Burden of Aging in Developing Countries: Disability Transitions in Mexico Compared to the United States

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Abstract

This paper examines the burden of aging in developing countries by contrasting patterns of disability transitions among older adults in a developing country (Mexico) with similar transitions in a developed society (the U.S. non-Hispanic White population). The driving hypothesis of this work is that current elderly in Mexico are survivors of infectious epidemiological and poor economic environments during their childhood and youth, while they are experiencing a mixed epidemiological environment of chronic and degenerative diseases combined with communicable diseases in their old age. This unique combination of conditions during their life cycle may imply more severe consequences regarding physical disability than current elderly in the United States, who have not been exposed to such disadvantaged conditions. The paper presents an assessment of this burden of disability in old age using data from the Mexican Health and Aging Study (MHAS) and the U.S. Health and Retirement Study (HRS), two highly comparable longitudinal studies on aging. Estimated probabilities of two-year transitions among disability states and mortality are presented for current older adults aged 50 and older. Overall, the findings reject the initial hypothesis and support the view that the current burden of disability in old age is lighter for a developing country compared to a developed society. The paper discusses the implications of these findings, possible explanations, likely scenarios for the future, and directions for further research.

1. Introduction

Over the 20th century, demographic changes in the Latin America region tracked a familiar pattern of high mortality and high fertility, followed by declining mortality and then a decline in fertility (Brea, 2003). The pace of decline in mortality rates in particular is quite remarkable in many countries of the Latin America region. By the beginning of the 21st century, aging of the population started in the region, representing simultaneously the success of the population and health policies established in the previous half a century and a new challenge to meet the needs of the rising number of older adults (Kinsella & Phillips, 2005). In the year 2000, the proportion of the population aged 65 and older in the region was approximately 5 percent, and is projected to reach 17 percent in 2050. This regional statistic masks cross-country differences that reflect also the variation in the timing and pace of the mortality and fertility declines. For example, Bolivia and Haiti still lag behind in the mortality gains enjoyed by the rest of the region. Uruguay is currently the country with the highest proportion of population aged 65 or older (13 percent), compared to only 3.5 percent in Honduras (Wong & Palloni, 2009).

Aging in the region is also characterized by a relatively fast pace compared to the aging speed experienced by developed countries that aged before (Palloni, Pinto-Aguirre, & Pelaez, 2002), and this is a natural consequence of the rapid mortality and fertility declines that ensued in the region. The case of Mexico illustrates this rapid pace. In 1921, life expectancy at birth was 32.9 years, compared to 74.0 years in the year 2000, with the most accelerated gains occurring between 1942 and 1960. On the other hand, fertility began a steep decline in the 1970 (Partida, 2006). The percent of population aged 60 and older is expected to grow steadily, from 6% in 2000, to 15% in 2027 (CONAPO, 2005). This 27-year pace is relatively fast. By comparison, it

will have taken the United States 70 years to close this gap and reach similar percentage (in 2013); it took Japan about 40 years (from 1947 to 1985).

Another important feature of this aging process is that it is ‘premature,’ given the low level of economic development and institutional infrastructure to support this aging process (Palloni et al., 2002; Wong & Palloni, 2009). Developed countries that aged before, such as the United States or Japan, enjoyed high standards of living at the time that their aging process started. An additional remarkable feature of the aging process in Latin America has to do with the mixed epidemiological regime experienced currently by older adults. On the one hand, the prevalence of chronic conditions such as diabetes, arthritis, heart and lung disease are rising, while infectious diseases continue to prevail in certain groups (Samper-Ternent, Michaels-Obregon, Wong, & Palloni, 2010). Furthermore, current older adults are survivors of infectious diseases regimes during their early life, and we know little about how a disadvantaged childhood combined with a mixed epidemiological regime could impact their health, disability, and mortality in old age. The burden of aging could be greater for developing countries that age under these circumstances compared to developed countries.

Scholars have suggested that the rapid aging in countries like Mexico, occurring under premature levels of infrastructure and economic development, may represent extreme challenges for health and social systems to meet the demand for care of aging populations (Frenk, Bobadilla, Stern, Frejka, & Lozano, 1991; Cutler, 2001). In addition though, rapid aging is occurring such that the current generations of elderly are living longer (surviving to older ages) despite having lived their childhood under precarious conditions. Specifically, older adults turning 50 or older around the year 2000 were born in 1950 or earlier, generally with high prevalence of infectious and communicable diseases common in the first half of the 20th century

in the region. This confluence of mixed epidemiological regimes affecting the same individuals over their life course is somewhat unique to the current elderly in most of Latin America. Again, we know little about the consequences of such mixed infectious-chronic regime, and how it will affect the well being of populations in old age (Frenk et al., 1991; Murray & Lopez, 1997). The hypothesis is that the assault of chronic conditions in old age on these cohorts may result in more severe consequences compared to those experienced by societies that aged under less-infectious conditions over their life course. One way to assess these consequences is to focus on the extent of physical limitations or disability, and the progression to more severe disability or death in populations that have aged under the two vastly different regimes (one developed- and one developing-country), and this is the approach we adopt.

Hence the goal of this paper is to examine the burden of aging in developing countries by focusing on the hypothesis that the burden of physical disability in old age for Latin American countries is likely to be higher than for countries that aged at a more advanced stage of development. If this is true, compared to populations in developed countries, we should observe populations in developing countries to have higher disability rates, and moving faster towards disabled states or death over time. We should also observe that recovery or moves out of disability should be more prevalent in a developed country compared to a developing one. We use two countries as case studies: 1) Mexico, which fits the pattern of rapid aging under premature conditions, and experiencing a mixed epidemiological regime. 2) United States non-Hispanic White population, which fits the pattern of developed-country aging and can be used as benchmark or comparison group for Mexico.

The paper is organized as follows: We first provide an overview of aging and physical disability, turning to a focus on Mexico and the United States. Second, we expand on physical

disability as a measure of burden of aging for different societies and provide our working definition. Third, we describe the data sources used for the analyses and the methods used to test the project hypothesis. We provide a list of comparable measures across the two countries. We provide descriptive results comparing Mexico with the United States, as well as multivariate methods. We expand on our most relevant results: two-year transitions in physical disability across the two countries and among sub-groups in the two countries.

Disability as Burden of Aging

Loss of physical, cognitive, and emotional functionality is one of the most important problems facing adults in old age. Along with degenerative chronic diseases, the loss of physical function constrains the ability to conduct normal activities of everyday's life, and can severely impact the quality of life for older adults, potentially increasing the constant need for help and thus impacting on other family members and society at large. There are several definitions that are used to capture this concept. The World Health Organization defines dependence as the 'diminishing or absence of capacity to perform an activity in a form or within margins considered normal.' This implies that there must be another person that intervenes directly in the personal care of the older adult and even in the completion of basic needs (Dorantes-Mendoza, Avila-Funes, Mejía-Arango, & Gutiérrez-Robledo, 2007). Functional independence is defined also as the ability 'to conduct personal care chores without active personal supervision, direction or assistance'. Functional dependence is not a condition inherent of older adults, even though its prevalence rises with age. While several definitions emphasize the need for help to perform activities (Harwood, Sayer, & Hirschfeld, 2004; Rodgers & Miller, 1997), others focus on having difficulty to perform activities, either basic or instrumental for daily living. The latter definition

captures the concept of 'disability' and may include degrees or severity of disability, recognizing that there can be disability without the need for help or dependence to perform the activities. This functional dependence is traditionally measured at the population level through surveys with self-reports from older adults on the ability to conduct without help the basic activities of daily living (ADL) such as eating, bathing, walking, or getting in and out of bed (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963). For the purposes of this paper, we adopt the definition of disability as having difficulty to perform physical activities, and we focus on five basic activities of daily living (walking, eating, bathing, getting in and out of bed, and getting into and using the toilet).[1]

Data sources to measure the prevalence of disability at the national level are scarce in developing countries; Mexico and the rest of Latin America are not an exception. Differences in definitions also make comparisons difficult across countries. Using the multi-site study in seven cities of Latin America (for a description of the SABE study, see Albala et al. 2005) several authors have studied physical disability. Consistent with previous research in developed countries (McDermott et al 2005; Smits, Deeg & Jonker 1997; Black, Markides & Ray 2003) The likelihood of reporting disability is closely associated with depressive symptoms, older age, self-report of poor global health, and self report of chronic conditions (Menendez et al. 2005). Women are consistently more likely to report disabilities than men (Albala et al 2005) and the gender gap is not trivial (Al Snih et al. 2010). Similar findings are reported for other developing countries (Yount and Agree 2005). We note that these statistics, although based on cross-sectional samples of older adults, provide a general image of disability across Latin America.

[1] We note that in the remaining of the paper, unless specified, we use interchangeably the terms disability, functional limitations, or physical limitations.

Longitudinal studies should provide a more robust estimate of the association between disability progression and its covariates.

More is known about disability in developed countries because of the greater availability of survey data specialized on aging. Longitudinal studies of disability in the United States indicate that there has been a decline in disability prevalence among older adults from the 1980's to the early 2000's (Crimmins, Hayward, Hagedorn, Saito, & Brouard, 2009; Cutler, 2001). Scholars find that the decline may be attributable to both delays in onset of disability and increased likelihood of recovery from disability. This was so despite a counter-acting decrease in mortality among the disabled that contributed to slight increase in overall disability prevalence. In general, levels of disability tend to decline with higher socioeconomic levels and older women tend to experience functional limitations more than older men and over longer periods of time (Freedman et al., 2004). Across different studies, consistent predictors of disability or functional impairment are depression, comorbidity, few social contacts, low physical activity, and smoking (Stuck et al., 1999). Methodological advances have been possible also in the measurement and study of disability thanks to the availability of long-term longitudinal studies in developed countries (see Crimmins et al., 2009 and the references mentioned therein).

2. Data and Methods

a. Data

We used panel survey data from two waves of the U.S. Health and Retirement Study (HRS) and the Mexican Health and Aging Study (MHAS). These two studies are highly comparable and ideal for cross-national comparisons. We use two waves of data from the HRS and MHAS, each two years apart, in order to examine the transitions in disability.

The Health and Retirement Study (HRS) is a large-scale longitudinal study of Americans over the age of 50 conducted by the University of Michigan with support from the National Institute on Aging. This ongoing study is nationally representative for community-dwelling elders in the United States and is conducted bi-annually. The HRS is a multi-stage national area probability sample of households in the United States, with an oversample of Blacks, Hispanics and persons living in the state of Florida (see HRS, 2008 for more details). Proxy interviews were conducted in cases where subjects were too ill or cognitively unable to respond or if respondents were unavailable.

The current study used data from the 2000 (Time 1) and 2002 (Time 2) waves of the HRS, using the dataset prepared by the RAND center (RAND, 2010). This is a user-friendly dataset compiling all waves of the HRS data and using bracketing methods to minimize non-response in variables such as income and wealth (see RAND, 2010 for more details). The sample size of the 2000 wave of the HRS was 19,579 representing a response rate of 86.9% for that wave. The comparison group for this study was community-dwelling non-Hispanic whites that were born in the United States. Thus, only persons that identified as non-Hispanic white and who reported being born in the U.S. were included in the sample. Persons that were not living in the community at wave 2000 were excluded. Because the HRS interviews spouses of age-eligible respondents regardless of age, the sample was further restricted to only include persons aged 51 and older at wave 2000. Any spouses or partners that were added to the sample that were younger than the age selection criteria were removed from the sample. Finally, only persons that provided complete information on each variable of interest were included in the final analyses.

