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Social Support and Cognitive Impairment in Mexican Origin Older Adults in the US and Mexico

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Aim: This study examines living arrangements of older adults with cognitive impairment in the Hispanic-EPESE and the Mexican Health and Aging Study (MHAS).

Methods: Our sample includes 1,072 adults 80 years and older from the HEPSE and 1,481 from the MHAS. We create a typology of living arrangements consisting of marital status and household size using wave 7 (2010-2011) of the H-EPESE and wave 3 (2012) ofs the MHAS.

Results: Respondents in the HEPESE were twice as likely to live in non-extended households as respondents in the MHAS. About one-fifth of the cognitively impaired in the HEPESE lives alone, while only 12% of the cognitively impaired in the MHAS lived alone.

Conclusion: We discuss the extent of social support measures used as well as methodological implications of cognitive evaluations used in both studies.

Introduction

The majority of previous research on health and support among racial/ethnic minorities in the U.S. in general, among Latinos in particular, and among peoples of Latin American countries, relies on the concept of *familismo*, the idea that family needs are is put before individual ones. While within Latinos in both the U.S. and the Mexican contexts, family care corresponds with strong familial obligations, social and economic conditions are also affecting traditional social norms. Results from a national survey in Mexico show that while children declare strong willingness to care for their parents, when asked how much they are able to follow through on taking up care-giving activities, they feel that currently children care for their parents less than they did so in the past (López-Ortega and Gutiérrez-Robledo 2015).

As of 2012, Hispanic origin elderly individuals made up 5.6% of the U.S. population 85 and older. This population is projected to be nearly six times larger and make up 12.5% of the oldest-old population by 2050 (Ortman, Velkoff, & Hogan, 2014). The majority of those individuals will be of Mexican origin. Elderly Mexican-origin individuals are less likely than non-Hispanic white elderly individuals to use formal long-term care services (Thomeer, Mudrazija, & Angel, 2014). Instead, Mexican-origin elderly stay in their homes even after they become seriously impaired. While most frail elderly individuals live at home or in the community rather than in long-term care facilities (Silverstein & Wang, 2015), we know little about the role of cognitive impairment in determining different living arrangements among community-dwelling elderly individuals. Despite a developed formal long-term care system in the United States, the use of institutional and community care among Latinos remains low. Older Latinos tend to remain in their communities, often relying heavily on family for assistance even after losing their autonomy.

In both countries, the Mexican-origin population is highly reliant on family members for late-life care and support, due to lack of public formal long-term care services for older adults and people with disabilities in Mexico, and low use of formal services by Latinos in the U.S. In the context of high reliance of older adults on family unpaid care and support, living arrangements become a fundamental factor in maintaining their health and well-being. This is especially relevant for older adults with cognitive impairment and dementia who present continuous highly demanding care and instrumental support. However, there remains much to be learned about the extent of need for dementia-related assistance as well as how cognitive trajectories impact family living arrangements and caregiving.

About 35 million people worldwide live with dementia, and the prevalence is especially high in Latin America (Prince et al., 2016). In Mexico, the prevalence is close to 7.4%, and due to the rapidly aging population, dementia is expected to affect over 3.5 million persons in Mexico by 2050, and according to the World Alzheimer Report 2015, it is estimated that there will be 1.6 million people with dementia in Mexico by 2030 (Prince et al. 2015). In the U.S., there are clear disparities in dementia prevalence: elder Latinos are one and a half times more likely to suffer from dementia than non-Latino Whites are (Alzheimer's Association, 2017; Clark et al., 2005; Mayeda, Haan, Kanaya, Yaffe, & Neuhaus, 2013). In addition, Mexican adults have high prevalence of chronic diseases that are the main risk factors for dementia, such as diabetes and obesity, which poses additional challenges to formal and informal support for older adults in the future. Given its lack of national policies and services, most care for people with dementia in Mexico is provided by family members who have little knowledge about dementia; moreover, no formal support for family caregiving is available (Prince et al. 2016).

