Immigration and Tomorrow's Elderly

March 4, 2019

Kristin F. Butcher
(Wellesley College)
and
Tara Watson
(Williams College)

Note: This working paper was made possible by the US 2050 project, supported by the Peter G. Peterson Foundation and the Ford Foundation. The statements made and views expressed are solely the responsibility of the authors. We thank Maria Fitzpatrick, Andra Gillespie, Adriana Kugler, and US 2050 conference participants for helpful suggestions. All errors are our own.

Abstract.

It is well-known that the U.S. population is aging. The Census Bureau predicts that there will be about 32 million Americans aged 80 and up in 2050, 2.6 times today's number. In this project, we consider the implications of the coming demographic shift for caregiving labor, and the role immigration policy plays in the future of caregiving. We focus on eight occupations including nursing occupations and service jobs that might help elderly individuals age in place, such as housekeeping. Using the results from a cross-metropolitan area study, we show that metropolitan areas with a larger elderly population have disproportionate employment in caregiving occupations. We use these findings to predict that there will be substantial increases in these key occupations by 2050, representing a growth from 8.4 percent to 12 percent of the total workforce. We also document that the foreign-born are disproportionately represented in these caregiving occupations. Significant increases in the foreign-born population will be needed to maintain the current foreign-born representation in key caregiving occupations as the population ages. Immigration policy has important implications for the cost and quality of care that the elderly will receive in 2050.

I. Introduction

The United States population is aging. Improvements in longevity coupled with fertility declines have changed the age structure of the population, and these trends are expected to continue. In addition, surviving members of the "baby-boom" generation, born between 1945 and 1964, will be between 86 and 105 years old in the year 2050. These facts combined mean that we are in a moment of particularly pronounced demographic change. Observers have noted that this expansion in the number of older adults will have widespread societal implications. In this project, we focus on the implications for caregiving labor and the role of immigrants as a source of that labor.

As the population ages, there will be more individuals in need of care.[1] This care may take many forms, from medical care provided by doctors and nurses, to assistance with activities of daily living – cooking, cleaning, bathing, dressing, for example - provided by family or personal aides. Availability of labor to assist with housework and yard work may affect whether the elderly can "age-in-place" in their own homes, and the quantity (and quality) of labor available for nursing homes may affect the quality of care and life for those who move to assisted living facilities.

[1] The issue of how to meet coming elder-care needs is receiving much popular attention. For example, the Wall Street Journal's July 20th, 2018 article "America Is Running Out of Family Caregivers, Just When it Needs Them Most: Smaller, more far-flung families mean fewer unpaid helpers." https://www.wsj.com/articles/america-is-running-out-of-family-caregivers-just-when-it-needs-them-most-1532094538?

One does not always think about immigration policy in conjunction with care-giving for tomorrow's elderly. However, recent economics research suggests two particularly important pathways by which immigrants may have an effect on outcomes of the elderly. In turn, these pathways imply that the number of immigrants living in the United States in 2050 will have implications for caregiving markets.

First, research has documented that the presence of immigrants can affect household production decisions. Cortes and Tessada (2011) shows that where there are more immigrants, highly skilled women supply more labor to the market, presumably because the presence of immigrants reduces the cost of home services like cleaning and child care. In our complementary NIH-supported research (Butcher and Watson 2019), we investigate whether a similar mechanism is at work for the elderly: does the availability immigrant labor increase household services available for the elderly and thus allow them to age-in-place? The preliminary analysis suggests that this is indeed the case. In this paper, we examine the increased number of workers likely to be employed in care-giving and home services provisions given the aging of the population by 2050.

A second route through which the size of the elderly population may have implications for immigrant labor demand is through assisted living and nursing home care. The availability of immigrant labor may have implications for the quality of care available to those who need to move into institutional settings. Stevens et al. (2015) demonstrate a link between the supply of nursing aides and excess mortality. During good economic

times, a tight labor market leads to changes in staffing ratios in nursing homes, resulting in increased mortality among those aged 80 and up. Immigrants provide a disproportionate share of this type of caregiving labor, suggesting that changes to immigration may also affect staffing ratios in institutional care settings.[2] Furtado and Ortega (2018) provide evidence that when a local labor market has a higher share of immigrants, the quality of care in nursing homes improves, as measured by fewer falls and residents' engagement in activities of daily living.

In this paper, we begin by describing the literature on the caregiving labor market, and then we turn to describing the data used in our analysis. We then review the projected population changes. The projected changes in the elderly population have implications for the changes in the number and proportion of people with age-related morbidity, and thus the need for caregiving. We examine how employment in various occupations is likely to be affected by the aging of the population. Next, we document representation of the foreign born in different industries and occupations at the national level. We then discuss links between aging, shifts in caregiving labor markets, and immigration policy, and discuss implications for the well-being of the elderly.

[2] Note that there is no conflict in these potential mechanisms. It is possible that immigrant labor can affect the length of time that the elderly are able to live in their own homes and affect the quality of care in institutional settings once that transition is made. Lewis (2013) provides evidence in another context that firms' decisions about production technology can respond to immigration.

II. The Elderly, Labor Market for Caregiving, and Immigration

As shown below, by 2050 there will be over 30 million people who are 80 and older, more than a doubling of the size of that population. At the same time, the share of the population that is working-age will grow much more slowly, meaning that there will be far fewer working-age adults per elderly person. This demographic shift has many potential implications for the caregiving labor market and for the health and well-being of the elderly.

It is well-documented that age-related morbidity may include cognitive decline and mobility challenges that interfere with the activities of daily living. Age-specific disability rates among the elderly have been declining in recent years. However, increases in mortality and morbidity for middle-aged non-Hispanic white Americans (Case and Deaton 2017) suggest the possibility that this trend could reverse, leading to increases in morbidity among this group and more caregiving needs later in life. Rising obesity rates may necessitate earlier assistance with physical activities of daily living, and may make it more challenging to deliver effective assistance.[3] Also, later retirement ages may affect caregiving needs; Choi and Schoeni (2017) find that cohorts that retire later have more reported cognition difficulties and difficulties with activities of daily living in their early

[3] Felix et. al. (2015) states that in 2010 nearly 25% of nursing home residents had a body mass index greater than or equal to 35, up from 14.7% in 2000. A New York Times article (Varney 2015) describes the difficulty nursing homes are having caring for these patients who may require additional staff to assist with mobility and/or specialized equipment to give them adequate care.

sixties than cohorts that were able to retire earlier.[4] All of these factors point to a greater need for caregiving workers as the population ages, including both those providing medical care and those providing non-medical assistance with activities of daily living.