Box 2. MHAS and HRS General Information

	HRS	MHAS
General Description	Large-scale longitudinal study of adults 51 years and older. Started in 1992, conducted every two years, and is ongoing.	Prospective panel study, of adults 51 years and older in 2001, with a follow-up in 2003.
Representativeness	Nationally representative of the United States community dwelling population. Includes an oversample of Blacks, Hispanics and persons living in the state of Florida.	Nationally representative of non-institutionalized individuals in Mexico, in both urban and rural areas. Includes an oversample of high migration states at a rate 1.7:1.
Survey Protocol	Direct interview with each individual when possible, and proxy interviews when poor health or temporary absence An exit interview is conducted with a proxy informant for deceased respondents	Direct interview with each individual when possible, and proxy interviews when poor health or temporary absence At the follow-up, next-of-kin interviews were conducted on deceased respondents
Weights	Weights were post-stratified to the March Current Population Survey (CPS), based on the birth cohort as well as the gender and race/ethnicity	Weights were stratified, based on the birth cohort, household composition, and place of residence by urban/rural areas and geography
Survey Content	Health and cognitive conditions Demographic background Employment status and job history Retirement plans and perspectives Family structure and transfers Housing Anthropometric measures	Health measures Background (childhood health and living conditions, education, migration and marital history etc) Family Financial transfers and help Economic measures Housing Environment Anthropometric measures
Samples Used in the Analyses	2000 and 2002 waves Including 51 years and older in 2000, and 53 years and older in 2002 Selected only US-born Non-Hispanic Whites Sample size (age eligible)=13,404 in 2000 and 13,229 for longitudinal analysis	2001 and 2003 waves Including 52 years and older in 2001, and 54 years and older in 2003 Sample size (age eligible)=11,837 in 2001 and 11,766 for longitudinal analysis

With sampling procedures and survey designs modeled after the HRS, the Mexican Health and Aging (MHAS) serves as the companion study to the HRS. The MHAS is a two-wave prospective panel study of community-dwelling individuals born prior to 1951 and their spouses regardless of their age. It is nationally representative of 13 million Mexicans of rural and urban areas. The study was funded by the National Institutes of Health/ National Institute on Aging and conducted by researchers at University of Pennsylvania, University of Maryland, University of Wisconsin, and the Instituto Nacional de Estadística, Geografia e Informática (INEGI) in Mexico. For a more detailed description of the study see (MHAS, 2004; Wong, Pelaez, Palloni, & Markides, 2006).

For this study we selected respondents age 52 years and older in 2001 (Time 1) with complete information on all variables of interest in order to make it comparable to the HRS sample, excluding spouses or partners non-age eligible. In addition to this, the follow-up cohort at 2003 (Time 2) was further restricted to individuals 54 years and over, which served to exclude any new partners that were added to the sample and were younger than the selection criteria.

Finally, both studies included responses from proxy respondents. In both surveys the proxy rate was approximately 7% (7.5 in the HRS 2000 and 7.3% in MHAS 2001).

b. *Indicators used in both surveys*

The HRS and MHAS datasets provide an ideal opportunity to address health outcomes comparisons of the Mexican and the U.S. population 50 years and older. Since MHAS was designed to be comparable to others studies, and in particular to the HRS, most of the survey questions are similar (Kohler & Soldo, 2004) (see Box #2). Specifically, the questions for the

main outcome variable of interest in the study (functional limitations) were measured using the same Activities of Daily Living (ADL) scale. However, it is important to highlight the limitations as well as some differences across the two studies in the following measurements: education, urban/rural, and insurance.

Functional limitations were measured using the same questions across both surveys: "Because of a health problem do you have any difficulty..."[2]. We also used the same recoding methods. The five components of functional limitations included: bathing, toileting, transferring into/out of bed, walking, and eating. These five components have been used by other authors before using HRS and MHAS data (Hayward, Wong, Chiu, & Gonzales, 2010). Even though individuals across both surveys were also asked if they had difficulty with dressing, we did not include this component because the question was answered by all respondents in the HRS but not by proxies in MHAS.

The recoding methods were modeled after RAND recoding of HRS data (St.Clair et al., 2009). This approach has been previously used to examine the difference between Mexico and the U.S. (Hayward et al., 2010). Each of the five components in the questionnaire were coded disabled if the respondent answered "Yes" or "Can't do" to having difficulty in performing the activity. If the respondent answered "No" to the question about having any difficulty, disability was coded as non-disabled. If they answered "Don't do" then the response was coded as missing. However, if they answered "Don't do" and received help performing the activity, they were coded as disabled. Finally, if the respondent answered "Don't do" and does not get help performing the activity they were coded as missing values. We computed the total score ranging from 0 to 5 by adding the five components. If the respondent had a missing value for any of the

[2] In both surveys, respondents were asked to exclude difficulties that lasted less than three months.

five questions we considered the total score missing. In addition, a dummy variable was constructed where individuals with one or more disabilities were defined “disabled” and those with zero were defined “non-disabled”. In summary, we constructed four disability variables for each study: a count-score and a dummy variable for each time 1 and time 2.

Box 3. Variables Definition: Similarities and Differences Across Studies

Variables	HRS	MHAS
Similarities		
Age	Continuous	
Sex	Categorical (Two categories): Female=1, Male=0	
Marital Status	Categorical (Three categories): Married & Union=1 Single, Separated, and Divorced=2 Widowed=3	
Wealth	Categorical: Tertiles of the distribution of wealth at the individual level	
ADLs (For both time 1 and 2)	Categorical (Three categories): Non Disabled=0 One physical disability=1 (Among bathing, toileting, transferring Two physical disabilities or more=2 (Among bathing, toileting, transferring into/out of bed, walking, and eating)	
Differences		
Education	Continuous and Categorical (Three categories): Less than High School=1 High School=2 More than High School=3	Continuous and Categorical (Four categories): 0 years=0 1 to 5 years=1 6 years=2 7 years or more=3
Residence Area	Categorical (Two categories): Urban (Populations of 1 million or more)=1	Categorical (Two categories): Urban (Populations of 100,000 or more)=1
Insurance	Categorical (Two categories): Insured=1 (Covered by any health insurance plan)	Categorical (Two categories): Insured=1 (Health insurance coverage, private or public)

The education variable used in the analyses differs slightly across the two datasets. For both studies respondents were asked the number of years of education completed. For the HRS we used this variable to create a three-category variable of highest education level achieved: less than high school (reference category), high school and more than high school. However, for the

MHAS this coding was not appropriate because of the lower average education in Mexico for this cohort. We therefore created a four-category variable: zero years of education (reference category), 1-5 years of education, 6 years of education, and 7 years or more. Six years of education was considered as a separate category because it is a meaningful category with relevant social and economic research applications, especially for this cohort. Other studies have previously used this same convention (Wong, Espinoza Higgins, & Palloni, 2007).

Place of residence was measured differently across the two countries. The HRS measure was based on the ten category 1993 Beale Rural-Urban Continuum Codes (for more information, see (HRS, 2010), which were collapsed into Urban (population 1 million or more), Suburban (population between 250,000 to 1 million) and Ex-urban (population less than 250,000). We further collapsed this variable into urban (combining urban and suburban) and rural (ex-urban). The MHAS used a locality size measure of four categories. We considered a community residence with 100,000 people or more the cut-off point for urban; the other three categories were coded rural.

This study controlled for whether respondents had health insurance coverage. In the HRS a series of questions asked the respondent whether they were covered by a government health insurance program, an employer-based program (either through themselves or a spouse) or some other health insurance plan. A response of yes to any of these plans was coded as having health insurance. In the MHAS, respondents were asked whether they had the right to medical attention through the Mexican Institute of Social Security (IMSS), the Institute of Social Security and Services Workers (ISSSTE), the Social Security of Mexican Oil Workers (PEMEX), the Armed forces Social Security (Defense or Navy), any other private medical insurance, or other health

insurance. If the respondent had health care coverage with at least one of these it was coded as having health insurance.

For both the HRS and MHAS information on wealth was collected at the household level. Specifically, wealth was measured using household's net worth of homes, businesses, rental properties, capital, vehicles, as well as other debts and other assets. Because of the high non-response rate for these questions it was necessary to use imputation. The imputation technique used in MHAS was modeled after the HRS using unfolding brackets to recover the non-response (RAND, 2010; Wong & Espinoza, 2004).

As we mentioned previously, these two studies provide unique cross-national research opportunities. Although MHAS was designed using an approach that facilitated these comparisons, researchers need to consider several issues. For example, cross-cultural differences may be reflected in how similar questions are interpreted and in the resulting missing values for certain questions.

Additionally, it is important to recognize the cross-national differences in long-term care options, which is particularly relevant when researching the disabled population. The HRS provides data for persons that become institutionalized. However, in Mexico there is no information for institutionalized persons, since most long-term care is provided by family members. In the 2000 Mexico Census, 0.4% of the population resided in group quarters such as nursing homes, hospitals, jails, and military quarters (INEGI, 2000). On the other hand, in the same year approximately 2.7% of the American population lived in group quarters (US Census Bureau, 2002). Among persons living in group quarters, approximately 1.4% were institutionalized in a nursing home, group quarter or dormitory in the US. The approach we adopted to handle this limitation was to include all persons in nursing homes at follow-up in the

United States, in order to conduct a complete comparison of disability transitions across countries.

Researchers also need to recognize major differences between the two countries in terms of the health care systems. Health care coverage is low and fragmented in Mexico (Pagán, Puig, & Soldo, 2007; Wong, Díaz, & Espinoza Higgins, 2006) which is not the case for the U.S. population of elders. Moreover, as in any longitudinal analysis, there is also a limitation in conducting comparative analyses due to differences in the survey loss to follow-up. The following section describes the nature of the loss to follow-up between the two time points in more detail. Furthermore, another limitation of this study is that only two waves of data are available for the MHAS. This feature imposed the need to use two-year transitions in order to make the results comparable between Mexico and the United States. Additional waves would have allowed us to explore the transitions in more depth.

c. Weights, nursing home residents, loss to follow-up, and missing values

Both the HRS and the MHAS provide sampling weights to adjust for attrition across waves and thus result in nationally representative samples for the rural and urban U.S. and Mexican populations. The HRS provides person-level weights, which are the product of the household analysis weight, the respondent selection weight as well as the person-level post-stratification weight. The combination of the HRS and AHEAD in 1998 created changes in the sample weight of the HRS. The weights were post-stratified to the March Current Population Survey (CPS), based on the birth cohort as well as the gender and race/ethnicity. The MHAS weights were calculated based on the birth cohort, household composition, and place of residence by urban/rural areas and geographic area.

The approach to deal with missing values was the same across both studies. Since we used the HRS dataset prepared by the RAND center, the number of missing values for this study was relatively lower than for MHAS. While many variables in the HRS dataset were imputed by RAND, only the economic variables in MHAS were imputed. Missing values in the HRS represented only 0.02% to 0.27% of the eligible sample and were found only across marital status, education, area of residence (urban/rural), and insurance coverage variables. On the other hand, in MHAS missing values represented 1 to 3% of the eligible sample. These missing values were the result of respondents who refused to answer or did not know the answer to the specific questions used in this study.

We include individuals who moved to institutions and lost to follow-up in one category in the U.S., and we include the category lost to follow-up in Mexico. This approach takes into account the possibility that some of the cases that were lost to follow-up in Mexico actually could have moved to institutions. This convention allows us to conduct a complete analysis of disability transitions in both countries. Also in both countries we include only persons living in the community at baseline in order to conduct analysis of transitions among community dwelling populations in both countries.

