

Gender Differences in Cognitive Abilities among the Elderly Poor of Peru

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Research questions

- Are there gender differences in cognitive abilities in old age among the poor?
- If so, what are the main predictors?

Motivation

- Understand long-term effects of education and health during childhood
- Understand gender differences among individuals with large cumulative deprivations
- Evaluate cognitive functioning in later-life: Are there gender differences?

Previous findings and similar studies

- Lee et al. (2014) report some studies suggesting that in developed countries there are not significant gender differences in cognitive functioning, while in developing countries there are important differences to the detriment of women
- Gender differences: Lei et al. (2012 and 2013) analyse Chinese data (CHARLS), and Lee et al. (2014) use Indian survey data. Maurer (2011) uses SABE surveys from 7 Latin American country capitals
- Lei et al. (2013): Chinese males are better in mental intactness, and females are better in episodic memory
- Case and Paxson (2008): Strong correlation between height at early life (<3 years) and adulthood. Adulthood's height indicates the nutrition and health experienced in early life. Similar for Guven and Lee (2013a, 2013b) and Lei et al. (2012 and 2013)
- Some authors cite a higher cognitive aptitude of females for episodic memory, whereas males are better on tasks that involve spatial recognition (Lewin et al., 2001; Hertlitz and Yonker, 2002)

Data: ESBAM

- The Survey of Health and Wellbeing of the Elderly is the baseline for *Pension 65*
- Cross-section
- Large number of elderly individuals (3,947)
- Rich set of control variables: Objective measures of health (hemoglobin, arm span, mental illness, physical disabilities), etc.

Data: ESBAM

- **Period:** November–December 2012 in 12 departments where MIDIS had already completed the census of socio-economic variables intended to update its targeting score system SISFOH
- **Population of study:** 65–80-year-old individuals living in households classified as poor according to SISFOH
- **Next wave:** About March 2015

Data: ESBAM

- **Sampling selection:** probabilistic, independent in each department, stratified in rural/urban areas carried out in two steps. In the first step the Primary Sampling Units (PSU) are census units in urban areas and villages in rural areas with at least 4 households living in poverty and with elderly members. The selection is PPS according to the total number of households. In the second step, 4 households are randomly drawn from each PSU for interview and 2 for replacements
- **Modules:** 1) characteristics of household and each member, detailed expenditures, perceptions, food security; 2) specific questions for 65–80-year-old individuals (health, perceptions, time use, labor, etc.); 3) specific questions for the rest of household members (labor, education, health); 4) anthropometrical measures, blood sample and arterial pressure for the 65–80-year-old individuals

Ongoing research with ESBAM

- **Gender Differences in Cognitive Abilities among the Elderly Poor of Peru** (joint with Rafael Novella, IADB)
- **Mental Retirement and Non-Contributory Pensions** (joint with Rafael Novella, IADB)
- **Cognitive Abilities and Ethnicity** (joint with Raya Muttarak, Wittgenstein Centre; Simone Ghislandi, U Bocconi)
- **Successful Ageing and Poverty: the Case of Peru** (joint with Isabelle Tournier, U of Luxembourg)
- **Ethnicity and Respecting Preferences** (joint with Erik Schokkaert, KULeuven; Koen Decancq, U of Antwerp)

Cognitive functioning

- ESBAM uses a reduced version of the mini-mental-state examination (MMSE) (Folstein et al., 1975) to evaluate cognitive functioning of the elderly; similar to the version used in the Survey on Health and Well-Being of Elders (SABE) in 7 capital cities in Latin America
- Our score of cognitive functioning adds up the results of five questions dealing with different aspects of cognitive functioning:
 1. *Orientation*: Asks about the day of the month, month, year and day of week
 2. *Memory*: Three words are mentioned and the respondent has to repeat these immediately after in any order. These words are asked later again (forth question) in order to measure *delayed recall*
 3. *Command understanding*: The respondent must follow in order the following three actions: “I will give a piece of paper. Take this with your right hand, bend in half with both hands and place it on your legs”.
 4. *Visual-spatial ability*: The respondent must replicate a drawing of two circles intercepting

Education levels, %

Education level	All	<u>Female</u>	<u>Male</u>
Illiterate	28.4	50.2	10.8
Incompleted primary	50.8	39.3	60.0
Completed primary	13.9	7.7	18.9
Incompleted secondary	3.6	1.9	5.0
Completed secondary or higher	3.3	1.0	5.2
Total	100.0	100.0	100.0
Observations	3947	1760	2187

Distribution of cognitive score by question

Question type	Points on correct answers (%)						Mean score
	0	1	2	3	4	total	
Episodic memory							5.06
Word memory immediate recall	0.68	1.57	13.55	84.19		100.00	2.81
Word memory delayed recall	6.59	10.74	33.67	49.00		100.00	2.25
Mental intactness							6.62
Orientation	2.25	7.14	16.92	30.43	43.25	100.00	3.05
Command following	0.53	3.70	21.26	74.51		100.00	2.70
Drawing	12.72	87.28				100.00	0.87
Total							11.69

Source: Authors' elaboration on the base of ESBAM.

