

Invited Article

# Aging and Disability Among Hispanics in the United States: Current Knowledge and Future Directions

Marc A. Garcia, PhD,<sup>1,\*</sup> Brian Downer, PhD,<sup>1</sup> Michael Crowe, PhD,<sup>2</sup> and Kyriakos S. Markides, PhD<sup>3</sup>

<sup>1</sup>Division of Rehabilitation Sciences, Sealy Center on Aging, University of Texas Medical Branch. <sup>2</sup>Department of Psychology, University of Alabama at Birmingham. <sup>3</sup>Department of preventive medicine and Community Health, University of Texas Medical Branch, Galveston, Texas.

\*Address correspondence to: Marc A. Garcia, PhD, Center on Aging, University of Texas Medical Branch, 301 University Boulevard Sealy, Galveston, TX 77555-0177. E-mail: [marcagar@utmb.edu](mailto:marcagar@utmb.edu)

Received: June 15, 2017; Editorial Decision Date: August 27, 2017

Decision Editor: J. Jill Suitor, PhD

## Abstract

**Background and Objectives:** Hispanics are the most rapidly aging minority population in the United States. Our objective is to provide a summary of current knowledge regarding disability among Hispanics, and to propose an agenda for future research.

**Research Design and Methods:** A literature review was conducted to identify major areas of research. A life course perspective and the Hispanic Paradox were used as frameworks for the literature review and for identifying future areas of research.

**Results:** Four research areas were identified: (1) Ethnic disparities in disability; (2) Heterogeneity of the U.S. older Hispanic population; (3) Risk factors for disability; and (4) Disabled life expectancy. Older Hispanics are more likely than non-Hispanic whites to be disabled or to become disabled. Disability varied by country of origin, nativity, age of migration, and duration in the United States. Important risk factors for disability included chronic health conditions, depression, and cognitive impairment. Protective factors included positive affect and physical activity. Older Hispanics have longer life expectancy than non-Hispanic whites but spend a greater proportion of old age disabled. Future research should continue to monitor trends in disability as younger generations of Hispanics reach old age. Attention needs to be given to regional variation within the United States for disability prevalence, early-life risk factors, and factors that may contribute to variation in disabled life expectancy. There is also an urgent need for interventions that can effectively prevent or delay the onset of disability in older Hispanics.

**Discussion and Implications:** Considerable research has examined disability among older Hispanics, but continued research is needed. It is important that research findings be used to inform public policies that can address the burden of disability for older Hispanic populations.

**Translational Significance:** The highly diverse and rapidly aging Hispanic population of the United States is long living overall but by old age it is generally characterized by high rates of disability and comorbidity. High-disability rates translate into high caregiver burden on families dealing with serious life stressors, both economic and psychosocial, on top of poor access to medical care.

**Keywords:** Disabilities, Function/mobility, Immigration, Latino/a (Mexican American)

The older population of the United States has experienced unprecedented growth in the past several decades. Hispanics are the fastest growing segment of this population. In 2010, 2.9 million U.S. Hispanics were 65 or older (7.1% of age 65+ population) and this number is projected to increase to over 17.5 million (19.8% of 65+ population) by 2050 (Vincent & Velkoff, 2010). These demographic projections underscore the importance of research on the health of older Hispanics.

Hispanic refers to any individual who is of Mexican, Cuban, Puerto Rican, South or Central American, or other Spanish origin. In 2012, 33.7 million Hispanics living in the United States were of Mexican origin, which accounted for 64% of the total U.S. Hispanic population (Gonzalez-Barrera & Lopez, 2013). Although the majority of U.S. Hispanics are of Mexican origin, Hispanics who are from Puerto Rico, Central and South America, and Cuba account for a substantial proportion of Hispanics living in the Eastern and Southern regions of the United States (Brown & Lopez, 2013). The terms Hispanic and Latino are often used interchangeably in research. For consistency, Hispanic will be used throughout this manuscript.

Disability can be defined as the difficulty or the inability to perform social roles and self-care tasks across any domain of life due to physical, sensory, emotional, or cognitive limitations (Verbrugge, 2016). Disability is a key indicator of population health and the prevalence of disability provides a useful global measure to assess current and future patterns of health for older populations. Disability is often measured by difficulty or inability to complete activities of daily living (ADLs) or instrumental activities of daily living (IADLs). According to the 2011 National Health and Aging Trends Study, 21% of all older adults reported needing help completing one or more ADLs (Freedman et al., 2014). Despite an increase in the prevalence of chronic health conditions, there is evidence for a decreasing trend in the prevalence of ADL and IADL disability in the 1980s through the early 2000s (Freedman, Martin, & Schoeni, 2002). This decline was attributed in part to a decrease in disability due to vascular conditions, vision impairment, and arthritis (Freedman, Schoeni, Martin, & Cornman, 2007). Although, more recent research indicates the declining prevalence in ADL and IADL disability has stabilized for older adults (Freedman et al., 2013).

## Objectives

Our first objective is to provide a thorough review of existing research on disability among older Hispanics. We use a life course perspective and the Hispanic paradox, which are briefly described in the following section, as frameworks for synthesizing the results from current research. We have organized this review according to four key areas

of disability research: (1) Ethnic disparities in disability; (2) Heterogeneity of the older U.S. Hispanic population; (3) Risk factors for disability; and (4) Disabled life expectancy. Our second objective is to propose areas of future research that can advance understanding of disability among older Hispanics.

## The Life Course

We frame our review of the disability literature from a life course perspective (Alwin, 2012; Dannefer, 2003; Ferraro & Kelley-Moore, 2003). This framework emphasizes that major life events and early-life experiences can affect future transitions, and trajectories in later life. Specifically, this framework posits that late-life outcomes are influenced by exposure to biological, behavioral, health, environmental, and social factors early in life and that the effects of these exposures accumulate over time and influence health in old age (Ben-Shlomo & Kuh, 2002; Dannefer, 2003; Ferraro & Kelley-Moore, 2003).

## Importance of the Hispanic Paradox on Health Outcomes Among Older Hispanics

Research on Hispanic health has been dominated by the concept of the Hispanic paradox. That is, Hispanics fare better than expected on several health outcomes relative to non-Hispanic whites despite lower socioeconomic status (Markides & Coreil, 1986; Markides & Eschbach, 2005). This finding is particularly robust for lower mortality and longer life expectancies among foreign-born Mexican Americans compared to non-Hispanic whites and blacks (Lariscy, Hummer, & Hayward, 2015). These findings have been attributed to selective migration of Hispanics who come to the United States, return migration of less healthy older persons, cultural factors that may lead to better health behaviors and strong family systems that are associated with greater longevity (Markides & Eschbach, 2011).