In addition to the missing values we considered possible differences in the nature of respondents that were lost to follow-up between the two interview times. A descriptive analysis of this group was performed for both MHAS and the HRS, allowing us to establish differences across the two datasets. Overall, 5.2% in MHAS and 5.6% in the HRS of the age eligible persons were lost in the follow-up (including persons in nursing homes in the U.S.). We found similar sample characteristics across both studies for the individuals that were lost to follow-up. In both Mexico and the U.S., the loss to follow-up sample was composed primarily of younger people

living in urban areas. They also reported higher education compared to the people that were interviewed at time 2 in both countries. As expected, these patterns may be explained by the fact that younger individuals with more years of education tend to move more than older populations and individuals with fewer years of education and therefore are harder to re-interview. We also found some differences across the two studies regarding the prevalence of disability. Those lost to follow-up in Mexico had lower mean number of functional limitations (0.23) compared to the U.S. (0.34), and those lost to follow up in Mexico were younger than their counterparts in the U.S. These differences in disability rates may be due to the inclusion of nursing home residents at follow-up together with lost to follow-up respondents, in the US.

Table 1. Nature of Loss to Follow-up (LTF) and Nursing Home (NH)

	HRS				MHAS	
	Loss to Follow-up	**Loss to Follow-up / Nursing Home**	**Interviewed at Time 2**		**Loss to Follow-up**	**Interviewed at Time 2**
	Mean (SD)/ %	**Mean (SD)/ %**	**Mean (SD)/ %**		**Mean (SD)/ %**	**Mean (SD)/ %**
ADLs *				**ADLs ****		
Mean (SD)	0.17 (0.63)	0.34 (0.90)	0.22 (0.71)	Mean (SD)	0.23 (0.90)	0.24 (0.88)
Disabled	8.8%	16.8%	11.8%	Disabled	7.3%	9.5%
Age *				**Age ***		
Mean (SD)	65.77 (9.68)	69.33 (11.53)	66.29 (10.06)	Mean (SD)	62.73 (8.64)	64.26 (9.62)
Age Categories				*Age Categories*		
51-59	34.0%	26.9%	32.8%	52-59	44.3%	39.1%
60-69	30.3%	24.9%	30.4%	60-69	36.0%	34.0%
70-79	26.2%	26.2%	24.9%	70-79	13.1%	18.3%
80+	9.6%	22.0%	12.0%	80+	6.6%	8.7%
Sex				**Sex**		
Male	46.9%	42.3%	45.6%	Male	48.2%	47.1%
Female	53.1%	57.7%	54.4%	Female	51.8%	52.9%
Education *				**Education ***		
Low	25.0%	27.6%	19.5%	0 years	25.7%	33.3%
Moderate	39.4%	36.7%	36.8%	1-5 years	25.4%	35.7%
High	35.6%	35.8%	43.7%	6 years	13.7%	15.0%
				7+ years	35.2%	16.0%
Location				**Location ***		
Urban	64.7%	64.1%	67.2%	Urban	65.5%	44.3%
Rural	35.3%	35.9%	32.8%	Rural	34.5%	55.7%
Total sample size [a]	**599**	**774**	**12,630**	**Total sample size [a]**	**618**	**11,373**

Note: Percentages, means, and standard deviations (SD) are weighted statistics. Statistical test of the difference across categories for each variable within each country are reflected by embedded asterisks: * p<0.001, ** p<0.05, *** p<0.1.

[a] Sample size may vary due to missing values

d. Methods

To estimate the transition rates across states of physical disabilities between time 1 and 2 in both studies, we used a multivariate model and estimated the probabilities controlling for the number of physical limitations at time 1 (see Section 4.b for more detail on coding for physical limitations). A dependent categorical variable was created to capture possible outcomes of disability at time 2, including death and loss to follow-up as outcomes. We collapsed the number of disabilities to facilitate the analysis[3]. Therefore we constructed three categories: no ADLs, one ADL, two ADLs or more. Two more categories were created; one for death and another for lost to follow-up or nursing home (no ADLS was used as reference category in the model) in order to explore all possible transitions across time.

Box 4. Outcome Variable at Time 2

Value	Definition
0	No ADLs
1	One ADL
2	Two ADLs or more
3	Death between time 1 and 2
4	Lost to follow-up or Nursing Home

We first conducted a logit regression analysis at time 1 to determine the cross-sectional association of disability for each country with the covariates: age, sex, marital status, education, wealth, area of residence (urban/rural), and insurance coverage. The dependent variable was a binary response where 0 was "non-disabled" and 1 "disabled". The regression estimators are given in odds ratios of falling in either of the two possible response outcomes. In each of the models, the p-values point out significant associations between the independent variables and the dependent variable for each country.

[3] An alternative outcome for transition was considered using the following categories: same no ADLs, same number of ADLs, increase in number of ADLs, decrease in number of ADLs, no ADLs to death , from at least one ADL to death, from no ADL to loss to follow-up (LTF), and from at least one ADL to LTF. A detailed descriptive analysis using the full outcome variable is available upon request.

In addition, we designed a third stratified model to determine significant differences across the U.S. and Mexico. This third model uses the same dependent and independent variables. The two datasets (MHAS and HRS) were merged together and additional variables were created to test the difference between countries. First, a dummy variable for country was created where 0 represented the U.S. and 1 Mexico. This variable allowed us to establish if there was a statistically significant difference in the level of disability between the two countries. We also included interactions for each of the independent variables with the dummy variables "country". The interactions are used to determine if each predictor influence the outcome differently across the two countries.

A multinomial logistic model was then used to determine transition rates across categories of physical limitations and death at time 2. Covariates at time 1 included in the model were: age, sex, marital status, education, wealth, area of residence (urban/rural), and insurance coverage[4]. We also included ADLs at time 1 using a three categories variable in order to determine transition rates between the two times (see Section 4. Data and Methods).

The estimators of the multinomial model indicate a relationship that can be interpreted as a relative risk ratio compared to a given category (Hilbe, 2009). In our model we used "No ADLs" as the reference category. To facilitate the interpretation of results, we used estimated probabilities, making the discussion of these relationships more straightforward than analyzing the relative risk ratios. We estimated the general probabilities of each outcome at time 2, controlling for the number of ADLs (0, 1, 2 or more) at time1. We also calculated the estimated probabilities by additional covariates, including sex, age, and education.

[4] In a separate analysis we included in the model the interaction of age and marriage. The interaction term was not significant and did not improve the model. We also considered age squared as a covariate in the model. Results of these analyses are available upon request.

Finally, we constructed an index to summarize the burden of disability in the two countries. Using the probabilities obtained from the multinomial logit we calculated the number of years that a person at certain age will spend active or disabled (moderately disabled=one ADL limitation and severely disabled=2 or more ADL limitations). We also included the number of years lost to follow-up or in a nursing home. Since mortality rates are underestimated because of the low number of deaths between the two time periods, we used age and gender specific life expectancies with the Life tables provided by the World Health Organization (2009) to establish the number of years a person is expected to live for each age group (see Appendix B). We multiply the probabilities of disability states by age to the years lived by age and obtain a measure that approximates the number of years in each state (no disability (active), with 1 disability (moderately disabled) and 2 or more disabilities (severely disabled). By adding these estimates across the age groups we obtain the *overall index* for each country. This index can be interpreted as the expected burden of disability for older adults aged 50. The index thus captures the disability progression net of mortality, including the transitions in-out of disability, and losses to follow-up and institutionalization.

3. Descriptive Results

a. Disability prevalence in Mexico and the U.S.

Descriptive statistics show that disability rates are higher for the United States compared to Mexico at time 1 among community-dwelling adults (see Box 5a). In the U.S., the percent (age standardized using US population as reference)[5] with at least one ADL limitation at time 1

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[5] We use age standardized rates because the age distribution across countries differs and disability is positively associated with age.

was higher than for Mexico (11.5% and 10.6%, respectively). However, the prevalence rates of disability are higher for Mexico compared to the United States for each of the activities of daily living.

This suggests that there is more overlap in ADL limitations among persons in Mexico than in the United States. Box 5b confirms this pattern. Persons in Mexico have higher prevalence of three or more ADL limitations (age standardized using US population as the standard). While about 6.2% of adults in the US had only one limitation, only 3.2% of persons in Mexico had only one limitation. Another striking difference is the prevalence of persons reporting five or more limitations. While only 0.6% of adults in the US reported having limitations in all five ADLs, more than three times as many (1.9%) of adults in Mexico reported five ADL limitations.

Box 5a. Percent reporting ADL limitations at time 1, US and Mexico, by ADL components - community dwelling only

	United States	Mexico
At least one ADL	**11.5%**	**10.6% ***
Walking	5.2%	7.5% *
Bathing	5.0%	5.3% *
Eating	2.1%	3.0% *
Transferring in/out of bed	4.6%	7.2% *
Toileting	4.2%	5.2% *

Notes: Age standardized using the weighted average of the two countries as the standard; population 51 years and older in the U.S. and 52 years and older in Mexico; weighted statistics using community-dwelling population only; * significant differences between countries at p=.01.

Box 5b. Percent reporting ADL limitations at time 1, US and Mexico, by number of ADLs - community dwelling only

	United States	Mexico
At least one ADL	**11.5%**	**10.6% ***
None	88.5%	89.4% *
One	6.2%	3.2% *
Two	2.7%	2.4% *
Three	1.3%	1.7% *
Four	0.7%	1.4% *
Five	0.6%	1.9% *

Notes: Age standardized using the weighted average of the two countries as the standard; population 51 years and older in the U.S. and 52 years and older in Mexico; weighted statistics using community-dwelling population only; * significant differences between countries at p=.01.

As stated earlier, information on elders living in nursing homes was available in the HRS dataset. Although institutionalized cases were not the focus of our analyses, we provide a description of this group in Box 6. Approximately 2.3% (N=313) of the total sample resided in a nursing home at time 1. As expected, rates of disability were high in this group, where 83.7% reported at least one ADL limitation. Three-quarters (75%) of institutionalized persons reported difficulty with bathing, and nearly two-thirds (63.6%) reported trouble with walking. Approximately half the institutionalized group reported difficulty with toileting and transferring in and out of the bed.

Box 6. Percent reporting ADL limitations for institutionalized sample in US, HRS data time 1 (N=313)

	N	Percent
1 or more ADL limitations	**262**	**83.7%**
Walking	199	63.6%
Bathing	235	75.1%
Eating	141	45.1%
Transferring in/out of bed	162	51.8%
Toileting	159	50.8%

Note: Population 51 years and older in the US

b. Descriptives of disability in Mexico and the U.S.

Table 2 provides detailed descriptives for those having at least one ADL limitation across the two time periods for the United States and Mexico. All differences across the outcome (disabled vs. non-disabled) were significant at the 0.05 level within country using chi-square test on dichotomous variables and t-test on the continuous variables.

The unadjusted descriptive statistics are similar for the two countries. In both the United States and Mexico, persons with at least one ADL limitation are more likely to be older, female, widowed and less educated than non-disabled persons. In addition, for both countries those with at least one ADL limitation have lower assets and are more likely to live in urban areas. However, the prevalence of disability differs across the two countries by whether or not respondents reported having health insurance. In the United States persons with health insurance

were more likely to be disabled than persons who were not insured, whereas the opposite is true in Mexico. This is to be expected because in the United States persons aged 65 and older are more likely to be insured since this is the age of eligibility for Medicare, and the table does not control for age.

It is worth noting that the prevalence of disability is lower in Mexico than in the U.S. for the younger cohorts. However, this pattern reverses for people aged 80 years or older, where disability is more prevalent in Mexico than the U.S. Additionally, the gender gap in disability rates seems greater in the U.S. than in Mexico even though in both countries women have a higher prevalence of disability. In both countries, the general patterns are similar for the two cross-sections. Also, analyses using the mean number of ADLs (range 0-5) echoed these patterns for both countries (results available upon request).

