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Differences in the Progression of Disability: A U.S.–Mexico Comparison

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Abstract

Objectives: This article seeks to document the progression of disability in a developing country by implementing a model to examine how this process compares to a developed country.
Methods: Data come from the Mexican Health and Aging Study (MHAS), including a baseline survey in 2001 and a follow-up in 2003, and from the U.S. Health and Retirement Study (HRS), using the 2000 and 2002 waves. An ordinal logistic regression approach is used to examine a progression of disability that considers (a) no disability, (b) mobility problems, (c) mobility plus limitations with instrumental activities of daily living, (d) mobility plus limitations with activities of daily living (ADLs), (e) limitations in all three areas and (f) death.
Results: In both data sets, approximately 44% of the sample remained in the same level of disability at the 2-year follow-up. However, the progression of limitations with two disabilities differs by gender in the MHAS but is consistent for both men and women in the HRS.
Discussion: Our model reflects the importance of ADLs in the disablement process in Mexico. We speculate that the difference in lifetime risk profiles and cultural context might be responsible for the divergence in the progression of disability by gender.

Keywords: Gender differences—HRS—Mexico—MHAS—Progression of disability—USA

Disability is a process that is affected by individual conditions and also highlights cultural and societal differences across nations (Chan, Kasper, Brandt, & Pezzin, 2012). Unfortunately, there is no standard measure of disability that is consistently used by social or medical researchers (McDermott & Turk, 2011), and its calculation is muddled by different methodologies and by seeing disability only as a process where the individual has no possibility of recovering either partially or completely (Freedman, Martin, & Schoeni, 2004).

The transitions from healthy aging to illness and disability are expressed through the disablement process. This process is modeled as a progression of a healthy individual moving to limitations in lower extremity functions (mobility) to limitations in instrumental activities of daily living (IADLs) and/or basic activities of daily living (ADLs), and to limitations in all three areas (Verbrugge & Jette, 1994).

The progression of disability is linked to socioeconomic conditions, particularly poverty, in a vicious cycle: Disability increases poverty and poverty increases the chances of being disabled (Mitra, Posarac, & Vick, 2011). Countries with low inequality have the ability to provide more resources, social capital, and better overall quality of life and, as a result, generate cohesive societies better suited

to deal with physical limitations (Wilkinson, 2000). In addition, cultural differences in a country tend to assign gender roles that influence behavior, attitudes, and the way men and women approach disability (Zunzunegui, Alvarado, Béland, & Vissandjee, 2009).

International comparative studies of disability highlight the challenges that developing and developed countries face when socioeconomic inequalities and cultural differences are present (Madans, Loeb, & Altman, 2011). There is, however, little information regarding disability and how the elderly population, especially those in developing countries, transition from healthy aging to being disabled (Eide & Loeb, 2005). The relevance of this research focuses on the socioeconomic differences in a developed and in a developing country and how these differences have an impact on disability.

Mexico and the United States present a unique opportunity to compare how differences in socioeconomic factors and access to health services affect the progression of disability over time. Both countries are aging, but the current pace of aging in Mexico is much faster than the pace of aging followed by the United States in the past. Furthermore, Mexico faces a combination of chronic illnesses and some infectious diseases, particularly in rural areas (Águila, Díaz, Manqing-Fu, Kapteyn, & Pierson, 2011); thus, the progression of disability seen in the U.S. population will most likely differ from the one observed in the Mexican population.

In addition, both countries possess a different socioeconomic, political, and cultural environment that limits the availability and access to health-related resources and impacts the well-being of older adults (Gerst, Michaels-Obregón, & Wong, 2011). For example, research has shown that the percentage of the disabled population with at least one ADL limitation is higher in the United States, but the percentage of the population with three or more ADL limitations is higher in Mexico (Gerst-Emerson, Wong, Michaels-Obregón, & Palloni, 2015).

The United States has seen an increase in the proportion of the population aged 65 or older of 18.3% between 2000 and 2011 (U.S. Department of Health and Human Services, 2012), and at the same time, the size of the elderly population will continue to increase in the following years (He & Larsen, 2014). In addition, there are wide disparities among racial/ethnic groups with non-Hispanic Blacks being at a higher risk of becoming disabled than non-Hispanic Whites and even Hispanics (Warner & Brown, 2011). In 2010, two of every five individuals with a disability were aged 65 or older, one of every four did not earn a high school degree, and one of every ten had no insurance coverage of any kind (U.S. Census Bureau, 2010).