The Hispanic Paradox is important to consider for multiple reasons when studying late-life disability among older Hispanics. First, the advantage in life expectancy for Hispanics may not coincide with favorable health outcomes. Lower mortality without subsequent improvements in disability may lead to an overall deterioration in population health. The benefits of greater longevity will be undermined if the additional years lived are characterized by high levels of physical disability (Markides, Eschbach, Ray, & Peek, 2007). Second, the Hispanic Paradox has motivated research that has identified nativity, selective migration, age of migration to the United States, acculturation, and number of years lived in the United States to all be key factors that influence the life expectancy of Hispanics. The association between older age and increased disability makes it highly plausible that factors that influence longevity also influence disability.

## Literature Review

Our review revealed four major areas of disability research: (1) Ethnic disparities in disability; (2) Heterogeneity of the U.S. older Hispanic population; (3) Risk factors for disability; and (4) Disabled life expectancy. In the first and second sections, we describe the prevalence of disability among older Hispanics compared to non-Hispanic whites and highlight the variation between Hispanic subgroups. Section three describes the literature that has identified risk factors for disability in older Hispanics. Section four is a review of recent literature on disabled life expectancies.

### Ethnic Disparities in Disability

Research on disparities in disability initially focused on older non-Hispanic white and black adults. One of the first studies to include older Hispanics in disability research was conducted by [Stump, Clark, Johnson, and Wolinsky \(1997\)](#) using data from the Asset and Health Dynamics Among the Oldest Old (AHEAD). While disparities in disability prevalence was not the primary objective of their analyses, the authors reported that Hispanics aged 70 and older were more likely to report needing help, not being able to do, or having difficulty completing ADLs and IADLs compared to non-Hispanic whites and blacks ([Stump et al., 1997](#)). Several studies have reported older Hispanics to be more disabled or to have greater risk of becoming disabled than non-Hispanic whites ([Brenner & Clarke, 2016](#); [Warner & Brown, 2011](#); [Zsembik, Peek, & Peek, 2000](#)). The evidence for ethnic disparities in disability is not conclusive and there are studies that have observed little or no differences in disability between older Hispanics and non-Hispanic whites ([Latham, 2014](#)). Many studies that identified ethnic disparities in disability reported that these differences were explained by socioeconomic status and health characteristics ([Zsembik et al., 2000](#)), particularly for older men ([Brenner & Clarke, 2016](#); [Warner & Brown, 2011](#)).

### Heterogeneity of the U.S. Older Hispanic Population

Hispanics are a diverse segment of the U.S. population and include distinct subpopulations based on nativity, country of origin, and number of years lived in the United States. Research has identified substantial differences in socioeconomic status ([Arias, 2010](#)) and health ([Dominguez et al., 2015](#)) between Mexican, Puerto Rican, Dominican, and Central and South Americans. These differences make it necessary to consider nativity status and country of origin when studying disability among older Hispanics.

#### Nativity and country of origin

[Markides and colleagues \(2007\)](#) were the first to document disability patterns among older Hispanics by nativity and country of origin. Using 2000 Census data, the authors

used five items to measure disability in sensory, physical, mental, self-care, and mobility domains. Their findings indicated that both Hispanic men and women reported higher levels of disability at older ages than non-Hispanic whites, with Hispanic women exhibiting higher disability rates than their male counterparts. Among Hispanic subgroups, older Puerto Ricans exhibited the highest rates of disability regardless of gender. For men, Mexican Americans, Dominicans, and “other Hispanics” reported higher disability rates, Central Americans and Cubans had similar disability rates, and South Americans reported lower disability rates than non-Hispanic whites. For women, a similar pattern was observed. This study also documented an immigrant advantage in disability for “All Hispanics” and those of Mexican origin when compared to their U.S.-born counterparts. However, this advantage was not observed among women, which suggests weaker health selection among female migrants ([Markides et al., 2007](#)). This finding has been observed in other studies using the same data ([Markides & Gerst, 2011](#)).

[Mehta, Sudharsana, & Elo \(2015\)](#) differentiated between foreign-born and U.S.-born Hispanic subgroups ages 50 to 84 to assess racial/ethnic variations in disability using the National Health Interview Survey (NHIS). They found that older Puerto Ricans and other U.S.-born Hispanics do not significantly differ from U.S.-born Mexican Americans in the odds of disability, independent of age, education, sex, and region of residence. Conversely, foreign-born Mexican Americans and other foreign-born Hispanics had lower odds of functional limitations and ADL disability relative to U.S.-born Hispanics and Puerto Ricans.

More recent research by [Sheftel \(2017\)](#) used data from the 2010–2014 American Community Survey to examine the prevalence of disability (i.e., hearing, vision, cognitive, ambulatory, self-care, and independent living) among Hispanic subgroups 18–90 years old. Hispanic subgroups in the analysis included U.S.-born and foreign-born Mexican-origin individuals, Cubans, and foreign-born Hispanics from other countries (“other Hispanics”), as well as mainland-born and island-born Puerto Ricans. Among working age adults (18–64), all foreign-born Hispanic groups (with the exception of island-born Puerto Ricans) exhibited significantly lower age standardized rates (an immigrant advantage) of disability relative to non-Hispanic whites regardless of gender. However, U.S.-born Mexican, Puerto Rican, and other Hispanic origin men and women had higher disability rates than non-Hispanic whites. U.S.-born Cubans did not significantly differ from non-Hispanic whites. Among older adults (65–90), evidence of an immigrant health advantage relative to non-Hispanic whites was reversed for all foreign-born men and women with the exception of Cuban and other foreign-born Hispanic men. U.S.-born Cuban men and women had comparable disability to non-Hispanic whites ([Sheftel, 2017](#)).

Recent research using data from the 2002 waves of the Health and Retirement Study (HRS) and Puerto Rican Elderly

Health Conditions (PREHCO) study found differences in ADL disability between older adults residing in Puerto Rico and the older mainland U.S. population (Perez & Ailshire, 2017). Island-dwelling Puerto Ricans were found to have a lower prevalence of ADL disability compared to mainland U.S.-born non-Hispanic whites, blacks, and Hispanics. After adjusting for sociodemographic characteristics, island-born Puerto Ricans continued to exhibit an advantage in ADL limitations relative to non-Hispanic whites.

### Gender

Many studies have explored if gender influences the relationship between nativity, country of origin, and disability. Research by Melvin, Hummer, Elo, & Mehta (2014) used 14 years of NHIS data to examine age-specific functional limitation and disability patterns by race/ethnicity, nativity, and gender. They found middle-aged (50–64) foreign-born Mexican, Cuban, and other Hispanic origin groups had lower or comparable proportions of functional limitations and ADL/IADL disability compared to non-Hispanic whites, regardless of gender. However, island-born Puerto Ricans did not share this advantage. Foreign-born persons of Mexican origin, followed by Cubans, and other Hispanics displayed the lowest rates of functional limitations and disability among foreign-Hispanic subgroups. In general, all foreign-born men and women (with the exception of island-born Puerto Ricans) showed an immigrant advantage compared to their U.S.-born co-ethnics. However, this advantage was reversed for all foreign-born Hispanic subgroups (with the exception of Cubans) in later-life with immigrant men and women exhibiting higher rates of functional limitations and disability relative to non-Hispanic whites and their U.S.-born co-ethnics (Melvin et al., 2014).