Table 2. Descriptive statistics of disability status at time 1 and 2 by characteristics, HRS and MHAS

HRS

Time 1:	**Time 1**		**Time 2**	
	Disabled	**Non Disabled**	**Disabled**	**Non Disabled**
Age				
Mean (SD)	71.81 (11.55)	65.72 (9.74)	72.03 (11.35)	65.69 (9.75)
Age Categories				
51-59	7.72%	92.28%	7.22%	92.78%
60-69	8.46%	91.54%	8.43%	91.57%
70-79	13.75%	86.25%	14.77%	85.23%
80+	28.79%	71.21%	28.30%	71.70%
Sex				
Male	8.87%	91.13%	8.89%	91.11%
Female	14.77%	85.23%	14.79%	85.21%
Marital Status				
Married, union	9.11%	90.89%	8.83%	91.17%
Single, divorced, separated	13.16%	86.84%	13.32%	86.68%
Widowed	21.75%	78.25%	22.88%	77.12%
Education				
< 12 years	20.77%	79.23%	20.12%	79.88%
12 years	12.04%	87.96%	11.55%	88.45%
> 12 years	8.19%	91.81%	8.93%	91.07%
Assets				
Low	20.40%	79.60%	17.98%	82.02%
Medium	10.78%	89.22%	11.76%	88.24%
High	8.29%	91.71%	8.94%	91.06%
Location				
Urban	11.53%	88.50%	11.35%	88.65%
Rural	13.20%	86.80%	13.66%	86.34%
Health Insurance				
Uninsured	9.68%	90.32%	10.04%	89.96%
Insured	12.17%	87.83%	12.18%	87.82%
Total Sample	**1,672**	**11,732**	**1,671**	**11,733**
	12.09%	87.01%	12.11%	87.89%

MHAS

	Time 1		**Time 2**	
	Disabled	**Non Disabled**	**Disabled**	**Non Disabled**
Age				
Mean (SD)	72.20 (12.07)	63.32 (8.84)	71.62 (11.51)	62.95 (8.61)
Age Categories				
52-59	4.59%	95.41%	4.47%	95.53%
60-69	6.41%	93.59%	7.13%	92.87%
70-79	13.31%	86.69%	13.96%	86.04%
80+	35.00%	65.00%	36.46%	63.54%
Sex				
Male	7.95%	92.05%	7.64%	92.36%
Female	10.57%	89.43%	11.03%	88.97%
Marital Status				
Married, union	6.75%	93.25%	6.99%	93.01%
Single, divorced, separated	10.50%	89.50%	13.26%	86.74%
Widowed	15.26%	84.74%	13.76%	86.24%
Education				
0 years	14.64%	85.36%	13.45%	86.55%
1-5 years	7.83%	92.17%	8.83%	91.17%
6 years	6.66%	93.34%	6.23%	93.77%
7+ years	4.26%	95.74%	5.66%	94.34%
Assets				
Low	10.60%	89.40%	11.79%	88.21%
Medium	9.26%	90.74%	8.24%	91.76%
High	7.95%	92.05%	8.03%	91.97%
Location				
Urban	8.32%	91.68%	7.66%	92.34%
Rural	10.17%	89.83%	10.88%	89.12%
Health Insurance				
Uninsured	10.41%	89.59%	10.12%	89.88%
Insured	8.41%	91.59%	8.90%	91.90%
Total Sample	**1,170**	**10,667**	**1,087**	**9,655**
	9.33%	90.67%	9.45%	90.55%

Notes: Percentages, mean, and standard deviations are weighted statistics; All differences across disability groups (disabled versus non-disabled) were statistically significant within each country at the .05 level; Sample sizes may vary due to missing values; data may not add to 100% due to rounding; HRS included persons age 51 and older at time 1; MHAS included 52 years and older at time 1 (See Box 2); HRS and MHAS data includes only community-dwelling populations at time 1; HRS data for time 2 includes persons who became institutionalized between time 1 and time 2.

c. Logit Regression Models of Disability at time 1

Table 3 presents stratified regression analyses for Mexico and the United States, with the outcome of whether a respondent reported at least one ADL limitation at time 1. The regression models indicate that for the United States, older age, female gender, being widowed or single, low education and low wealth are significantly associated with having at least one ADL limitation. The significantly associated variables differed slightly for Mexico. Age, gender and education are associated as well, but only highest wealth and being single are significantly associated with the outcome. However, medium wealth and being widowed are not significant. Additionally, living in an urban area was significantly associated with higher likelihood of reporting at least one ADL limitation for Mexico but not for the United States.

We conducted a third logistic regression analysis on a combined dataset for the two countries, which included a dummy variable for country[6]. The results indicated that the two countries differed significantly in the level of ADL disability (p-value=0.000). The last column of Table 3 shows the results for the interactions of the independent variables with the dichotomous country variable. This allows us to compare the odds ratios for each of the variables across the two countries.

[6] We do not include the full model and report only p-values to establish significant differences across countries. The full model is available upon request.

Table 3. Stratified Regression of at Least One Disability at Time 1, by Country

	United States				Mexico				
	OR	SE	95 % CI		OR	SE	95 % CI		**P-value [a]**
Age	1.06*	0.00	(1.05	1.06)	1.08*	0.00	(1.07	1.08)	0.000
Female	1.43*	0.09	(1.27	1.61)	1.46*	0.10	(1.27	1.69)	0.820
Single	1.34**	0.12	(1.12	1.60)	1.00	0.11	(0.81	1.24)	0.040
Widowed	1.27*	0.09	(1.11	1.46)	1.05	0.09	(0.90	1.24)	0.090
Education	0.92*	0.01	(0.91	0.94)	0.95*	0.01	(0.93	0.97)	0.110
Med. Wealth	0.52*	0.03	(0.45	0.59)	0.91	0.07	(0.78	1.06)	0.000
High Wealth	0.39*	0.03	(0.34	0.45)	0.83***	0.07	(0.70	0.98)	0.000
Urban	0.96	0.06	(0.85	1.07)	1.21**	0.09	(1.05	1.39)	0.010
Insured	1.07	0.18	(0.76	1.50)	1.02	0.07	(0.89	1.18)	0.790
Country									0.000
N		13,331				11,452			
Pseudo R2		0.097				0.100			
LR		971.77				728.19			
Prob>chi2		0.000				0.000			

Notes: * < .05, **< .01, ***< .001, within country significance; HRS included persons age 51 and older at time 1; MHAS included 52 years and older at time 1 (See Box 2); HRS and MHAS data includes only community-dwelling populations.
[a] P-values indicate significance of the difference between the two countries in the effect of each variable.

Using a p-value of .05 as the cut-off point, the model shows that all other variables held constant, the effect on the likelihood of disabilities of the variables age, marital status, education, wealth and living in an urban area were significantly different across the two countries. Age and gender had greater associations with ADL limitations in Mexico, but the direction of the effects were in the same direction across countries. However, whereas being single or widowed in the United States was associated with *higher* chance of ADL limitations compared to married persons; this was not the case in Mexico. In Mexico being single was associated with *lower* odds of having at least one ADL disability compared to married persons, and widowed elders were not significantly different from otherwise similar married respondents. On the other hand, while living in an urban area was associated with significantly *higher* odds of ADL limitations in Mexico, this was *not significant* in the United States.

d. Description of Disability Transitions

Table 4 presents bivariate results for the outcome at time-2 (none, one or several ADL limitations, death or loss to follow-up) for the United States and Mexico by disability outcomes, at time-1.

The first portion of the table shows the distribution of the outcomes at time-2 by ADL status at time 1 (none, one, or several limitations). Comparing across the countries shows that among persons that began with no ADL limitations at time-1, a higher proportion transitioned to one ADL at time-2 in the U.S. compared to Mexico (4.3% versus 2.7%). However, a higher proportion of persons went from no ADL limitations at time-1 to 2 or more ADL limitations at time-2 in Mexico compared to the U.S. (2.9% versus 1.9%).

Among persons that reported only one ADL limitation at time-1, less than half (41.9%) recovered to no ADL limitations at time-2 in the U.S. This differed for the Mexican population. Of those that began with one ADL limitations, 62.5% recovered to report no ADL limitations at time-2. Individuals with one ADL limitation at time-1 were also more likely to remain with one ADL limitation at time-2 in the U.S. than those in Mexico (23.6% and 10.3%, respectively). Overall, respondents in Mexico were more likely to report no-ADL limitations across all age groups and the proportion of people reporting no-ADL limitations decreased with age in both countries. However, a slightly lower percentage of people aged 80 years and older reported no-ADL limitations at time-2 in Mexico compared to the US.

In the U.S. a lower proportion of persons that had two or more ADL limitations at time-1 went to no ADLs compared to Mexico. However, a higher proportion went from 2 or more ADLS at time-1 to one ADL at time-2 in the U.S. than in the Mexican sample. Additionally, a

higher proportion (40.1%) remained in the 2+ ADL limitation category in the U.S. compared to Mexico (32%).

The transitions to mortality are somewhat more difficult to examine because of the relatively few cases that died in the panels in two years. However, the percent that went from no ADL limitation at time 1 to death 2 years later was slightly higher for the US than for Mexico (4.1% vs. 2.8%). This was also true for those with one ADL at time 1 where 12.6% died over the two years in the United States, versus 11.2% in Mexico. And slightly higher proportion of persons with two or more ADLs died in Mexico compared to the US (Approximately 22% in the US compared to about 25% in Mexico).

Table 5 presents bivariate results for the outcome at time-2 for the United States and Mexico by demographic and socioeconomic variables. The associations between the other socio-demographic factors and the outcome at time-2 are similar across the two countries. For both countries, those reporting at least one ADL or who died between waves were older. Women were more likely to report disability than men, whereas men were more likely to die between waves compared to women. Widowed respondents were more likely to be in either disability group or to die between waves than other married, single, or divorced persons in both countries. Similar patterns held true for education and assets levels for both countries.

<u>In summary</u>, the data show that there are differences between the U.S. and Mexico for transitions in disability between time 1-and time-2. Disability onset seems higher in the U.S. while recovery from disability appears more likely in Mexico. However, multiple limitations seem more common in Mexico too. For instance, while more persons in the U.S. transitioned from no ADL at time-1 to one ADL at time-2 than in Mexico, more transitioned from no ADL at time-1 to 2 or more ADL limitations at time-2 in Mexico than in the United States. Additionally,

recovery from one ADL limitation at time-1 to no ADL limitation at time-2 was higher in Mexico than in the U.S. However, the associations between socio-demographic factors and outcome at time-2 are relatively similar in both countries.