Differences in unconditional means

Episodic memory			
Overall	Female	Male	F-M
5.063	5.053	5.072	-0.019
Mental intactness			
Orientation			
Overall	Female	Male	F-M
3.053	2.712	3.327	-0.615***
Command			
Overall	Female	Male	F-M
2.697	2.699	2.696	0.002
Drawing			
Overall	Female	Male	F-M
0.873	0.809	0.924	-0.115***
Total mental intactness			
Overall	Female	Male	F-M
6.623	6.220	6.947	-0.728***

Identification (OLS)

- We use a rich set of control variables to reduce potential bias due to omitted variables:
 - **Confounders**: schooling, sex, age, and local fixed effects
 - Moreover, we use objective measures of health:
 - **Arm span**, which is a better measure than height in old-age population to proxy the nutritional status acquired in childhood, which positively affects cognitive ability development (Case and Paxon, 2008; Guven and Lee, 2013a and 2013b)
 - Altitude-corrected measure of **hemoglobin** to account for current nutritional status. There is evidence that poor nutritional status is associated with an increase in the risk of dementia (Hyung Hong et al., 2013)
 - Chronic illnesses related to **mental disorders**

$$c_i = \alpha_0 + \beta D_i^{fem} + \delta X_i + \alpha_d + \varepsilon_i \quad (1)$$

$$c_i = \alpha_0 + \beta D_i^{fem} + \delta_1 D_i^{fem} X_i + \delta_2 X_i + \alpha_d + \varepsilon_i \quad (2)$$

Results (OLS)

Variable	Memory	Mental intactness			Overall	
	(1) Total	(2) Orientation	(3) Command	(4) Drawing	(5) Total	(6) Additive
Female	0.167*** (0.039)	-0.203*** (0.037)	0.061* (0.037)	-0.127*** (0.037)	-0.157*** (0.036)	-0.011 (0.036)
Age	-0.027*** (0.004)	-0.022*** (0.004)	-0.003 (0.003)	-0.018*** (0.004)	-0.022*** (0.003)	-0.029*** (0.003)
Mother tongue is indigenous	0.059 (0.082)	0.063 (0.071)	0.037 (0.085)	0.001 (0.070)	0.063 (0.072)	0.073 (0.073)
Urban	0.151** (0.077)	0.014 (0.066)	0.052 (0.075)	0.085 (0.075)	0.052 (0.069)	0.117* (0.071)
Retired	-0.108*** (0.040)	-0.131*** (0.037)	-0.065* (0.037)	-0.089** (0.043)	-0.146*** (0.036)	-0.154*** (0.036)
Uncompleted primary education	0.245*** (0.043)	0.794*** (0.041)	0.116*** (0.039)	0.528*** (0.046)	0.767*** (0.039)	0.636*** (0.039)
Completed primary education	0.425*** (0.058)	0.943*** (0.051)	0.163*** (0.055)	0.559*** (0.055)	0.906*** (0.050)	0.825*** (0.051)
Uncompleted secondary education	0.440*** (0.081)	0.931*** (0.077)	0.280*** (0.079)	0.637*** (0.064)	0.963*** (0.071)	0.871*** (0.070)
Completed secondary educ. or higher	0.479*** (0.094)	0.988*** (0.084)	0.310*** (0.095)	0.606*** (0.071)	1.011*** (0.081)	0.923*** (0.083)
Arm span (z-score)	0.032* (0.018)	0.033** (0.015)	0.047*** (0.017)	0.053*** (0.018)	0.056*** (0.016)	0.054*** (0.016)
Haemoglobin (z-score)	0.037** (0.018)	0.050*** (0.016)	0.014 (0.016)	-0.009 (0.017)	0.041** (0.016)	0.047*** (0.016)
Mental disorders	-0.218*** (0.045)	-0.098** (0.040)	-0.118*** (0.043)	-0.117*** (0.044)	-0.150*** (0.042)	-0.217*** (0.043)
Smoking	0.023 (0.042)	-0.013 (0.037)	-0.093** (0.041)	-0.073* (0.040)	-0.066* (0.036)	-0.030 (0.036)
Constant	1.660***	1.091***	0.155	0.962***	1.093***	1.645***
R-squared	0.20	0.35	0.28	0.23	0.37	0.34

More results (OLS)

