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# Age at migration and disability-free life expectancy among the elder Mexican-origin population

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## Abstract

**BACKGROUND—**Migration selectivity is thought to shape the health profiles of Mexican immigrants.

**OBJECTIVE—**This study examines how the experience of Mexican migration to the United States affects the health process and the quality of life in old age by age at migration, specific to sex.

**METHODS—**We use 20 years of data from the Hispanic Established Populations for the Epidemiologic Study of the Elderly to estimate the proportion of life spent disability-free prior to death across eight subgroups by sex, nativity, and age at migration among Mexican-origin elderly in the United States.

**RESULTS—**Female migrants are at a significant disadvantage in terms of IADL disability-free life expectancy relative to US-born women, particularly late-life migrants. Conversely, mid- and late-life male migrants exhibit an advantage in ADL disability-free life expectancy compared to their US-born counterparts.

**CONCLUSIONS—**Foreign-born Mexican elders are not a homogeneous group. This issue merits special attention in the development of community-based long-term care programs in order to appropriately target the specific needs of different subgroups of older Mexican individuals entering their last decades of life.

**CONTRIBUTION—**This study contributes to immigrant health literature by providing a more comprehensive documentation of nativity differentials, by distinguishing subgroups of Mexican elderly by sex, nativity, and age at migration.

## 1. Introduction

A growing body of research indicates declines among the older population in functional limitations and disability (Crimmins and Saito 2001). Although disability may be decreasing in general, recent evidence suggests that functional disability may be more common among Latinos – or at least among certain subgroups of Latinos. (Hayward et al. 2014; Melvin et al. 2014). Previous research reveals that although the Mexican-origin population has a relatively long life span, this rapidly aging population is disproportionately beset by chronic disease (Caskie, Sutton, and Margrett 2010). This high rate of chronic illness suggests that a large

proportion of the years past 65 may be characterized by serious functional disability (Al Snih et al. 2009).

Given the potential of higher rates of disability and an earlier onset among Mexican-origin elderly, this research examines nativity and age at migration differences in disability-free life expectancy, by sex, based on Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). Nativity status has been found to be strongly related to health (Hummer and Hayward 2015). Indeed, research has identified a 'healthy immigrant effect' in which foreign-born individuals residing in the United States tend to show favorable health and mortality profiles relative to their US-born counterparts (Bostean 2013; Singh and Hiatt 2006). We assess whether the healthy immigrant effect in mortality documented among immigrants extends to disability by examining the number of years past age 65 that elderly Mexicans live disability-free.

## 2. Conceptual framework

We employ a life course perspective to test the healthy immigrant effect, specific to age at migration, among foreign-born Mexican elderly subgroups. This framework aims to link migration, disability, and healthy aging. Migration is a phenomenon that impacts individuals throughout the life course (Angel and Angel 1992). We posit that the life experiences of the Mexican elderly are likely shaped by where they are born and, for the foreign-born, the age at which they immigrated to the United States. Thus, we examine how the experience of Mexican migration to the United States affects the health process and the quality of life in old age.

Health selection likely operates differently for different age groups and by sex. For example, migration selectivity may be strongest at young and middle ages, when immigrants decide to cross the border to pursue occupational opportunities in physically demanding fields such as agriculture, construction, and the service sector (Gubernskaya, Bean, and Van Hook 2013). Labor migrants are healthy enough to migrate, work when they arrive, and deal with the potential challenges they face in the process of migration, and thus are self-selected on the basis of good health (Angel et al. 2010).

By contrast, Mexicans who migrated as children or adolescents are more likely to have been brought to the United States by their parents or to have migrated in order to join family members. These early-life migrants have little or no positive selection, since their migration depends on their parents' characteristics and they do not necessarily have to deal with the demands of migration (Gubernskaya 2014). Positive health selectivity may also be weaker among those who migrate in late life because older migrants are more likely to migrate for reasons of family reunification rather than job opportunities (Treas 2015). Furthermore, if late-life immigrants come to the United States to seek care from family members they may exhibit negative health selection.