Table 4. Distribution of outcome at Time 2, by disability status at Time 1

	HRS					
Time 1:	**No ADLs**	**One ADL**	**2+ ADLs**	**Death**	**LTF/NH**	**P-value**
Disability Status						
None	84.4%	4.3%	1.9%	4.1%	5.3%	0.000
One ADL	41.9%	23.6%	15.8%	12.6%	6.1%	
2+ ADLs	13.6%	14.9%	40.1%	21.7%	9.7%	
By Disability Status and Age						
None						0.000
51-59	90.3%	2.9%	1.0%	1.2%	4.6%	
60-69	87.9%	3.1%	1.3%	2.9%	4.7%	
70-79	80.1%	5.6%	2.5%	5.9%	5.9%	
80+	64.2%	9.9%	5.4%	12.6%	7.9%	
One ADL						0.000
51-59	56.5%	24.4%	10.2%	4.9%	4.0%	
60-69	50.9%	24.5%	16.7%	6.1%	1.8%	
70-79	38.7%	26.4%	18.2%	12.1%	4.6%	
80+	27.3%	18.9%	16.4%	24.4%	13.1%	
2+ ADLs						0.000
51-59	26.6%	13.7%	48.4%	5.2%	6.0%	
60-69	13.8%	22.9%	39.2%	18.4%	5.8%	
70-79	13.8%	16.6%	38.9%	23.0%	7.7%	
80+	5.1%	9.6%	36.1%	33.3%	16.0%	
Total Sample**	**10,287**	**846**	**679**	**818**	**774**	
	77.7%	6.2%	4.9%	5.6%	5.6%	

	MHAS					
Time 1:	**No ADLs**	**One ADL**	**2+ ADLs**	**Death**	**LTF**	**P-value**
Disability Status						
None	86.4%	2.7%	2.9%	2.8%	5.2%	0.000
One ADL	62.5%	10.3%	13.9%	11.2%	2.0%	
2+ ADLs	29.5%	8.4%	32.0%	25.3%	4.8%	
By Disability Status and Age						
None						0.000
51-59	90.0%	1.4%	1.9%	1.0%	5.7%	
60-69	86.2%	2.7%	2.4%	3.3%	5.5%	
70-79	84.2%	5.0%	3.3%	3.9%	3.6%	
80+	69.2%	6.0%	12.0%	9.0%	3.8%	
One ADL						0.000
51-59	84.9%	8.7%	3.2%	1.6%	1.7%	
60-69	76.5%	4.9%	14.0%	3.5%	1.0%	
70-79	37.6%	14.8%	18.0%	25.3%	4.3%	
80+	44.0%	15.5%	24.1%	16.1%	0.3%	
2+ ADLs						0.000
51-59	53.4%	9.1%	23.4%	6.7%	7.3%	
60-69	44.8%	15.0%	20.5%	16.5%	3.3%	
70-79	27.8%	10.8%	34.4%	23.0%	4.0%	
80+	12.7%	3.3%	39.9%	38.9%	5.2%	
Total Sample**	**9,655**	**472**	**615**	**511**	**618**	
	82.0%	3.5%	5.0%	4.5%	5.0%	

Notes: Percentages, mean, and standard deviations are weighted statistics; Sample sizes may vary due to missing values; data may not add to 100% due to rounding; HRS included persons age 51 and older at time 1; MHAS included 52 years and older at time 1 (See Box 2); HRS and MHAS data includes only community-dwelling population at time 1; HRS data at time 2 includes persons who became institutionalized between time 1 and time 2.

LTF/NH = Loss to follow-up or Nursing Home

P-values indicate significance of the difference across time-2 outcome categories using Chi-squared tests within each country.

Table 5. Distribution of outcome at Time 2, by socioeconomic variables at Time 1

	HRS							MHAS					
Time 1:	**No ADLs**	**One ADL**	**2+ ADLs**	**Death**	**LTF/NH**	**P-value**	**Time 1:**	**No ADLs**	**One ADL**	**2+ ADLs**	**Death**	**LTF**	**P-value**
Age Categories							**Age Categories**						
51-59	86.6%	4.2%	3.1%	1.5%	4.6%	0.000	52-59	89.0%	1.7%	2.5%	1.2%	5.6%	0.000
60-69	83.4%	4.9%	3.4%	3.7%	4.6%		60-69	84.5%	3.2%	3.3%	3.7%	5.3%	
70-79	73.0%	8.0%	5.8%	7.4%	5.9%		70-79	77.2%	5.9%	6.6%	6.6%	3.7%	
80+	50.2%	11.1%	11.5%	17.3%	9.8%		80+	49.8%	8.4%	20.2%	17.8%	3.8%	
Sex							**Sex**						
Male	79.8%	4.9%	3.5%	6.6%	5.2%	0.000	Male	82.8%	2.5%	4.4%	5.2%	5.1%	0.000
Female	75.9%	7.3%	6.1%	4.8%	5.9%		Female	81.3%	4.5%	5.6%	3.8%	4.9%	
Marital Status							**Marital Status**						
Married, union	82.1%	4.8%	3.7%	4.4%	5.0%	0.000	Married, union	85.9%	2.9%	3.6%	3.0%	4.6%	0.000
Single, divorced, separated	77.1%	7.5%	5.0%	5.0%	5.4%		Single, divorced, separated	76.6%	4.8%	6.9%	4.0%	7.7%	
Widowed	62.5%	10.3%	9.3%	10.3%	7.7%		Widowed	74.8%	4.6%	7.3%	8.7%	4.5%	
Education							**Education**						
< 12 years	64.5%	9.1%	9.2%	9.5%	7.7%	0.000	0 years	77.9%	4.8%	7.3%	6.1%	3.9%	0.000
12 years	78.4%	6.2%	4.7%	5.1%	5.6%		1-5 years	84.6%	2.9%	5.3%	3.6%	3.6%	
> 12 years	83.1%	4.8%	3.2%	4.2%	4.6%		6 years	85.5%	2.7%	3.0%	4.3%	4.6%	
							7+ years						
Assets							**Assets**						
Low	69.0%	8.7%	7.9%	8.1%	6.4%	0.000	Low	78.2%	4.3%	6.2%	5.4%	5.9%	0.000
Medium	78.1%	6.0%	4.8%	5.2%	5.9%		Medium	85.2%	2.5%	5.2%	4.0%	3.2%	
High	82.5%	4.9%	3.3%	4.5%	4.9%		High	83.3%	3.8%	3.5%	3.9%	5.6%	
Location							**Location**						
Rural	75.7%	7.2%	5.2%	5.8%	6.1%	0.023	Rural	82.3%	4.4%	5.7%	4.5%	3.2%	0.000
Urban	78.7%	5.7%	4.8%	5.5%	5.4%		Urban	81.6%	2.5%	4.3%	4.4%	7.2%	
Health Insurance							**Health Insurance**						
Uninsured	78.3%	5.9%	3.9%	2.1%	9.9%	0.001	Uninsured	81.2%	4.0%	5.2%	5.3%	4.4%	0.267
Insured	77.8%	6.2%	5.0%	5.7%	5.4%		Insured	82.6%	3.2%	4.9%	3.8%	5.5%	
Total Sample**	**10,287**	**846**	**679**	**818**	**774**		**Total Sample****	**9,655**	**472**	**615**	**511**	**618**	
	77.7%	6.2%	4.9%	5.6%	5.6%			82.0%	3.5%	5.0%	4.5%	5.0%	

Notes: Percentages, mean, and standard deviations are weighted statistics; Sample sizes may vary due to missing values; data may not add to 100% due to rounding; HRS included persons age 51 and older at time 1; MHAS included 52 years and older at time 1 (See Box 2); HRS and MHAS data includes only community-dwelling populations at time 1; HRS data at time 2 includes persons who became institutionalized between time 1 and time 2.

LTF/NH = Loss to follow-up or Nursing Home

P-values indicate significance of the difference across time-2 outcome categories using Chi-squared tests within each country.

4. Estimated Transition Probabilities

a. General Estimated Transitions

Table 6 presents the predicted probabilities of transitioning between time-1 and time-2 for the U.S. (Tables 6a) and for Mexico (Table 6b). These probabilities are based on the results of the multivariate logistic model, as described previously (for full multinomial logistic model results, see Appendix A). The predicted probabilities confirm the findings of the bivariate analyses and show that the transitions differ for the U.S. and for Mexico, even after controlling for relevant sociodemographic variables.

The probability of beginning with no ADL limitation at time-1 and remaining without any ADL limitation was similar across the two countries. However, recovery from one or several ADL limitation at time-1 to no ADL limitations at time-2 was more likely in Mexico than the U.S.

For persons that did not have a disability at time-1, the probability of transitioning to one ADL limitation or death was higher among persons in the U.S. than in Mexico. Similarly, for persons starting with one disability or with several disabilities at time-1, the probability of deteriorating, or moving to one ADL at time-2 was higher for person in the U.S. than in Mexico. Conversely, the probability of recovering, or moving from one or several disabilities at time 1 to none at time 2 were lower for persons in the U.S. than in Mexico.

However, the story differs somewhat for persons moving into 2 or more disabilities at time-2. Persons in the U.S. that had no ADL at time-1 had lower probability of transitioning to 2 or more disability at time-2 than persons in Mexico.

Additionally, persons in the U.S. that had no ADL limitations or just one limitation at time-1 were more likely to die than those in the same two categories in Mexico. The differences

in probability are perhaps most striking for persons that reported one disability at time-1. In Mexico the probability of death at follow-up is 0.043, whereas it is nearly double (0.091) in the United States. However, the probability of death at time-2 if a respondent had two or more ADL limitations was not significantly different across the two countries.

Table 6a. HRS Estimated Transition Rates, by Disabilities in time 1

			HRS Time 2			
Time 1	**No ADLs**	**One ADL**	**2+ ADLs**	**Death**	**LTF/NH**	**Total**
None	0.852	0.043	0.019	0.033	0.053	1.000
1 Disability	0.490	0.220	0.135	0.091	0.063	1.000
≥ 2 Disabilities	0.171	0.162	0.381	0.172	0.115	1.000
By Gender						
Female						
None	0.854	0.046	0.021	0.025	0.054	1.000
1 Disability	0.487	0.234	0.146	0.069	0.064	1.000
≥ 2 Disabilities	0.170	0.172	0.412	0.130	0.116	1.000
Male						
None	0.846	0.039	0.017	0.046	0.052	1.000
1 Disability	0.486	0.202	0.121	0.130	0.062	1.000
≥ 2 Disabilities	0.167	0.146	0.336	0.242	0.110	1.000

Table 6b. MHAS Estimated Transition Rates, by Disabilities in time 1

			MHAS Time 2			
Time 1	**No ADLs**	**One ADL**	**2+ ADLs**	**Death**	**LTF/NH**	**Total**
None	0.873	0.031	0.026	0.022	0.048	1.000
1 Disability	0.702	0.120	0.101	0.043	0.034	1.000
≥ 2 Disabilities	0.470	0.114	0.210	0.153	0.054	1.000
By Gender						
Female						
None	0.870	0.036	0.029	0.018	0.047	1.000
1 Disability	0.686	0.136	0.111	0.035	0.033	1.000
≥ 2 Disabilities	0.462	0.130	0.231	0.125	0.052	1.000
Male						
None	0.875	0.026	0.023	0.028	0.048	1.000
1 Disability	0.717	0.102	0.090	0.055	0.035	1.000
≥ 2 Disabilities	0.472	0.096	0.185	0.193	0.055	1.000