Sheftel (2017) also identified that specific to Hispanics, all foreign-born women reported higher rates of disability compared to their U.S.-born co-ethnics (with the exception of other Hispanics). However, a different pattern emerged for men. Foreign-born Mexican, Cuban, and other Hispanic males all reported lower rates of disability and exhibited an immigrant advantage over their U.S.-born counterparts, whereas island-born Puerto Ricans were observed to be at a disadvantage relative to mainland Puerto Rican men. This study further assessed disability advantages/disadvantages among foreign-born Mexican men and women by age and period of migration. The results indicated that Mexican-born men and women who migrated to the United States after age 55 did not significantly differ from Mexican-origin men and women who immigrated to the United States prior to age 55. These findings suggest that immigrants from Mexico who migrate in late life are not negatively selected on disability. In addition, no differences were found between Mexican men and women who migrated during the Bracero program (1942–1964) and those who immigrated afterward (Sheftel, 2017).

Finally, Garcia and Reyes (2017) used 20 years of data from the Hispanic Established Populations for the

Epidemiological Study of the Elderly to document age-specific prevalence of ADL and IADL disability by nativity, gender, and 5-year age groups among Mexican Americans 65 years and older living in the southwest United States. They found that foreign-born males had lower rates of ADL disability compared to U.S.-born Mexican Americans, but this difference was not significant. Conversely, foreign-born females were at a significant disadvantage compared to U.S.-born Mexican American women in IADL disability across all 5-year age categories. These differences in the prevalence of IADL disability were largely driven by difficulty with using transportation, using the telephone, shopping, and performing heavy housework. Controlling for sociodemographic characteristics revealed an immigrant advantage for ADL disability among males but an immigrant disadvantage for females relative to their U.S.-born co-ethnics. Significant nativity by age groups interactions provided evidence that foreign-born males maintained their health advantage in ADL disability through late life, whereas immigrant women experienced a convergence with their U.S. counterparts at 80 years of age in IADL disability (Garcia & Reyes, 2017).

### Migration selection

Despite lower levels of income, education, and health care coverage, Hispanics in the United States have higher or comparable life expectancies to non-Hispanic whites. This pattern is primarily observed among the foreign-born and has been attributed to health selectivity, positive health behaviors (e.g., lower levels of smoking), and social and cultural practices that are protective of poor health. However, it is less clear how these factors contribute to disability patterns across the life course. For instance, recent studies (Melvin et al., 2014; Sheftel, 2017) cited above observed an immigrant advantage (with the exception of island-born Puerto Ricans) among immigrants younger than 65 years of age regardless of disability measure. These findings suggest that disability patterns among Hispanics are shaped by nativity status and health selectivity.

### Acculturation

While foreign-born Hispanics appear to have an advantage to non-Hispanic whites in disability, there is evidence that the foreign-born advantage exhibited among younger immigrants does not hold at older ages. This crossover effect may be due in part to greater acculturation from longer residence in the United States among older Hispanics. This greater acculturation can lead to the adoption of negative health behaviors that are detrimental to health. Acculturation has been described as a gradual process in which immigrants adopt behaviors and traits of the host country. However, longer residence in the United States has also been found to be associated with higher levels of social and economic incorporation into U.S. mainstream institutions. This leads to upward social mobility and greater access to health care which may be protective of health in later life. Immigrant

selectivity may also decrease with increased duration in the United States.

Research has found that age of migration (selectivity) has a stronger relationship with mortality than duration (negative acculturation) in the United States (Riosmena, Kuhn, & Jochem, 2017). Smoking, drinking, and other poor health behaviors that have been posited to affect immigrant health with increased duration have been found to not significantly change the overall mortality risk among Hispanics. In addition, research has shown that smoking and drinking do not affect the prevalence of disability among Hispanics (Garcia & Reyes, 2017; Perez & Ailshire, 2017). Structural factors such as low levels of education, extended periods lived in poverty, employment in high-risk occupations, and discrimination may have a larger role in disability patterns of U.S. Hispanics than poor health behaviors.

### Risk Factors for Disability

Extensive research since the 1990s has identified several risk factors for disability among older Hispanics. This research has mostly focused on the impact that health conditions, physical limitations, and mental health and cognitive impairment have on disability risk.

#### Health conditions

Type 2 diabetes is a major public health concern for Hispanics. Older Hispanics with type 2 diabetes have been shown to be twice as likely than non-diabetics to become disabled (Al Snih, Fisher, et al., 2005). Diabetes complications and more years lived with diabetes have also been associated with greater declines in ADL and IADL functioning (Wu et al., 2003). Older Hispanics with type 2 diabetes often have comorbid health conditions that have been associated with increased disability risk, such as hypertension (Caskie, Sutton, & Margrett, 2010), obesity (Al Snih et al., 2007), arthritis (Markides et al., 1996), and metabolic syndrome (Blaum, West, & Haan, 2007).

Furthermore, older Hispanics with type 2 diabetes are more likely to experience a stroke or heart attack, which have both been associated with disability (Patel, Peek, Wong, & Markides, 2006). Also, older Hispanics with type 2 diabetes who experienced a stroke have higher odds for disability than those with diabetes or stroke only (Otiniano, Du, Ottenbacher, & Markides, 2003). Among older Hispanics who have experienced a stroke, higher positive affect, higher cognitive functioning, and being married were associated with lower disability (Bui, Markides, Ottenbacher, & Ostir, 2005).

#### Physical limitations

Muscle weakness, slow walking speed, exhaustion, low physical activity, and unintended weight loss are all components of frailty as defined by Fried and colleagues (2001).

Frailty (3+ criteria) and prefrailty (1–2 criteria) have both been identified as risk factors for disability (Al Snih et al., 2009). The individual components of frailty have also been shown to increase disability risk. Low grip strength has been associated higher risk for incident ADL disability (Al Snih et al., 2004), particularly for those with diabetes (McGrath et al., 2017), weight loss of 5% or greater (Al Snih, Raji, et al., 2005), and slow walking speed (Ostir, Markides, Black, & Goodwin, 1998).

#### Mental health and cognition

Maintaining mental health is important to an older adult's ability to live independently. Depression has been associated with increased risk for ADL disability among older Mexican American (Black, Markides, & Ray, 2003; Downer, Rote, Markides, & Al Snih, 2016) and Puerto Rican adults (Downer, Crowe, & Markides, 2017). These studies also observed that Hispanics with comorbid depression and type 2 diabetes were at greater risk for ADL disability than those with diabetes only (Black et al., 2003; Downer et al., 2016, 2017). In addition, older Hispanics with functional disability are often cognitively impaired. Raji and colleagues have reported that impaired cognition is associated with increased risk for incident ADL disability (Raji, Al Snih, Ray, Patel, & Markides, 2004), which is partly explained by muscle strength (Raji et al., 2005).

