

Social Inequality and Cognitive Ability in Older Mexican Adults

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Introduction

The total population of adults over 60 years of age is expected to climb to approximately 2 billion individuals by 2050 (United Nations 2002). As is happening in many developing countries over the next few decades, the age group with the fastest demographic growth is the older adult population. Before 2050, they will be the dominant group in the population age pyramid of most countries, growing at about 2% every year in Mexico (Shamah-Levy et al. 2008). As of yet, there is little information regarding the older adult health profile in developing countries, with only a few national surveys providing most of the data (Olaiz et al. 2003).

Moreover, what we know of the aging process comes mostly from developed countries, in which social and economic disparities are less pronounced. Most research focuses also on cross-national comparisons but not much on differences within a country (Braveman & Tarimo 2002; World Health Organization 1998), in particular within a country with deep social and economic inequality such as Mexico. The country has severe regional differences and economic development occurring due to urbanization (Smith & Goldman 2007). Over one-third of the population is concentrated in areas surrounding the cities of Monterrey, Guadalajara, and Mexico City with living standards, employment opportunities, and access to health services varying between urban and rural Mexico (Organization for Economic Cooperation and Development 2005).

Hence we know little, for example, about how cumulative disadvantage over the lifecycle translates into old age poor health. Does the long-term disadvantage experienced over the life cycle make older adults weaker or more resilient in old age?

Increased prevalence of chronic conditions such as Alzheimer's disease, inappropriate treatment of many chronic conditions, and the obesity epidemic present significant challenges for the aging population (Águila, Díaz, Manqing-Fu, Kapteyn, & Pierson 2011). These challenges impact older adults differently depending of the socioeconomic conditions, measured by educational achievement, area of residence (urban/rural), and marital status, for example. (Wong & Palloni 2009). The population aged 60 or older living in urban areas use more health services and use them more frequently than any other age group. This is influenced in part by the fact that the majority of insured people live in urban areas in developing countries (Álvarez-Gutiérrez and Brown 1983).

Cognitive function has become an important health dimension for researchers on aging because it significantly affects independence and quality of life among older adults (Langa et al. 2009). The cost of caregiving rises quickly with cognitive deterioration, and this implies that the quality of life of the social and family network is affected as well as the wellbeing of older adults with cognitive deterioration. There are changes in cognitive function that can be expected by the aging process, but most cognitive alterations are due to different diseases. Among those who experience cognitive decline, there are different factors that determine the rate of decline (Comijs, Dik, Deeg, & Jonker 2004). Both economic and health factors have been shown to affect the type and rate of decline in cognitive function. In countries like Mexico, with profound social and economic inequalities, studies have shown that demographic and socioeconomic variables account for over 20% of the variance in cognitive test scores (Zelinski, Gilewski, &

Schaie 1993). Poor institutional support and weak economic conditions translate into low overall education and poor health conditions that affect cognitive function in older life. This is important given that education is one of the variables that most affects cognitive function (Matallana et al. 2011; Uhlmann & Larson 1991). Additionally, education has been shown to explain a large percentage of the variance in cognitive scores between men and women.

The goal of this paper is to better understand the cognitive status of older adults in developing societies with vastly heterogeneous socioeconomic status, in particular educational achievement. We will analyze the distribution of older Mexican adults across different cognitive domains and identify how education is associated with each domain and explore potential social and economic factors that determine differences observed in cognitive function. We focus first on major dimensions of social inequality: culture (gender), education, and access to services (urban/rural residence) that have been recognized as hallmarks of socioeconomic inequality, and then incorporate other dimensions of health (chronic diseases, depression, health insurance), and lifestyles (obesity, smoking).

Data and Methods

Sample

Data come from the Mexican Health and Aging Study (MHAS), a nationally representative panel investigation of health and aging in Mexicans born in 1951 or earlier. The MHAS was designed to be comparable to the U.S. Health and Retirement Study (HRS). The baseline data, consisting of 15,186 in-person interviews, were collected in 2001 with follow-ups in 2003 (with a 93% response rate) and 2012 (with an 88% response rate). Information from a knowledgeable proxy was obtained for individuals who were unable to complete the interview

themselves because of illness or cognitive incapacity. The database includes information on the participant's economic situation, education, living arrangements, marital status, and social network, as well as self-reports of functional capacity and chronic conditions. The MHAS also provides detailed health characteristics such as limitations with basic and instrumental activities of daily living, cognition, depression, and mobility (Mexican Health and Aging Study 2004).

Our analysis begins with a sample of 7,171 respondents aged 60 or older. We exclude ??? respondents who did not have complete information at baseline and at the 2012 follow-up. The sample for our descriptive analysis included ??? respondents, representing ??% of the eligible respondents.

In constructing the regression model we further excluded ?? subjects who were lost to follow-up between 2001 and 2012, and ??? respondents with missing information in multiple covariates so STATA 12.0 could not include them in the regression. The sample for the regression analysis included ??? respondents.

Measures

Cognitive function was assessed using the screening portion of the Cross-Cultural Cognitive Evaluation (CCCE). The CCCE was developed as a brief and sensitive tool for the diagnosis of dementia in the community. All tasks included in the CCCE are accepted as indicators of cognitive function and the effect of literacy and level of education is supposed to be negligible (Glosser et al. 1993).

