Racial and Ethnic Origins, Nativity and the Cognitive Health Trajectories of US Older Adults

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Research on social disparities in cognitive aging rarely addresses both racial and ethnic origins and nativity. Even less is known about the potential role of neighborhood sociocultural and socioeconomic conditions in explaining any observed immigrant health advantages and racial/ethnic health disadvantages on cognition. Using data from the Health and Retirement Survey linked with the 2000 Census, we observe both cognitive health advantages among foreign-born Mexican Americans and cognitive health disadvantages among non-Hispanic black and Mexican American US-natives, after adjusting for individual social and economic characteristics. Models that additionally adjust for residence in immigrant enclaves or impoverished communities support the role of neighborhood characteristics in racial/ethnic health disadvantages but not immigrant health advantages on cognition. Preliminary analyses provide no evidence that our longitudinal analyses are biased by selective attrition. We discuss our findings in the context of current and future demographic and public health trends in the US.

Ethnic Origins, Nativity and the Cognitive Health Trajectories of US Older Adults

Despite longstanding interest in the consequences of migration, acculturation, and ethnic origins for the social stratification of health (Markides and Eschbach 2005; Ruiz et al. 2013), little is known about how these forces may intersect to influence the trajectories of US older adults' cognitive health. There are only seven known previous studies on nativity and cognition of Mexican Americans (Nguyen et al. 2002; Collins et al. 2009; Sachs-Ericsson et al. 2009; Sheffield and Peek 2009; Haan et al. 2011; Hill et al. 2012b; Hill et al. 2012a). All of these studies were restricted to adults at least 60 years old. Nearly all employ the same sample of Mexican Americans from Southwestern states (Nguyen et al. 2002; Collins et al. 2009; Sachs-Ericsson et al. 2009; Sheffield and Peek 2009; Hill et al. 2012b; Hill et al. 2012a),[1] and all arrived at generally null findings, albeit in the direction of an immigrant health advantage.

A hypothesis of immigrant health advantages on cognition is substantiated by a broader literature on the 'surprisingly' good health outcomes of Hispanics, and Mexican immigrants in particular, that is commonly referred to as the Hispanic Paradox or Immigrant Epidemiological Paradox (Markides and Eschbach 2005; Ruiz et al. 2013). Predominant explanations for health advantages despite predominant socioeconomic disadvantage include hypotheses about stronger social supports and salubrious cultural values as well as potential selectivity of healthy in-migrants and unhealthy out-migrants to the US (National Research Council 1999; Jasso et al. 2004; Palloni and Arias 2004; Mulvaney-Day et al. 2007; Hamilton et al. 2011). An important dimension of the former set of hypotheses about sociocultural protection is the role of context, in particular residence in an 'immigrant enclave.' Residential homogeneity on ethnicity, immigrant status and/or language is hypothesized to support information exchange and shared cultural norms and life-styles (Espino et al. 2001; Ostir et al. 2003; Eschbach et al. 2004; Eschbach et al. 2005; Cagney et al. 2007; Lee and Ferraro 2007; Lee 2009; Viruell-Fuentes and Schutz 2009; Osypuk et al. 2010; Aranda et al. 2011).

We know of only three studies, however, to have examined the contextual dimensions of cognitive health of Hispanics, or Mexican Americans in particular (Espino et al. 2001; Simpao et al. 2005; Sheffield and Peek 2009). All three studies suffer generalizability limitations; two were unable to address nativity (Espino et al. 2001; Simpao et al. 2005) and they reached conflicting findings. Sheffield and Peek (2009) provide provisional evidence for immigrant status and Mexican American residential homogeneity protecting cognitive health. By contrast, Espino and colleagues (2001; 2005) found that Mexican Americans living in "low income, almost exclusively Mexican American neighborhoods, where a highly traditional Mexican American cultural orientation predominated" actually had *poorer* cognition than Mexican Americans living in "middle, income ethnically balanced" or "high income, predominantly European-American" neighborhoods. This raises a provocative alternative – or even complementary hypothesis— about the apparently stronger role of neighborhood socioeconomic disadvantage than hypothesized ethnic homogeneity in shaping Mexican American's cognitive health.

As a counterpoint to sociocultural and socioeconomic hypotheses about immigrant advantages and racial/ethnic disadvantages, other studies have argued that health-selective migration and health-selective mortality may account for 'paradoxical' health patterns by race/ethnicity and nativity (Manton and Stallard 1981; Vaupel and Yashin 1985; Palloni and Arias 2004; Palloni and Ewbank 2004; Markides and Eschbach 2005). Due to the relative paucity of literature on

[1] The only other sample that has been studied was restricted to Sacramento adults and also found null results.(Haan et al. 2011)

ethnicity, nativity and cognitive health, the implications of such forms of selectivity in the adult US population are not well understood.