## 3. Data and methods

Data from the Hispanic Established Populations for the Epidemiologic Study of the Elderly (H-EPESE) was used to estimate the proportion of life spent disability-free prior to death for

US-born and foreign-born Mexican-origin elderly. The H-EPESE is a longitudinal study of Hispanics, aged 65 years and older, residing in the southwestern United States (Markides et al. 1997). We used aggregated data from 1993–2013 to obtain prevalence estimates across survey years, with mortality linkages through the National Death Index (NDI) up to December 31, 2015. Respondents range in age from 65 to 107 years. The final analytic sample comprises 3,860 unique individuals and 37,203 person-years of data.

Disability refers to limitations in the performance of social roles and tasks in the context of the socio-cultural and physical environment (Verbrugge 2016). Measures of disability include ADLs and IADLs. These two measures differ significantly in the manner in which they are affected by nativity and sex. ADLs assess the ability to carry out self-care activities such as eating, bathing, personal grooming, and getting around inside the home (Katz et al. 1963). IADLs assess the ability to perform more complex activities that require cognitive competence, familiarity with the local environment, and language, which are associated with traditional gender and family roles such as managing household finances, using transportation, preparing meals, and shopping (Lawton and Brody 1969). We dichotomized disability as ‘no help needed’ versus ‘unable to perform one or more of the tasks.’ The disability questions are presented in Appendix A.

Mexicans involved in the migration process are not a monolithic group but are heterogeneous in various aspects. Although the factors that contribute to this heterogeneity are less studied, some scholars suggest that age at migration can be useful for understanding health disparities in later life, by approximating the type of migration (i.e., labor versus family) and the degree of selectivity among immigrants (Markides and Rote 2014; Gubernskaya 2014). We included two measures of immigration status: nativity and age at migration. To classify nativity we used birthplace information and categorized respondents as born in the United States versus born in Mexico. To measure life course stage at migration we included three age-at-migration groups: those who arrive in childhood (0–19 years), in middle age (20–49 years), and in later life (after age 50).

### 3.1 Statistical analysis

We combined age-specific mortality rates with age-specific prevalence of ADL and IADL disabilities to calculate Sullivan-based multistate life table models of disabled life expectancy (DLE) and disability-free life expectancy (DFLE) for each group (Sullivan 1971). This method divides total life expectancy (TLE) into different health states based on the age-specific prevalence of disabled and disability-free states.

To estimate mortality rates, we employed Gompertz models of the following form stratified by sex, nativity, and age at migration:

$$\ln\, m(x)=\beta_0+\beta_1 \cdot \mathrm{Age} \quad (1)$$

where $x$ is age, $m(x)$ is age-specific mortality rate, $\beta_0$ the constant term, and $\beta_1$ is the coefficient for age (Teachman and Hayward 1993).

To estimate prevalence, we fitted the logistic regressions of the following form stratified by sex, nativity, and age at migration:

$$\ln\frac{\pi}{1-\pi}=\beta_0+\beta_1\cdot\mathrm{Age} \quad (2)$$

where **π** is the prevalence probability.

Using equation (1), we estimate age-specific mortality rates and obtain TLE. From equation (2) we obtain the age-specific prevalence of ADL and IADL. We use the estimated prevalence to divide TLE into the different health states based on the age-specific prevalence of disabled and disability-free states. DLE and DFLE calculated by this method is the number of remaining years (at age 65) a population can expect to live in a disabled/disability-free state (Jagger et al. 2006).

We used a bootstrapping technique to obtain standard errors (Efron and Tibshirani 1986). Bootstrapping generates repeated estimates of DFLE by randomly drawing a series of bootstrap samples from the analytic samples. Repeating this approach 300 times, the distributions we obtain allow us to estimate sampling variability for TLE, DLE, and DFLE. Based on the 300 life tables for a given group, we obtain simulated 95% confidence intervals for the distributions of TLE, DLE, and DFLE, or the ratio of disability-free to TLE of that group. The 95% interval is from the 2.5th to the 97.5th percentile of the simulated distribution.

## 4. Results

Table 1 presents ADL and IADL related life expectancy data (see also Figure 1). We stratified the analysis by nativity, age at migration, and sex to determine whether an immigrant advantage emerges. Overall, foreign-born immigrants have a higher TLE at age 65 relative to their US-born counterparts, regardless of sex.