In Mexico, the lack of formal long-term institutional and community care, limited fiscal resources, and competing priorities in care have rendered the family the primary source of elder care and support (Angel et al. 2016). The doubling of the population over 60 is occurring much more rapidly in Mexico than it did in the United States (Angel, Angel, López-Ortega, Gutierrez Robledo, & Wallace, 2016). Limited fiscal resources and the needs of a large low-income population present serious challenges to the development of a formal long-term care system for aging elders.

Family support is commonly viewed as relatively strong for older people, however, for Latinos in the U.S. and Mexican older adults, the shrinking of once large caregiver networks, trends in increased frailty and dementia, and a lack of affordable formal care services in both countries create serious concerns for the availability of support to provide them with adequate support to older adults.

This bi-national study is the first step toward assessing how Mexican and Mexican American families organize caregiving relationships for elderly family members who experience cognitive impairment and dementia by looking at living arrangements. To address the limited research on dementia care in the Mexican-origin population, we use two cohort studies of Mexican-origin older adults in the U.S. and Mexico to explore the changing need for assistance and the role of dementia as these processes unfold. Specifically, to:

1. Investigate living arrangements among the oldest old in the U.S. in Mexico.
2. Describing the differences in living arrangements by level of cognitive impairment
3. Describing the correlates of living arrangements in each country controlling for health, finance, and demographic characteristics.

Our approach highlights socioeconomic and immigration-related factors and their relationships to dementia support systems among Mexican-origin older adults. Our ultimate objective is to determine viable ways to improve the quality of life of Mexican-origin individuals living with dementia and decrease the costs of caregiving to families, as well as municipal, state, and federal governments.

Methods

Data

The data we use are from the Hispanic Established Populations for Epidemiologic Studies of the Elderly (H-EPESE) (Markides et al., 1999) and the Mexican Health and Aging Study (Wong, Michaels-Obregon, & Palloni, 2017).

The H-EPESE is a prospective cohort household-based sample that, at baseline, is representative of Mexican Americans aged 65 and above living in the southwestern states of Arizona, California, Colorado, New Mexico, and Texas. The original baseline sample of 3050 was interviewed between September 1993 and June 1994 and a secondary refreshing sample of 902 was interviewed during the fifth follow up between September 2004 and June 2005. Interviews took place both in person and via proxy. For this study we use the 7th wave of the HEPESE for the years 2011-2012 with a sample of n=1,078 respondents aged 80 and older.

The Mexican Health and Aging Study (MHAS) is a prospective panel study of adults 50 years and older in Mexico. The baseline survey were conducted in 2001 to ensure national and urban/rural representation of adults born in 1951 or earlier. Follow-up interviews were conducted

in 2003, 2012, and 2015, and a new sample of adults born between 1952-1962 was added in 2012.

In the present study, we use data from the 3rd wave of the MHAS for the year 2012 which includes n=15,723 respondents and proxies. To make the MHAS sample comparable to the HEPESE sample, we limit our analysis to individuals aged 80 and older (n=1,481).

Dependent Variable

Our dependent variable of interest is living arrangement. We create a typology of four living arrangements based on the number of people living with the survey respondent and the marital status of the survey respondent; Single Alone, Married Alone, Single with Others and Married with Others. Individuals who live in a house alone and are not married are considered single alone (HEPESE n=298 MHAS n=192).We classify people who live with their spouse or common law partner but no one else as married alone (HEPESE n=185 MHAS n=162). Individuals who are not married/ do not have a partner and live with others are classified as Single with Others (HEPESE n=381 MHAS n=751). Respondents who are living with their partner in addition to other are classified as Married with Others (HEPESE n=128 MHAS n=376).

Independent Variable

The key independent variable of interest in our analysis is cognitive impairment. The HEPESE measures cognitive impairment using the Mini Mental Status Exam which covers 6 domains of mental health. We use the different MMSE domains and IADL information to classify individuals as having dementia (2 impaired domains and an IADL disability), and non-

dementia. While dementia is a clinical condition that requires physicians diagnosis, our categorization is based on survey tools and might more accurately be described as likely diagnosis of dementia. Nonetheless, we call our classification dementia despite this shortcoming. A detailed examination of the CIND protocol is available in the appendix.