Mexico belongs to the region of the world (Latin America) with the highest level of socioeconomic inequality (UNU-WIDER, 2014). Over the past three decades, a sudden increase in life expectancy combined with a reduction in fertility and mortality rates have almost doubled the proportion of individuals aged 65 or older (Gerst-Emerson et al., 2015). In 2010, almost half of the individuals with a disability were aged 65 or older, one of every four had no formal education, and one of every three had no insurance coverage of any kind (Instituto Nacional de Estadística y Geografía, 2010).

These two countries exhibit different epidemiological, socioeconomic, and health characteristics that expose individuals to a specific set of living conditions during their life cycle and put them at different risks of becoming disabled in old age. The objective of this article is to establish if the progression of disability is different in Mexico than in the United States and to examine gender differences. We propose a model for disablement that progresses from no limitations, to one limitation (only in mobility), to two limitations (in mobility and IADL or in mobility and ADL), to three limitations (in mobility, ADLs, and IADLs), and finally to death.

The goal is to establish the order in which the combination of disabilities will be present in a population of healthy adults. Several factors are known to affect the progression of disability, so we include covariates like age and location size (Pérès, Verret, Alioum, & Barberger-Gateau, 2005), education and socioeconomic status (Deeg, 2005), gender (Warner & Brown, 2011), health insurance (Sesma-Vázquez, Pérez-Rico, Sosa-Manzano, & Gómez-Dantés, 2005), and social networks (Mendes de Leon et al., 1999). Health- and function-related variables are also relevant, so we consider cognition (Fauth, Zarit, & Malmberg, 2008), number of depressive symptoms (Fauth et al., 2007), self-rated health (Peek, Ottenbacher, Markides, & Ostir, 2003), and the initial level of disability (Hébert, Raîche, Dubois, Gueye, & Tousignant, 2012).

We hypothesize that because of the socioeconomic conditions that older adults in Mexico and in the United States face over their life cycle, the progression of disability for the elderly population will differ between both countries.

Data and Methods

The first data source comes from the Mexican Health and Aging Study (MHAS), a nationally representative study of Mexicans born in 1951 or earlier and designed to be highly comparable with the Health and Retirement Study in the United States. Participants were first interviewed in 2001, and baseline data consisted of 15,186 in-person interviews (92% response rate) with a follow-up in 2003 (93% response rate). Detailed information on the study has been published elsewhere (Wong, Michaels-Obregón, & Palloni, 2015).

From the 2001 MHAS total sample (*n* = 15,186), we exclude 10,314 respondents younger than 65 years of age, 449 respondents who answered through a proxy, and 71 respondents with missing information in ADL, IADL, and/or mobility. Respondents who were deceased at the 2003 follow-up were included in the analysis only if they reported their disability status at Time 1 (2001). The sample

for our descriptive analysis includes 4,352 respondents. In the regression analysis, we further exclude 44 respondents who fell in the "other" category of limitations (limitation in ADL only, limitation in IADL only, or limitations in both ADL and IADL), 171 respondents who were lost to follow-up in 2003, and 854 respondents with missing information in multiple covariates. Thus, the MHAS sample for the regression analysis includes 3,283 respondents.

The second data source comes from the Health and Retirement Study (HRS), a nationally representative panel of Americans aged 51 or older that contains information on health, housing, disability, and so on. Baseline data collection began in 1992 with more than 15,000 in-person and telephone interviews. We use data from the 2000 (88% response rate) and 2002 (88% response rate) follow-ups (Health and Retirement Study, 2003, 2006) because these years are closer in time to the years of the MHAS waves.

From the 2000 HRS total sample (*n* = 19,579), we exclude 8,866 non–community-dwelling respondents younger than 65 years of age, 451 respondents who were institutionalized, 1,036 respondents who answered through a proxy, and 3,425 respondents with missing information in ADL, IADL, and/or mobility. Respondents who were deceased at the 2002 follow-up were included in the analysis only if they reported their disability status at Time 1. The sample for our descriptive analysis includes 5,801 respondents. In the regression analysis, we further exclude 365 respondents who fell in the "other" category of limitations, 74 respondents who were lost to follow-up in 2003, and 853 respondents with missing information in multiple covariates. Thus, the HRS sample for the regression analysis includes 4,509 respondents.

Respondents with missing information on disability were slightly younger (1 year in the MHAS and 1.5 years in the HRS), had about the same educational attainment than the rest of their study's average, and had around 1%–2% less health insurance coverage than respondents who were included in our analyses.