How the elderly will access the caregiving and health services they need will entail decisions about living arrangements, which in turn will be informed by individuals' preferences, savings, health status, access to public benefits, and the costs of accessing personal care and medical care in different settings. As Grabowski, Gruber, and Mor pointed out in a 2017 NYTimes Op-Ed: "Roughly one in three people now turning 65 will require nursing home care at some point during his or her life. Over three-quarters of long-stay nursing home residents will eventually be covered by Medicaid." A nursing home may be thought of as a high-density living arrangement that makes it easier for a group of workers, combined with specialized equipment, to deliver care. Presumably, more workers would be required to deliver the same quality and quantity care where the individuals not to be housed in a high-density, capital-intensive environment.

A large body of research finds that the elderly report strong preferences for living independently and aging in place (McGarry and Schoeni 2000). The ability of the elderly

[4] Some researchers have noted improvements in cognition, see for example, Leggett et. al. 2017). This research uses different measures of cognition – for example measuring mistakes in simple mathematical calculations – (in the Americans Changing Lives Study) and finds that later cohorts have better cognition at age 65. Increasing education across cohorts can explain the improvement. Cognition in Choi and Schoeni (2017) is based on self-reports in the Health and Retirement Survey.

to realize their goal of aging at home is highly affected by economic conditions. Previous research has documented that living arrangements of the elderly respond to changes in Social Security benefit levels, and to Medicare reimbursement rates for home health aides (McKnight 2006, Orsini 2010, Englehardt and Greenlaugh-Stanley 2010). For example, Engelhardt et. al. (2005) finds that increases in social security income reduce the probability that elderly widows and divorcees live with others, indicating that when people have more income, they choose more privacy, which they achieve by living independently.

Thus, the existing literature strongly suggests that the living arrangements of the elderly are influenced by the costs of living independently. One potentially important driver of the costs is access to a supply of labor that can provide help with activities of daily living (such as cooking, shopping, housecleaning, laundry, yard work) and provide needed medical care in the home. Evidence indicates that when Medicare payments for formal home health care aides are more limited, the elderly substitute with informal care (Golberstein et al. 2009). Although previous work has not focused on the role of immigration in providing labor for home production on behalf of the elderly, Cortes and Tessada (2011) demonstrates that immigrants serve in this capacity in delivering home production for high-skilled women. There may be similar effects of immigrant labor supply for the elderly, with immigrants providing the services and caregiving that allow the elderly to age in place (this is the subject of Butcher and Watson's ongoing NIH

supported research). [5] As will be discussed below, immigrants form a large share of the labor force providing home production services.

Despite the frequent preference of the elderly to age in place, many do require long-term care in nursing homes and assisted living facilities at some point. Here again, immigrant labor plays an important role. Immigrants comprise a large share of the labor force providing formal health care. In particular, foreign-educated nurses went from about 6 percent of those taking the national licensure examination in the mid-1980s to about 20 percent in the mid-2000s (Cortes and Pan 2015). Research indicates that foreign-educated nurses are close substitutes for native-born/educated nurses (Kaushal and Kaestner 2015), and there is some evidence that nurses from the Philippines are more skilled than native-born nurses with other similar characteristics (Cortes and Pan 2015). As demand for medical services expand with an aging population, a steady supply of foreign-born medical staff will be important for meeting that demand. Staffing levels in nursing homes have been shown to be tied to elderly mortality and morbidity in nursing homes, and recent work shows that more immigrants in a local area lead to higher staffing levels in nursing homes and better outcomes for nursing home residents (Furtado and Ortega 2018).

[5] Immigrants also comprise a large share of the construction and home improvement industry. Adding safety features to a home (handrails in showers, for example) has been shown to reduce falls, and offsets short term medical expenditures nearly one-for-one (Eriksen et al. 2015). In addition to cooking, cleaning, and home health care, immigrants might have an impact on living arrangements through access to home modification.

In sum, there are strong reasons to believe immigration could affect the future of caregiving. We investigate the relationship between the age of the population and the demand for caregiving occupations below, and then consider the implications of immigration for the caregiving market.

III. Data

We use two sources of data for the analysis. The first are population projections calculated by the U.S. Census Bureau.[6] These are generated in 5-year age increments, with the 100-plus age category collapsed into one. For the work using Census projections, we refer to the working age population as those aged 15 to 64 and the elderly population as those 80 and up. Projections are reported for ten-year intervals through the year 2060; we focus on the year 2050.

The second source of data are individual microdata from the decennial Census/American Community Surveys (ACS) for 1990, 2000 and combined from 2006-2017.[7] We can examine institutionalization among the elderly (typically residence in nursing homes) as an outcome using these data. We define the foreign-born to include anyone born outside the U.S. and its outlying areas and territories, and use the terms "foreign born" and

[6] Available at https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html. These estimates are based on cohort-specific projections of fertility, mortality, and net migration.

[7] Steven Ruggles, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas, and Matthew Sobek. IPUMS USA: Version 8.0 [dataset]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D010.V8.0Available at www.ipums.org

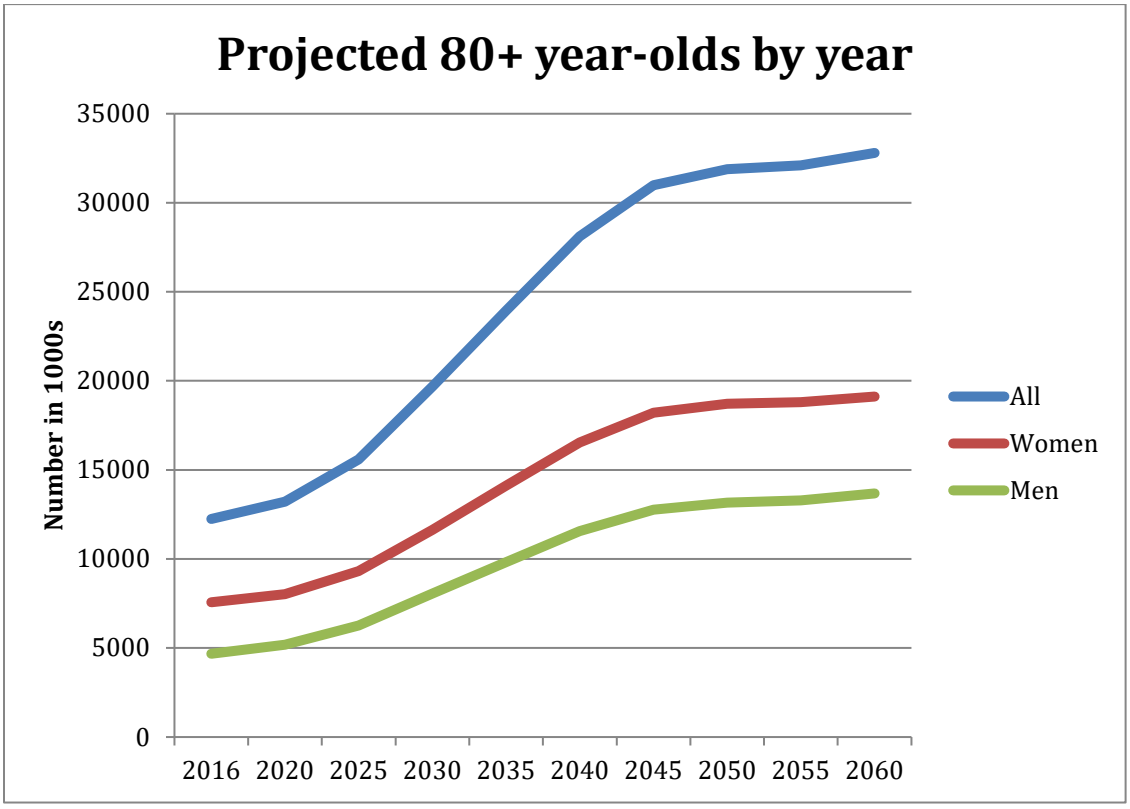
"immigrant" interchangeably. We define the working age population as those aged 16 to 64 for the ACS analyses.