The MHAS uses the Cross Cultural Cognitive Exam which covers 10 domains. The MHAS data is used to create a measurement of Dementia. Using a similar protocol, individuals who are impaired in 2 cognitive and an IADL disability are classified as having dementia compared with the non-dementia population.

Control Variables

We examined the robustness of the relationship between living arrangement and dementia classification by controlling for demographic characteristics, migration history, health, and finances. Demographic controls include self-reported age and gender (ref: male). Migration history in the HEPESE is nativity (ref: U.S. Born) while in the MHAS migration history is whether a respondent ever lived in the U.S. (ref: Never Migrated). Health controls include any ADL disability (walking across a room, dressing, bathing, eating, getting out of bed, or using a toilet), any chronic conditions (Stroke, diabetes, heart attack) and fair/poor self-rated health (ref: Excellent/Good). Financial controls include homeownership (ref: does not own) and Medicaid coverage in the HEPSE (ref: not covered) and Seguro Popular eligibility in the MHAS (ref: not eligible).

Analytic Plan

We begin by describing the characteristics of respondents in each living arrangement for both the U.S. and Mexico. Second, we look at the distribution of living arrangements for each individual characteristic. We then use multinomial logistic regression to examine the determinants of living arrangement in each nation separately.

Results

Table 1 about here

Marital Status and Living Arrangement in the MHAS (2012) and HEPESE (2010-2011)
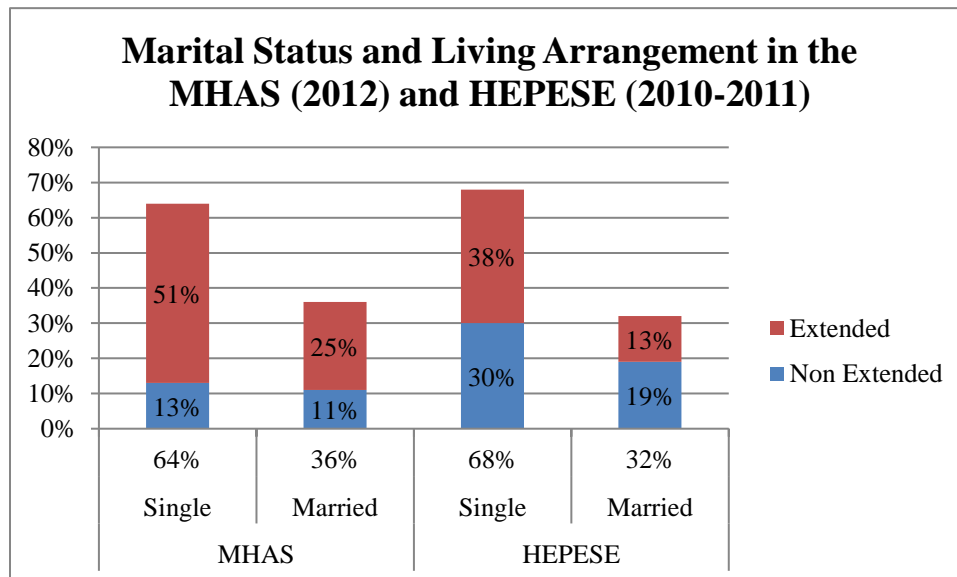
Table 1 shows the comparison of living arrangement characteristics in both the U.S. and Mexico. Sample adults in the U.S. sample are over represented in both non extended households relative to the Mexican sample adults who were more likely to live in extended households. Marital status was similar in both samples, 68% single in the HEPESE and 64% single in the MHAS, but the living arrangements of each marital status was different. In the U.S., nearly half of the sample lived in homes by themselves (30%) or with a spouse only (19%). In Mexico, only

24% of the sampled live in non-extended households, 13% lived alone and 11% lived with their spouse only. Extended households were less common in the HEPESE sample, 38% of extended households were non-married individuals living with others and 13% were married couples living with others. In Mexico, more than half of the sample were non-married and living with others (51%) and another 25% were married and living with others.