Measures

Dependent Variable

Three health-related measures were used to construct the progression of disability: A modified version of the Katz Index of ADLs (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963) in the form of a score (0–5) measuring if the respondent needed help to bathe, get dressed, eat, use the toilet, and transfer in and out of bed. A similar score (0–4) for the IADLs measuring if the respondent needed help preparing meals, taking medications, shopping for groceries or clothes, and managing money (Lawton & Brody, 1969). Finally, the Rosow-Breslau Functional Health Scale was included as a mobility score (0–3) measuring if the respondent needed help to climb a flight of stairs, walk one half mile, or lift heavy objects (Rosow & Breslau, 1966).

Each activity variable was dichotomized, and the respondent was assigned a value of 0 if help was not required, 1 otherwise. For ADLs and mobility tasks, respondents who answered "cannot do" or "does not do" were recoded as 1 if they could not or did not perform these activities but received help from their spouse or someone else to perform them, 0 otherwise, following previous literature (Cigolle, Langa, Kabeto, Tian, & Blaum, 2007). For IADLs, respondents who answered "cannot do" or "does not do" were recoded as 0 if they could not or did not perform these activities because of a non-health-related problem, and 1 otherwise. After recoding these three measures, we created the dependent variable measuring type of limitation. If respondents received a value of 1 in any of the ADLs, IADLs or mobility variables, then they were identified as having a limitation.

Our variable measuring disability at Time 2 includes six categories: respondents with no ADL, IADL or mobility limitations (=0); respondents with a limitation only in mobility (=1); respondents with limitations in both mobility and IADL (=2); respondents with limitations in mobility and ADL (=3); respondents with limitations in mobility, ADL, and IADL (=4); and respondents who died between Time 1 and Time 2 (= 5). We consider death to be a natural progression in our model as the worst and final outcome. By including death, we reduce the possibility of having survival selection bias. Thus, respondents who begin in any status at Time 1 (including those who have three limitations) can "progress" at Time 2 to a worse status, including death.

Covariates

Disability at Time 1: Five dichotomous variables measuring (a) no limitations (reference), (b) limitation in mobility only, (c) limitations in both mobility and IADL, (d) limitations in both mobility and ADL, and (e) limitations in all three.

Age: Dichotomous variables of respondents 65–69 years old (reference), respondents 70–74 years old, and respondents 75 years or older. Education: We created two sets of dichotomous variables to account for differences in educational achievement between both countries measuring no education (reference), 1–5 years of schooling, 6 years of schooling, and 7 or more years of schooling in Mexico and less than 9 years of schooling (reference), 9–11 years of schooling, 12 years of schooling, and 13 or more years of schooling in the United States. Gender: Dichotomous variable (women = 1). Level of urbanicity: Dichotomous variable (communities of less than 100,000 inhabitants = 1). Social support: Coded as 1 if the respondents answered "yes" to either receiving help from their neighbors/friends or from their spouse/children, 0 otherwise. These questions were combined to consider the respondent's marital status and living arrangements. Unmarried respondents living alone might only have support from their neighbors/friends

whereas married respondents might receive support from their spouse/children and also from neighbors/friends.

Monthly income: We created dichotomous variables for each nation to account for the differences in income. In Mexico, respondents were divided in those who were indebted or had no income (reference), earned less than 5,000 Mexican Pesos (less than US$370 at current exchange rates), earned between 5,000 and 9,999 Mexican Pesos (approximately between US$370 and US$736 at current exchange rates), and earned 10,000 Mexican Pesos or more (over US$736 at current exchange rates). MHAS imputed values were used to avoid missing income information (Wong & Espinoza, 2004). In the United States, respondents were divided in those who were indebted or had no income (reference), earned less than US$10,000, earned between US$10,000 and US$19,999, and earned US$20,000 or more. HRS imputed values were used to avoid missing income information (Moldoff et al., 2013). Health insurance: For the MHAS, a dichotomous variable measuring whether the respondents have insurance from any of the public health institutions in Mexico and/or from a private company. For the HRS, a dichotomous variable measuring whether the respondents have insurance from a private company and/or from any of the public programs created by the government.

