

## Social inequality and its impact on life expectancy

*Inequidade social e seu impacto na expectativa de vida*

*La inequidad social y su impacto en las expectativas de vida*

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**ABSTRACT:** Brazil has experienced a pronounced aging of its population with marked gains in life expectancy among older adults. However, individuals of lower socioeconomic conditions often exhibit worse health outcomes that translate in lower life expectancy and fewer years in good health. In this presentation, I examine how education influence prevalence of chronic conditions, life expectancy and life expectancy in good health.

**Keywords:** Social inequality; Life expectancy; Aging; Brazil.

**RESUMO:** O Brasil experimentou um envelhecimento acentuado de sua população, com ganhos marcantes na expectativa de vida entre idosos. No entanto, indivíduos de condições socioeconômicas mais baixas geralmente apresentam piores resultados de saúde que se traduzem em menor expectativa de vida e menos anos com boa saúde. Neste estudo, examino como a educação influencia a prevalência de condições crônicas, a expectativa de vida e a expectativa de vida em boa saúde.

**Palavras-chave:** Desigualdade social; Expectativa de vida; Envelhecimento; Brasil.

Brazil has experienced a pronounced aging of its population, with a large increase in the number of older adults in recent decades. In 1980, 7.1 million individuals were 60 and older in Brazil (5.8%) and this number reached 19.8 million (10.0%) in 2010

(ECLAC, 2019). This process is expected to continue in coming decades and the number of older adults should reach 43.3 million (18.9%) in 2030 (ECLAC, 2019). At the same time, the country is experiencing marked gains in life expectancy among older adults. Life expectancy at age 60 among men increased from 14.6 years in 1980 to 19.1 in 2010 (ECLAC, 2017). Among women, gains were also marked – from 17.6 in 1980 to 22.5 in 2010 (ECLAC, 2017). The probability of a 60-year old man to survive to age 80 increased 80% between 1980 and 2010 (ECLAC, 2017). Among women, this increase was of 50%, but a higher proportion of women reach older ages than men (ECLAC, 2017). This fast aging process creates additional challenges for Brazil, which is marked by a number of social inequalities, limitations in health care access and inadequacies in the social security system.

In Brazil, individuals of lower socioeconomic conditions often exhibit worse health outcomes across several health outcomes, such as infant mortality, life expectancy and disability (Szwarcwald, Andrade, & Bastos, 2002; Szwarcwald, *et al.*, 2016). These health differences are evident despite the fact that Brazil has been expanding access to health care services following the 1988 constitution, which declared health to be a right of all citizens (Almeida-Filho, 2011). The Unified Health System is the major employer of health care professionals in Brazil (Almeida-Filho, 2011; Paim, *et al.*, 2011). However, adequate care is not universal and there are inequalities in health care access across social groups and across geographic areas (Paim, *et al.*, 2011).

Even though disparities in health care access exist, there are other major social health determinants of health, such as education, income, wealth and region that help explain these disparities in Brazil. In the past decades, Brazil has been experiencing major changes in social determinants of health, particularly in educational levels. Since the 1990s, basic education expanded in Brazil. At the same time, the number of students in higher education has doubled (Schwartzman, 2004). The Gini educational coefficient reduced from 0.48 in 1990 to 0.35 in 2004 (Lustig, Lopez-Calva, & Ortiz-Juarez, 2011).. Even though inequalities in education remain, increased access to higher education has mostly benefited Whites and those from higher income households (Schwartzman, 2004). Therefore, large educational inequalities remain. These changes in social determinants of health, particularly education, along with increase access to health care have the potential to influence health indicators (Almeida-Filho, 2011).

In this presentation, I will focus on findings from recent papers that have addressed how these social inequalities influence healthy life expectancy and health care use in Brazil. In most papers, I am interested in how educational differentials influence health disparities. I draw from a series of recent papers I have published in the area.

We know that the one of the main changes related to the aging process is the increase of chronic conditions, particularly multimorbidity, in other words, multiple chronic conditions. In a paper with my colleague, Prof. Hiram Sanchez-Beltran, we examined how educational differences influence the prevalence of chronic disease in Brazil. In particular, we wanted to evaluate whether these educational disparities narrowed in Brazil from 1998 to 2013, a period of a booming economy accompanied by major investments in public health. To do so, we used data from the 1998, 2003 and 2008 Brazilian National Household Survey and the 2013 National Health Survey. We used several methodologies to examine these trends. We found that prevalence of diabetes and hypertension have increased over the period, whereas the prevalence of heart disease decreased. Brazilian adults with no education had higher levels of diabetes, hypertension and heart disease than those with some college or more. Adjusted prevalence for hypertension and heart disease indicate some progress in reducing educational disparities over time. However, for diabetes, adjusted results show a continuously increasing educational disparity from 1998 to 2013. By 2013, individuals with no education had about two times higher diabetes prevalence than those with higher education with larger disparity among women.