IV. Population Changes by 2050

The Census Bureau population projections show a large increase in the elderly population, which we define here as age 80 and up. As Figure 1 shows, there will be over 30 million people who are 80 and above in the year 2050, about 2.6 times more than there are today. The number of elderly individuals is expected to rise rapidly until about 2045 as the baby boom generation ages. Then, the elderly population will grow more modestly. There are more women than men among those age 80 and up, with about 1.62 elderly women for each elderly man in 2016, and this is projected to fall to 1.42 women per man by 2050.

Multiplying the elderly population by 2 to 3 times might not be a concern if it were occurring in the context of rapid population growth more generally. However, Census projections suggest the overall population will only grow 18 percent between now and 2050, and the working-age population (defined in the Census projection data as ages 15-64) will only increase 11 percent. Thus, it is the case that the elderly are projected to be a much larger share of the population in 2050 than they are today.

Figure 1: Projected number of 80+ year-olds by year (in thousands)



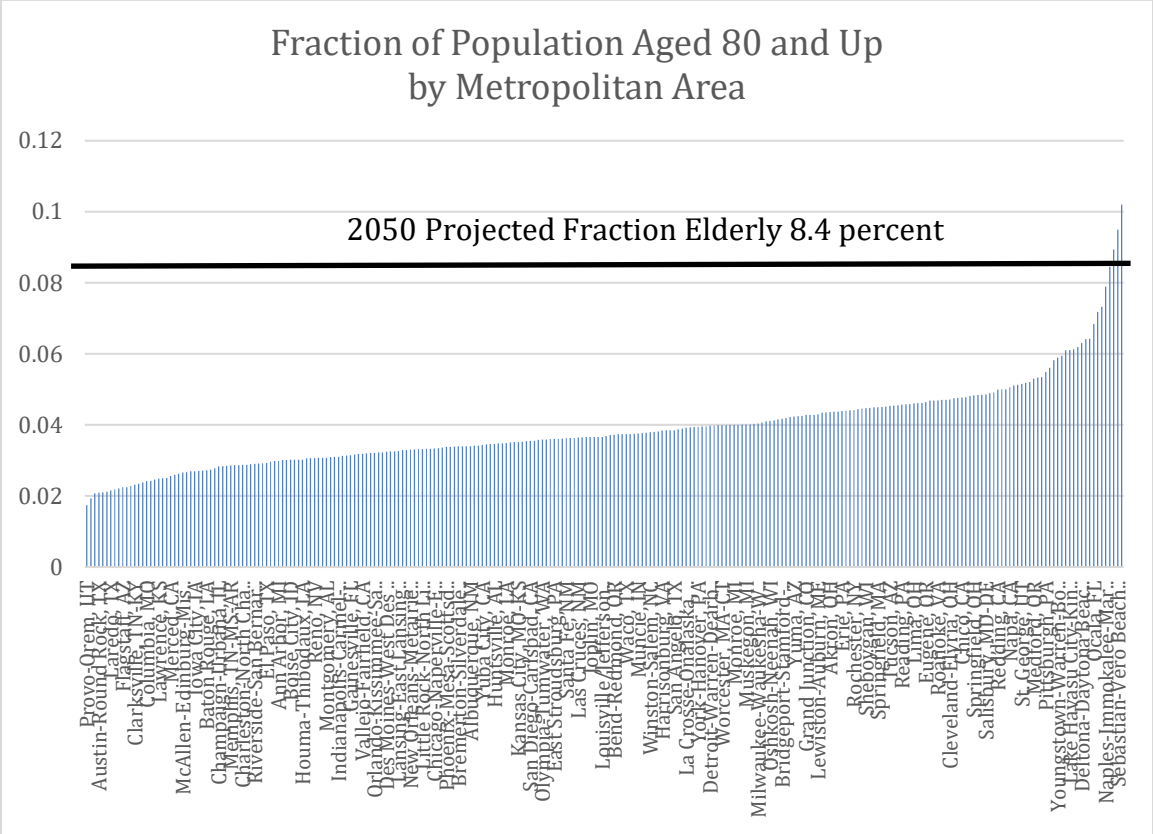
Source: From Projected 5-Year Age Groups and Sex Composition: Main Projections Series for the United States, 2017-2060. U.S. Census Bureau, Population Division: Washington, DC. Release Date: March 2018.

To put this change in context, consider that the fraction of individuals ages 80 and higher in the United States is estimated to be around 3.2 percent when calculated using 2012-2016 American Community Survey (ACS) data, or 3.8 percent in 2016 using Census Bureau estimates.[8] Florida has the highest share of elderly today of any state, at 5.1 percent, according to the ACS. The Census projects that the fraction of the whole U.S. population

[8] The 2016 Census Bureau numbers are a bit higher, at 3.8 percent. This may partially reflect the fact that the ACS incorporates earlier years.

age 80 and up will be 8.4 percent by 2050. As shown in Figure 2, today there are only four metropolitan areas in the entire country - all in Florida - that exceed 8 percent elderly. The Punta Gorda metropolitan area in Florida has the highest share elderly, at 10.2 percent. In other words, in 2050 the age distribution of the United States overall will resemble that of the oldest parts of Florida today.