Number of depressive symptoms: Respondents answered an abbreviated version of the original CES-D scale (Radloff, 1977) with the eight symptoms that are common in both studies. These symptoms include feeling that everything was an effort, restless sleep, feeling happy (reverse coded), feeling lonely, feeling that life was enjoyable (reverse coded), feeling sad, feeling tired, and feeling energetic (reverse coded). Each of the eight symptoms was dichotomized and then added to generate a score (0–8). Self-rated health: Measured as a dichotomous variable with poor self-rated health (=1) versus all other values (excellent, very good, good, or fair). Cognition: For the MHAS, respondents were asked to repeat all the words they could remember from a list of eight possible words and then recall these words later in the interview. For the HRS, the list consists of ten possible words but follows the same procedure as the MHAS. In both cases, we included an average of the two cognition tests (range 0–8 for the MHAS and 0–10 for the HRS) based on previous literature (Lei, Hu, McArdle, Smith, & Zhao, 2012). We performed an ancillary analysis taking two random words out of the HRS average to have similar average scores in both studies with the difference in the scoring scales not altering the regression results significantly.

Analytic Strategy

For each country, descriptive statistics were stratified by gender and we limited our sample to respondents aged 65 or older. This is because, although physical limitations at younger ages were reported, the prevalence was not as high as in older ages. In the 2000 HRS wave, 30.8% of respondents aged 65 or older had at least one ADL limitation, 22.2% had at least one IADL limitation, and 50.3% had at least one mobility limitation. In comparison, 20.2% of respondents aged 50–64 years had at least one ADL limitation, 9.2% had at least one IADL limitation, and 30.5% had at least one mobility limitation. In the 2001 MHAS sample, 19.1% of respondents aged 65 or older had at least one ADL limitation, 15.4% had at least one IADL limitation, and 54.4% had at least one mobility limitation. In contrast, 7.0% of respondents aged 50–64 years had at least one ADL limitation, 4.1% had at least one IADL limitation, and 28.9% had at least one mobility limitation.

In our regression analyses, our dependent variable was treated as a polychotomous outcome and modeled with an ordinal logistic regression (Kleinbaum & Klein, 2010) which has been used to evaluate health outcomes before (Das & Rahman, 2011). (Additionally, we performed multinomial logistic regressions and ordinal logistic regressions excluding death, excluding respondents with all limitations and including interaction terms from our model [not shown], and the results were similar to the ones presented here.) The model considers a dependent variable capturing disability status at Time 2 with the following categories: zero disabilities, one (mobility only), two (mobility + IADL or mobility + ADL), three (mobility + IADL + ADL), and death. We include as independent variable the equivalent variable for Time 1 with the same categories except "death." Because we are interested in the progression of disability, we use the odds ratios (ORs) of the disability status at Time 1 to empirically establish the order in which, on average, the individuals would move from one disability status category at Time 1 into a worse status at Time 2 and we then examine these results by gender in the two countries.

We computed three models for each country to assess the association of the covariates at Time 1 with the Time-2 level of disability. Model 1 includes the levels of disability at Time 1, indicating the starting point of each respondent in terms of disablement. Model 2 introduces the sociodemographic variables such as age, gender, education, insurance coverage, level of urbanicity, income, marital status, and social support. Finally, Model 3 adds the health-related variables such as self-rated health, the number of depressive symptoms, and the average combined verbal recall score. All the analyses were performed with Stata/SE version 13.1 (StataCorp, 2013).

Results

Table 1 presents descriptive characteristics of the respondents aged 65 or older by gender, where several differences emerge.

First, for the MHAS, more than half of the men report no limitations at Time 1, whereas 7.9% of the women report limitations in mobility and IADL compared with only 3.7%

Table 1. Selected Characteristics of Respondents Aged 65 or Older in the Mexican Health and Aging Study (MHAS) and the Health and Retirement Study (HRS)