This study examines the following questions:

1) Are there differences in the onset of cognitive impairment between foreign-born Mexican Americans and native-born Mexican Americans, or between native-born Mexican Americans and non-Hispanic whites? How do any observed cognitive disadvantages for Mexican Americans compare with those for native-born non-Hispanic blacks?
2) Do the characteristics of the neighborhoods in which older adults live help to explain any observed cognitive health advantages or disadvantages and their inter-relationships with ethnic origin and nativity?
3) What role does selection play in explaining any observed cognitive health advantages or disadvantages and their inter-relationships with ethnic origin and nativity?

METHODS

Data and Measures

Data come from the Health and Retirement Study (HRS), a nationally-representative longitudinal household survey of retirement and health among the elderly in the U.S. In 1992, the HRS conducted a household probability sample of non-institutionalized men and women age 51-61 in 1992, and their partners or spouses, oversampling of Hispanics, blacks and residents of Florida. This sample has been followed biennially since 1992. The initial response rate was 81.6%, with rates for subsequent biennial waves above 85% (HRS 2014). Our primary data source is the RAND-HRS,[2] a cleaned and streamlined collection of the public-use variables collected by the HRS.

Cognitive function is assessed in the HRS using a modified version of the Telephone Interview for Cognitive Status (TICS) (Ofstedal et al. 2005), which was modeled after the Mini-Mental State Exam (Folstein et al. 1975). The TICS employed here is reported on a 27-item scale with higher values indicating better cognitive functioning. Based on prior literature, we categorize individuals as having cognitive impairment if their TICS score was 10 or less (Langa et al. 2001; Langa et al. 2005; Langa et al. 2008). The TICS cannot be implemented to respondents who are unable to be interviewed directly (i.e., respondents interviewed by proxy). For these respondents, cognitive functioning is assessed using the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) (Ofstedal et al. 2005). Again, based on prior literature, the IQCODE data, along with other HRS measures of daily functioning, are used to categorize respondents as having cognitive impairment or normal cognitive functioning (Langa et al. 2001; Langa et al. 2005; Langa et al. 2008).

Using the RAND-HRS, we also obtain the survey interview status of each respondent at every wave as either a respondent, a living non-respondent, or a respondent who had died. Death dates are ascertained both by the HRS directly and by linkage to the National Death Index. Among the living non-respondents, the HRS identifies those who have been dropped from the sample (upon the respondent's request).

In addition, we obtain background information on the respondents' age, gender, highest level of education, marital status in 2000 and the net value of the total wealth in 2000. The assessment

[2] RAND HRS Data, Version M. This dataset is produced by the RAND Center for the Study of Aging, with funding from the National Institute on Aging and the Social Security Administration.

of total wealth comes from a detailed series of questions from which the HRS has imputed estimates for item non-response. Respondents report their race (white/Caucasian; black/African American; or other), foreign-born versus US—born nativity, whether they consider themselves to be Hispanic or Latino, and among those identifying Hispanic or Latino origins, whether they are Mexican American/Chicano, Puerto Rican, Cuban American, or "something else". Using these data we are able to identify in sufficient numbers for analysis respondents who are US-born non-Hispanic white, US-born non-Hispanic black, US-born Mexican American/Chicano, and foreign-born Mexican American/Chicano. Heretofore we refer to the latter two groups as US-born Mexican Americans and foreign-born Mexican Americans.

Finally, using the RAND-HRS in conjunction with the restricted-use HRS geographical datafile, we are able to link selected Census data on the social and demographic characteristics of each respondent's residential census tract in 2000. We link data on the proportion of the population in the 2000 census tract that is foreign-born; and the proportion of households in the 2000 census tract with income below 100 percent of the poverty level.

Analysis Plan and Statistical Models

Our analysis is restricted to the sample of HRS respondents selected in 1992 and their spouses who were observed at ages 51 or older in 2000 as part of the community-dwelling sample and who designated a racial/ethnic origins and nativity of US-born non-Hispanic white, US-born non-Hispanic black, US-born Mexican American, or foreign-born Mexican American (N=8,741). Although the HRS added cohorts in 1993 and 1998, we chose not to include these respondents in our analysis because we observed an overall increase in the TICS scores for the 1998 cohort in 2000 suggesting the second-administration practice-effects for the measurement of cognitive function, which has been observed elsewhere(Frank et al. 1996; Salthouse and Tucker-Drob 2008). We also chose not to include the 1993 cohort because they were older than the 1992 cohort at their first assessment and preliminary analyses suggested that disparities by race/ethnicity and nativity operated differently in this cohort, raising substantive questions beyond the scope of this analysis. Our choice of the 2000 baseline was informed both by the fact that the TICS was not administered until the 1998 and that residential census tract information could be most cleanly matched to the 2000 baseline wave. From the 1992 HRS cohort we retain respondents with no item non-response on the individual, household, or neighborhood characteristics in 2000 (N=8,531).

