558***	0.833
Fall	0.554***	0.92
Birth Rank	0.901	0.983
Birth Year	1.3	1.01
N	596	596

- Strata Model: comparing within families
- Raw Cox Model: comparing robust and frail individuals

# Policy Implications

- Although the conditions at the turn of the twentieth century were different from those experienced by children today, the results of the present study have implications for contemporary social policy.
- The demonstration of strong, early life effects could provide researchers, policy makers, and practitioners with a strong rationale to direct energy and resources towards childhood.

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THANK YOU