Characteristic	MHAS		HRS	
	Men	Women	Men	Women
Disability at Time 1 (%)				
No disability	53.3	36.5***	37.1	26.8***
Limitations only in mobility	29.4	38.5***	30.0	37.4***
Limitations in mobility and IADL	3.7	7.9***	6.4	6.6
Limitations in mobility and ADL	4.6	5.6**	8.9	10.4**
Limitations in all three	8.1	9.7*	12.1	16.5**
Other limitations	0.9	1.8*	5.5	2.3*
Disability at Time 2 (%)				
No disability	45.3	32.0***	28.3	22.2***
Limitations only in mobility	26.2	33.0***	24.2	32.2***
Limitations in mobility and IADL	4.5	6.5**	5.6	7.3**
Limitations in mobility and ADL	3.9	5.3***	6.3	8.6**
Limitations in all three	3.9	9.3***	11.9	16.8***
Other limitations	1.2	0.7*	4.4	2.0*
Dead	9.9	8.3**	18.9	10.6***
Lost to follow-up	5.1	4.9	0.4	0.3
Sociodemographic and economic				
Age distribution (%)				
65–69 years old	36.6	37.4	27.4	25.6*
70–74 years old	25.7	25.5	26.5	25.5*
75 years or older	37.7	37.1	46.1	48.9***
Average age (years)	73.2	73.1	74.5	75.2
Education distribution (%)				
No education	39.1	43.2***		
Between 1 and 5 years of schooling	36.6	32.1**		
6 years of schooling	10.6	12.1		
7 or more years of schooling	13.7	12.6		
Less than 9 years of schooling			17.3	14.8***
Between 9 and 11 years of schooling			16.2	16.2***
12 years of schooling			29.6	38.8***
13 years or more of schooling			36.9	30.2***
Average education (years)	3.2	2.9	11.9	11.7
Monthly income distribution (%)				
Zero or negative income	22.6	29.1***		
Less than 5,000 Mexican Pesos	62.3	60.8*		
Between 5,000 and 9,999 Mexican Pesos	9.3	5.5		
10,000 Mexican Pesos or more	5.8	4.6		
Zero or negative income			0.9	0.9
Less than US$10,000			19.1	52.2***
Between US$10,000 and US$19,999			41.3	32.1***
US$20,000 or more			38.7	14.8***
Insurance (%)				
Any coverage	54.0	56.4	99.3	99.3
Health				
Poor self-rated health (%)	23.8	23.7	10.8	12.0 *
Number of depressive symptoms	3.6	4.5***	2.0	2.4***
Average combined verbal recall score	4.0	4.3	4.0	4.5***
Unweighted sample size	2,074	2,278	1,865	3,936

Notes: ADL = activities of daily living; IADL = instrumental activities of daily living.

Weighted data and unweighted sample size totals. All variables are at Time 1(2000 for the HRS and 2001 for the MHAS) unless noted. "Other limitations" refers to respondents with limitations only in ADL, or limitations only in IADL, or limitations in both ADL and IADL. This category and "Lost to follow-up" are only included for descriptive purposes and are excluded from the ordinal logistic regression analysis.

Significance: *$p \leq .05$. **$p \leq .01$. ***$p \leq .001$. Chi-square differences by gender for each country.

Source: Author's calculations with data from the Mexican Health and Aging Study (2001, 2003) and the Health and Retirement Study (2003, 2006).

for the men. For the HRS, men are less disabled than women (37.1% vs 26.8%), but both genders reported higher percentages of severe limitations (all three) compared with Mexican older adults. At Time 2, a portion of both populations has transitioned from health to any type of limitation. However, death and severe limitation are higher in the United States, the former among men (18.9%) and the latter among women (16.8%). Second, the MHAS sample had an average of 3.1 years of education (3.2 years for men and 2.9 years for women), whereas the HRS sample had an average of 11.8 years of schooling (11.9 years for men and 11.7 years for women). Third, at Time 1, the U.S. sample reported very small percentages of zero or negative monthly income in 2000 (0.9% for both men and women), whereas the Mexican sample reported much larger percentages in 2001 (22.6% for men and 29.1% for women).

Fourth, differences in insurance coverage are also noticeable at Time 1. In the MHAS, women reported 2.4% more insurance coverage than men, but percentages did not exceed 57%. In the HRS, there was no difference between genders with virtually every older adult aged 65 or older receiving some sort of insurance coverage in the United States. Finally, women in the MHAS reported similar poor self-rated health but more depressive symptoms than men, and had an average combined verbal recall score 0.3 points higher than men at Time 1. In contrast, reported percentages of poor self-rated health and number of depressive symptoms in the United States were much lower than in Mexico. American women had higher average combined verbal recall score and also more depressive symptoms than American men at Time 1.

The top part of Table 2 presents an ordinal logistic regression for covariates of the progression of disability at Time 2 for the MHAS, stratified by gender. Model 1 introduces disability at Time 1 and presents evidence of a different progression of disability across genders, as women are, on average, more likely to move from having limitations