#### Protective factors

Less research has focused on protective factors for disability. Physical activity may reduce the risk of disability among diabetics. Participating in more than 30 minutes of activity per day has been associated with less disability and slower declines in functioning among older Hispanics with diabetes compared to those who participated in less than 30 minutes of activity per day (Palmer, Espino, Dergance, Becho, & Markides, 2012). In addition, higher positive affect has been associated with lower risk for disability among older Hispanics (Ostir, Markides, Black, & Goodwin, 2000), including those with arthritis (Fisher, Snih, Ostir, & Goodwin, 2004). Furthermore, younger age, better lower body function, less depressive symptoms, and higher body mass index have been shown to be associated with greater odds of being independent of ADL disability (Al Snih et al., 2003).

#### Disabled life expectancy

Disabled life expectancy refers to the number of years an individual can expect to live (at a specific age) in a disabled state. Prevalence data from cross-sectional and longitudinal studies has shown that foreign-born Hispanics have lower mortality and extended longevity relative to non-Hispanic whites and their U.S.-born counterparts (Angel, Angel, Díaz Venegas, & Bonazzo, 2010; Cantu, Hayward, Hummer, & Chiu, 2013; Garcia, Angel, Angel, Chiu, &

Melvin, 2015; Garcia & Chiu, 2016; Garcia et al., 2017; Hayward, Hummer, Chiu, González-González, & Wong, 2014). However, findings regarding immigrant advantages for disabled life expectancy relative to non-Hispanic whites and U.S.-born Hispanics have been mixed depending on nativity, gender, and disability measurement.

For instance, Cantu and colleagues (2013) examined racial and ethnic differences in life expectancy with functional limitations using NHIS data for 1997–2006. They found that foreign-born Hispanics have the longest life expectancies at age 50 and have a lower prevalence of functional limitations compared to non-Hispanic whites. This study also showed that U.S.-born Hispanics do not share the same health advantages of their foreign-born counterparts. Although U.S.-born Hispanics have comparable life expectancies to non-Hispanic whites, they have a higher prevalence of functional limitations and spend more years with functional limitations than foreign-born Hispanics and non-Hispanic whites (Cantu et al., 2013). In addition, Hispanic women were found to spend a higher number of years with functional limitations than men regardless of nativity status. This study provides further support for the notion that health selectivity for physical functioning in old age varies by gender.

Conversely, Hayward and colleagues (2014) used data from the HRS to document a mortality advantage for both foreign-born and U.S.-born Hispanics. However, they found foreign-born Hispanics in the United States exhibited the greatest burden of disability among all racial/ethnic groups, defined by number of years lived after age 50 with an ADL limitation. This was particularly the case for foreign-born Hispanic women who were the most disabled of all racial/ethnic subgroups. Among Hispanics, foreign-born females spend more years disabled and fewer years after age 50 disability-free. Foreign-born Hispanic men also spent more years disabled compared to their U.S.-born counterparts. However, due to their advantage in longevity, they spent a larger proportion of late-life disability-free (Hayward et al., 2014). Thus, the differences in disabled life expectancy for Hispanic women reflect both a greater prevalence of disability and longer longevity. Whereas for Hispanic men, differences in disabled life expectancy is more of a reflection of lower mortality among the foreign-born than higher prevalence rates.

Research on disabled life expectancy among the elder Mexican-origin population in the United States has documented differences in physical function and ADL/IADL disability by nativity, gender, and age of migration status (Angel, Angel, & Hill, 2015; Garcia et al., 2015, 2017; Garcia & Chiu, 2016). Using panel data from the Hispanic Established Population for the Epidemiological Study of the Elderly, Angel and colleagues (2015) found that Mexican-born elders live over half their lives after age 65 with a serious physical impairment. Notably, this study documents important interactions by nativity such that Mexican-born women have the highest life expectancy and spend

two thirds of their older years with a functional limitation (Angel et al., 2015). Extending this research, Garcia and colleagues (2017) found the nativity disadvantage in years lived with a physical impairment was driven by immigrant women who migrated to the United States in early life (ages 0–19) and late life (after age 50). Immigrant women who migrated during mid-life (20–49 years of age) did not significantly differ from U.S.-born Mexican American women (Garcia et al., 2017).

Additional research by Garcia and colleagues (2015) documents nativity differences for elder Mexican men and women in life expectancy with ADL and IADL disability. Foreign-born Mexican women were found to be particularly disadvantaged in years lived with *both* ADL and IADL limitations and the proportion of life spent disabled relative to U.S.-born Mexican women. In addition, foreign-born men were found to spend significantly longer time with IADL disability compared to their U.S.-born counterparts. The observed nativity differentials were attributed to lower mortality among the foreign-born and a higher prevalence of IADL disability for women due to low levels of acculturation (Garcia et al., 2015). In a more recent analysis using the same data, Garcia and Chiu (2016) assessed immigrant selectivity in disability by age of migration. Their findings indicate nativity disadvantages among immigrant women in ADL-disabled life expectancy were driven by early-life and late-life migrants. Conversely, all immigrant women were found to be at a disadvantage in the number of years lived with IADL disability and the proportion of elderly life spent with IADL disability compared to U.S.-born women. For men, an immigrant disadvantage was observed only for IADL disability among mid-life and late-life migrants relative to their U.S.-born counterparts. The authors also note there were no immigrant advantages/disadvantages in ADL-disabled life expectancies between mid-life immigrant women and U.S.-born women or early-life migrant men and U.S.-born men in IADL disabled life expectancy. However, mid-life and late-life immigrant men exhibited a significant advantage in years spent ADL disability free relative to U.S.-born Mexican-origin men (Garcia & Chiu, 2016).

Studies examining disabled life expectancy among other Hispanic subgroups are scarce. A notable exception is an analysis of island-born Puerto Ricans (Payne, 2015). Using data from the Puerto Rican Elderly: Health Conditions, Payne (2015) documents ADL-disabled life expectancy among adults 65 years and older. The findings suggest that older island-born Puerto Ricans have similar total and disabled life expectancies to older adults in the HRS. This was a surprising finding given differences in socioeconomic indicators and health expenditures between the United States and Puerto Rico (Payne, 2015). Although no overall population differences were evident, Puerto Rican women were found to spend almost twice as many years with ADL disability compared to Puerto Rican men (6.5 years vs. 3.2 year, respectively).

## Future Directions

Extensive research has been conducted on disability among older Hispanics. This research has led to major advances in our understanding of disability in older Hispanics, but continued research is needed. In the following sections, we highlight areas for future research within each of the four major areas that were described above.