Because the HRS imputed missing data on wealth and obtained the highest educational attainment using data reported at any wave, sample loss due to item non-response in 2000 is almost entirely determined by a few cases with missing information on the 2000 census tract of residence. From this sample we determine that the sample-weighted prevalence of cognitive impairment in 2000 is 10% for US-born non-Hispanic whites, 35% for US-born non-Hispanic blacks, 27% for US-born Mexican Americans, and 40% for foreign-born Mexican Americans. Although these unadjusted distributions show a statistically significant immigrant *dis*advantage for Mexican Americans, in models that adjust for the individual social and economic characteristics (and most notably education and wealth), we do observe that the prevalence of cognitive impairment is lower among foreign-born than US-born Mexican Americans and that the prevalence is higher among US-born non-Hispanic blacks than either US-born non-Hispanic whites or US-born Mexican Americans. Our final sample for the longitudinal analyses presented here entail those respondents categorized as cognitively normal (i.e., without cognitive impairment) in 2000 (N=7,306).

We evaluate the magnitude and direction of differences by race/ethnicity and nativity in the likelihood of developing cognitive impairment using a competing risks extension of discrete-time hazards analysis. Our reference group is US-born Mexican Americans. In conventional discrete time-hazards analysis of cognitive impairment fit to the biennial HRS data, respondents would be censored from the risk pool: *after* the first biennial wave in which cognitive impairment is observed; *in and after* the wave the respondent exits the community-dwelling HRS sample (through non-response or entry into institutionalized care); *in and after* the respondent dies; or upon the end of the study period in 2010. Thus respondents in the sample are observed as either having remained cognitively normal between biennial waves (Y=0) or as having developed cognitive impairment between biennial waves (Y=1). We extend this model to assess the latter two potential selection mechanisms by including the competing risks of attrition and death along with the risk of cognitive impairment in the discrete time hazards analysis. Respondents in the competing risks model are censored *after* the first biennial wave in which cognitive impairment, attrition or death is observed, or upon the end of the study period, and respondents in the sample are observed as either having remained cognitively normal (Y=0); having developed cognitive impairment (Y=1); having undergone attrition (Y=2); or having died (Y=3) between the biennial waves. The model is estimated using a multinomial logistic regression model for the log-odds of incident cognitive, attrition, or death relative to remaining cognitively normal in which we employ age as the exposure time variable. All analyses employ year 2000 sample weights provided by the HRS to make nationally-representative inferences and adjust for the stratified sampling and the clustering of households within neighborhoods.

PRELIMINARY RESULTS

Descriptive statistics for the sample of cognitively normal US-born non-Hispanic white, US-born non-Hispanic black, US-born Mexican American, and foreign-born Mexican American adults ages 51 and older in 2000 who comprise our sample are displayed in Table 1. The foreign-born Mexican Americans are seen to have the fewest years of education (by a substantial margin, at approximately 5 years less than US-born Mexican Americans, and 6-7 years less than the US born white or black population). This group also has the least amount of wealth (although on this measure the US-born non-Hispanic white sample is considerably higher than any of the other groups.) We find that at the 2000 baseline, foreign-born Mexican Americans resided in census tracts that had the highest concentrations of foreign-born residents (on average 22% of the population is foreign-born) and of poverty (on average 30% of households live below the federal poverty level). Neighborhood conditions for US-born Mexican Americans are similar but slightly less pronounced, 19% of the households were below the federal poverty level and 22% of the population was foreign born. Rates of marriage and partnership for foreign-born and US-born Mexican Americans adults are about 70%, this is a level substantially higher than for US-born non-Hispanic blacks (53%) but lower than for US-born whites (78%). Foreign-born Mexican Americans are the group least likely to have never married (less than 2%) and, with US-Born Mexican Americans have a lower likelihood of being divorced than either US-Born non-Hispanic whites or US-born non-Hispanic blacks.

[Table 1 about here]

Our first analysis evaluates whether there are immigrant health advantages or racial/ethnic health disadvantages in the onset of cognitive impairment. In Table 2 we report the findings from discrete-time multinomial logistic regression models estimating the relative biennial log-odds of developing incident cognitive impairment with competing risks of attrition or death relative to remaining cognitively normal. This model also adjusts for individual and household

social and economic characteristics. We observe health advantages among foreign-born Mexican Americans as well as racial/ethnic health disadvantages among both US-born Mexican Americans and US-born non-Hispanic blacks, with the largest disadvantages to US-born non-Hispanic blacks. The biennial odds of incident CI for foreign-born Mexican Americans are almost half (exp(-0.60)=0.55) those for US-born Mexican Americans. In contrast, the biennial odds of incident CI is (1/(exp(-0.44)=) 1.56 times larger for US-born Mexican Americans as US-born non-Hispanic whites, and again (exp(0.45)=1.56 times larger for US-born non-Hispanic blacks than for US-born Mexican Americans.