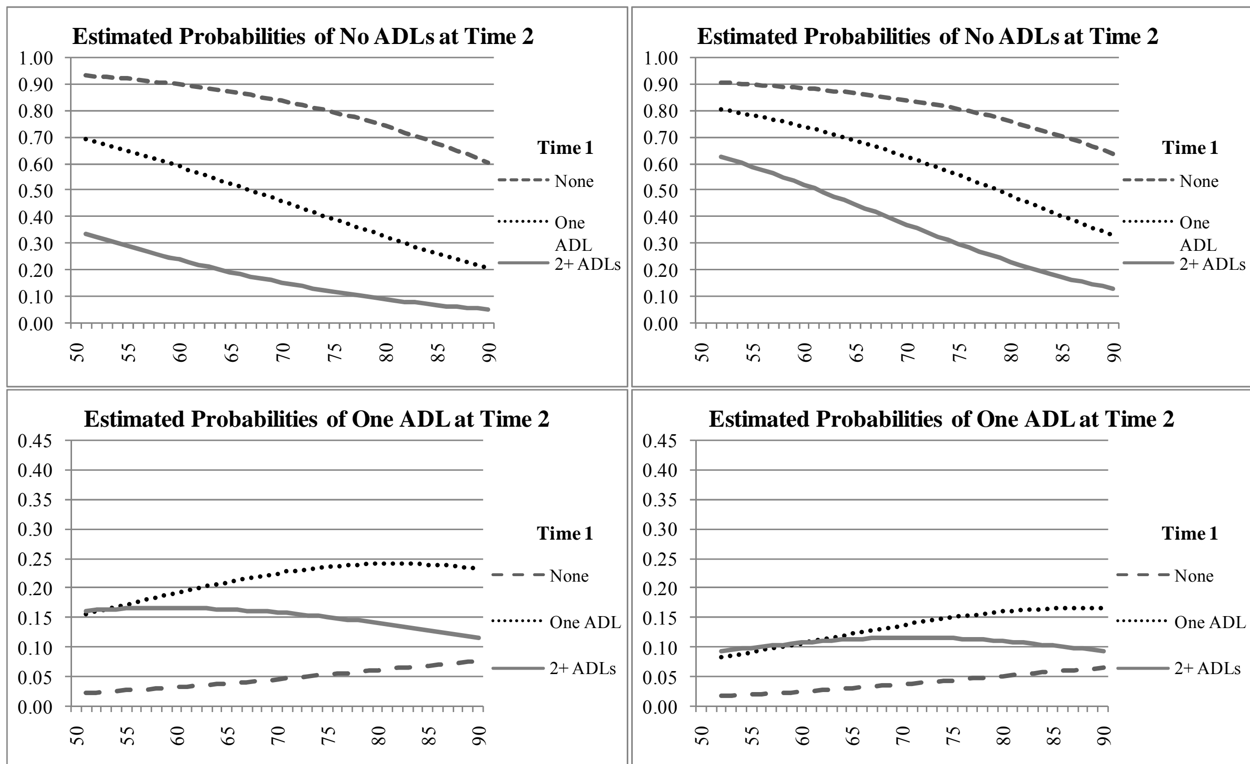
LTF/NH= Lost to follow up or moved to Nursing Homes by time-2

b. Estimated Transitions by Selected Covariates

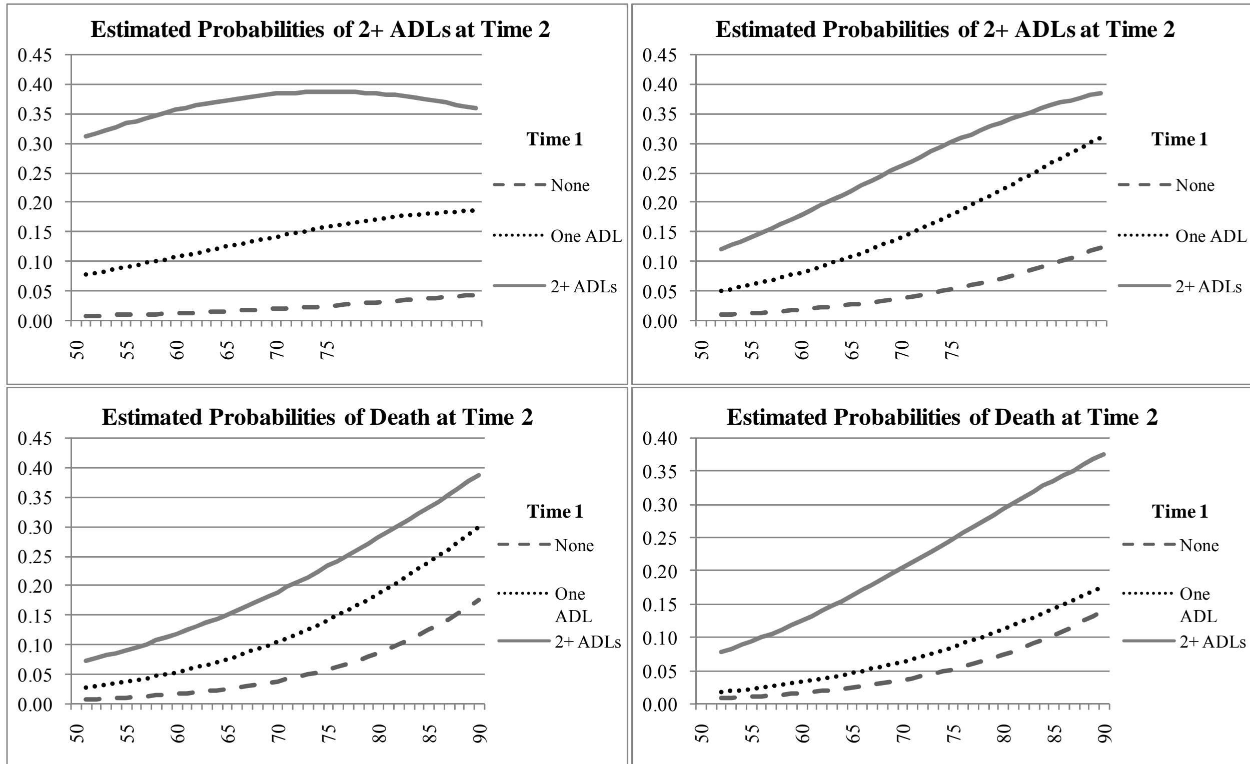
<u>Estimated Probabilities of Disability at Time 2, by Number of Disabilities and Age at Time 1</u>

Figures 1a and 1b graph the predicted probabilities of transition to no ADLs, 1 ADL, 2 or more ADLs or death at time 2, by time-1 disability status and by age. In general terms, the predicted probabilities of transitioning to no ADLS at time-2 decrease with age across both countries. However, the probability curve for persons with two or more ADL limitations at time-1 is much lower in the U.S. than in Mexico.

1a) United States **1b) Mexico**



1a) United States **1b) Mexico**



The probability of transitioning to one ADL at time-2 also showed different patterns across the two countries. The probability of transition to one ADL at time-2 does not appear to be linear with age for persons that began with one ADL at time-1 in the U.S. Whereas the probability increases until the mid 80's, the probability begins to level off after that. The pattern appears more linear for Mexico, where the probabilities of transitioning to one ADL at time-2 for persons that had one ADL at time-1 increase for each year of age.

The differences appear particularly striking for the transitions to 2 or more ADLs at time-2. The predicted probability curve in the U.S. for persons that begin with 2 or more ADLs at time-1 and end at the same level of disability at time-2 is curvilinear. The probability increases with age, but begins to decline around the mid 70's. The line appears straight for Mexico, where the probabilities for transitioning to 2 or more ADL limitations increases with age for those that

began with 2 or more ADL limitations. Similar differences are evident for those that began with one ADL limitation at time-1 and transitioned to two or more ADL limitations at time-2. The line appears to level off for the U.S. but shows a steep continuous increase for Mexico.

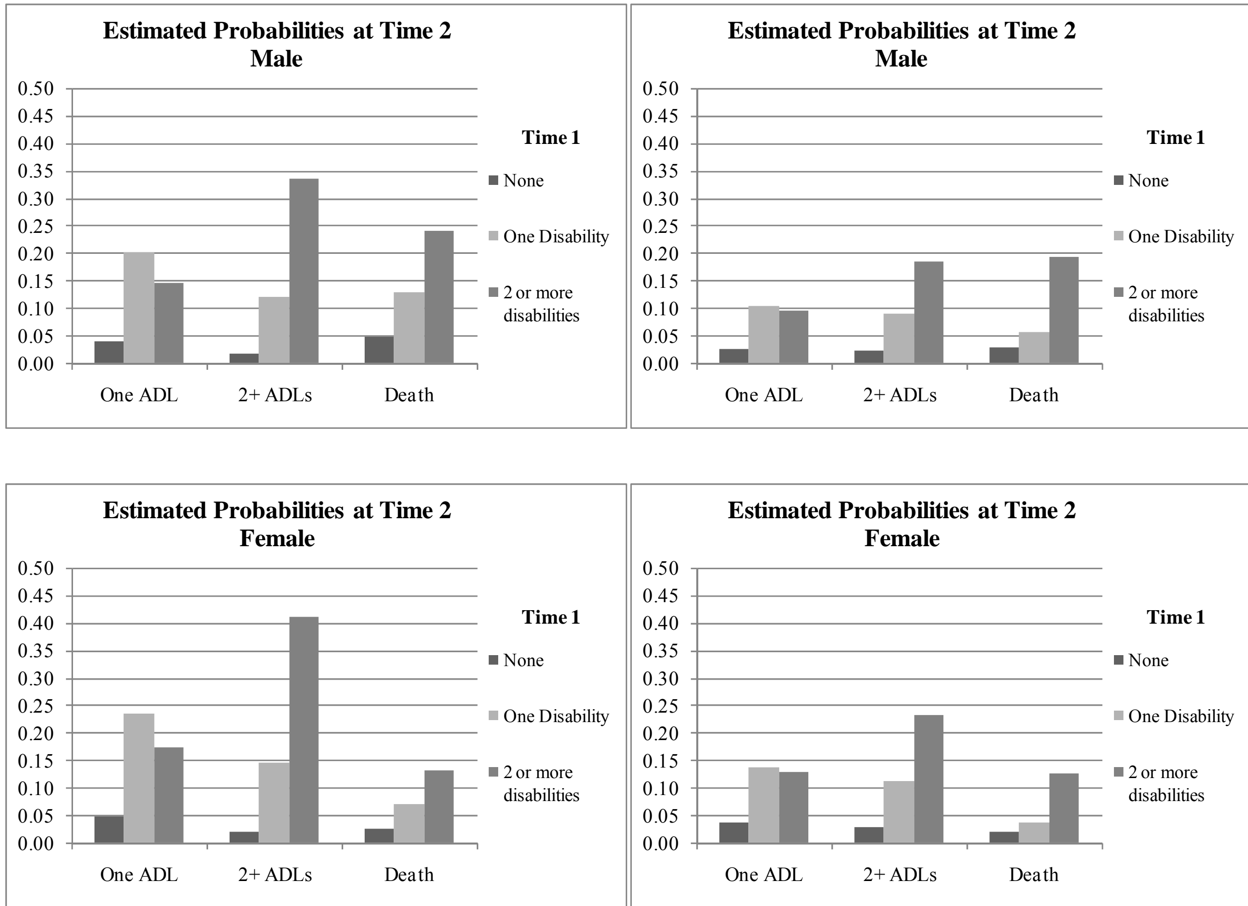
The transitions to death show a difference in the gradient for ADL disability at time-1 at older ages between Mexico and the United States. The probability increases between none, one ADL or several ADLs at time-1 appear to be similar in the United States. However, for Mexico, there is a much larger increase in probability of death between one ADL and 2 or more ADLs than the difference between none and one ADL at time-1.

In summary, the probability of transitioning to the outcomes at time-2 by number of disability at time-1 and age vary by country. For the transitions to one ADL at time-2 and the transition to 2 or more ADL limitations at time-2, there were curvilinear probability curves for the U.S., but not for Mexico, where the effect became a plateau or decreased in the older ages in the U.S., but not for Mexico.

Estimated Probabilities of Disability at Time 2, by Number of Disabilities and Sex at Time 1

Figures 2a and 2b show the estimated probabilities by number of disabilities at time-1 and gender for the U.S. and for Mexico, respectively. In general, the probability of transitioning to 2 or more ADLs and death follow the same pattern in both countries. In both Mexico and the U.S. the probabilities of transitioning to disabilities were higher for women than men, and the probabilities of transitioning to death were higher for men than women.

