

Parental education and adult mortality in Chile

Introduction

An extensive literature establishes that socioeconomic conditions during childhood have "long-term" effects on the chances of living a healthy and long life (Hayward and Gorman, 2004; Montez and Hayward, 2014).

Socioeconomic and family disadvantages during early life impact a range of socioeconomic events and lifestyle choices during adulthood that negatively impacts health, increasing the chances of premature mortality (Montez and Hayward, 2014; Ross and Mirowsky, 2011; Hayward and Gorman, 2004). On the other hand, socioeconomic status (SES) in adulthood can partially compensate for disadvantages experienced during childhood. Thus, positive or upward intergenerational mobility can benefit health outcomes, decreasing the chances of illness or premature death (Graham, 2002; Luo and Waite, 2005; Ross and Mirowsky, 2011; Montez and Hayward, 2014).

Latin America is a region marked by high levels of inequality, which are mainly transmitted through generations. However, the last few decades have witnessed deep transformations in the region's countries. In addition to a significant change in the educational profile of the population, especially for the younger cohorts, there have been successive gains in mortality for practically all age groups.

In this context, it is necessary to discuss the extent to which education, especially among individuals born in socioeconomically disadvantaged contexts, becomes an "escape" from premature adult mortality, diminishing the effects of the "social legacy" that comes from childhood. This paper aims to examine how intergenerational transmission of education is associated with educational differences in adult and old-age mortality in Chile. Specifically, we investigate whether parental education is associated with the adult mortality of offspring and the extent to which family history (other SES measures and health factors) explains this association. We also hope to examine the effect of educational mobility on adult mortality.

Figure 1 shows four possible ways parental and individual education are associated with adult mortality. We highlight the protective character of education that gains strength when the transmission of education between generations is positive or upward. Therefore, according to Quadrant 1, the combination of high parental education with high individual education is associated with the lowest mortality levels during adulthood. If parental education is low, but there has been intergenerational educational mobility (Quadrant 2), mortality is also low during adulthood, although at higher levels than in Q1. On the other hand, downward mobility (Quadrant 3) and particularly the combination of low parental education with low individual education (Quadrant 4) are associated with higher mortality levels.

Methods

We draw data from the 2004 wave of the Chilean Social Protection Survey (EPS) to examine the article's research questions. The EPS is a longitudinal survey linked with administrative data, including death statistics from the civil registry. In our study, we included 10,147 people aged 40 years or older at the time of the survey. We follow individuals from entry into the study in 2004 until the day of death or, alternatively, until December 31, 2016 (right censoring).

Variables

Our models include nine different variables. We categorized gender as a dichotomous variable and age into 10-year groups (40 to 49, 50 to 59, 60 to 69, 70 to 79) and an open interval (80 years or more). We use two measures for education, individual and parental. Individual education is categorized into four groups: 0-4 years, 5-8 years, 9-12 years, and 13 years or more. Concerning parental education, we measure both mother's and father's education according to four groups: no schooling; 1-5 years; 6 years and more; don't know. They reflect the old Chilean educational system to capture the schooling experience of parents generations better. The category *Don't know* includes missing cases for mother's education (19.9%) and father's education (29%).

We added other three variables to account for other SES and health conditions. The first one indicates *socioeconomic conditions in childhood* and was categorized as poor and non-poor. The other two variables reflect family health conditions: survival status of the mother (1 dead; 0 alive) and survival status of siblings (1 if at least one is dead; 0 alive) at the time of the survey. The mortality of relatives is key in our models since longevity has been described as a family trait. Thus, premature mortality of the mother and siblings may reveal the combination of many different factors that can affect individuals' survival: environmental, behavioral, social, and genetic (Gudmundsson et al., 2000; Herskind, 1996; Perls et al., 2007 Vagero et al., 2018)

Finally, we exclude 150 cases (1.5%) from our sample because they did not inform the survival status of mothers or did not answer about socioeconomic conditions in childhood. Thus, the baseline data consisted of 9,997 older adults aged 40 and over.

Analytical Strategy

We define six different Poisson regression models to measure the association between parental and individual education with adult mortality. The first model estimates mortality differentials by individual education, controlling by sex and age. Model 2 adds mother's education to measure how mortality differentials by individual education are affected by mothers' educational levels. In model 3, we add the variables about family history (socioeconomic and family health conditions) to control other mechanisms that may connect mothers' and children's mortality experience. Models 4 and 5 replace the mother's education with the father's education to test for possible variations between the roles played by parents' background. Model 6 includes all nine covariates, including both mother's and father's education.