[Table 2 about here]

We next examine models considering potential neighborhood-level contributions to immigrant advantage and racial/ethnic disadvantage. In Table 3, we report findings from an extension of the previous model that not only adjusts for individual characteristics, but also the neighborhood indicators for residence in an immigrant enclave and residence in an impoverished community (measured respectively by census tract proportion foreign-born and census tract proportion below the poverty level). We find that residing in a more impoverished neighborhood (as measured by the census tract proportion below the poverty level) is independently associated with the biennial hazard to cognitive impairment, but residing in an immigrant enclave (as measured by the proportion foreign-born) was not. The immigrant health advantages of foreign-born Mexican Americans remain largely unchanged, with a slight increase in the advantage. These findings are consistent with an improvement adjustment in this model for the neighborhood-level (as well as individual-level) socioeconomic resources which comparison between Table 2 and Table 3 suggest previously suppressed our ability to detect the immigrant advantage of Mexican-Americans. The racial/ethnic health disadvantages of US-born Mexican Americans and non-Hispanic also remain largely unchanged, although with a slight decrease in the disadvantage of US-born Mexican Americans relative to US-born non-Hispanic whites and a slight increase in the disadvantages of US-born non-Hispanic blacks relative to US-born Mexican Americans. Similarly, our descriptive findings on the greater exposure of US-born Mexican Americans to neighborhood poverty (relative to either US-born non-Hispanic whites or US-born non-Hispanic blacks) is consistent with our findings of a reduced disparity between US-born Mexican Americans and US-born non-Hispanic whites and an increased disparity between US-born Mexican Americans and US-born non-Hispanic blacks, after adjusting for neighborhood poverty.

[Table 3 about here]

Finally, our assessment of the competing risks of attrition and death indicate that there are no statistically significant differences in the likelihood of attrition or death by nativity of Mexican Americans or by race and Mexican ethnic origins of US-born older adults (see Table 2). In the models that also adjust for the neighborhood characteristics (Table 3), we observe that only the census-tract proportion of foreign born is independently associated with selection, and only through the selection mechanism of exit from the sample via non-response or institutionalization. We find that a higher proportion of foreign born is positively associated with increased non-response or institutionalization.

DISCUSSION OF PRELIMINARY ANALYSES

In preliminary analyses we have observed immigrant health advantages on the incidence of CI among Mexican Americans in a nationally-representative sample of US older adults, and we have found racial/ethnic disparities among US-born older adults in the likelihood of developing

cognitive impairment, with the largest disadvantages to non-Hispanic blacks followed by Mexican-Americans. Our preliminary examinations of the role of neighborhood-level poverty and immigrant concentration provide no evidence that residence in an immigrant enclave is associated with the onset of cognitive impairment. However, we do find that residence in an impoverished neighborhood is not only independently associated with an increase in the onset of cognitive impairment, but that failure to adjust for this neighborhood-level aspect of social and economic resources leads to both downwardly biased estimates of Mexican American immigrant cognitive advantages and upwardly biased estimates of the Mexican American US-born cognitive disadvantages.

Even these preliminary analyses strengthen our understanding of immigrant health advantages on cognition and provide national generalizability to the previously null findings or only provisional evidence for immigrant health advantages on cognition observed in older adults from Southwestern states in the Hispanic Established Populations for Epidemiologic Studies of the Elderly (HEPESE) and other geographically restricted samples(Nguyen et al. 2002; Collins et al. 2009; Sachs-Ericsson et al. 2009; Sheffield and Peek 2009; Haan et al. 2011; Hill et al. 2012b; Hill et al. 2012a). Among the only two sets of studies not observing null findings, Sheffield and Peek (2009) observed an unadjusted immigrant advantage in the HEPESE, and, in adjusted models, that living in areas with a greater concentration of Mexican Americans decreased the likelihood of cognitive decline. In contrast, Hill and colleagues (2012a; 2012b) had reported immigrant advantages on cognition for a subset of foreign-born Mexican Americans in the HEPESE (i.e., those immigrating between ages 20 and 50). Our findings of immigrant health advantages to Mexican Americans on the onset of cognitive impairment is important given that Mexican Americans comprise the largest subset of the Hispanic population and population growth among Hispanics now accounts for more than half of the country's total population growth(Ennis et al. 2011). Furthermore, the fact that we observed these advantages in a nationally-representative sample is critical given that more than half of all Hispanics now live outside of traditional gateway states in the Southwest (Johnson and Lichter 2008).

We have also begun to develop insights about the potential role of neighborhood factors and of selection in the immigrant cognitive advantages and racial/ethnic cognitive disadvantages. An expanding literature has examined the role of neighborhood contextual processes, and residential homogeny in specific, in explaining immigrant advantages on a range of health outcomes (Ostir et al. 2003; Eschbach et al. 2004; Eschbach et al. 2005; Cagney et al. 2007; Lee and Ferraro 2007; Lee 2009; Viruell-Fuentes and Schutz 2009; Osypuk et al. 2010; Aranda et al. 2011). We know of only one study to have considered cognitive health outcomes (Sheffield and Peek 2009), and as noted above, their findings for the HEPESE observed no immigrant advantages on incident cognitive decline in models adjusting for individual-level social and economic characteristics. They do, however, find that an indicator for residential ethnic homogeny (census tract proportion Mexican American) was protective of incident cognitive decline. Both of these findings are at odds with our findings, and in future analyses, we intend to examine whether our findings are sensitive to alternative individual and neighborhood measures. For example, we were able to assess social and economic characteristics using a more detailed measure of wealth than available in the HESEPSE. Thus our individual-level measures may have allowed us to better adjust for socioeconomic differences between immigrant and US-born Mexican Americans, leading to less suppression of immigrant advantages which may have led to null effects in previous studies, including that by Sheffield and Peek. Additionally, although Sheffield and Peek were able to adjust for neighborhood poverty, the null findings of other studies that did not include such a control may have also been suppressed by inadequate controls for the neighborhood dimensions of immigrant Mexican

American's socioeconomic disadvantage. The suppression effects we observed in our models without the neighborhood-level controls support this supposition.