### Ethnic Disparities in Disability

#### Trends in disability prevalence

Disability prevalence and incidence can be useful measures for evaluating the health of a population. The prevalence of disability has decreased in the United States, but this decline may not continue because of changes in the demographic, socioeconomic, and health characteristics among more recent generations of older adults (Martin, Schoeni, & Andreski, 2010). Older Hispanics may be especially vulnerable to an increase in disability prevalence. Data from the National Health and Nutrition Examination Survey indicates that Hispanics aged 60 and older experienced a significantly greater increase than older non-Hispanic whites in the prevalence of ADL disability between 1988–1994 and 1999–2004 (Seeman, Merkin, Crimmins, & Karlamangla, 2010). Data from the Hispanic-EPESE also found increases in disability among Mexican Americans aged 75 and older from 1993–1994 to 2004–2005 (Markides & Gerst, 2011). Future research should continue to monitor trends in the prevalence and incidence of disability among older Hispanics. This research will need to pay careful attention to trends in disability for specific Hispanics subpopulations based on nativity, country of origin, and related characteristics. Future research should also focus on evaluating trends of differences in disability between older Hispanics and non-Hispanic whites to determine if disparities are increasing, decreasing, or are remaining stable.

#### Ethnic disparities among women

Prior studies have reported that disparities in disability are explained by socioeconomic, physical functioning, and health characteristics for men but not women, (Brenner & Clarke, 2016; Warner & Brown, 2011). This highlights the importance of considering gender differences in the disablement process. Continued research is needed to identify additional factors that contribute to ethnic disparities in disability between Hispanic and non-Hispanic white women.

### Heterogeneity of the U.S. Older Hispanic Population

The Hispanic paradox has had a considerable influence on disability research. The majority (55%) of U.S. Hispanics live in California, Texas, and Florida (Brown & Lopez, 2013), but an increasing number of Hispanics are residing

in Midwestern states, as well as the Southeastern United States. Between 1980 and 2009, the total percentage of the Midwest population that was Hispanic increased from 2.2% to 6.6% (Mendes de Leon, Eschbach, & Markides, 2011). The geographic dispersion of U.S. Hispanics from the Southwest to the Midwest and Eastern regions of the United States may impact population level health. Using data from the 2008 American Community Survey, Mendes de Leon and colleagues (2011) observed that Hispanics aged 50 and older living in the Midwest reported slightly less disability in cognition, mobility, and self-care than Southwest Hispanics. The authors propose that these regional differences among Hispanics may reflect a stronger impact of positive health selection for Midwest Hispanics than Southwest Hispanics. Future research should investigate if the level of regional variation in disability among Hispanics has changed since 2008 and possible explanations for this variation.

### Risk Factors for Disability

#### Early-life risk factors

The importance of early-life risk factors is supported by evidence that nativity, country of origin, and age of migration all influence disability among older Hispanics. The next step of this research is to incorporate information from multiple stages of the life course into analyses of disability in old age. Data limitations are an obvious challenge and cohort studies that have been used to study disability in older Hispanics have not followed participants prior to midlife or old age. Using data that have been collected retrospectively may be an alternative in some instances. This can include measures for parental occupation or education as a proxy for childhood socioeconomic status, an individual's education or work history, the age in which health conditions were diagnosed, and later-life behaviors. Advanced statistical methods can be used to study the temporal relationship between risk factors and to examine if the effects of risk factors from different stages of the life span accumulate over time to impact disability in old age (Ben-Shlomo & Kuh, 2002).

#### Translational research

The knowledge gained from disability research will not improve the lives of older Hispanics if it is not used to inform interventions and public policy. It is difficult to implement interventions for minority and immigrant populations. Assembling a diverse research team, engaging the community, and creating a culturally sensitive intervention can be effective strategies for overcoming challenges in participant recruitment, participant retention, and ineffective interventions (Lindenberg, Solorzano, Vilaro, & Westbrook, 2001). The large body of evidence from research on risk factors for disability can be used to identify Hispanics who are at high-risk for becoming disabled and are in the most need for intervention. Interventions

that promote physical activity and mental health may be especially effective for preventing or delaying disability. Future research should focus on identifying other protective factors that can be modified by interventions. Potential areas of research include the impact of diet, nutrition, and management of chronic health conditions on disability risk.

Disability research can also inform public policy. Researchers need to make sure that policy makers appreciate the diversity of the Hispanic population and are aware of the impact this diversity has on disability in old age. Policy makers need to have information on what proportion of their state's or county's older Hispanic population is U.S.-born, the countries of origin, and related demographic statistics to have a better understanding of the potential burden of disability in the population and the types of services that may need to be provided.

## Disabled life expectancy

### Heterogeneity of disabled life expectancy

Disabled life expectancy is a useful measure of the burden of disability in a population. Older Hispanics spend a greater proportion of old age disabled compared to non-Hispanic whites. Future research should examine differences in disabled life expectancy between specific Hispanic subpopulations. Research into the burden of disability according to country of origin is important because of the increasing number of Hispanics in the United States who are of Cuban, Puerto Rican, Central and South American descent.

## Summary and Conclusions

Disability among older Hispanics has been studied extensively. We identified disparities in disability, heterogeneity of the U.S. Hispanic population, risk factors for disability, and disabled life expectancy as four major areas of disability research. We also proposed opportunities for research within each of the four research areas.

Although not observed by all studies, there is evidence that older Hispanics are more disabled and are more likely to become disabled than older non-Hispanic whites. These disparities are largely due to lower socioeconomic status and poorer health of older Hispanics, particularly for men. The higher levels of disability among Hispanic women compared to non-Hispanic white women remain after controlling for socioeconomic, health, and behavioral factors. Future research should continue to examine trends in disability as younger generations of Hispanics reach old age. Future research should also focus on identifying other factors that contribute to ethnic disparities in disability among women.

Disability trends for Hispanics vary by nativity, country of origin, gender, migration selection, and acculturation. Research points to nativity as a key factor for determining individual health status among older Hispanics in part because the foreign-born generally have less access to

health care and socioeconomic resources (Angel, Buckley, & Sakamoto, 2001; Garcia & Reyes, 2017; Markides & Gerst, 2011). Health selectivity among foreign-born Hispanics who migrate to the United States also contributes to variation in disability trends between Hispanic subpopulations. This is highlighted by the results from Melvin and colleagues (2014) and Sheftel (2017) in which island-born Puerto Ricans did not show an advantage in disability compared to non-Hispanic whites. Island Puerto Ricans who come to the mainland U.S. experience little or no migration selection because they are U.S. citizens. There is more evidence that older Hispanic women have greater disability compared to non-Hispanic white women, whereas the evidence for differences in disability between Hispanic men and non-Hispanic white men is less consistent. The strength of migration selection may be less for foreign-born Hispanic women compared to Hispanic men (Treas, 2015). The weaker migration selection may contribute to gender differences in the relationship between Hispanic ethnicity and disability. Future research should explore regional variations in disability among older Hispanics and potential explanations for this variation.