### 4.1 ADL disability

Early-life immigrant women displayed a health advantage in DFLE, relative to their US-born counterparts (15.6 vs. 13.4 years). Conversely, late-life foreign-born women were at a significant disadvantage ($p<.05$) in the ratio of number of years lived ADL disability-free to total number of years lived. The results indicate that late-life foreign-born women spend 70% of their remaining years after age 65 disability-free compared with 76% for the US-born. The findings show a different pattern for men. At age 65, mid-life migrant males can expect to spend a greater amount of time ADL disability-free than US-born males (14.3 vs. 12.7 years). However, foreign-born and US-born men have a largely similar ratio of number of years lived ADL disability-free.

### 4.2 IADL disability

Overall, foreign-born women are at a significant disadvantage in terms of DFLE and the ratio of years spent IADL disability-free, relative to their US-born counterparts. Foreign-

born females can expect to spend between 22% and 28% of their remaining years after age 65 disability-free compared with 40% for US-born women. However, there are important differences by age at migration. Early-life and mid-life migrant women generally exhibited positive health selectivity relative to late-life migrant women. In terms of DFLE and the ratio of disability-free years, early-life immigrant women displayed the healthiest outcome (5.8 years), followed by mid-life (5.3 years) and late-life (4.2 years) women.

In general, foreign-born men exhibit no health advantage in DFLE with IADL disability. In fact, the results point in the opposite direction. Mid-life and late-life migrant males spend fewer years after age 65 IADL disability-free than US-born men. Indeed, the ratio of number of elderly years lived disability-free to total number of years lived is significantly lower for mid-life (54%) and late-life (51%) immigrant men than for US-born men (57%).

## 5. Discussion and conclusion

This analysis examined differences in Activities of Daily Living and Instrumental Activities of Daily Living life expectancy among Mexican-origin elderly residing in the southwestern United States. Our aim was to assess whether the ‘healthy immigrant effect’ documented among immigrants for mortality extends to disability by examining the number of years past 65 lived disability-free. Although previous research has focused on comparing life expectancy across racial and ethnic groups, few studies have focused specifically on disability-free life expectancy among Mexican-origin elders as a function of nativity, and for immigrants as a function of age at migration. Utilizing a life course perspective allows us to advance current knowledge by examining the role of age at migration. This perspective argues that experiences that happen early in the life course impact health outcomes in later stages of life (Dannefer 2003). Differences in immigration motivation and selection mechanisms might be found between younger and older immigrants and within the older immigrant population. Thus, comparing disability outcomes among the foreign-born can highlight positive health selectivity.

Our results are consistent with previous findings that foreign-born individuals residing in the United States have lower mortality than their US-born counterparts (Cantu et al. 2013; Singh and Hiatt 2006). As other studies increasingly show, the healthy immigrant effect does not appear to apply to disability, with the exception of ADL disability among males (Garcia et al. 2015; Hayward et al. 2014). Furthermore, these results add to emerging literature on age at migration as an important factor for understanding health outcomes among older immigrants (Angel, Angel, and Markides 2003; Gubernskaya 2014). Importantly, our results build on previous studies by documenting that immigrant health selectivity varies by both age at migration and sex, depending on the health outcome.

For example, foreign-born males who migrate in mid-life have both lower mortality and fewer ADL disabilities, followed by late-life immigrants. Conversely, for women this health advantage was found only among early-life immigrants, a finding which lends support to the idea that older immigrant men are positively health-selected because they migrate primarily for job opportunities, while older immigrant women are more likely to migrate for family reunification purposes (Angel et al. 2010). In addition, immigrant women who arrive during

early life have fewer IADL disabilities than mid-life and late-life immigrant women. Foreign-born males follow a similar pattern in the fraction of later years lived IADL disability-free. This important finding highlights the crucial role that age at migration plays in acquiring the knowledge essential for IADL-related tasks, including language proficiency, literacy level, and technological skills. Immigrants who migrate in early life have more opportunity to integrate into and acculturate to US society (Garcia et al. 2015; Treas 2015). These findings further support the idea that IADL disability among the foreign-born is largely attributable to low levels of acculturation, associated with both traditional gender roles and the structural factors encountered when driving a vehicle or obtaining the transportation necessary for shopping, banking, and managing household business; areas in which they are clearly disadvantaged (Garcia et al. 2015; Angel et al. 1996).