We also recognize that our null findings for the potential neighborhood dimensions of immigrant advantages may be because our measure of census tract proportion foreign-born inadequately captures the sociocultural context. Although previous research has employed our measure (Cagney et al.), many of the other studies on the neighborhood dimensions of immigrant Mexican American advantages have instead employed the census tract proportion Mexican American (Ostir et al. 2003; Eschbach et al. 2004; Kimbro 2009; Lee 2009; Aranda et al. 2011). Recent research on the neighborhood dimensions of immigrant advantage has highlighted the importance of distinguishing between residence in an immigrant enclave (measured by functions of the census tract proportion foreign-born) and residence in an ethnic enclave (measured by a function of the census tract proportion Mexican American) (Osypuk et al.). It is noteworthy, however, that even with this more detailed assessment, only racial/ethnic disadvantages among Mexican American natives and not immigrant advantages were observed.

Our findings on the contextual dimensions of cognitive health disadvantages of US-born Mexican American and non-Hispanic blacks extend existing literature. Although not specific to Mexican Americans, other studies have observed Hispanic cognitive health disadvantages in the HRS when race/ethnicity was included as a demographic control variable (Herzog and Wallace 1997; Wight et al. 2006; Hurd et al. 2013). In fact, one of these studies observed that the poorer cognitive health of Hispanics compared to non-Hispanic whites was reduced in magnitude and became non-significant once census tract measures of the neighborhood educational composition and income levels were controlled (Wight et al. 2006). They conclude that "targeted studies are needed to fully investigate how neighborhood socioeconomic characteristics may be uniquely consequential to older Hispanics." Our preliminary analyses begin to address this research gap. We intend to do so more fully in future analyses that examine alternative indicators of contextual sociocultural protection and socioeconomic disadvantage.

Finally, studies on the immigrant health paradox have described two types of health-selective migration that could explain health advantages among foreign-born adults. First, they argue that immigrants are in general a healthier subset of the sending population, and secondly they argue that return-migrants are in general a *less* healthy subset of the foreign-born population residing in the US. In addition, studies have described how health-selective mortality can change the composition of aging populations so that there is a 'crossover' in the trajectory of differences in health or mortality between two ethnic groups (e.g., typically between non-Hispanic blacks and whites)(Manton and Stallard 1981; Vaupel and Yashin 1985; Palloni and Ewbank 2004). Our analyses of the competing risks of attrition and mortality have allowed us to shed light on the latter two selection mechanisms. Although it is beyond the scope of this study to compare the cognitive health of return migrants to Mexico and immigrants who remained in the US, we found no evidence that there was differential attrition (which includes return-migration, loss to follow-up, and institutionalization) between Mexican immigrants. In addition, we found no evidence of mortality-selection operating differentially by race/ethnicity or nativity; however it is notable that all models assumed proportionality of these contrasts with increased duration of exposure to the risk pool (as measured by elapsed age). We anticipate conducting further sensitivity of our analyses to evaluate whether differences, especially between non-Hispanic blacks and non-Hispanic whites may have been suppressed by assuming that racial-disparities were proportional over time.

References

Aranda, M. P., L. A. Ray, S. A. Snih, K. J. Ottenbacher, and K. S. Markides. 2011. "The protective effect of neighborhood composition on increasing frailty among older Mexican Americans: a barrio advantage?" *Journal of aging and health* 23(7):1189-217.

Cagney, K. A., C. R. Browning, and D. M. Wallace. 2007. "The Latino paradox in neighborhood context: the case of asthma and other respiratory conditions." *American journal of public health* 97(5):919-25.

Collins, N., N. Sachs-Ericsson, K. J. Preacher, K. M. Sheffield, and K. Markides. 2009. "Smoking increases risk for cognitive decline among community-dwelling older Mexican Americans." *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry* 17(11):934-42.

Ennis, Sharon R., Merarys Ríos-Vargas, and Nora G. Albert. 2011. *The Hispanic Population: 2010*: US Census Bureau.

Eschbach, K., J. D. Mahnken, and J. S. Goodwin. 2005. "Neighborhood composition and incidence of cancer among Hispanics in the United States." *Cancer* 103(5):1036-44.

Eschbach, K., G. V. Ostir, K. V. Patel, K. S. Markides, and J. S. Goodwin. 2004. "Neighborhood context and mortality among older Mexican Americans: is there a barrio advantage?" *American journal of public health* 94(10):1807-12.

Espino, D. V., M. J. Lichtenstein, R. F. Palmer, and H. P. Hazuda. 2001. "Ethnic differences in mini-mental state examination (MMSE) scores: where you live makes a difference." *Journal of the American Geriatrics Society* 49(5):538-48.