Table 2. Odds Ratios for the Progression of Disability by Gender for Adults Aged 65 or Older in the Mexican Health and Aging Study (MHAS) 2001–2003 (top) and in the Health and Retirement Study (HRS) 2000–2002 (bottom)

| | Model 1 | | Model 2 | | Model 3 | | | |
| | | | | | Odds ratio | | 95% CI | |
MHAS (Mexico)	Males	Females	Males	Females	Males	Females	Males	Females
Disability								
At Time 1 (Ref.: no disability)								
Mobility only	3.07***	2.82***	2.76***	2.46***	2.49***	2.10***	1.96–3.17	1.68–2.63
Mobility and IADL	5.54***	7.81***	5.03***	6.32***	3.52***	4.64***	2.07–5.99	3.18–6.78
Mobility and ADL	7.23***	4.47***	6.21***	3.89***	4.78***	3.00***	3.31–6.90	2.10–4.28
All three	22.30***	16.20***	19.68***	14.63***	13.38***	8.96***	9.00–19.91	6.51–12.33
Unweighted *N*	1,527	1,756	1,527	1,756	1,527	1,756		
Pseudo *R*²	.08	.07	.10	.09	.10	.10		

| | Model 1 | | Model 2 | | Model 3 | | | |
| | | | | | Odds ratio | | 95% CI | |
HRS (USA)	Males	Females	Males	Females	Males	Females	Males	Females
Disability								
At Time 1 (Ref.: no disability)								
Mobility only	3.60***	5.46***	3.29***	4.98***	2.91***	4.56***	2.24–3.78	3.77–5.53
Mobility and IADL	11.97***	30.94***	10.08***	22.99***	6.53***	16.22***	4.22–10.11	11.93–22.06
Mobility and ADL	7.02***	14.56***	6.21***	13.09***	4.99***	10.91***	3.46–7.20	8.42–14.13
All three	20.57***	52.47***	16.60***	42.02***	8.73***	25.78***	5.96–12.86	19.75–33.64
Unweighted *N*	1,310	3,199	1,310	3,199	1,310	3,199		
Pseudo *R*²	.09	.13	.11	.15	.12	.15		

Notes: ADL = activities of daily living; CI = confidence interval; IADL = instrumental activities of daily living.
Unweighted results. Model 1 controls only for disability at Time 1. Model 2 controls for the variables on Model 1 plus age, level of urbanicity, social support, educational attainment, monthly income, and insurance. Model 3 controls for the variables on Model 2 plus poor self-rated health, number of depressive symptoms, and the average combined verbal recall score. Confidence intervals are only presented for the full model (Model 3) due to space purposes.
*p ≤ .05. **p ≤ .01. ***p ≤ .001.
Source: Author's calculations with data from the Mexican Health and Aging Study (2001, 2003) and from the Health and Retirement Study (2003, 2006).

only in mobility to having limitations in mobility and IADL (OR = 7.81) than moving to limitations in mobility and ADL (OR = 4.47). In contrast, men are, on average more likely to move from having limitations only in mobility to having limitations in mobility and ADL (OR = 7.23) than moving to limitations in mobility and IADL (OR = 5.54). Model 2 introduces the sociodemographic and economic variables (age, level of urbanicity, social support, education, income, and insurance coverage; results not shown). In general, being 75 years or older seems to have a bigger impact on worsening disability for both genders than for those aged 65–69 years. More years of education (7 or more) is weakly associated with a lower level of disability for women, while living in a less urbanized area (less than 100,000 inhabitants) along with the effects of income and being insured are not statistically significant.

Model 3 introduces health-related variables including poor self-rated health, number of depressive symptoms, and the combined verbal recall score (results not shown). Women who receive help from neighbors and/or children (social support) have a higher chance of being at a later stage in the progression of disability. The effect of living in a rural environment continues to show no impact on the progression of disability at Time 2. All three health-related variables are statistically significant, with depressive symptoms (OR = 1.07 for men and 1.09 for women) and poor self-rated health (OR = 1.55 for men and 1.64 for women) being linked to a later stage in the progression of disability. The effect is the opposite for the average combined verbal recall scores where the higher the cognitive score, the less likely to be disabled for both men and women. The effects of income, health insurance, and years of schooling are not significant in this model.

The bottom part of Table 2 presents an ordinal logistic regression for covariates of the progression of disability at Time 2 for the HRS, stratified by gender. Model 1 introduces disability at Time 1 and presents evidence of a similar progression of disability for men and women. On average, both genders are more likely to move from having limitations only in mobility to having limitations in mobility and IADL (OR = 30.94 for women and 11.97 for men) than moving to limitations in mobility and ADL (OR = 14.56 for women and 7.02 for men). Model 2 presents similar results to the Mexican case (not shown), with older age having a bigger impact on worsening disability for both genders. Living in a less urbanized area (less than 100,000 inhabitants) has a negative impact for women but in contrast, receiving support from neighbors and/or family seems to help slow down their progression of disability. Education seems to benefit women more than men with more years of schooling representing a slower progression of disability. In contrast, the effects of monthly income and being insured are not significant.