Figure 2. Fraction of Population Aged 80 and Up by Metropolitan Area

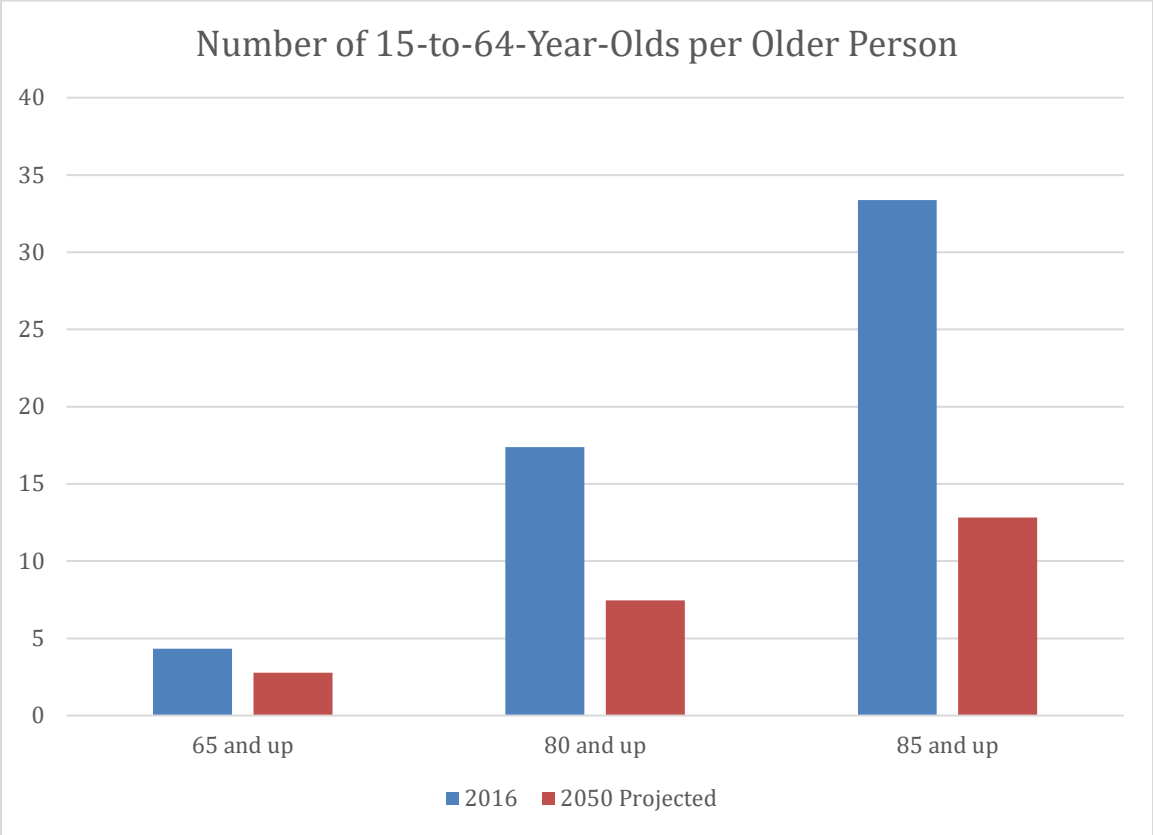


Source: Authors' calculations using American Community Survey, 2012-16.

Figure 3 uses the Census projections to calculate the number of each elderly age group relative to the working age population. There are projected to be more than twice as

many 80-to-84-year-olds relative to 15-to-64-year-olds in 2050 as there were in 2016. The change in the elderly population relative to the working age population will pose challenges for many aspects of society, from old age insurance to caregiving markets.

Figure 3: Age group size relative to working age (age 15 to 64)



Source: Authors' calculations using Projected 5-Year Age Groups and Sex Composition: Main Projections Series for the United States, 2017-2060. U.S. Census Bureau, Population Division: Washington, DC. Release Date: March 2018.

Though the Census does not produce population projections by age for each state, we can project the future number of elderly per potential worker in each state by assuming tomorrow's elderly will be distributed in the same way as today's elderly, and today's

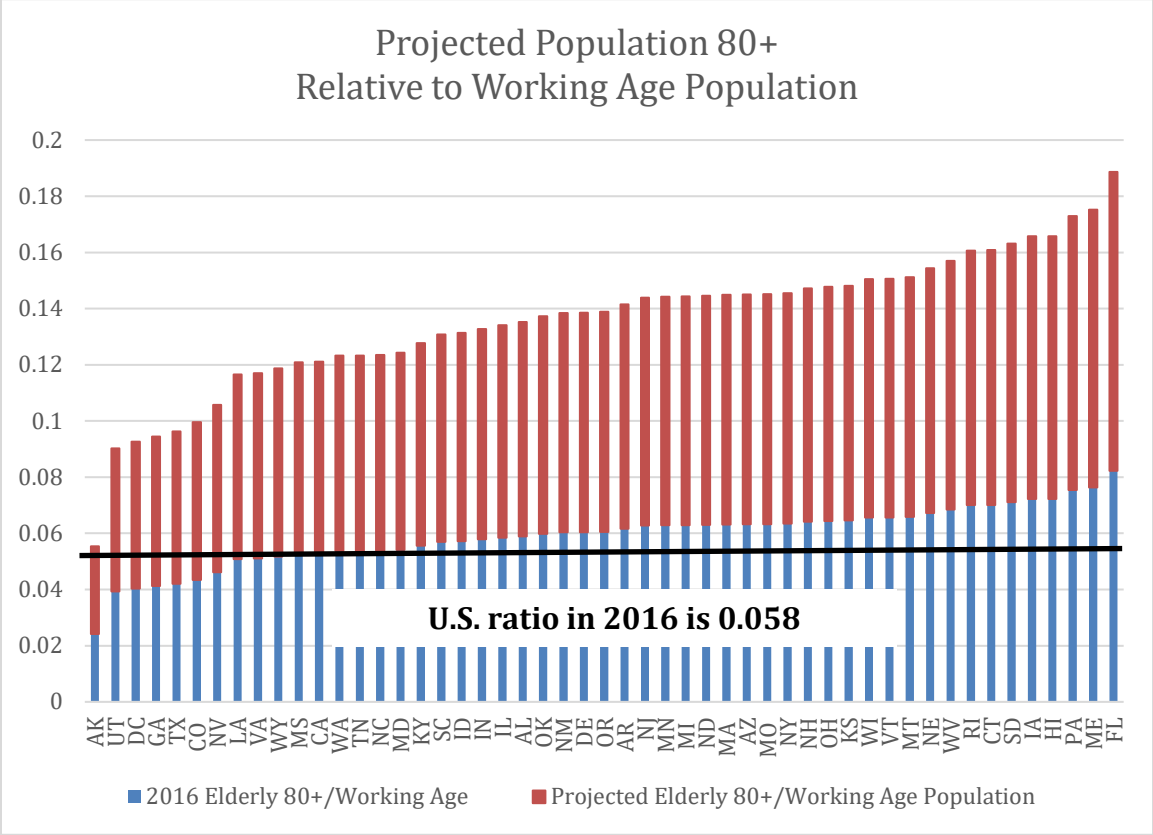
working age population will be distributed as today's working age population. This approach does not take into account differential demographic trends occurring within places for reasons unrelated to the overall aging of the population, but nevertheless gives a sense of the year 2050 across the country.

Today, the U.S. has 0.058 people over age 80 per working age person. Florida is the state with the highest relative population of elderly, with 0.082 people over age 80 per working age person. Figure 4 shows the projected ratio of elderly to working age population in the year 2050, assuming the elderly and non-elderly populations are distributed across states as they are today. All states except one (Alaska) are projected to have more elderly individuals per potential worker than today's Florida. In other words, we can expect the demand for caretaking labor to increase across the country to levels not currently seen in any state.