The profiles of each living arrangement were different in each nation. Overall, dementia was slightly higher in the US than in Mexico (23% vs 18%). Individuals with dementia made up a disproportionate amount of non-married extended households in each sample. 1 in 5 individuals living alone in the US were living alone and 12% of individuals living alone were classified as having dementia. There were more women than men surviving to age 80 plus in both samples. The non-married extended had the most ADL's (52% US and 41% Mexico) in both samples. Chronic conditions were most prevalent for the non married extended in the US and the Married extended in Mexico. Fair/poor health was most prevalent for the married alone in the US and the extended households in Mexico. The married alone were most likely to own homes in both samples and the non-married alone were the least likely to own homes in both samples. Medicaid was highest among the alone in the HEPESE and Seguro Popular eligibility was highest among the Married extended in Mexico.

While Table 1 describes the profiles of different living arrangements, Table 2 shows the distribution of each independent characteristic in each type of living arrangement. Men in both samples were more likely to be in married households while women were more likely to live in non-married households, likely as a result of death of a spouse. No differences in living arrangement by nativity in the US nor migration history in Mexico. People with poor health were over represented in the single extended households. People with chronic conditions and ADL

disability were over represented in single extended households in both samples. Although conventional wisdom might suggest that individuals who live alone do so because they can afford to, our data suggest that individuals who live alone are actually less financially stable than those living in extended households in the HEPESE, people who do not own houses and are on Medicaid are disproportionately living alone.

Tables 3 and 4 compare all living arrangements simultaneously compared to the non-married alone. We compare the non-married alone, the most vulnerable living arrangement to understand how they differ from less vulnerable households. Table 3 shows that non married people classified as having dementia are nearly twice (Model 1 OR 2.02 p<=.001) as likely to extend their living arrangements compared to single households, and that relationship maintains its significance net of all controls (Model 4 OR 1.83 p<=.01). Similarly, extended married households are more likely to have dementia than non-married alone households (Model 1 OR 1.73 p<=.05). Migration history is not associated with living arrangements. Non married individuals who have chronic conditions are significantly more likely to extend their households (Model 4 OR 1.61 p<=0.01). Homeownership is higher in all living arrangements than non-married alone households. Non married individuals who own their homes are more likely to extend their households (Model 4 OR 1.50 p<=0.05). Married alone households were the most likely to own their homes (Model 4 OR 3.48 p<=0.001) follow by married extended households (Model 4 OR 2.30 p<=0.01). Despite high levels of Medicaid participation, Medicaid was not significantly associated with living arrangements in Model 4.

Table 4 looks at living arrangements in the MHAS. Dementia is significantly associated with household extension for singles (Model 1 OR 1.65 p<=0.05) but the relationships does not maintain significance when controlling for chronic conditions (Model 3 OR 1.37 n.s.). Non

married individuals with chronic conditions are significantly more likely extend their households (Model 4 OR 1.62 p<=0.05). Homeowner ownership was not associated with household extension for non married households (Model 4 OR 1.21 p<=n.s.). In the MHAS, Married alone households were the most likely to own their homes (Model 4 OR 3.37 p<=0.01) follow by the married extended (Model 4 OR 1.99 p<=0.05). Eligibility for Seguro Popular was significantly higher for the Married extended households (Model 4 OR 1.56 p<=0.05)

Discussion

We have documented the different living arrangements in both the U.S. and Mexico for older Mexican Origin adults. We found that dementia was significantly associated with household extension in the U.S., while in Mexico the relationship between household extension and dementia was no longer significant when controlling for chronic conditions. Chronic conditions were associated with household extension in both samples, confirming that poor health is an important reason for household extension. Finances relationship with living arrangements, as measured by public insurance participation and homeownership were similar in the two nations. Homeownership was an important characteristic of household extension in both samples, but in somewhat unexpected ways. Individuals who did not own homes were the least likely to extend their households in the U.S. Public programs participation was not associated with household extension in the U.S. and only associated with extension for the Married in Mexico. An important impactions of these results for medical care providers is a need to understand living arrangement and isolation as a possible concurrent condition with dementia in late life. Health care professionals need to be aware of households as a contextual level risk factor in late life. Where and who do you live with are important social determinants for health and wellbeing. Finally, while aging in place may be the preferred model for late life, extension

may be the most appropriate living arrangement for individuals who are living alone with dementia. Additionally while extension may be functional alternative to nursing homes for vulnerable population in both countries, public strategies are necessary to achieve optimal care and support in late life.