Folstein, M.F., S.E. Folstein, and P.R. McHugh. 1975. "Mini-Mental State: A practical method for grading the cognitive state of patients for the clinician." *Journal of Psychiatric Research* 12 189-98.

Frank, R., W. C. Wiederholt, D. KritzSilverstein, D. P. Salmon, and E. BarrettConnor. 1996. "Effects of sequential neuropsychological testing of an elderly community-based sample." *Neuroepidemiology* 15(5):257-68.

Haan, M. N., A. Zeki Al-Hazzouri, and A. E. Aiello. 2011. "Life-span socioeconomic trajectory, nativity, and cognitive aging in Mexican Americans: the Sacramento Area Latino Study on Aging." *The journals of gerontology. Series B, Psychological sciences and social sciences* 66 Suppl 1:i102-10.

Hamilton, E. R., J. B. Cardoso, R. A. Hummer, and Y. C. Padilla. 2011. "Assimilation and emerging health disparities among new generations of US children." *Demographic Research* 25:783-818.

Herzog, A. R., and R. B. Wallace. 1997. "Measures of cognitive functioning in the AHEAD study." *Journals of Gerontology Series B-Psychological Sciences and Social Sciences* 52:37-48.

Hill, T. D., J. L. Angel, K. S. Balistreri, and A. P. Herrera. 2012a. "Immigrant status and cognitive functioning in late-life: an examination of gender variations in the healthy immigrant effect." *Social science & medicine* 75(12):2076-84.

Hill, Terrence D., Jacqueline L. Angel, and K. S. Balistreri. 2012b. "Does the 'Healthy Immigrant Effect' Extend to Cognitive Aging?" Pp. 19-33 in *Aging, Health and Longevity in the Mexican-Origin Population*, edited by Jacqueline Angel, Fernando torres-Gil, and Kyriakos Markides. New York: Springer.

HRS. 2014. "Sample Sizes and Response Rates."

Hurd, M. D., P. Martorell, A. Delavande, K. J. Mullen, and K. M. Langa. 2013. "Monetary Costs of Dementia in the United States." *New England Journal of Medicine* 368(14):1326-34.

Jasso, Guillermina, Douglas S. Massey, Mark R. Rosenzweig, and and James P. Smith. 2004. "Immigrant Health: Selectivity and Acculturation." Pp. 227-66 in *Critical Perspectives on*

Racial and Ethnic Differences in Health in Late Life, edited by Norman B. Anderson, Rodolfo A. Bulatao, and Barney Cohen. Washington, D.C.: National Academies Press.
Johnson, K. M., and D. T. Lichter. 2008. "Natural increase: A new source of population growth in emerging Hispanic destinations in the United States." *Population and Development Review* 34(2):327-+.
Kimbro, R.T. 2009. "Acculturation in Context: Gender, Age at Migration, Neighborhood Ethnicity, and Health Behaviorsn." *Social Science Quarterly* 90(5):1145-66.
Langa, K. M., M. E. Chernew, M. U. Kabeto, A. R. Herzog, M. B. Ofstedal, R. J. Willis, R. B. Wallace, L. M. Mucha, W. L. Straus, and A. M. Fendrick. 2001. "National estimates of the quantity and cost of informal caregiving for the elderly with dementia." *Journal of General Internal Medicine* 16(11):770-78.
Langa, K. M., E. B. Larson, J. H. Karlawish, D. M. Cutler, M. U. Kabeto, S. Y. Kim, and A. B. Rosen. 2008. "Trends in the prevalence and mortality of cognitive impairment in the United States: Is there evidence of a compression of cognitive morbidity?" *Alzheimers & Dementia* 4(2):134-44.
Langa, K. M., B. L. Plassman, R. B. Wallace, A. R. Herzog, S. G. Heeringa, M. B. Ofstedal, J. R. Burke, G. G. Fisher, N. H. Fultz, M. D. Hurd, G. G. Potter, W. L. Rodgers, D. C. Steffens, D. R. Weir, and R. J. Willis. 2005. "The aging, demographics, and memory study: Study design and methods." *Neuroepidemiology* 25(4):181-91.
Lee, M. A. 2009. "Neighborhood residential segregation and mental health: a multilevel analysis on Hispanic Americans in Chicago." *Social science & medicine* 68(11):1975-84.
Lee, M. A., and K. F. Ferraro. 2007. "Neighborhood Residential Segregation and Physical Health among Hispanic Americans: Good, Bad, or Benign?" *Journal of Health and Social Behavior* 48(2):131-48.
Manton, K. G., and E. Stallard. 1981. "Methods for Evaluating the Heterogeneity of Aging Processes in Human-Populations Using Vital Statistics Data - Explaining the Black-White Mortality Crossover by a Model of Mortality Selection." *Human Biology* 53(1):47-67.
Markides, K. S., and K. Eschbach. 2005. "Aging, migration, and mortality: current status of research on the Hispanic paradox." *The journals of gerontology. Series B, Psychological sciences and social sciences* 60 Spec No 2:68-75.
Mulvaney-Day, N. E., M. Alegria, and W. Sribney. 2007. "Social cohesion, social support, and health among Latinos in the United States." *Social science & medicine* 64(2):477-95.
National Research Council. 1999. *Children of Immigrants: Health, Adjustment, and Public Assistance*. Washington, D.C.: National Academy Press.
Nguyen, H. T., S. A. Black, L. A. Ray, D. V. Espino, and K. S. Markides. 2002. "Predictors of decline in MMSE scores among older Mexican Americans." *The journals of gerontology. Series A, Biological sciences and medical sciences* 57(3):M181-5.
Ofstedal, MB, GG Fisher, and AR Herzog. 2005. "Documentation of cognitive functioning measures in the Health and Retirement Study."
Ostir, G. V., K. Eschbach, K. S. Markides, and J. S. Goodwin. 2003. "Neighbourhood composition and depressive symptoms among older Mexican Americans." *Journal of epidemiology and community health* 57(12):987-92.
Osypuk, T. L., L. M. Bates, and D. Acevedo-Garcia. 2010. "Another Mexican birthweight paradox? The role of residential enclaves and neighborhood poverty in the birthweight of Mexican-origin infants." *Social science & medicine* 70(4):550-60.
Palloni, A., and E. Arias. 2004. "Paradox lost: Explaining the Hispanic adult mortality advantage." *Demography* 41(3):385-415.
Palloni, Alberto, and Douglas C. Ewbank. 2004. "Selection processes in the study of racial and ethnic differentials in adult health and mortality." Pp. 171-226 in *Critical perspectives on*