Variable	Memory		Mental intactness		
	(1) Total	(2) Orientation	(3) Command	(4) Drawing	(5) Total
Female	1.099** (0.541)	-0.635 (0.495)	0.350 (0.491)	0.483 (0.566)	-0.217 (0.482)
Age	-0.021*** (0.005)	-0.023*** (0.004)	-0.001 (0.005)	-0.012*** (0.005)	-0.021*** (0.004)
Age*Female	-0.014* (0.008)	0.004 (0.007)	-0.004 (0.007)	-0.012 (0.008)	-0.001 (0.007)
Mother tongue is indigenus	0.022 (0.088)	0.160** (0.074)	-0.002 (0.089)	-0.010 (0.073)	0.117 (0.075)
Mother tongue is indigenus*Female	0.062 (0.073)	-0.197*** (0.064)	0.092 (0.070)	0.036 (0.073)	-0.101 (0.063)
Uncompleted primary education	0.218*** (0.078)	0.652*** (0.075)	0.183*** (0.068)	0.347*** (0.081)	0.646*** (0.072)
Completed primary education	0.435*** (0.087)	0.763*** (0.081)	0.221*** (0.080)	0.381*** (0.087)	0.752*** (0.079)
Uncompleted secondary education	0.452*** (0.110)	0.701*** (0.105)	0.367*** (0.103)	0.480*** (0.093)	0.789*** (0.098)
Completed secondary education or higher	0.485*** (0.113)	0.851*** (0.104)	0.369*** (0.113)	0.474*** (0.095)	0.901*** (0.101)
Uncompl. primary educ.*Female	0.057 (0.093)	0.170* (0.091)	-0.098 (0.083)	0.258*** (0.100)	0.148* (0.087)
Compl. primary educ.*Female	-0.080 (0.123)	0.326*** (0.111)	-0.064 (0.112)	0.291** (0.116)	0.286*** (0.109)
Uncompl. secondary educ.*Female	-0.060 (0.163)	0.504*** (0.154)	-0.162 (0.161)	0.243* (0.130)	0.368*** (0.141)
Compl. secondary educ. or higher*Female	-0.042 (0.282)	0.150 (0.240)	-0.033 (0.223)	0.191 (0.227)	0.144 (0.248)
Constant	1.252*** (0.356)	1.310*** (0.327)	-0.003 (0.334)	0.761** (0.332)	1.144*** (0.319)
R-squared	0.21	0.36	0.28	0.23	0.37

Results with time use (OLS)

Variable	Memory	Mental intactness			
	(1) Total	(2) Orientation	(3) Command	(4) Drawing	(5) Total
Female	0.135*** (0.045)	-0.227*** (0.041)	0.045 (0.045)	-0.144*** (0.043)	-0.185*** (0.041)
Time use variables (hours a week):					
Cooking, cleaning & housing maintaining	0.002 (0.002)	0.002 (0.002)	0.001 (0.002)	0.001 (0.002)	0.002 (0.002)
Looking after children	0.002 (0.002)	0.002 (0.002)	-0.001 (0.002)	-0.002 (0.003)	0.000 (0.002)
Administration and organization of household	0.006 (0.006)	0.006 (0.005)	0.002 (0.006)	0.008** (0.004)	0.007 (0.005)
Sharing time with family / attend social meetings	0.007*** (0.003)	-0.002 (0.003)	0.008*** (0.002)	-0.001 (0.002)	0.001 (0.003)
Leisure activities (watch tv, read, walk around, rest, sports, talk with friends, drawing, dance, art activities)	-0.001 (0.002)	-0.002 (0.002)	-0.005** (0.002)	-0.003 (0.002)	-0.004** (0.002)
Gardening and animal caring	0.006** (0.002)	0.005** (0.002)	0.007*** (0.002)	0.006** (0.003)	0.008*** (0.002)
Voluntary work	-0.007 (0.006)	0.010* (0.006)	-0.004 (0.007)	-0.001 (0.007)	0.005 (0.005)
Constant	1.571*** (0.281)	1.015*** (0.264)	0.065 (0.257)	0.934*** (0.289)	0.992*** (0.255)
R-squared	0.21	0.35	0.29	0.23	0.37

Discussion

- Overall, cognition is not associated with gender, conditional on the full set of controls. But, the overall score hides some gender differences in memory and mental intactness
- Females perform better than men in memory but worse in mental intactness
- Individuals in urban areas have better cognition, which lends support to the existence of persistent differences between urban and rural localities (inadequate infrastructure, public services, education, health, market access, etc.)
- It is striking that even in a sample of poor individuals, it is found that regional differences matter

Discussion

- The positive effects of education and childhood nutrition confirm the long-term impacts of early-life developments on current outcomes. Therefore, policies directed at improving early childhood development are expected to have a positive impact in later life
- Current nutritional state (haemoglobin) and diseases related to mental health are important predictors as well. Public policies directed at the current elderly poor group might have an important impact on their well-being. For instance, raising the quality of nutritional intake and medically attending to chronic mental diseases may be relevant for delaying cognitive decline in old age

Thanks!