Most studies have focused on identifying factors associated with increased risk for disability. Type 2 diabetes is an especially important risk factor for disability and is associated with an increased risk for disability among older Hispanics with depression, stroke, and physical limitations. Poor physical functioning, depression, and impaired cognition are also important risk factors for disability. Less research has explored modifiable factors that may protect against disability or be associated with recovery from disability. Potentially modifiable factors that have been associated with lower risk for disability include positive affect and physical activity. Future research should look for opportunities to incorporate risk factors from childhood, young adulthood, and middle age when studying disability. There is also a critical need for research findings to inform interventions and public policy that can address the substantial burden of disability among older Hispanics.

Older Hispanics spend a substantial proportion of old age as disabled, but this proportion varies according to nativity, gender, age of migration and how disability is measured. Less research has examined differences in disabled life expectancy between Hispanic subpopulations. The growing diversity of the U.S. Hispanic population makes it necessary to examine potential differences in disabled life expectancy between Hispanic subpopulations.

The substantial increase in the older population of U.S. Hispanics has been accompanied by a growing interest in Hispanic health by researchers and policy makers. Most studies focus on Hispanics as a whole or Mexican-origin adults, the largest of the Hispanic groups in the United States. However, U.S. Hispanics are heterogeneous with regard to nativity and country of origin. As summarized above, there is evidence that Hispanics are more likely to develop disability than non-Hispanic whites. But the functional status of



older Hispanics and ability to live independently in later life may vary considerably depending on place of birth, gender, immigration experience (e.g., age of migration, duration in the United States) and socioeconomic profile. Disregarding these important factors results in an incomplete understanding of current disability patterns among older Hispanics. Furthermore, the favorable mortality profile among older Hispanics raises important theoretical and practical questions given the extended years of life is accompanied by a protracted period of disability. The implications of how current disability patterns may affect future demands on family and health care systems are of utmost importance given the high societal cost of long-term care, particularly for a population that is characterized by high rates of poverty, low levels of education, and inadequate access to health care relative to non-Hispanic whites.

## Acknowledgments

The research was supported in part by the National Institutes of Health/National Institute on Aging (T32AG6270T32AG6270).

## Conflict of Interest

None reported.

## References

- Al Snih, S., Fisher, M. N., Raji, M. A., Markides, K. S., Ostir, G. V., & Goodwin, J. S. (2005). Diabetes mellitus and incidence of lower body disability among older Mexican Americans. *The Journal of Gerontology, Series A: Biological Sciences and Medical Sciences*, *60*, 1152–1156. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/16183955>
- Al Snih, S., Graham, J. E., Ray, L. A., Samper-Ternent, R., Markides, K. S., & Ottenbacher, K. J. (2009). Frailty and incidence of activities of daily living disability among older Mexican Americans. *Journal of Rehabilitation Medicine*, *41*, 892–897. doi:10.2340/16501977-0424
- Al Snih, S., Markides, K. S., Ostir, G. V., Ray, L., & Goodwin, J. S. (2003). Predictors of recovery in activities of daily living among disabled older Mexican Americans. *Aging Clinical and Experimental Research*, *15*, 315–320. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/14661823>
- Al Snih, S., Markides, K. S., Ottenbacher, K. J., & Raji, M. A. (2004). Hand grip strength and incident ADL disability in elderly Mexican Americans over a seven-year period. *Aging Clinical and Experimental Research*, *16*, 481–486. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/15739601>
- Al Snih, S., Ottenbacher, K. J., Markides, K. S., Kuo, Y. F., Eschbach, K., & Goodwin, J. S. (2007). The effect of obesity on disability vs mortality in older Americans. *Archives of Internal Medicine*, *167*, 774–780. doi:10.1001/archinte.167.8.774
- Al Snih, S., Raji, M. A., Markides, K. S., Ottenbacher, K. J., & Goodwin, J. S. (2005). Weight change and lower body disability in older Mexican Americans. *Journal of the American Geriatrics Society*, *53*, 1730–1737. doi:10.1111/j.1532-5415.2005.53522.x
- Alwin, D. F. (2012). Integrating varieties of life course concepts. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *67*, 206–220. Retrieved May 19, 2017 from <http://www.ncbi.nlm.nih.gov/pubmed/22399576>
- Angel, J. L., Buckley, C. J., & Sakamoto, A. (2001). Duration or disadvantage? Exploring nativity, ethnicity, and health in midlife. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *56*, S275–S284. Retrieved May 19, 2017 from <http://www.ncbi.nlm.nih.gov/pubmed/11522809>
- Angel, R. J., Angel, J. L., Díaz Venegas, C., & Bonazzo, C. (2010). Shorter stay, longer life: age at migration and mortality among the older Mexican-origin population. *Journal of Aging and Health*, *22*, 914–931.
- Angel, R. J., Angel, J. L., & Hill, T. D. (2015). Longer lives, sicker lives? Increased longevity and extended disability among Mexican-origin elders. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *70*, 639–649.
- Arias, E. (2010). *United States Life Tables by Hispanic Origin*. Washington, DC: National Center for Health Statistics.
- Ben-Shlomo, Y., & Kuh, D. (2002). A life course approach to chronic disease epidemiology: Conceptual models, empirical challenges and interdisciplinary perspectives. *International Journal of Epidemiology*, *31*, 285–293. Retrieved May 19, 2017 from <http://www.ncbi.nlm.nih.gov/pubmed/11980781>
- Black, S. A., Markides, K. S., & Ray, L. A. (2003). Depression predicts increased incidence of adverse health outcomes in older Mexican Americans with type 2 diabetes. *Diabetes Care*, *26*, 2822–2828. Retrieved May 19, 2017 from <http://www.ncbi.nlm.nih.gov/pubmed/14514586>
- Blaum, C. S., West, N. A., & Haan, M. N. (2007). Is the metabolic syndrome, with or without diabetes, associated with progressive disability in older Mexican Americans? *The Journal of Gerontology, Series A: Biological Sciences and Medical Sciences*, *62*, 766–773. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/17634325>
- Brenner, A. B., & Clarke, P. J. (2016). Understanding socioenvironmental contributors to racial and ethnic disparities in disability among older Americans. *Research on Aging*. doi:10.1177/0164027516681165
- Brown, A., & Lopez, M. H. (2013). *Mapping the Latino population, by state, county and city*. Washington, DC: Pew Research Hispanic Center Retrieved May 19, 2017 from [http://www.pewhispanic.org/files/2013/08/latino\\_populations\\_in\\_the\\_states\\_counties\\_and\\_cities\\_FINAL.pdf](http://www.pewhispanic.org/files/2013/08/latino_populations_in_the_states_counties_and_cities_FINAL.pdf)
- Bui, W., Markides, K. S., Ottenbacher, K. J., & Ostir, G. V. (2005). Predictors of disability post stroke: Findings from the H-EPESE. *Journal of Mental Health and Aging*, *10*, 221–230.
- Cantu, P., Hayward, M., Hummer, R., & Chiu, C.-T. (2013). New estimates of racial/ethnic differences in life expectancy with chronic morbidity and functional loss: Evidence from the National Health Interview Survey. *Journal of Cross-Cultural Gerontology*, *28*, 283–297. doi:10.1007/s10823-013-9206-5
- Caskie, G. I., Sutton, M. C., & Margrett, J. A. (2010). The relation of hypertension to changes in ADL/IADL limitations of Mexican American older adults. *Journal of Gerontology, Series B: Psychological Science and Social Science*, *65B*, 296–305. doi:10.1093/geronb/gbq001