racial and ethnic differences in health in late life, edited by Barney Cohen, Randy A. Bulatao, and Norman B. Anderson: National Academies Press.
Ruiz, J. M., P. Steffen, and T. B. Smith. 2013. "Hispanic Mortality Paradox: A Systematic Review and Meta-Analysis of the Longitudinal Literature." *American journal of public health* 103(3):E52-E60.
Sachs-Ericsson, N., E. Corsentino, and J. R. Cougle. 2009. "Problems meeting basic needs predict cognitive decline in community-dwelling Hispanic older adults." *Journal of aging and health* 21(6):848-63.
Salthouse, T. A., and E. M. Tucker-Drob. 2008. "Implications of Short-Term Retest Effects for the Interpretation of Longitudinal Change." *Neuropsychology* 22(6):800-11.
Sheffield, K. M., and M. K. Peek. 2009. "Neighborhood context and cognitive decline in older Mexican Americans: results from the Hispanic Established Populations for Epidemiologic Studies of the Elderly." *American Journal of Epidemiology* 169(9):1092-101.
Simpao, M. P., D. V. Espino, R. F. Palmer, M. J. Lichtenstein, and H. P. Hazuda. 2005. "Association between acculturation and structural assimilation and mini-mental state examination-assessed cognitive impairment in older Mexican Americans: findings from the San Antonio Longitudinal Study of Aging." *Journal of the American Geriatrics Society* 53(7):1234-9.
Vaupel, J. W., and A. I. Yashin. 1985. "Heterogeneity's ruses: some surprising effects of selection on population dynamics." *The American statistician* 39(3):176-85.
Viruell-Fuentes, E. A., and A. J. Schutz. 2009. "Toward a Dynamic Conceptualization of Social Ties and Context: Implications for Understanding Immigrant and Latino Health." *American journal of public health* 99(12):2167-75.
Wight, R. G., C. S. Aneshensel, D. Miller-Martinez, A. L. Botticello, J. R. Cummings, A. S. Karlamangla, and T. E. Seeman. 2006. "Urban neighborhood context, educational attainment, and cognitive function among older adults." *American Journal of Epidemiology* 163(12):1071-78.

Table 1. Sample descriptive statistics (means or proportions) for cognitively normal US-born non-Hispanic whites, US-born non-Hispanic blacks, and US-born and foreign-born Mexican Americans aged 51 and older in the Health and Retirement Survey, 2000

	Total Sample	US-born Mexican-American	US-born non-Hispanic white	US-born non-Hispanic black	Foreign-born Mexican-American	Difference by race/ ethnicity and nativity (p-value)
Female gender	0.55	0.52	0.55	0.60	0.61	0.01
Highest educational attainment (years)	12.9	10.6	13.1	12.4	5.8	<0.001
Marital status						<0.001
Married	0.74	0.66	0.76	0.49	0.69	
Partnered	0.02	0.04	0.02	0.03	0.04	
Separated/divorced	0.11	0.17	0.10	0.24	0.13	
Widowed	0.10	0.09	0.10	0.18	0.12	
Never-married	0.03	0.04	0.03	0.05	0.02	
Total assets ($, log transformed)	11.71	10.42	11.95	9.50	9.29	<0.001
Birth year	1936.4	1937.6	1936.6	1936.8	1938.1	<0.001
Proportion foreign-born	0.079	0.204	0.072	0.085	0.303	<0.001
Proportion below the poverty level	0.111	0.187	0.091	0.195	0.215	<0.001
Sample N	7,153	217	5,933	867	136	

Data are restricted to the Health and Retirement Survey (HRS) cohort initially sampled in 1992. Means and proportions are weighted using sample weights for 2000 provided by the HRS and the test for differences across the groups adjusts for the stratified sampling design and the clustering of households within census tracts.