Limitations

Cognitive impairment is based on survey instruments and as such, they do not compare to clinical diagnosis of this and other related conditions as dementia. However, the cognitive impairment no dementia (CIND) measure has been previously validated and is generally considered a reliable indicator of dementia (Langa et al., 2016).

Conclusions

We find that living arrangements for the older Mexican population varies between the U.S. and Mexico in important ways. Older Mexican-origin adults in the U.S. are twice as likely to live in non-extended households as people in Mexico. Dementia is an important predictor of household extension in both nations. Nearly 1 in 4 people with dementia in the U.S. and 1 in 10 people with dementia in Mexico are living alone. Future research should seek to understand how these individuals remain in the community and why there are more people living alone in the U.S. compared to Mexico.

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Table 1: Characteristics of Living Arrangements for HEPESE and MHAS by Living Arrangement

| | HEPESE | | | | | | | MHAS | | | | | |
| | Non-Extended | | Extended | | | | | Non-Extended | | Extended | | | |
	Alone	Married	Non Married	Married	Total	pvalue		Alone	Married	Non Married	Married	Total	pvalue
Count	298	185	381	128	992		Count	192	162	751	376	1,481	
Percentage	30%	19%	38%	13%	100%		Percentage	13%	11%	51%	25%	100%	
Dementia	20%	17%	30%	20%	23%	<0.01	Dementia	12%	6%	25%	11%	18%	<0.01
Age	86.1	84.66	86.4	84.56	85.74	<0.01	Age	84.53	83.82	84.59	83.05	84.09	<0.01
Female	76%	40%	79%	34%	65%	<0.01	Female	60%	35%	73%	25%	54%	<0.01
US Born	52%	52%	57%	58%	55%		US Migrant	13%	13%	9%	19%	13%	<0.01
Any ADL	48%	32%	52%	39%	45%	<0.01	Any ADL	28%	28%	41%	31%	35%	<0.01
Fair/Poor Health	66%	77%	64%	62%	67%	<0.01	Fair/Poor Health	67%	63%	69%	69%	68%	
Diabetes	33%	36%	38%	33%	35%		Diabetes	11%	15%	18%	16%	16%	
Heart Attack	4%	7%	12%	12%	9%	<0.01	Heart Attack	3%	5%	4%	6%	5%	
Stroke	7%	6%	11%	11%	9%	<0.01	Stroke	1%	4%	4%	5%	4%	
Any Condition	40%	43%	50%	44%	45%		Any Condition	14%	22%	24%	25%	22%	
Own Home	51%	79%	61%	71%	63%	<0.01	Own Home	81%	93%	85%	91%	87%	<0.01
Medicaid	53%	40%	50%	46%	49%		Seguro Popular	27%	30%	24%	33%	28%	

Source: HEPESE Wave 7 (2011-2012) and MHAS Wave 3 (2012)

p value is statistical differences between living arrangements

Table2: Living Arrangements of Different Risk Factors for HEPESE and MHAS by Living Arrangement