V. Incidence of Morbidity

The aging of the population is important for caregiving needs because the incidence of morbidity increases with age. Figure 5 uses the 2017 American Community Survey to calculate the fraction of the population reporting disability, called "difficulties" in the survey, by age. The difficulties in the ACS are self-reported and include difficulties with cognition, difficulties with physical mobility/ambulation, difficulties with independent living, difficulties with self-care, and difficulties with senses (vision and/or hearing).

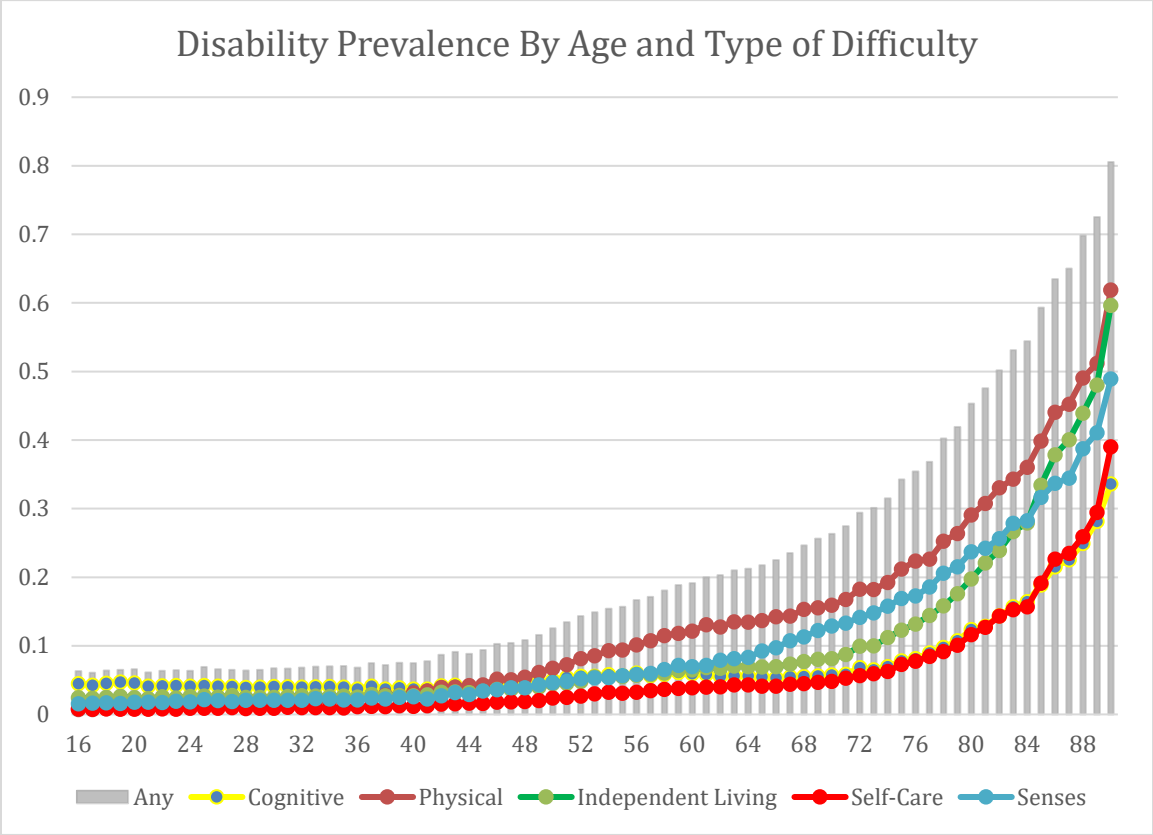
Figure 4. Projected Population Aged 80 and Up in 2050 Relative to the Working Age Population



Source: Authors' analysis of American Community Survey data and Census projections. Calculated by allocating projected 80+ U.S. Population in 2050 according to current distribution of 80+ population across states.

Disability rates increase rapidly with age, with an inflection point around age 80. At age 80, about 45 percent of people report some type of difficulty, the most common being physical mobility (29 percent). By the time they reach their late eighties, almost half of individuals report difficulty with independent living and more than half have physical challenges. About 30 percent report cognitive difficulty. In the age 90-plus group, 81 percent of individuals report a difficulty.

Figure 5. Disability Prevalence by Age and Type of Disability



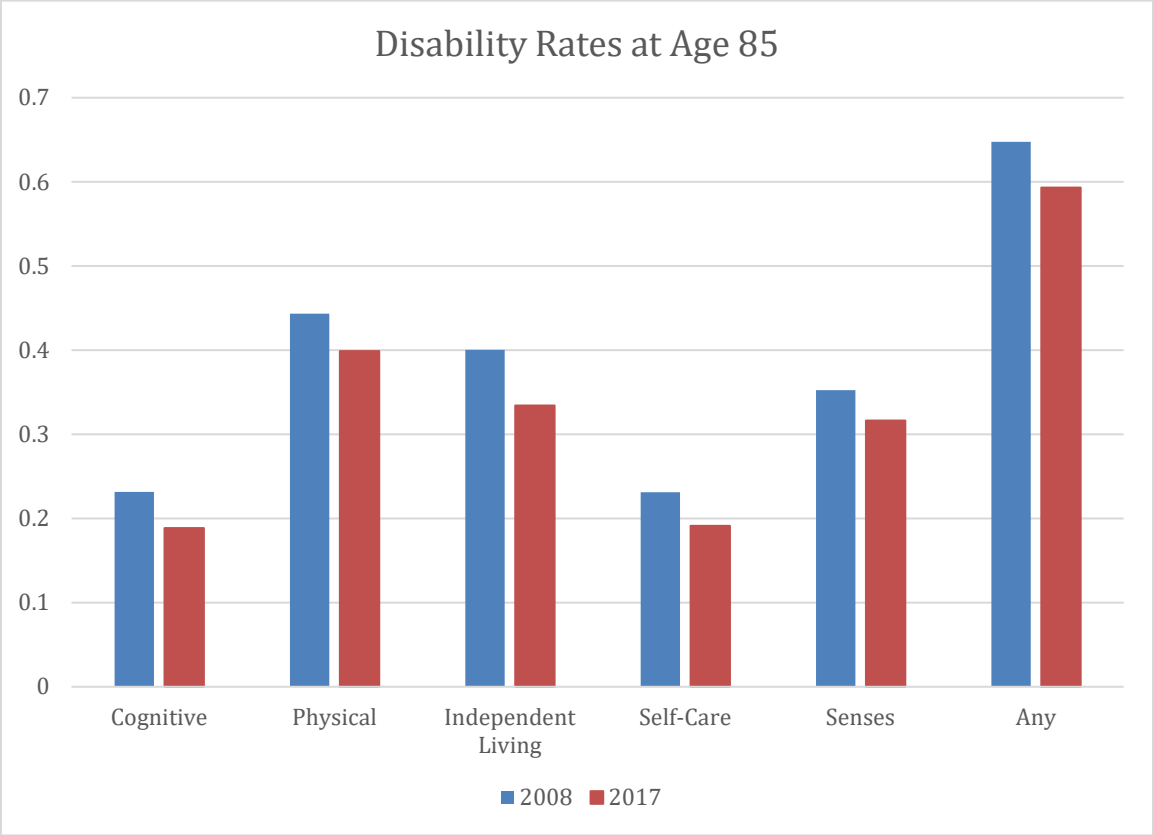
Source: Authors' analysis of 2017 American Community Survey Data. Final datapoint reflects ages 90 and above.