2a) United States **2b) Mexico**



However, there were notable differences across the countries as well. The results show that transitioning to 2 plus ADLs when having 2 or more ADLs at time-1 is significantly higher in the U.S. compared to Mexico. This is particularly striking for women, where the probability of this transition is 0.441 in the U.S. and 0.232 in Mexico. These results replicate the descriptives discussed previously, where we found greater gender difference in the U.S. than in Mexico.

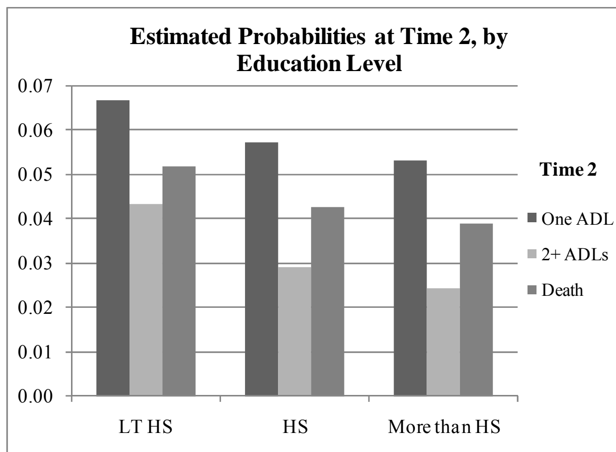
In summary, there appears to be an interesting difference in gender across countries for persons that transitioned from 2 or more ADLs at time-1 to 2 or more ADLs at time-2.

Estimated Probabilities of Disability at Time 2, by Education

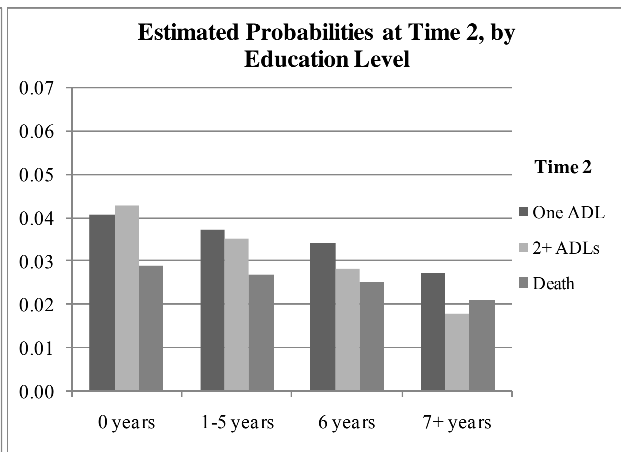
Figures 3a and 3b show the predicted disabilities of the disability outcome at time-2 (controlling for time-1 disability). Overall, there are similar patterns across education levels in the United States. Having medium and high education (high school and more than high school) in the U.S. is associated with lower estimated probabilities of disability compared to having low education (less than high school). In contrast, the education gradients seem different in Mexico; the effect of education on the predicted disabilities of outcome at time 2 are noticeable starting at 6 years of education and higher. It is interesting to note that the predicted probabilities for those with the highest levels of education in Mexico (7 years and more) are similar to the United States. But this only occurs in this highest education category.

In summary, the levels of disability are different between the two countries, and the gradient across education groups differs too. For Mexico, only in the two higher levels of education (six years or seven years and higher) does education appear to impact disability levels at time 2. Furthermore, disability levels in Mexico reach levels similar to those in the U.S. only at high education levels.

3a) United States



3b) Mexico



5. Summary Index of Disability

We used the estimated probabilities to construct an index that summarizes the burden of disability in the two countries. We do this for the total by age group, and then separately for men and women by age group. The index uses the transition probabilities in Tables 6a and 6b, weighed by the proportion of the samples that are in each disability category at time-1, to obtain the proportions in each category (non-disabled, 1 disability, 2+ disabilities) at time-2. These proportions take into account not only the prevalence of disability at a given time, but also the movement across states. Thus the index is taking into account the progression and recovery movements across disability states, and the moves to nursing homes or death in each country. Table 7 presents the resulting index by age group, for the total and by gender. The percent disabled at young ages (50-59) is higher for the U.S. (8.3%) compared to Mexico (5.7%) , while the percent disabled at old ages (80+), is higher for Mexico (28.8%) than the U.S. (21.4%). Looking at disability according to number of limitations, the U.S. propensities are higher than Mexico for one disability. However for 2 or more limitations, the probabilities are much higher for Mexico compared to the U.S. By gender, women are more likely to be disabled than men, for all age groups, number of limitations, and in both countries.

The Overall Index capturing the burden of disability is given also in Table 7. The index can be interpreted as follows: for the total U.S. population 50 and older, out of the years expected to live at age 50 (27.9), 80.3% are expected to be free of disability, 7.1% with one disability, 5.8% with 2 or more disabilities. The comparable figures for Mexico are: out of 27.2 years, 82.3% would be free of disability, 5.2% with one, and 8.0% with 2 or more disabilities.

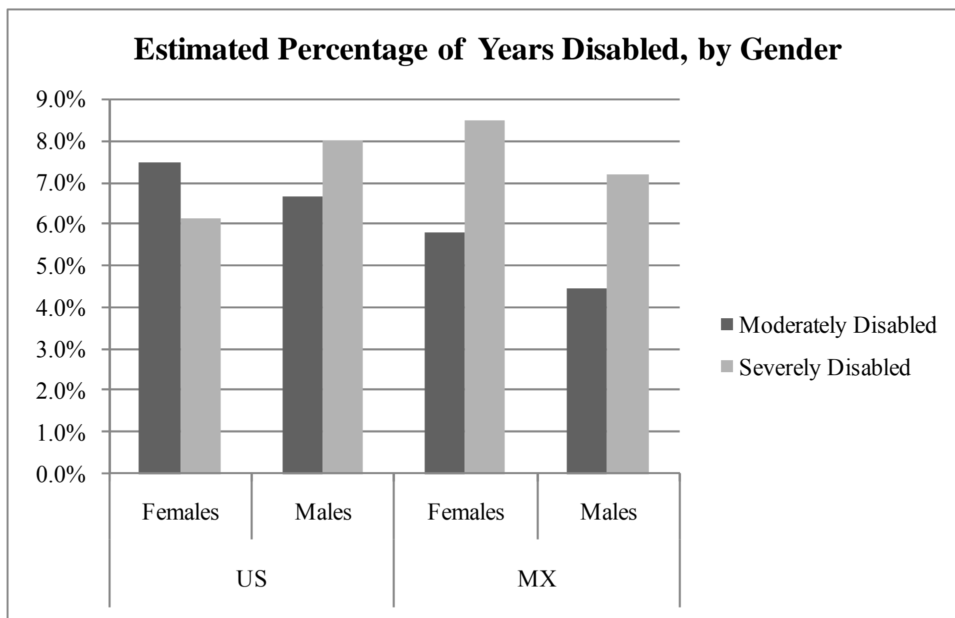
Table 7. Burden of Disability Index, by Country

	% Active	% (MD+SD)	% MD	% SD	Life expectancy (a)	Active (yrs)	Moderately Disabled (yrs)	Severely Disabled (yrs)	LTF/ NH (yrs)
United States									
By Age									
50-59	87.7%	8.3%	4.6%	3.6%	27.9	7.1	0.4	0.3	0.3
60-69	83.7%	10.8%	6.0%	4.8%	19.8	5.8	0.4	0.3	0.4
70-79	78.3%	14.2%	7.9%	6.4%	12.9	6.2	0.6	0.5	0.6
80+	66.5%	21.4%	11.6%	9.9%	4.9	3.3	0.6	0.5	0.6
						22.4	*2.0*	*1.6*	*1.9*
					Overall Index at Age 50	*80.3%*	*7.1%*	*5.8%*	*6.8%*
By Gender and Age									
Females									
50-59	87.3%	2.5%	4.9%	3.8%	29.7	7.4	0.4	0.3	0.3
60-69	83.1%	3.9%	6.3%	5.0%	21.3	6.1	0.5	0.4	0.4
70-79	77.6%	9.3%	8.2%	6.7%	13.9	6.7	0.7	0.6	0.7
80+	65.5%	22.5%	12.1%	10.4%	5.2	3.4	0.6	0.5	0.6
						23.6	*2.2*	*1.8*	*2.0*
					Overall Index at Age 50	*79.6%*	*7.5%*	*6.1%*	*6.8%*
Males									
50-59	88.3%	2.3%	4.4%	3.4%	25.9	6.9	0.3	0.3	0.3
60-69	84.4%	3.7%	5.7%	4.5%	18.0	5.5	0.4	0.3	0.4
70-79	79.2%	8.3%	7.4%	6.0%	11.5	5.6	0.5	0.4	0.5
80+	67.9%	20.2%	10.9%	9.3%	4.4	3.0	0.5	0.4	0.5
						21.0	*1.7*	*1.4*	*1.7*
					Overall Index at Age 50	*81.3%*	*6.6%*	*5.4%*	*6.7%*
Mexico									
By Age									
50-59	89.0%	1.6%	3.1%	2.6%	27.2	6.9	0.2	0.2	0.4
60-69	86.4%	3.0%	4.2%	4.6%	19.4	5.7	0.3	0.3	0.3
70-79	81.8%	8.2%	5.7%	8.2%	12.8	6.2	0.4	0.6	0.3
80+	68.0%	28.8%	8.7%	20.0%	5.2	3.5	0.5	1.0	0.2
						22.4	*1.4*	*2.2*	*1.2*
					Overall Index at Age 50	*82.3%*	*5.2%*	*8.0%*	*4.5%*
By Gender and Age									
Females									
50-59	88.4%	6.4%	3.5%	2.9%	28.6	7.2	0.3	0.2	0.4
60-69	85.5%	9.8%	4.8%	5.0%	20.5	5.9	0.3	0.3	0.3
70-79	80.5%	15.3%	6.5%	8.8%	13.6	6.6	0.5	0.7	0.3
80+	66.3%	30.5%	9.6%	20.9%	5.4	3.6	0.5	1.1	0.2
						23.2	*1.7*	*2.4*	*1.3*
					Overall Index at Age 50	*81.3%*	*5.8%*	*8.5%*	*4.4%*
Males									
50-59	89.6%	4.9%	2.6%	2.3%	25.7	6.7	0.2	0.2	0.4
60-69	87.3%	7.7%	3.6%	4.1%	18.3	5.5	0.2	0.3	0.3
70-79	83.2%	12.3%	4.9%	7.4%	12.0	5.8	0.3	0.5	0.3
80+	71.1%	25.4%	7.6%	17.9%	5.0	3.6	0.4	0.9	0.2
						21.5	*1.1*	*1.8*	*1.2*
					Overall Index at Age 50	*83.7%*	*4.4%*	*7.2%*	*4.7%*

[a] With life expectancy (LE) using age and gender specific life tables. Source: World Health Organization Global Health Observatory, Year 2000.
Note: Moderately disabled (MD)=1 ADL limitation, Severely disabled (SD)=2+ ADL limitations

Figure 4 shows the index by sex, presenting the percent distribution of disability states for men and women, in both countries. Overall, the burden of disability is higher for women than men, with one exception that emerges when disability is examined by severity: the percent severely disabled is higher for men than women in the U.S. Overall also, the burden of disability is higher in the U.S than in Mexico, with one exception too: the index is higher for severely disabled women in Mexico compared to the U.S.

Figure 4.



6. Discussion and Conclusions

We set out to compare disability rates and two-year transitions across disability states for two countries at vastly different stages of the epidemiologic and demographic transitions as well as economic development. Our initial hypothesis was that the burden of aging in terms of disability would be higher in the developing country than the developed one. This hypothesis has been posited by researchers and is motivated by the disadvantaged past environment and current

mixed epidemiologic regime that prevails in developing countries, their premature aging, and a faster pace of aging compared to developed countries.