| | HEPESE | | | | | MHAS | | | |
	Alone	Spouse Only	Single Others	Married Others		Alone	Spouse Only	Single Others	Married Others
Male	20%	32%	24%	24%	Male	11%	16%	31%	42%
Female	35%	11%	47%	7%	Female	15%	7%	67%	12%
US Born	30%	19%	38%	12%	US Migrant	13%	11%	53%	24%
Non US Born	29%	18%	40%	13%	Non US Migrant	14%	12%	38%	36%
No ADL	29%	24%	33%	14%	No ADL	14%	14%	44%	29%
ADL	30%	13%	45%	12%	ADL	12%	8%	58%	22%
Excellent	31%	13%	43%	14%	Excellent	14%	13%	46%	27%
Fair Poor	29%	21%	37%	12%	Fair Poor	13%	12%	47%	28%
No Diabetes	31%	18%	38%	13%	No Diabetes	14%	11%	50%	25%
Diabetes	27%	19%	41%	13%	Diabetes	10%	9%	55%	26%
No Heart Attack	31%	19%	37%	13%	No Heart Attack	13%	11%	51%	25%
Heart Attack	15%	15%	54%	15%	Heart Attack	10%	13%	45%	31%
No Stroke	31%	19%	38%	12%	No Stroke	13%	11%	50%	25%
Stroke	20%	12%	51%	18%	Stroke	7%	10%	54%	29%
No Condition	33%	19%	35%	13%	No Condition	14%	11%	50%	25%
Any Condition	25%	18%	44%	13%	Any Condition	9%	10%	53%	28%
Non Dementia	32%	21%	34%	13%	Non Dementia	14%	13%	46%	28%
Dementia	24%	13%	51%	13%	Dementia	11%	4%	68%	17%
Non Homeowner	40%	10%	40%	10%	Non Homeowner	18%	5%	56%	22%
Homeowner	25%	24%	36%	15%	Homeowner	12%	12%	50%	26%
Non Medicaid	27%	22%	38%	13%	Non Medicaid	14%	10%	53%	23%
Medicaid	32%	15%	40%	13%	Medicaid	12%	12%	46%	30%
Total	30%	19%	38%	13%	Total	13%	11%	51%	25%

Source: HEPESE Wave 7 (2011-2012) and MHAS Wave 3 (2012)

Table 3 HEPESE Multinomial Logistic Regression Predicting Living Arrangement (Ref: Non-Married Extended)

	Demography M1			Migration M2			Health M3			Finances M4		
	Married	Non Married Extended	Married Extended	Married	Non Married Extended	Married Extended	Married	Non Married Extended	Married Extended	Married	Non Married Extended	Married Extended
Dementia	1.10 (0.36)	2.02*** (3.83)	1.73* (2.06)	1.09 (0.34)	2.03*** (3.85)	1.75* (2.09)	1.15 (0.50)	2.11*** (3.83)	1.60 (1.63)	1.17 (0.54)	1.83** (2.97)	1.35 (0.95)
Female	0.19*** (-8.07)	1.19 (0.95)	0.14*** (-8.27)	0.19*** (-8.07)	1.19 (0.92)	0.14*** (-8.28)	0.20*** (-7.72)	1.25 (1.16)	0.15*** (-8.02)	0.21*** (-7.19)	1.20 (0.91)	0.15*** (-7.66)
Age	0.88*** (-4.49)	1.01 (0.30)	0.88*** (-3.78)	0.88*** (-4.51)	1.01 (0.33)	0.88*** (-3.74)	0.89*** (-3.96)	1.01 (0.61)	0.88*** (-3.66)	0.88*** (-4.03)	1.01 (0.67)	0.86*** (-4.11)
US Born				0.95 (-0.24)	1.12 (0.73)	1.15 (0.61)	1.02 (0.09)	1.08 (0.48)	1.14 (0.57)	0.78 (-1.13)	1.04 (0.26)	1.05 (0.20)
Any ADL							0.65 (-1.90)	0.93 (-0.43)	1.08 (0.30)	0.71 (-1.45)	0.96 (-0.23)	1.09 (0.34)
Any Chronic Condition							1.01 (0.06)	1.60** (2.87)	1.19 (0.76)	1.02 (0.09)	1.61** (2.85)	1.10 (0.41)
Fair Poor Health							2.05** (3.08)	0.79 (-1.40)	0.93 (-0.32)	2.06** (3.01)	0.84 (-0.99)	0.94 (-0.24)
Own Home										3.48*** (5.21)	1.50* (2.37)	2.30** (3.18)
Medicaid										0.78 (-1.12)	0.89 (-0.68)	1.07 (0.28)
Count	992			992			985			933		
Psuedo R2	0.09			0.09			0.10			0.11		
Loglik	-1185.54			-1184.94			-1160.15			-1089.19		