Of course, current disability rates may not predict those in the future. In general, recent cohorts of older Americans appear to be healthier than prior generations.[9] In the American Community Survey, the disability questions have changed over time, so a recent direct comparison is only available between 2008 and 2017. Even in that short time,

[9] How the aging population will affect demand for health care services is an important question. While it is clear that health care expenditures rise as people age, recent work points out that health expenditures rise rapidly as "time-to-death" decreases, with expenditures rising very rapidly in the last year of life (Howdon and Rice 2018). If the future elderly experience lower morbidity rates at a given age than the current elderly, then we may see further shifts down in the age-institutionalization curve.

however, it is clear that there are reductions in self-reported difficulties among older adults. Figure 6 shows that 85-year-olds have substantially reduced rate of all types of difficulty over the past decade.

Figure 6. Disability Rates at Age 85



Source: Authors' analysis of 2008 and 2017 American Community Survey data.

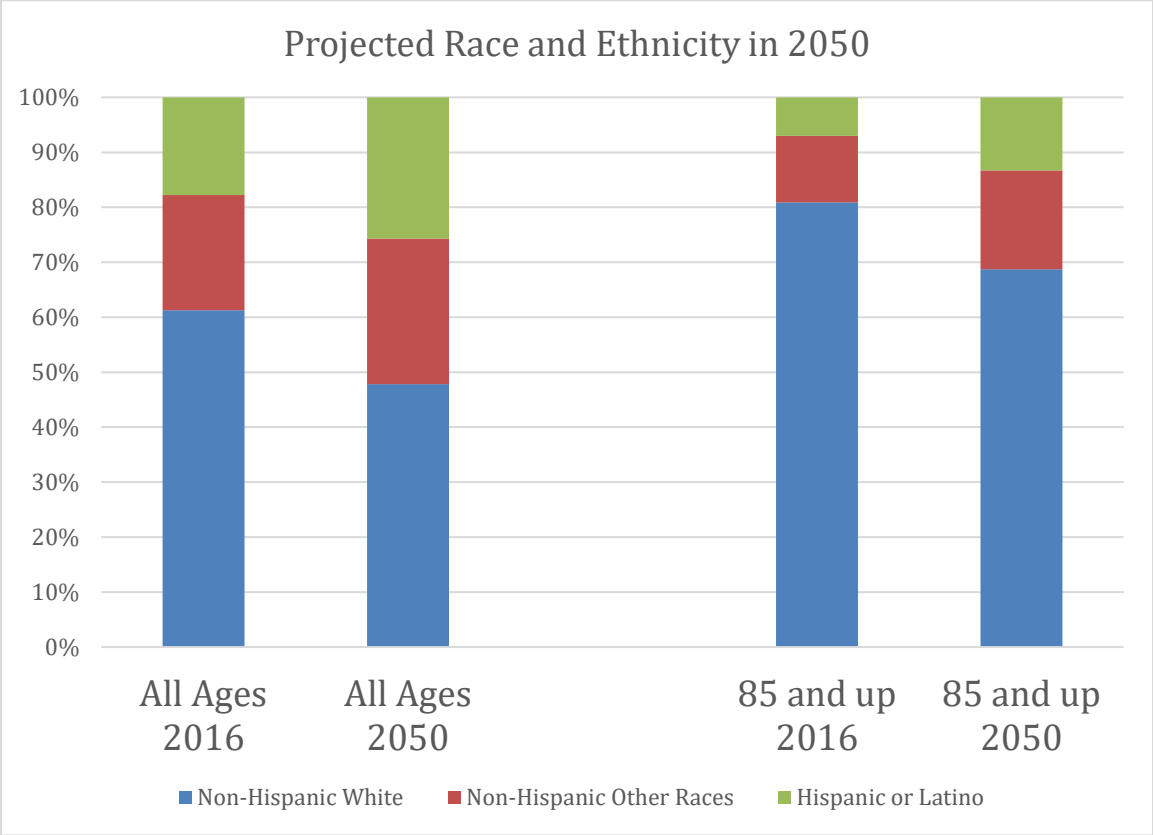
It remains to be seen whether reductions in morbidity are likely to continue at the same pace until 2050. It is likely that improvements in health interventions and technologies will continue. For example, knee and hip replacements will likely get better, and technology will allow individuals to live at home longer with virtual monitoring (we will

return to this issue below). On the other hand, researchers have documented increasing health challenges for today's cohort of middle-aged adults, which may manifest themselves as slower morbidity improvements in tomorrow's elderly (Case and Deaton 2017).

On average, today's "difficulty" rates are 50 percent for 80-to-84-year-olds, 65 percent for 85-to-89-year-olds, and 81 percent for those ages 90 and up. That implies about 7.5 million individuals aged 80 and up living with a difficulty today. By 2050, these same age-specific disability rates would yield over 20 million people ages 80 and up living with a difficulty. Even if disability rates are cut in half over the coming decades due to improved health and technology, 10 million people ages 80 and up will have a disability in the year 2050.

Another factor to consider in predicting future morbidity is changing demographics of the older population. The Census Bureau predicts a substantial shift in the racial and ethnic composition of the U.S. population in general by 2050, and a somewhat more modest shift for the older population, as shown in Figure 7. For example, non-Hispanic whites are projected to be 81 percent of the population aged 85 and up in 2050, compared with 87 percent today. The Hispanic or Latino population will grow from 7 percent of those age 85 and up to 13 percent. There will be higher shares of those identifying as black/African-American of (11 percent compared with 8 percent today, including black Latinos) and Asian (6 percent rather than 4 percent, including Asian Latinos.)