Table 2. Multinomial log-odds of biennial hazards of cognitive impairment, attrition, or death predicted by individual characteristics

	Cognitive impairment			Attrition			Death		
	estimate	SE	p-value	estimate	SE	p-value	estimate	SE	p-value
Intercept	-4.00	0.16	<0.001	-4.08	0.26	<0.001	-5.63	0.29	<0.001
Age (time-varying, centered at 55 years)	0.14	0.01	<0.001	0.06	0.01	<0.001	0.16	0.01	<0.001
Individual characteristics									
Race/ethnicity and nativity (reference: US-born Mexican American)									
Foreign-born Mexican American	-0.60	0.22	0.006	-0.16	0.39	0.690	-0.36	0.43	0.400
US-born non-Hispanic white	-0.44	0.14	0.002	-0.17	0.23	0.473	0.04	0.26	0.879
US-born non-Hispanic black	0.45	0.15	0.003	0.23	0.25	0.362	0.13	0.29	0.641
Female gender (reference: Male)	-0.30	0.06	<0.001	-0.12	0.06	0.044	-0.62	0.08	<0.001
Highest educational attainment (centered at 12 years)	-0.17	0.01	<0.001	-0.04	0.02	0.027	-0.06	0.02	0.001
Marital status (reference: married)									
Partnered	0.12	0.17	0.483	0.12	0.25	0.636	0.80	0.19	<0.001
Separated/divorced	-0.02	0.09	0.855	0.16	0.13	0.225	0.53	0.13	<0.001
Widowed	-0.05	0.09	0.593	-0.20	0.14	0.142	0.48	0.13	<0.001
Never married	0.13	0.17	0.442	0.44	0.20	0.026	0.27	0.25	0.294
Assets in 2000 (natural logarithm, centered at 10)	-0.06	0.01	<0.001	0.00	0.02	0.993	-0.08	0.01	<0.001
Birth year (centered at 1936)	0.07	0.01	<0.001	0.08	0.01	<0.001	0.10	0.01	<0.001

Notes: standard error=SE. Data come from the 2000-2010 waves of the Health and Retirement Survey (HRS) and are restricted to the cohort initially sampled in 1992. Estimates are weighted using sample weights for 2000 provided by the Health and Retirement Survey and standard errors and p-values adjust for the stratified sampling design and the clustering of households within census.

Table 3. Multinomial log-odds of biennial hazards of cognitive impairment, attrition, or death predicted by individual and neighborhood characteristics

	Cognitive impairment			Attrition			Death		
	estimate	SE	p-value	estimate	SE	p-value	estimate	SE	p-value
Intercept	-4.28	0.18	<0.001	-4.39	0.32	<0.001	-5.70	0.33	<0.001
Age (time-varying, centered at 55 years)	0.14	0.01	<0.001	0.06	0.01	<0.001	0.17	0.01	<0.001
Individual characteristics									
Race/ethnicity and nativity (reference: US-born Mexican American)									
Foreign-born Mexican American	-0.63	0.22	0.005	-0.31	0.39	0.432	-0.36	0.43	0.405
US-born non-Hispanic white	-0.31	0.15	0.037	0.03	0.26	0.920	0.05	0.28	0.851
US-born non-Hispanic black	0.48	0.15	0.002	0.40	0.27	0.130	0.10	0.30	0.742
Female gender (reference: Male)	-0.30	0.06	<0.001	-0.12	0.06	0.052	-0.61	0.08	<0.001
Highest educational attainment (centered at 12 years)	-0.17	0.01	<0.001	-0.04	0.02	0.013	-0.05	0.02	0.002
Marital status (reference: married)									
Partnered	0.13	0.17	0.436	0.10	0.25	0.690	0.78	0.19	<0.001
Separated/divorced	-0.03	0.09	0.723	0.13	0.14	0.338	0.51	0.13	<0.001
Widowed	-0.06	0.09	0.510	-0.21	0.14	0.121	0.47	0.13	<0.001
Never married	0.11	0.17	0.527	0.38	0.20	0.058	0.26	0.25	0.302
Assets in 2000 (natural logarithm, centered at 10)	-0.05	0.01	<0.001	0.00	0.02	0.930	-0.08	0.01	<0.001
Birth year (centered at 1936)	0.07	0.01	<0.001	0.08	0.01	<0.001	0.10	0.01	<0.001
Neighborhood characteristics									
Proportion foreign-born	0.29	0.30	0.347	1.31	0.51	0.010	-0.16	0.46	0.731
Proportion below the poverty level	1.08	0.30	<0.001	0.10	0.57	0.859	0.62	0.49	0.204

Notes: standard error=SE. Data come from the 2000-2010 waves of the Health and Retirement Survey (HRS) and are restricted to the cohort initially sampled in 1992. Estimates are weighted using sample weights for 2000 provided by the Health and Retirement Survey and standard errors and p-values adjust for the stratified sampling design and the clustering of households within census.