Model 3 has a few changes after the inclusion of the health-related variables (results not shown). The effect of living in a less urbanized environment is no longer significant for women. All three health-related variables are statistically significant and have similar effects to those seen in

the Mexican case. The effects of income and health insurance remain not statistically significant, and the effect of education for American women has been attenuated considerably with the inclusion of these variables.

From Table 2, it is clear that the order of the categories in the progression of disability for Mexican women aligns with the model found in the American sample. In contrast, for Mexican men, the middle categories of the progression (mobility and IADL, and mobility and ADL) are reversed. It is worth noting that, in the MHAS, the reverse pattern for men and women obtained in Model 1 still remains in Models 2 and 3, after all controls are included, whereas in the HRS, the pattern is consistent for both genders in all three models. Statistical analysis (not shown) confirmed that the ORs for each of the disability variables at Time 1 were significantly different between countries.

To illustrate the difference in the middle categories of the progression of disability (mobility & IADL and mobility & ADL), Figures 1 (for men) and 2 (for women) present selected predicted probabilities by country, controlling for all covariates included in Model 3 at their means, when respondents have limitations in mobility and IADL or limitations in mobility and ADL. Results show that respondents in the MHAS have higher chances of recovering (improving to limitations in mobility only or to no limitations at all) compared with the HRS. Further, American men who indicated a limitation in mobility and IADL or mobility and ADL have higher chances of dying than their Mexican counterparts. These results are similar to the ones observed for women in Figure 2. However, the probabilities of dying are lower for women than for men in both countries. The complete figures including the predicted probabilities by gender and country for the complete progression of disability are presented as Supplemental Material.
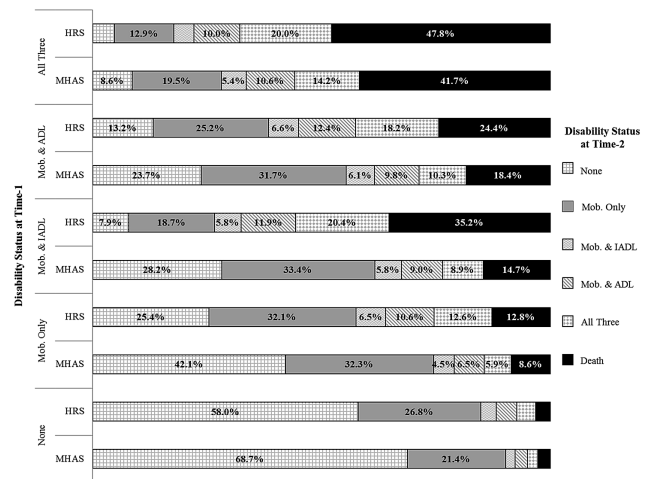

Figure 1. Two-year progression of disability for men with limitations in mobility and instrumental activities of daily living (IADL) and limitations in mobility and activities of daily living (ADL) at Time 1 by country. Source: Author's calculations with data from the Mexican Health and Aging Study (2001, 2003) and the Health and Retirement Study (2003, 2006).
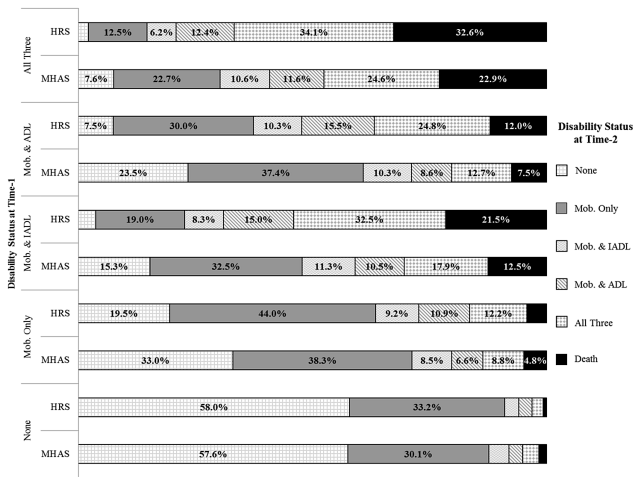
Figure 2. Two-year progression of disability for women with limitations in mobility and instrumental activities of daily living (IADL) and limitations in mobility and activities of daily living (ADL) at Time 1 by country. Source: Author's calculations with data from the Mexican Health and Aging Study (2001, 2003) and the Health and Retirement Study (2003, 2006).