Figure 7. Projected Race and Ethnicity in 2050

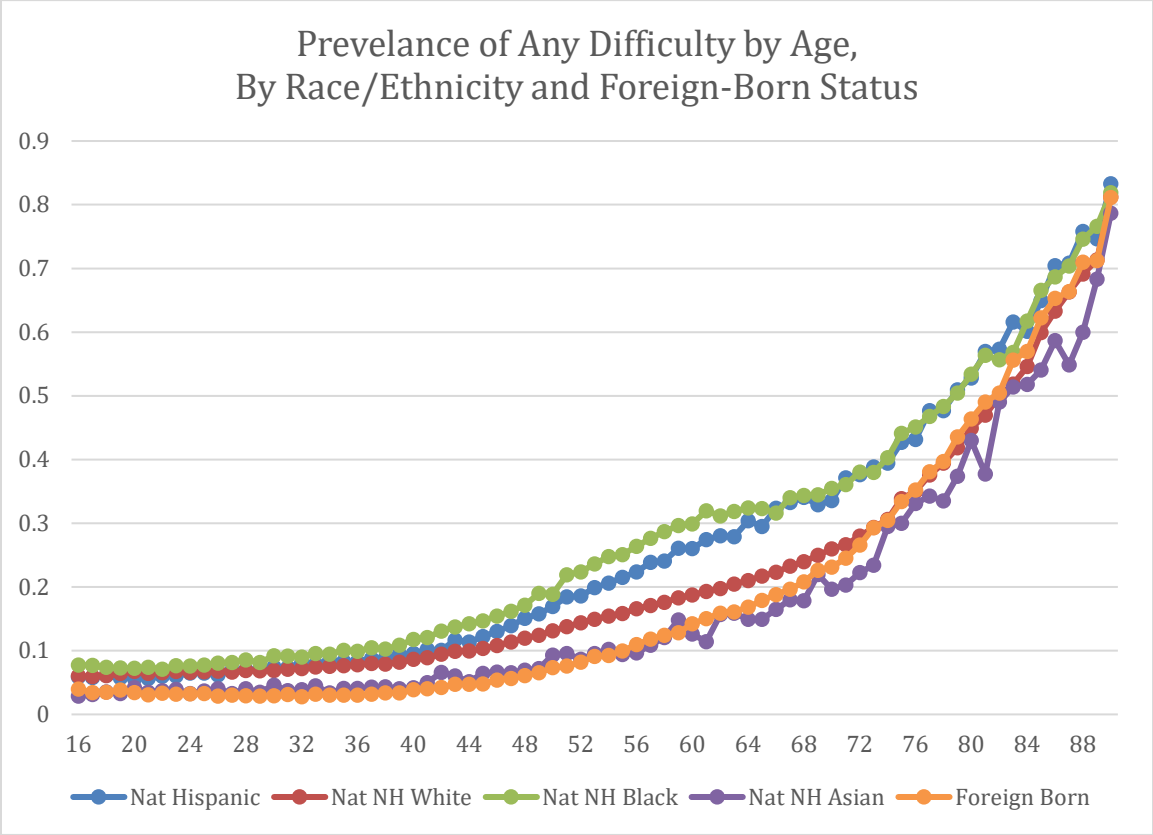


Source: U.S. Census Population Projections.

These demographic changes could predict changing disability rates among the elderly if race and ethnicity are strong predictors of morbidity. Researchers have documented better health outcomes among the Latino population than might be expected based on income and education levels, for example, and this finding is especially true for the foreign-born Latino population. However, it is unclear whether this health advantage will continue for future cohorts (Goldman 2016).

To investigate the potential impacts of changing demographics, we examine the "difficulties" reported in the American Community Survey based on age, Hispanic/Latino ethnicity, race, and foreign-born status, as shown in Figure 8. (These categories do not line up exactly with the categories available in Census projections.) We combine five years of ACS data to improve precision. We find that, conditional on age, the foreign-born population and the U.S.-born Asian population generally have the lowest prevalence of disability, whereas U.S.-born African-Americans and U.S.-born Latinos tend to have higher disability rates. Importantly, these differences are most pronounced around age 60. At older ages morbidity rates tend to converge. By age 84, a majority of each group faces some sort of difficulty, and the difference in disability prevalence rates between groups is less than ten percentage points. We conclude that changes in the racial and ethnic composition of the older population are unlikely to have a major impact on elderly disability rates observed in the year 2050.

Figure 8. "Difficulty" Rates by Age by Race-Ethnicity and Foreign-Born Status



Source: Authors' analysis of 2013-17 American Community Surveys. Final datapoint reflects ages 90 and above.

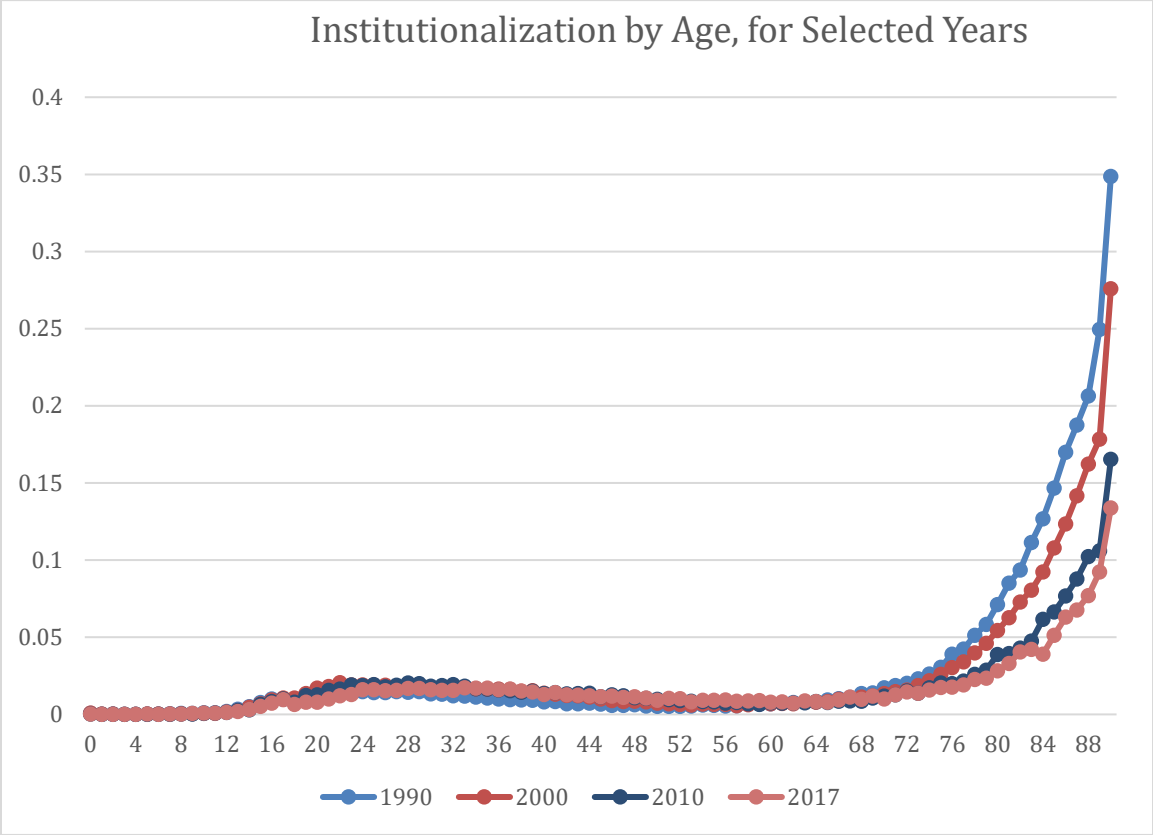
VI. Institutionalization

In the American Community Survey data, institutional populations may live in mental institutions, criminal justice institutions, and institutions for the disabled, poor, or elderly. Although one cannot separately identify the types of institutions in the ACS, most of the institutionalized elderly reside in institutions that provide nursing care and assistance with activities of daily living.