Table 4 MHAS Multinomial Logistic Regression Predicting Living Arrangement (Ref: Non-Married Extended)

	Demography M1			Migration M2			Health M3			Finances M4		
	Married	Non Married Extended	Married Extended	Married	Non Married Extended	Married Extended	Married	Non Married Extended	Married Extended	Married	Non Married Extended	Married Extended
Dementia	0.57	1.65*	1.29	0.57	1.65*	1.27	0.61	1.37	1.19	0.63	1.40	1.19
	(-1.69)	(2.43)	(1.03)	(-1.67)	(2.42)	(0.97)	(-1.37)	(1.38)	(0.61)	(-1.27)	(1.45)	(0.62)
Female	0.33***	1.62**	0.19***	0.29***	1.55*	0.18***	0.30***	1.53*	0.18***	0.28***	1.55*	0.17***
	(-4.60)	(2.65)	(-8.07)	(-4.82)	(2.27)	(-7.94)	(-4.76)	(2.18)	(-7.90)	(-4.88)	(2.24)	(-7.89)
Age	0.96	1.01	0.87***	0.96	1.01	0.87***	0.97	1.01	0.87***	0.96	1.01	0.87***
	(-1.31)	(0.51)	(-5.44)	(-1.37)	(0.50)	(-5.54)	(-0.99)	(0.53)	(-5.13)	(-1.22)	(0.46)	(-5.12)
US Migrant				0.57	0.80	0.71	0.57	0.82	0.72	0.54	0.80	0.65
				(-1.58)	(-0.78)	(-1.19)	(-1.56)	(-0.72)	(-1.14)	(-1.72)	(-0.77)	(-1.44)
Any ADL							0.91	1.16	1.10	0.94	1.15	1.14
							(-0.35)	(0.74)	(0.40)	(-0.21)	(0.69)	(0.58)
Any Chronic Condition							1.76	1.66*	1.90*	1.76	1.62*	1.96*
							(1.88)	(2.18)	(2.48)	(1.85)	(2.06)	(2.57)
Fair Poor Health							0.85	0.99	1.09	0.86	0.99	1.08
							(-0.59)	(-0.03)	(0.38)	(-0.56)	(-0.05)	(0.32)
Missing Health							0.71	1.22	0.90	0.70	1.26	0.88
							(-0.90)	(0.74)	(-0.34)	(-0.93)	(0.85)	(-0.40)
Own Home										3.37**	1.21	1.99*
										(2.86)	(0.83)	(2.33)
Seguro Popular										1.32	0.97	1.56*
										(1.05)	(-0.17)	(2.00)
Count	1338			1328			1326			1301		
Psuedo R2	0.10			0.10			0.11			0.12		
Loglik	-1418.40			-1403.86			-1394.50			-1364.22		

APPENDIX: HEPESE Dementia Protocol

We begin by creating a protocol for excluding individuals from MMSE consideration. Anyone who is missing the first orientation question (What year is it?) are excluded from being included in out MMSE estimation, otherwise we assume that missing values are also incorrect.

We identify 5 domains of cognition in the MMSE: Orientation, Recall, Attention, Language, and Spatial Construction.

Due to high levels of illiteracy in the sample (24%) and the number of questions that require literacy, we evaluate cognitive impairment on 4 domains for the illiterate: Orientation, Recall, Language, and Spatial Construction.

Orientation

Orientation is made from 9 questions: Year, Season, Month, Data, Day of week, State, County, City, and Address. We originally included 10 questions but a substantial portion of the sample did not answer a question about what floor they live on.