These findings have important research and policy implications. The disability results demonstrate the importance of considering multiple factors, including nativity, age at migration, and gender, when planning for long-term care in the rapidly aging Mexican-origin population. Because disability is a major driver of acute and chronic healthcare costs, prevention and treatment of medical conditions should be given high priority in this population to reduce disability as much as possible. The possibility of a longer life characterized by compromised health and material hardship raises serious questions about the potential burden on government and family. Our findings clearly illustrate that as they grow older, Mexican immigrant families will need to mobilize their informal support systems since they will be heavily burdened with physical and cognitive impairments. Future research should investigate specific ADL and IADL domains in order to develop community-based programs aimed at meeting the specific needs of older Mexican-origin subgroups.

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## Appendix A: Activities of Daily Living and Instrumental Activities of Daily Living scales

| |
|---|
| **ADL Items: Do you need help from another person or special equipment or a device?** |
| Walking across a small room |
| Bathing (either a sponge bath, tub bath, or shower) |
| Personal grooming like brushing hair, brushing teeth, or washing face |
| Dressing (like putting on a shirt, buttoning and zipping, or putting on shoes) |
| Eating (like holding a fork, cutting food, or drinking from a glass) |
| Getting from a bed to a chair |
| Using the toilet |
| **IADL Items: Can you do these activities by yourself or without any help from anyone else?** |
| Can you use the telephone without help (including looking up numbers and dialling) |
| Can you drive your own car or travel alone on buses or taxis |
| Can you go shopping for groceries or clothes without help (taking care of all shopping needs yourself, assuming you had transportation) |
| Can you prepare your own meals without help (plan and cook full meals yourself) |
| Can you do light housework without help (dish washing and bed making, etc.) |
| Can you take your own medicine without help (in the right doses at the right time) |
| Can you handle your money without help (write checks, pay bills, etc.) |
| Can you do heavy work around the house like washing windows, walls and floors without help |
| Can you walk up and down stairs to the second floor without help |
| Can you walk half a mile without help |

*Note*: ADL=Activities of Daily Living; IADL=Instrumental Activities of Daily Living