In another paper, along with my past student Jeenal Metha, I explore educational differentials in the perception of general health, captured by self-rated health (SRH). SRH has been shown to be a predictor of chronic disease, disability and mortality (Guimarães, *et al.*, 2012; Santiago, Novaes, & Mattos, 2010). In fact, poor self-rated health is not only a good predictor of mortality, but its predictive effect is comparable to objectively measuring health (Lima-Costa, Cesar, Chor, & Proetti, 2011). Our results indicate a clear educational gradient in poor SRH. Prevalence ratios show that Brazilian adults with no education have levels of poor SRH that are 7 to 9 times higher than those with some college or more. The difference between those with lowest and highest education increased from 1998 to 2013. Compared to those with no education, there were increases in the prevalence of poor SRH among those with primary and secondary incomplete as

well as among those with secondary complete in 2008 and 2013. In conclusion, those with low education have worse SRH.

From these studies, it is clear that older adults with low education in Brazil have worse perceived and objective measures of health. In other papers, we examine how education influence two important indicators of well-being: frailty and cognitive health. In particular, how education influence life expectancy and life expectancy in good health.

In a recent paper, I have co-authored with Profs. Luciana Alves and Ligiana Corona, we examine how education may influence the number of years that older adults expect to live with frailty. These socioeconomic differences are important because frailty is a geriatric syndrome that causes early disability and mortality in older adults. We use data from the Health, Well-being, and Aging (SABE) Study, which was approved by the ethics committee from the Faculdade de Saúde Pública of São Paulo University and from the CONEP (National Council for Ethics in Research) under the protocol 315/99 for the baseline collection and protocol 1345 for the 2006 data collection. The sample included 1,398 older adults ( $\geq 60$  years old) followed up from 2006 to 2010. Frailty status was classified according to the Fried criteria. We found that 13.7% were frail and they had, on average, 4.0 years of education. Men had more years of education than women (4.6 vs. 3.7,  $p < 0.001$ ). We found that older adults with higher education live fewer years with frailty. Compared to older adults with no education, those with 6 years of education have higher life expectancy without frailty. At age 70, men with no education expect to live 9.1 years (95% CI 7.8, 10.4) without frailty compared to 10.6 years (95% CI 9.4, 11.8) among those with six years of education. Among women age 70, life expectancy without frailty reaches 11.7 years (95% CI 10.6, 12.8) among those with no education, but 13.9 years (95% CI 12.5, 15.3) among those with six years.

Another issue that has been emerging and it is associated with the fasting population aging in Brazil is the growth in the number of individuals with cognitive impairment. Problems related to cognition tend to increase because old age is a major risk factor for cognitive limitations and decline (Plassman et al., 2010). Severe cognitive limitations reduce the ability to make decisions, to care for oneself, and to live independently (Albert, *et al.*, 2011). These changes can have profound effect on individuals, families, and societies and costs are not equally experienced across social groups. Evidence from developed countries indicate that higher educational attainment reduce the risk of cognitive impairment and Alzheimer's disease.

Along with Profs. Ligiana Corona and Yeda Duarte, I investigate how education affects total life expectancy and life expectancy with cognitive impairment using data from three waves (2000, 2006, and 2010) of the Health, Well-Being, and Aging Study collected in Sao Paulo, Brazil. Findings show that adults over 60 with no education in Brazil live shorter lives and with longer periods of cognitive impairment than those with education. Women in Sao Paulo live longer lives than men, but they live with cognitive impairment for a greater number of years. In particular, we found that life expectancy without cognitive impairment at age 60 was 13.0 years among men with no education and 17.6 among their counterparts with 8 years of schooling. On the other hand, life expectancy with cognitive impairment was higher among men with no education than those with more education (3.2 and 0.6 years, respectively). Among 60-year old women without education, life expectancy without cognitive impairment reached 16.2 years, but it was considerably higher among more educated women (22.7 years). Life expectancy with cognitive impairment reached 4.5 years among women aged 60 with no education, versus 1.0 year among women with 8 years of schooling. In conclusion, older adults with lower education are expected to live shorter lives and more years with cognitive problems. Even though educational levels have been increasing in Brazil, they remain relatively low. Further investments are needed to improve educational levels for future generations, but additional programs should be devised to assist those with lower educational levels to reach better health outcomes. Given the heterogeneity of cognitive health, programs should target ways to postpone the development of cognitive impairment.

In sum, these studies show that despite the social changes in Brazil in recent decades, which include reduced inequality and poverty, the effect of socioeconomic inequality on the health status of the elderly in the country nevertheless continues to be relevant. The findings are innovative and make an important contribution to the study of health inequalities among older adults in Brazil. Given the recent changes in educational achievement in Brazil, we believe that educational policies are powerful ways in addressing inequalities in healthy life expectancy. Finally, specific strategies and actions directed at slowing, minimizing or recovering from disease, frailty and cognitive impairment are of extreme importance. Public health policies aimed at avoiding the development of chronic conditions, frailty and cognitive impairment among elderly at risk should be encouraged.

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