Five tasks measuring four cognitive domains make up the screening portion of the CCCE. The tasks are: construction, construction recall, verbal learning, verbal recall and visual scanning. Construction is measured by presenting two geometrical figures and asking respondents to copy the figures within 90 seconds. Construction recall is measured by asking

respondents to remember the figures they copied and draw them in a blank piece of paper; three minutes are allowed to complete this task. This task was administered after the verbal tasks.

Verbal learning is measured by asking respondents to listen to a list of eight words and repeat them. This exercise was performed three times and we calculated the average score of these tests (immediate verbal recall). For verbal recall, respondents were asked to repeat all the words they could remember from a list of 8 possible words. Finally, visual scanning is measured by asking respondents to circle all figures that are identical to an indicated model in a provided disorganized display. Respondents are given 60 seconds for this task.

At baseline, the score for construction and construction recall goes from 0-2 each, the score for verbal learning and verbal recall goes from 0-8 each, and the score for visual scanning goes from 0-60. In the end, the total cognitive score ranges from 0-80. In the 2012 follow-up the scores were slightly modified to reflect an update of the CCCE, the scores for construction and construction recall have a range of 0-6 each with the remaining dimensions being unchanged. The total score increased from a maximum of 80 to a maximum of 88. However, following Mejía-Arango's methodology (??) the scores were modified to allow for comparisons between cognitive results at baseline and at the 2012 follow-up and have a consistent score ranging from 0 to 80 at all times.

Independent Variables

Age: dichotomous variables measuring respondents aged 65-69 (reference category), respondents aged 70-74, and respondents aged 75 or older. *Education*: continuous variable measuring the last completed year of schooling. *Gender*: dichotomous variable (women = 1). *Location size*: dichotomous variables measuring residence in communities under 100,000 inhabitants (reference category) and 100,000 inhabitants or more. *Health conditions*: a discrete

variable measuring the total number of reported health conditions ranging from 0 to 5 and including hypertension, diabetes, stroke, heart problems, and ???. Population distribution for each cognitive task is analyzed by each of these variables. For descriptive analyses we also included education as a categorical variable (0 years of education, 1-5 years, 6 years and 7 or more years).

Statistical Analysis

We initially analyze the characteristics of the study sample by education categories. We use an ordinary least squares regression to predict 2012 cognition scores after controlling for several socioeconomic variables like gender, years of education, and location size at baseline.

Preliminary Results

Table 1 presents preliminary results of the average combined recall score by gender, location size, and years of schooling for Mexicans aged 60 or older. Overall, those living in urban communities (over 2,500 inhabitants) report a higher average verbal recall score than those living in rural areas. Similarly, those with six or more years of education have a higher average verbal recall score than respondents with incomplete elementary school by almost a full point. Interestingly, when presented by gender, females have a higher average verbal recall score (3.78) than males (3.45), despite women having lower education than men. This is consistent with previous literature showing that women have a concrete advantage over men on verbal memory tasks due to their ability to associate an image with the corresponding word (Herlitz, Nilsson, & Bäckman 1997; Kimura & Clarke 2002).

[TABLE 1 AROUND HERE]

Results from a simple OLS regression are presented in Table 2. For now, we only try to determine the 2012 average combined verbal recall score controlling for gender, education, and location size. Overall, the base score starts at 3.16 with females adding 0.35 points. Living in an area of less than 2,500 inhabitants associates with a score drop of 0.15 points. In contrast, completing elementary school (6 years) represents an addition of 0.79 points to the average verbal recall score.

[TABLE 2 AROUND HERE]

Future Analysis

The full manuscript will include a more refined analysis of the overall cognition score and also a detailed descriptive analysis separating the individual components, and documenting the progression in cognitive score over the 11 years of the panel. Additional covariates will be included in the regression models, such as chronic conditions, income, insurance, marital status, among others, to generate a stepwise model that will measure the impact of these variables on the predicted 2012 average verbal recall score. We conclude on the relative importance of measuring the impact different socioeconomic variables may have on cognitive impairment, especially in a developing country with social inequalities.

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Table 1 – Average Combined Verbal Recall Score in 2012 by Gender, Location Size, and Years of Education for Mexican Adults Aged 60 or Older

Variables	By Gender		By Location Size		By Years of Education	
	Males	Females	Urban	Rural	Less than 6 years	6 years or more
Average Score	3.45	3.78	3.75	3.34	3.38	4.18
<i>Unweighted N</i>	1,404	1,784	2,558	630	2,152	1,036

Table 2 – Coefficients for Average Combined Verbal Recall Score in 2012 for Mexican Adults Aged 60 or Older

Variables	Coefficient
Gender (<i>Ref.: males</i>)	
Females	0.35 (0.06)***
Education (<i>Ref.: Less than 6 years of schooling</i>)	

Six or more years of schooling	0.79 (0.06)***
Location Size (Ref.: <i>Urban</i>)	
Rural	-0.15 (0.07)*
Constant	3.16 (0.05)***
<i>Unweighted N</i>	2,678
<i>R</i> ²	0.08

Note: Preliminary model. Numbers in parenthesis are robust standard errors.
 * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.