Our estimates of how populations of older adults in a developing country (Mexico) transition across disability states or death compared to a developed country (non-Hispanic Whites born in the United States) yield results that reject our initial hypothesis. The levels of disability prevalence and the two-year transitions are consistent with a heavier burden of aging for the U.S. than for Mexico, at least in terms of disability measured by limitations with activities of daily living (ADL). This generalized finding holds even after controlling for age, sex, marital status, educational achievement, urban-rural residence, wealth, and availability of health insurance.

We find many features of the disability patterns that are remarkably similar across the two countries. In univariate analyses, older persons are more likely to report disabilities than younger adults, women more than men, those with low socioeconomic status more than those in the high end of the scale, and those living in rural areas more than urban residents. Women are more likely to transition to or stay in disabled states, while men are more likely to transition to death than women.

In two-year transitions, among older adults aged 50 or older, the U.S. population is more likely to transition to a disabled state or increase the number of disabilities than the Mexican counterparts, while Mexicans are more likely to move out of disability or reduce the number of disabilities reported. Although we are cautious to generalize our findings regarding mortality transitions because of a low number of deaths in Mexico, the transition to mortality is also higher for the U.S. compared to Mexico.

The two studies that we used for our analysis are highly comparable in study protocols and contents, and our analyses were carefully harmonized across the two databases, thus we rule out differences in the surveys, measures, or methods as possible explanations for these results. Rather, we speculate that these results could be explained by several other factors. First, it is possible that Mexican older adults tend to under-report functional limitations compared to their U.S. counterparts. Researchers have previously discussed the validity of self-reported measures in particular when performing cross-country analyses and when comparing different cultures (Finch et al, 2002; Kandula et al, 2007). Self-reports of physical conditions may be biased because of cultural as well as linguistic differences. Latino cultures are distinct from the culture of United States and their beliefs and traditions may affect the way they perceive health (Kandula et al, 2007). Other studies have found potential artifactual components of self-reported measures such as disability and global health (Finch et al., 2002). This "cultural bias" could affect the way that Mexicans perceive health as well as their attitudes and health behaviors. The bias could result in misreports or underreports of self-reported measures such as disability and these results have to be interpreted with caution. However, because we analyze the individuals' transitions and not only levels of disability, we partially take into account this possibility.

Second, the current cohorts of older adults in Mexico may be highly selected in terms of survival compared to the population we use as a benchmark in the United States. Infant and childhood mortality levels were much higher in Mexico than in the United States when the youngest of our cohorts were born. Between 1950 and 1955, the mortality rate was four times as high in Mexico than in the United States --121 deaths per 1,000 births in Mexico versus 28 deaths per 1,000 births in the United States (United Nations, 2009). Because infant and

childhood mortality levels were so much higher in Mexico, we can say that only the 'fittest' survived.

This assertion that in Mexico only the fittest persons survived into old age is also reflected in old age life expectancy differences across the two countries. Life tables provided by the World Health Organization (2009) (see Appendix B)[7] show that at younger ages, persons in Mexico have a lower life expectancy than in the United States. However, after ages 75-79 this pattern changes and the expectation of life becomes higher for Mexico than for the United States. This suggests that those persons currently surviving until the older ages in Mexico were relatively more robust (or less selected) than those currently surviving in the United States. One important caveat is that infant mortality data and life tables are subject to caution in interpretation. The data needed to construct such tables include information from vital registration (deaths) as well as the Census (population data) and such data sources may be incomplete or have errors in reporting. This is particularly a concern for developing countries (Murray et al., 2000) and therefore the comparison of Mexico to the US should be done cautiously. However, the overall patterns of both tables provide support for the hypothesis that in Mexico the fittest persons survived into old age. This survival selection implies that the cohorts that we observe until old age have a relatively low burden of disability in Mexico. In contrast, among the same age cohorts of non-Hispanic White populations born in the United States, mortality was less selective and more of those born are survivors and observed disabled in old age.

[7] Life tables in Appendix B compare the total population of Mexicans to the total population of Americans, regardless of race. Life tables for Whites only in the US show slightly higher life expectancies than the total populations. We choose to present the total population tables here because both the Mexican and total American life tables are collected by one organization (the WHO), which allows more confidence in cross-country comparison.

Third, the current stage of the epidemiological and lifestyle transitions in both countries are quite different, such that U.S. older adults have been exposed longer in their life cycle to chronic co-morbidities and other behaviors and risk factors associated with disability, such as smoking, obesity and a sedentary lifestyle than comparable populations in Mexico, and this may translate into higher disability burden for current elderly in the United States.

It is likely that the latter two explanations partially explain the patterns we find. Both explanations converge to a similar implication: the burden of old-age disability for Mexico is likely to change (and worsen) as the epidemiological, demographic, and lifestyle transitions continue to run their course in Mexico. Thus, the current burden of aging in Mexico presents a mixture of opportunities *and* challenges. The opportunity presents itself because, even though Mexico is aging fast and with low standards of living, apparently the burden of aging may not be as serious as anticipated by a potentially large number of survivors of infectious and mixed epidemiologic regimes who would be disabled in old age; our evidence does not support this conjecture. And the challenges lie immediately ahead if the transition path followed by Mexico mirrors the one followed by the United States. For example, tobacco smoking, dietary patterns associated with higher consumption of processed foods, and sedentary lifestyle associated with urban living, have all been established as risk factors for chronic degenerative conditions associated with physical disability. The challenge for Mexico is to continue along the path of the epidemiologic transition minimizing or avoiding these and other negative consequences of modernization and urbanization and their related changes in lifestyle.

It is also possible that we find this difference in disability prevalence across countries because while the U.S. has higher rates of institutionalization than Mexico and we took this into account, but the state of disability at the time of institutionalization may be quite different

between the two countries. If persons entering institutions in the U.S. are a lot more functional than the population entering institutions in Mexico, then the community dwelling populations we observe may be disproportionately skewed towards the disabled states in the U.S. compared to Mexico. We have no data to take into account the level of disability of institutionalized populations in both countries, however, and this is a limitation of our work.

Further research along the lines of this paper should address other limitations that we encountered. We were constrained in our analyses by the two-year transitions that we could estimate because the data for Mexico is only available for two years. As other panels of the MHAS data become available, it would be possible to track the disability transitions further and to confirm or revise the results obtained with our two-year analyses. While repeated cross-sectional studies can provide statistics to monitor changes in disability, only panel studies can inform the dynamics of disability, including onset of disability, recovery from disability, and mortality of the disabled and non-disabled (Crimmins et al., 2009). In addition, it should be possible to extend and replicate these analyses with other countries, as more panel studies on aging have become available for other developed and developing countries in recent years.

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Appendix

Appendix A. Multinomial model predicting outcome at time 2, HRS and MHAS

	HRS					MHAS			
	One ADL	2+ ADLs	Death	LTF		One ADL	2+ ADLs	Death	LTF
1 ADL	9.06***	12.58***	5.02***	1.4	**1 ADL**	4.92***	5.04***	2.51***	1.03
	(0.91)	(1.54)	(0.60)	(0.28)		(0.80)	(0.79)	(0.51)	(0.29)
2+ ADLs	19.66***	105.37***	28.55***	5.16***	**2+ ADLs**	6.86***	14.89***	12.37***	2.24***
	(2.95)	(14.85)	(4.15)	(1.15)		(1.07)	(1.86)	(1.65)	(0.51)
Age	1.05***	1.06***	1.10***	1.02**	**Age**	1.04***	1.08***	1.08***	0.99
	(0.00)	(0.01)	(0.01)	(0.01)		(0.01)	(0.01)	(0.01)	(0.01)
Female	1.19*	1.24*	0.54***	1.01	**Female**	1.40**	1.26*	0.67***	0.92
	(0.10)	(0.13)	(0.05)	(0.09)		(0.16)	(0.13)	(0.07)	(0.09)
Single	1.50***	1.29	1.53**	0.98	**Single**	1.18	1.34	1.41*	1.33*
	(0.18)	(0.2)	(0.21)	(0.14)		(0.19)	(0.20)	(0.24)	(0.18)
Widowed	1.43***	1.29*	1.31**	0.77*	**Widowed**	1.15	1.06	1.58***	1.09
	(0.14)	(0.15)	(0.14)	(0.1)		(0.15)	(0.13)	(0.20)	(0.14)
Ed <12 yrs	0.79*	0.63***	0.78*	0.71**	**Ed 1-5 yrs**	1.02	0.98	0.85	1.20
	(0.08)	(0.07)	(0.08)	(0.08)		(0.12)	(0.11)	(0.10)	(0.17)
Ed 12 yrs	0.83	0.59***	0.77*	0.55***	**Ed 6 yrs**	0.93	0.65**	0.79	1.37
	(0.09)	(0.07)	(0.08)	(0.07)		(0.15)	(0.11)	(0.14)	(0.22)
					Ed 7+ yrs	0.69	0.47***	0.83	2.59***
						(0.13)	(0.09)	(0.15)	(0.39)
Wealth	0.82*	0.87	0.68***	1.06	**Wealth**	0.90	1.00	0.92	0.67**
Medium	(0.08)	(0.10)	(0.07)	(0.12)	**Medium**	(0.11)	(0.12)	(0.11)	(0.08)
High	0.60***	0.60***	0.50***	0.91	**High**	1.02	0.97	0.81	0.88
	(0.06)	(0.08)	(0.05)	(0.11)		(0.13)	(0.12)	(0.10)	(0.10)
Urban	0.81**	1.05	1.06	1.02	**Urban**	0.80*	1.17	1.31*	1.71***
	(0.06)	(0.10)	(0.08)	(0.09)		(0.09)	(0.12)	(0.15)	(0.19)
Insurance	0.91	0.97	1.47	0.53**	**Insurance**	1.08	1.26*	0.96	0.73**
	(0.2)1	(0.30)	(0.52)	(0.10)		(0.12)	(0.13)	(0.11)	(0.08)
Number of obs		13,160			**Number of obs**			9,984	
Pseudo RSquare		0.170			**Pseudo RSquare**			0.1255	
LR chi2		3,748.87			**LR chi2**			1,903.47	
Prob>chi2		0.000			**Prob>chi2**			0.000	

Notes: HRS included persons age 51 and older at time 1; MHAS included 52 years and older at time 1 (See Box 2)
ADL=Activities of Daily Living
Cells indicate relative risk ratios, Standard Errors in parentheses
Reference category= No ADL limitations
*** p-value< .001, ** p-value< .01, *p-value< .05

Appendix B. Life tables for Mexico and the United States, by age groups, in 2000

Age group	Expectation of Life United States	Expectation of Life Mexico	Difference between US and Mexico
<1	76.9	74.4	2.5
1-4	76.5	75.1	1.4
5-9	72.6	71.4	1.2
10-14	67.6	66.5	1.1
15-19	62.7	61.6	1.1
20-24	57.9	56.8	1.1
25-29	53.2	52.0	1.2
30-34	48.4	47.4	1.0
35-39	43.7	42.7	1.0
40-44	39.0	38.1	0.9
45-49	34.4	33.6	0.8
50-54	30.0	29.3	0.7
55-59	25.7	25.1	0.6
60-64	21.6	21.2	0.4
65-69	17.9	17.6	0.3
70-74	14.4	14.3	0.1
75-79	11.3	11.3	0.0
80-84	8.6	8.9	-0.3
85-89	6.3	6.7	-0.4
90-94	4.5	4.8	-0.3
95-99	3.1	3.3	-0.2
100+	2.2	2.3	-0.1

Source: World Health Organization Global Health Observatory
Note: Data presented for total population, all races, Year=2000