Discussion and Conclusions

Mexico and the United States provide a unique opportunity for a cross-national comparison of the progression of disability because each faces different socioeconomic- and health-related conditions thus affecting this progression at a different pace (Putnam, 2002), and yet, there is high comparability in available data across both countries.

We used ordinal logistic regressions to examine and compare the progression of disability in a sample of older adults in Mexico and in the United States, stratified by gender, with several relevant findings. First, our results suggest that the progression of disability in Mexico might differ from the progression of disability previously estimated for developed countries (Wahl, Fänge, Oswald, Gitlin, & Iwarsson, 2009). Results for the MHAS showed that the progression of disability for women between 2001 and 2003 is consistent with the progression of disability between 2000 and 2002 observed for both genders in the HRS.

Simply put, elderly Mexican women and both elderly American men and women are more likely to move from having no limitations to limitations only in mobility to limitations in both mobility and ADL, to limitations in both mobility and IADL, to limitations in all three, and finally to death. The major difference occurs when analyzing elderly Mexican men where the progression of ADL and IADL limitations is reversed. Disability for Mexican men is more likely to begin with a status of no limitations, followed by limitations in mobility, then by limitations in both mobility and IADL, followed by limitations in both mobility and ADL, then limitations in all three, and then death.

This study closes a gap in the literature by providing a longitudinal analysis of the progression of disability in a developing country like Mexico because all previous research has come primarily from the United States and some Western European countries. Gender differences in

the progression of disability in Mexico seem to be particularly important in IADLs. Men in Mexico have more problems dealing with household-related IADLs than women seem to have with handling money and managing medications (Millán-Calenti et al., 2010). Further, cultural and gender interactions in a usually male-dominated society might alter how social networks interact with those who need help to perform IADLs or ADLs.

This work points to the importance of treating IADLs and ADLs as unique and separate in the progression of disability. Previous research has sometimes omitted or merged these two categories of limitations (Fauth et al., 2008). IADLs are activities that require interactions with others and demand higher cognitive and social functions. ADLs are basic activities performed for everyday living. Thus, IADLs are highly influenced by the person's background and culture compared with ADLs (Verbrugge & Jette, 1994). Further, cultural and economic differences between both countries might alter the way older adults deal with IADLs and ADLs as higher prevalence of disability has been linked to older adults with low socioeconomic status (Melzer, Izmirlian, Leveille, & Guralnik, 2001).

Another important contribution is the inclusion of mortality as an outcome. To better understand the progression of disability and the factors associated with it, research needs to extend beyond disability as the final stage of the process, as well as to understand that the progression of disability is dynamic and reversible (Peek, Patel, & Ottenbacher, 2005).

This study comes with limitations. IADL or ADL scores might be underreported in Mexico because social norms could make men hesitant to ask for help in case of a limitation (Hammer, Vogel, & Heimerdinger-Edwards, 2013). Further, gender roles are different in each country and are affected by many socioeconomic and cultural factors during the life course, and, as a result, they might influence the progression of disability (Spitzer, 2005). (To evaluate the potential that our findings were the result of traditional gender roles within IADLs, we ran additional models [not shown] that grouped IADLs by gender roles [shopping and meal preparation for women and money and medication management for men]. Results did not change the order of the progression of disability for either the MHAS or HRS cohorts, suggesting that results go beyond simple gender role explanations.) Finally, this study is only intended to show the possibility of different progressions of disability between a developing and a developed country and is not intended to draw absolute conclusions or to establish these progressions as definitive.

Further research is needed to confirm these findings by comparing the results from Mexico and the United States to other countries. The inclusion of new waves of information in the MHAS might verify the gender differences in the progression of disability in Mexico for men and women by having a longer period to study that could later be compared with a similar period in the American sample. The inclusion of different covariates such as smoking or drinking

behaviors, chronic conditions such as hypertension or diabetes, and occupation would provide a new perspective to the analysis, as these factors may have a different influence on the progression of disability in each country.

Older adults with a limitation in Mexico and in the United States are two heterogeneous groups influenced by different socioeconomic and demographic factors. The knowledge of a clear progression of disability in each country is essential to target the needs of these older adults because they may require more specialized medical attention, along with rehabilitation, and possibly, institutionalization (Raîche, Hébert, Dubois, Gueye, & Dubuc, 2014).

Supplementary Material

Supplementary material is available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Conflict of Interest

The authors have no conflict of interest to report.

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