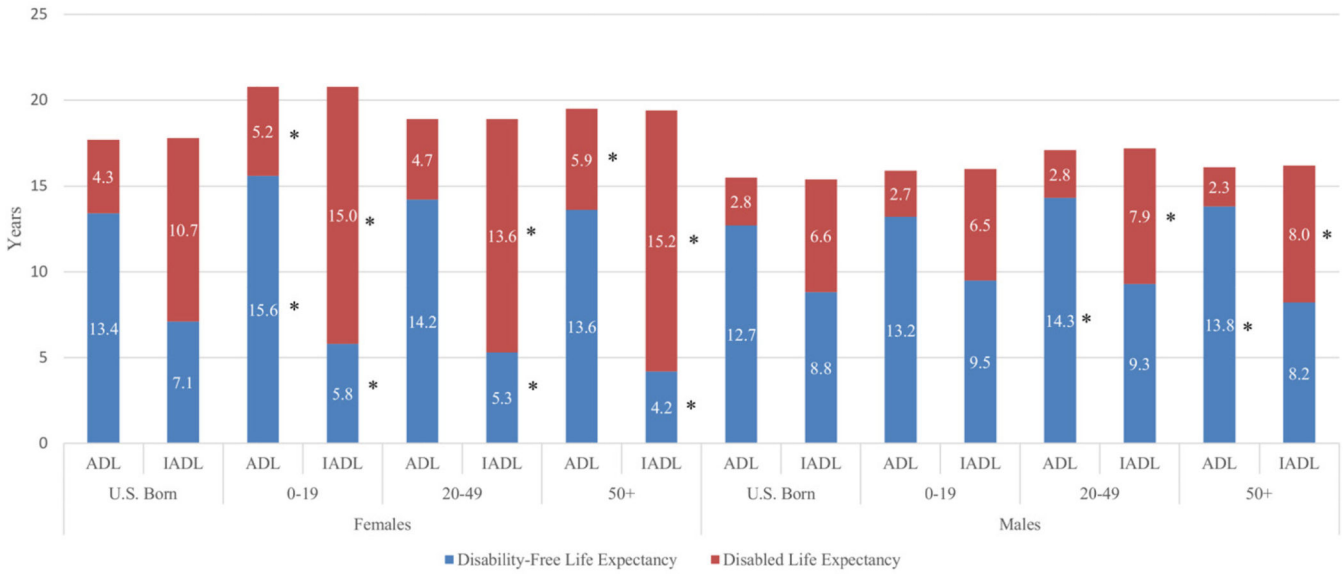


**Figure 1. ADL and IADL related life expectancy at age 65 by nativity, age at migration, and sex**

*Source*: HEPESE Wave 1–8 (1993–2013)

*Note*: DFLE = Disability-Free Life Expectancy; DLE = Disabled Life Expectancy;

*p<=0.05

**Table 1**

ADL and IADL related life expectancy at age 65 by nativity, age at migration, and sex

| | ADL | | | | IADL | | | |
|---|---|---|---|---|---|---|---|---|
| | **US-Born** | **0–19** | **20–49** | **50+** | **US-Born** | **0–19** | **20–49** | **50+** |
| **Females** | **Years (CI)** | **Years (CI)** | **Years (CI)** | **Years (CI)** | **Years (CI)** | **Years (CI)** | **Years (CI)** | **Years (CI)** |
| TLE | 17.8 (17.1–18.4) | 20.8 (19.3–22.4) * | 18.9 (17.9–19.7) | 19.5 (17.8–21.1) | 17.8 (17.1–18.4) | 20.8 (19.3–22.4) * | 18.9 (17.9–19.7) | 19.5 (17.8–21.1) |
| DFLE | 13.4 (12.9–14.0) | 15.6 (14.4–16.9) * | 14.2 (13.4–14.9) | 13.6 (12.2–14.8) | 7.1 (6.7–7.5) | 5.8 (4.8–6.0) * | 5.3 (4.5–5.7) * | 4.2 (3.4–5.1) * |
| DLE | 4.3 (4.0–4.6) | 5.2 (4.4–6.0) * | 4.7 (4.1–5.2) | 5.9 (4.9–7.0) * | 10.7 (10.2–11.1) | 15.0 (13.4–16.6) * | 13.6 (12.9–14.4) * | 15.2 (13.7–16.9) * |
| Ratio | 0.76 (0.74–0.77) | 0.75 (0.71–0.78) | 0.75 (0.73–0.78) | 0.70 (0.66–0.73) * | 0.40 (0.38–0.42) | 0.28 (0.24–0.33) * | 0.28 (0.25–0.32) * | 0.22 (0.18–0.26) * |
| **Males** | | | | | | | | |
| TLE | 15.4 (14.8–16.1) | 16.0 (14.1–18.1) | 17.1 (16.2–18.4) * | 16.1 (14.3–17.8) | 15.4 (14.8–16.1) | 16.0 (14.1–18.1) | 17.1 (16.2–18.4) * | 16.1 (14.3–17.8) |
| DFLE | 12.7 (12.1–13.3) | 13.2 (11.6–14.9) | 14.3 (13.4–15.2) * | 13.8 (13.4–15.3) * | 8.8 (8.3–9.3) | 9.5 (8.0–11.0) | 9.3 (8.3–10.2) | 8.2 (7.1–9.5) |
| DLE | 2.8 (2.5–3.1) | 2.7 (2.1–3.6) | 2.8 (2.4–3.3) | 2.3 (1.7–2.9) | 6.6 (6.2–7.1) | 6.5 (5.4–7.8) | 7.9 (7.2–8.7) * | 8.0 (6.6–9.2) * |
| Ratio | 0.82 (0.80–0.84) | 0.83 (0.79–0.86) | 0.83 (0.81–0.86) | 0.86 (0.83–0.89) | 0.57 (0.55–0.59) | 0.60 (0.54–0.64) | 0.54 (0.50–0.58) | 0.51 (0.45–0.57) * |

*Source*: HEPESE Wave 1–8 (1993–2013)

*Note*: CI = Confidence Intervals; TLE = Total Life Expectancy; DFLE = Disability-Free Life Expectancy; DLE = Disabled Life; Expectancy; Ratio = DFLE/TLE;

* p<=0.05