Preliminary Results

According to Model 1 (Table 1), adult mortality in Chile varies significantly by the individual's education. The relative risk ratios indicate that 9-12 years of schooling is associated with 30% lower mortality rates than 0-4 years. The relative difference increase to 35% for 13+ years of education. Adding mother's education does not change much of the picture (Model 2). The variable is statistically significant at the 10% only, but the coefficients vary as expected. Mortality rates decline by an extra 13% when adults have mothers who studied for six or more years. In model 3, after controlling for socioeconomic conditions during childhood and family health history, the effects of individual and maternal education remain of similar size and significance as in model 2. When replacing the mother's education with the father's (Model 4), the education gradient in adult mortality becomes shallower. In model 5, the risk ratios show that the effect of the father's education is slightly higher than the effect of individual education on individual mortality rates. Thus, having grown up in a family whose

father achieved high levels of education has an additional multiplier effect of 28% to that of having completed high individual education (25.2%). Finally, model 6 shows that differences in adult mortality by father's education are larger than mother's education (which is not statistically significant). The father's education is as crucial as individual education. Finally, those adults who do not know the education of their mothers or fathers show similar mortality compared to those whose fathers or mothers did not have any formal schooling, suggesting a similarity in the composition of these two groups.

In the final version of the paper, we will investigate separated models by sex and test for the effect of social mobility on the educational gradient in adult mortality by adding interaction terms.

References

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Figure 1. A conceptual model for the association between individual and parental education with adult mortality

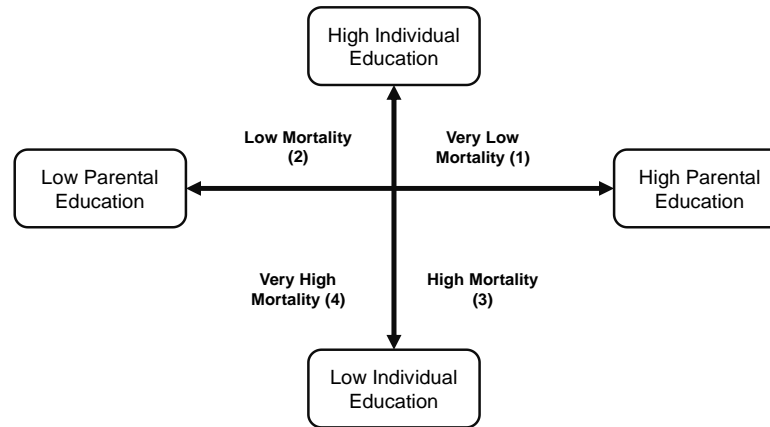


Table 1 – Risk ratios for the association between individual and parental education with mortality, Chile 2004-2016

Variables	MODEL 1		MODEL 2		MODEL 3		MODEL 4		MODEL 5		MODEL 6	
	IRR.	P-value	IRR.	P-value	IRR.	P-value	IRR.	P-value	IRR.	P-value	IRR.	P-value
Individual Education												
0 to years	1,000	-	1,000	-	1,000	-	1,000	-	1,000	-	1,000	-
5 to 8 years	0,859	0,010	0,874	0,028	0,867	0,020	0,901	0,090	0,892	0,061	0,890	0,059
9 to 12 years	0,695	0,000	0,730	0,000	0,725	0,000	0,768	0,000	0,757	0,000	0,756	0,000
13 years or more	0,642	0,000	0,698	0,003	0,691	0,002	0,761	0,021	0,748	0,015	0,745	0,016
Mother's Education												
No education			1,000	-	1,000	-					1,000	-
1 to 5 years			0,919	0,226	0,922	0,241					0,986	0,858
Six years or more			0,873	0,088	0,869	0,082					1,011	0,910
Don't Know			1,059	0,383	1,044	0,515					1,066	0,370
Father's Education												
No education							1,000	-	1,000	-	1,000	-
1 to 5 years							0,851	0,035	0,848	0,032	0,858	0,069
Six years or more							0,736	0,000	0,721	0,000	0,720	0,001
Don't know							0,941	0,354	0,935	0,314	0,909	0,182

Models 1, 2, and 4 control for sex and age. Models 3, 5, and 6 control sex, age, SES in childhood, mother's survival, and siblings' survival.