- Dannefer, D. (2003). Cumulative advantage/disadvantage and the life course: Cross-fertilizing age and social science theory. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *58*, S327–S337. doi:10.1093/geronb/58.6.S327
- Dominguez, K., Penman-Aguilar, A., Chang, M.-H., Moonesinghe, R., Castellanos, T., Rodríguez-Lainz, A., & Schieber, R. (2015). Vital signs: Leading causes of death, prevalence of diseases and risk factors, and use of health services among Hispanics in the United States—2009–2013. *Morbidity and Mortality Weekly Report*, *64*, 469–478.
- Downer, B., Crowe, M., & Markides, K. S. (2017). Influence of type II diabetes and high depressive symptoms on the likelihood for developing activities of daily living (ADL) disability and mortality in older Puerto Ricans. *Journal of Aging and Health*, *29*, 1079–1095. doi:10.1177/0898264317708882
- Downer, B., Rote, S., Markides, K. S., & Al Snih, S. (2016). The comorbid influence of high depressive symptoms and diabetes on mortality and disability in Mexican Americans aged 75 and above. *Gerontology and Geriatric Medicine*, *2*. doi:10.1177/2333721416628674
- Ferraro, K. F., & Kelley-Moore, J. A. (2003). Cumulative disadvantage and health: long-term consequences of obesity? *American Sociological Review*, *68*, 707.
- Fisher, M. N., Snih, S. A., Ostir, G. V., & Goodwin, J. S. (2004). Positive affect and disability among older Mexican Americans with arthritis. *Arthritis and Rheumatism*, *51*, 34–39. doi:10.1002/art.20079
- Freedman, V. A., Kasper, J. D., Spillman, B. C., Agree, E. M., Mor, V., Wallace, R. B., & Wolf, D. A. (2014). Behavioral adaptation and late-life disability: A new spectrum for assessing public health impacts. *American Journal of Public Health*, *104*, e88–94. doi:10.2105/AJPH.2013.301687
- Freedman, V. A., Martin, L. G., & Schoeni, R. F. (2002). Recent trends in disability and functioning among older adults in the United States: a systematic review. *Journal of the American Medical Association*, *288*, 3137–3146. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/12495394>
- Freedman, V. A., Schoeni, R. F., Martin, L. G., & Cornman, J. C. (2007). Chronic conditions and the decline in late-life disability. *Demography*, *44*, 459–477. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/17913006>
- Freedman, V. A., Spillman, B. C., Andreski, P. M., Cornman, J. C., Crimmins, E. M., Kramarow, E., ... Waidmann, T. A. (2013). Trends in late-life activity limitations in the United States: An update from five national surveys. *Demography*, *50*, 661–671. doi:10.1007/s13524-012-0167-z
- Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., ... McBurnie, M. A.; Cardiovascular Health Study Collaborative Research Group. (2001). Frailty in older adults: Evidence for a phenotype. *The Journal of Gerontology, Series A: Biological Sciences and Medical Sciences*, *56*, M146–M156. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/11253156>
- Garcia, M. A., Angel, J. L., Angel, R. J., Chiu, C. T., & Melvin, J. (2015). Acculturation, gender, and active life expectancy in the Mexican-origin population. *Journal of Aging and Health*, *27*, 1247–1265.
- Garcia, M. A., & Chiu, C. T. (2016). Age at migration and disability-free life expectancy among the elder Mexican-origin population. *Demographic Research*, *35*, 1523–1536.
- Garcia, M. A., & Reyes, A. M. (2017). Prevalence and trends in morbidity and disability among older Mexican Americans in the Southwestern United States, 1993–2013. *Research on Aging*. doi:10.1177/0164027517697800
- Garcia, M. A., Valderrama-Hinds, L. M., Chiu, C. T., Mutambudzi, M. S., Chen, N. W., & Raji, M. (2017). Age of migration life expectancy with functional limitations and morbidity in Mexican Americans. *Journal of the American Geriatrics Society*. doi:10.1111/jgs.14875
- Gonzalez-Barrera, A., & Lopez, M. H. (2013). *A demographic portrait of Mexican-Origin Hispanics in the United States*. Washington DC: Pew Research Hispanic Center. Retrieved May 19, 2017 from [http://www.pewhispanic.org/files/2013/05/2013-04\\_Demographic-Portrait-of-Mexicans-in-the-US.pdf](http://www.pewhispanic.org/files/2013/05/2013-04_Demographic-Portrait-of-Mexicans-in-the-US.pdf)
- Hayward, M. D., Hummer, R. A., Chiu, C.-T., González-González, C., & Wong, R. (2014). Does the Hispanic Paradox in U.S. adult mortality extend to disability? *Population Research and Policy Review*, *33*, 81–96. doi:10.1007/s11113-013-9312-7
- Lariscy, J. T., Hummer, R. A., & Hayward, M. D. (2015). Hispanic older adult mortality in the United States: New estimates and an assessment of factors shaping the Hispanic Paradox. *Demography*, *52*, 1–14. doi:10.1007/s13524-014-0357-y
- Latham, K. (2014). Racial and educational disparities in mobility limitation among older women: what is the role of modifiable risk factors? *The Journal of Gerontology, Series B: Psychological Sciences and Social Sciences*, *69*, 772–783. doi:10.1093/geronb/gbu028
- Lindenberg, C. S., Solorzano, R. M., Vilaro, F. M., & Westbrook, L. O. (2001). Challenges and strategies for conducting intervention research with culturally diverse populations. *Journal of Transcultural Nursing*, *12*, 132–139. doi:10.1177/104365960101200207
- Markides, K. S., & Coreil, J. (1986). The health of Hispanics in the Southwestern United States - an Epidemiologic Paradox. *Public Health Reports*, *101*, 253–265. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1477704>
- Markides, K. S., & Eschbach, K. (2005). Aging, migration, and mortality: Current status of research on the Hispanic paradox. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *60*, 68–75. Retrieved May 19, 2017 from [https://doi.org/10.1093/geronb/60.Special\\_Issue\\_2.S68](https://doi.org/10.1093/geronb/60.Special_Issue_2.S68)
- Markides, K. S., & Eschbach, K. (2011). *Hispanic paradox in adult mortality in the United States International handbook of adult mortality* (pp. 227–240). New York, NY: Springer.
- Markides, K. S., Eschbach, K., Ray, L. A., & Peek, M. K. (2007). *Census disability rates among older people by race/ethnicity and type of Hispanic origin: The health of aging Hispanics* (pp. 26–39). New York, NY: Springer.
- Markides, K. S., & Gerst, K. (2011). Immigration, aging, and health in the United States. In R. A. Settersten & J. L. Angel (Eds.), *Handbook of Sociology of Aging* (pp. 103–116). New York, NY: Springer.
- Markides, K. S., Stroup-Benham, C. A., Goodwin, J. S., Perkowski, L. C., Lichtenstein, M., & Ray, L. A. (1996). The effect of medical conditions on the functional limitations of