HEPESE Wave 7: Orientation			
	No Education	Less than 7	7 or more	Total
Mean	5.37	6.34	7.22	6.45
SD	3.38	3.07	2.73	3.02
Cutoff	1.99	3.27	4.49	N/A
Impaired n	18	70	32	120
Impaired %	12%	13%	11%	12%

Recall

Recall is made from 6 questions: Three immediate recall and three delayed recall. There are
more educated individuals who are impaired in the recall domain

	No Education	Less than 7	7 or more	Total
HEPESE Wave 7: Recall				
Mean	4.30	4.57	4.74	4.58
SD	1.99	1.72	1.67	1.75
Cutoff	2.30	2.84	3.07	N/A
Recall n	24	54	54	132
Recall %	15%	9%	17%	12%

Attention

Attention is determined by ability to spell world 0-5 determined by how many letters are placed
in the correct order. Attention is not an appropriate domain for evaluating cognitive functioning
in there MMSE for the illiterate. Literate individuals are considered impaired if they cannot spell
the word.

	No Education	Less than 7	7 or more	Total
HEPESE Wave 7: Attention				
Attention n	43	296	157	496
Attention %*	84%	71%	55%	66%

% of literate who cannot spell the word WORLD

Language

Language is assessed separately for the literate and illiterate. For the literate, the language domain is composed of 8 questions: Name a Watch, Name a Pencil, Repeat no ifs ands or butts, read and follow direction to close eyes, follow directions to take paper in right hand, fold paper in half, place paper on floor, and write a sentence. For the illiterate, the language domain is composed of 6 questions: Name a Watch, Name a Pencil, Repeat no ifs ands or butts, and follow directions to take paper in right hand, fold paper in half, place paper on floor.

	No Education	Less than 7	7 or more	Total
HEPESE Wave 7: Language				
Mean	5.51	6.45	6.80	6.41
SD	2.32	2.09	2.02	2.11
Cutoff	3.19	4.36	4.78	N/A
Language n	8	59	33	100
Language %	14%	13%	11%	12%
Mean	4.63	5.06	5.13	5.01
SD	1.86	1.55	1.51	1.59
Cutoff	2.77	3.51	3.62	N/A
Illit Lang	9	20	1	30
Illit Lang %	8%	15%	8%	12%

Spatial Construction

Spatial construction is determined by the ability to draw a figure. Large portions of each category are missing information on this task, likely due to blindness, arthritis, or other physical limitations. Our estimates of spatial impairment are likely conservative. We only consider those who are physically capable, not blind or unable to grasp a pencil, who cannot complete the task as impaired. Only 800 of the 994 who answered any task attempted the spatial construction task.

HEPESE Wave 7: Spatial Impairment			
	No Education	Less than 7	7 or more	Total
Impaired	56	189	70	315
Impaired%	61%	43%	27%	39%

CIND

Levels of cognitive impairment are determined by a combination of domain impairment and four IADL items: Medicine, Money, Meals, and Shopping. There are high levels of IADL disability in the sample.

HEPESE Wave 7: IADL			
	No Education	Less than 7	7 or more	Total
No IADL	29	187	167	383
	18%	32%	53%	36%
Any IADL	135	399	149	683
	82%	68%	47%	64%
Total	164	586	316	1066
	100%	100%	100%	100%

Cognitive Domain Impairment and IADL			
	Any IADL		
CI Count	No	Yes	Total
0	150	149	299
1	162	232	394
2	56	132	188
3	6	50	56
4	2	28	30
5	4	23	27
Total	380	614	994

Impairment is based on three criteria: # of Cognitive Domains Impaired, Any IADL, and Proxy Reports. Individuals who have fewer than 2 cognitive domain impairments are considered "Normal". Individuals who have 2 or more domains impaired but no IADL disability are labeled "Cognitively Impaired No Dementia (CIND)" . Individuals with 2 or more domains impaired and an IADL disability are labeled as " Dementia." Finally if proxies responded to helping fill out the survey because of mental impairment individuals are labeled as "Dementia".

Comparison 80+ Population MHAS and HEPSE					
HEPESE			MHAS		
Dementia	291	28.01	Dementia	323	20.83
CIND	67	6.45	CIND	181	11.67
Normal	681	65.54	Normal	1,047	67.5
Total	1,039	100	Total	1,551	100