- Mexican-American elderly. *Annals of Epidemiology*, 6, 386–391. Retrieved May 19, 2017 from <http://www.ncbi.nlm.nih.gov/pubmed/8915469>
- Martin, L. G., Schoeni, R. F., & Andreski, P. M. (2010). Trends in health of older adults in the United States: Past, present, future. *Demography*, 47 (Suppl), S17–S40. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/21302428>
- McGrath, R. P., Vincent, B. M., Snih, S. A., Markides, K. S., Dieter, B. P., Bailey, R. R., & Peterson, M. D. (2017). The association between handgrip strength and diabetes on activities of daily living disability in older Mexican Americans. *Journal of Aging and Health*. doi:10.1177/0898264317715544
- Mehta, N. K., Sudharsana, N., & Elo, I. R. (2015). Race/ethnicity and disability among older Americans. In Keith E. Whitfield & T. A. Baker (Eds.), *Handbook of Minority Aging*. New York, NY: Springer Publishing Company.
- Melvin, J., Hummer, R., Elo, I., & Mehta, N. (2014). Age patterns of racial/ethnic/nativity differences in disability and physical functioning in the United States. *Demographic Research*, 31, 497–509. Retrieved May 19, 2017 from <http://doi.org/10.4054/DemRes.2014.31.17>
- Mendes de Leon, C. F., Eschbach, K., & Markides, K. S. (2011). Population trends and late-life disability in Hispanics from the Midwest. *Journal of Aging and Health*, 23, 1166–1188. doi:10.1177/0898264311422100
- Ostir, G. V., Markides, K. S., Black, S. A., & Goodwin, J. S. (1998). Lower body functioning as a predictor of subsequent disability among older Mexican Americans. *The Journal of Gerontology, Series A: Biological Sciences and Medical Sciences*, 53, M491–M495. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/9823755>
- Ostir, G. V., Markides, K. S., Black, S. A., & Goodwin, J. S. (2000). Emotional well-being predicts subsequent functional independence and survival. *Journal of American Geriatrics Society*, 48, 473–478. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/10811538>
- Otiniano, M. E., Du, X. L., Ottenbacher, K., & Markides, K. S. (2003). The effect of diabetes combined with stroke on disability, self-rated health, and mortality in older Mexican Americans: Results from the Hispanic EPESE. *Archives of Physical Medicine and Rehabilitation*, 84, 725–730. Retrieved May 19, 2017 from <http://www.ncbi.nlm.nih.gov/pubmed/12736889>
- Palmer, R. F., Espino, D. V., Dergance, J. M., Becho, J., & Markides, K. (2012). The role of physical activity and diabetes status as a moderator: Functional disability among older Mexican Americans. *Age and Ageing*, 41, 752–758. doi:10.1093/ageing/afs106
- Patel, K. V., Peek, M. K., Wong, R., & Markides, K. S. (2006). Comorbidity and disability in elderly Mexican and Mexican American adults: Findings from Mexico and the southwestern United States. *Journal of Aging and Health*, 18, 315–329. doi:10.1177/0898264305285653
- Payne, C. F. (2015). Aging in the Americas: Disability-free life expectancy among adults aged 65 and older in the United States, Costa Rica, Mexico, and Puerto Rico. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, gbv076.
- Perez, C., & Ailshire, J. A. (2017). Aging in Puerto Rico: A comparison of health status among Island Puerto Rican and mainland U.S. older adults. *Journal of Aging and Health*. doi:10.1177/0898264317714144
- Raji, M. A., Al Snih, S., Ray, L. A., Patel, K. V., & Markides, K. S. (2004). Cognitive status and incident disability in older Mexican Americans: Findings from the Hispanic established population for the epidemiological study of the elderly. *Ethnicity and Disease*, 14, 26–31. Retrieved May 19, 2017 from <http://www.ncbi.nlm.nih.gov/pubmed/15002920>
- Raji, M. A., Kuo, Y. F., Snih, S. A., Markides, K. S., Peek, M. K., & Ottenbacher, K. J. (2005). Cognitive status, muscle strength, and subsequent disability in older Mexican Americans. *Journal of the American Geriatric Society*, 53, 1462–1468. doi:10.1111/j.1532-5415.2005.53457.x
- Riosmena, F., Kuhn, R., & Jochem, W. C. (2017). Explaining the immigrant health advantage: Self-selection and protection in health-related factors among five major national-origin immigrant groups in the United States. *Demography*, 1–26.
- Seeman, T. E., Merkin, S. S., Crimmins, E. M., & Karlamangla, A. S. (2010). Disability trends among older Americans: National Health and Nutrition Examination Surveys, 1988–1994 and 1999–2004. *American Journal of Public Health*, 100, 100–107. doi:10.2105/AJPH.2008.157388
- Sheftel, M. G. (2017). Prevalence of disability among Hispanic immigrant populations: New evidence from the American Community Survey. *Population Review*, 56, 1–30. doi:10.1353/prv.2017.0000
- Stump, T. E., Clark, D. O., Johnson, R. J., & Wolinsky, F. D. (1997). The structure of health status among Hispanic, African American, and white older adults. *The Journal of Gerontology, Series B: Psychological Sciences and Social Sciences*, 52 Spec No, 49–60. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/9215357>
- Treas, J. (2015). Incorporating immigrants: Integrating theoretical frameworks of adaptation. *The Journal of Gerontology, Series B: Psychological Sciences and Social Sciences*, 70, 269–278. doi:10.1093/geronb/gbu067
- Verbrugge, L. M. (2016). Disability experience and measurement. *Journal of Aging and Health*, 28, 1124–1158.
- Vincent, G. K., & Velkoff, V. A. (2010). *The next four decades: The older population in the United States: 2010 to 2050*. Washington, DC: US Department of Commerce, Economics and Statistics Administration, US Census Bureau.
- Warner, D. F., & Brown, T. H. (2011). Understanding how race/ethnicity and gender define age-trajectories of disability: An intersectionality approach. *Social Science and Medicine*, 72, 1236–1248. doi:10.1016/j.socscimed.2011.02.034
- Wu, J. H., Haan, M. N., Liang, J., Ghosh, D., Gonzalez, H. M., & Herman, W. H. (2003). Diabetes as a predictor of change in functional status among older Mexican Americans: A population-based cohort study. *Diabetes Care*, 26, 314–319. Retrieved May 19, 2017 from <https://www.ncbi.nlm.nih.gov/pubmed/12547855>
- Zsembik, B. A., Peek, M. K., & Peek, C. W. (2000). Race and ethnic variation in the disablement process. *Journal of Aging and Health*, 12, 229–249. doi:10.1177/089826430001200205