As shown in Figure 9, the proportion of the population that is institutionalized rises to about 2 percent for those in their late twenties, mostly due to incarceration, and then declines through middle age. It then begins to rise steeply around age eighty, reflecting the pattern seen in self-reported difficulties. Importantly, although the data indicate that the majority of the population ages 80 and up have some type of disability or difficulty, fewer than 10 percent of individuals in their eighties live in an institution. This indicates that many elderly individuals are able to access help that allows them to live outside of an institutionalized setting, or that there is unmet need for such help, or some combination of the two.

It is also clear from Figure 9 that institutionalization rates are changing over time. Since 1990, age-specific institutionalization rates have been declining rapidly among older individuals, consistent with the improved morbidity observed in recent data. In 1990, 15 percent of 85-year-olds lived in an institution; that number was around 5 percent by 2017.

Figure 9. Institutionalization Rates by Age, for Selected Years

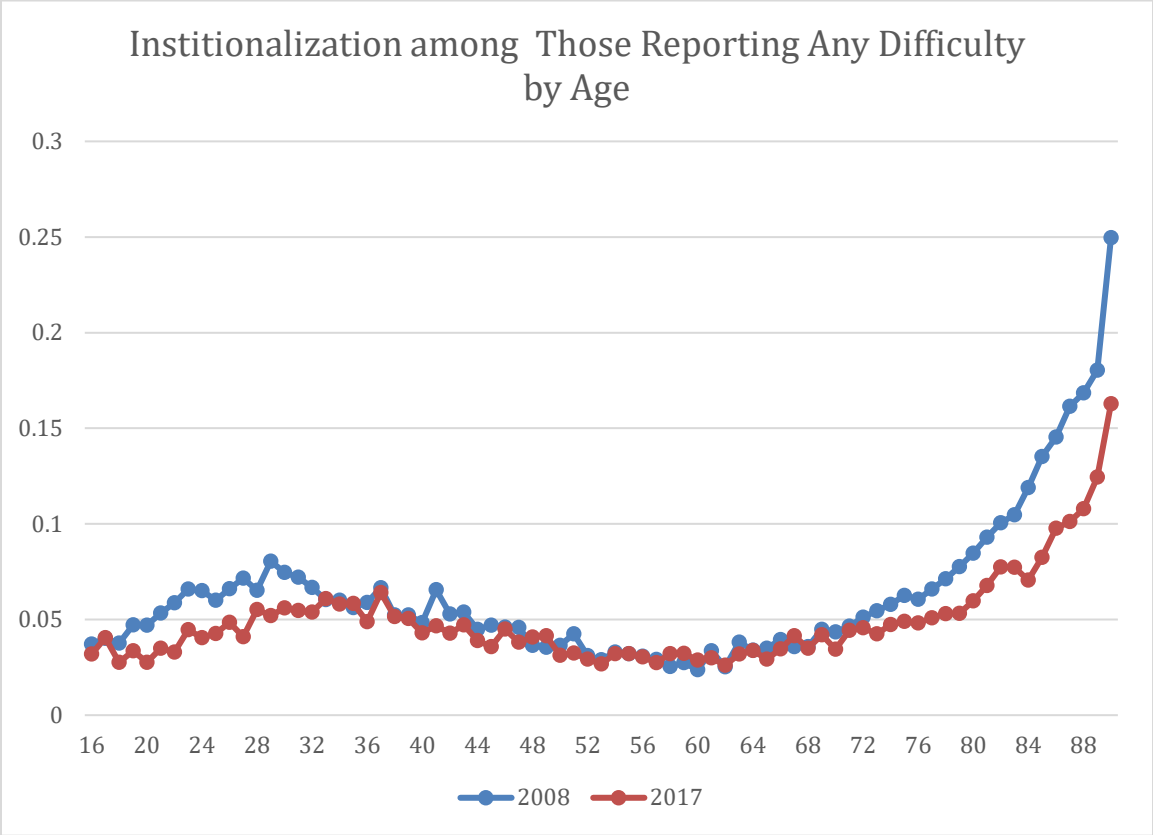


Source: Authors' analysis of 1990 and 2000 Censuses and 2010 and 2017 American Community Surveys. Final datapoint reflects ages 90 and above.

This pronounced decline in age-specific institutionalization reflects improved health among the elderly as well as changes in institutionalization conditional on having a disability. Figure 10 looks specifically at individuals reporting a "difficulty". Among this group, institutionalization rates declined between 2008 and 2017. It is possible that options for aging in place with disability have been improving over time, and disabilities may be becoming less sever over time. In 2008, about 13 percent of 85-year-old

individuals with a difficulty lived in an institution, but by 2017 that number was around 8 percent.

Figure 10. Institutionalization Rates among those Reporting Any Difficulty by Age



Source: Authors' analysis of 2008 and 2017 American Community Surveys. Final datapoint reflects ages 90 and above.

The degree to which older individuals with disabilities will continue the trend towards aging place in place depends in part on the availability of formal and informal care at home. Tomorrow's elderly will have fewer children available to care for them at home,

possibly putting upward pressure on institutionalization rates. Another important factor is the availability of paid workers to assist with care and other home production facilities.

There are about 810,000 individuals aged 80 and up currently living in an institution. To project the institutionalized population in the year 2050, we consider two scenarios. One is that institutionalization rates remain the same as today for the 80-to-84, 85-to-89, and 90-plus age groups. In this scenario, about 2.3 million individuals ages 80 and up will be living in institutions in the year 2050. Alternatively, we consider a scenario in which institutionalization rates continued to fall substantially such that they are half their current rate for each age group. In the alternative scenario, about 1.1 million individuals would be living in institutions in the year 2050, still a meaningful increase relative to today.

A rise in the number of institutionalized elderly suggests that the labor force working in such institutions will increase as well. Many states have minimum staffing ratios for long term care facilities. The Centers for Medicare and Medicaid Services (CMS) penalizes nursing homes in their quality rating system if they fail to have a registered nurse on site 8 hours per day. CMS also recommends that facilities have 4.1 hours of nursing care per resident per day, including a prescribed mix of registered nurse hours, licensed nurse hours, and certified nurses' aide hours, though over half of nursing homes fail to achieve this goal (Harrington et al., 2016). It is likely that the demand for nurses and nurses' aides

will grow in the coming decades to along with a larger institutional population. In the absence of substantial growth in this sector, today's staffing guidelines will not be met.

VII. Projecting Caregiving Labor

As the number of individuals needing care at home or in an institution increases, the market for caregiving labor is likely to change. We expect to see higher demand for caregiving labor generate higher wages as well as an increase in the number of workers in the caregiving sector. The degree to which there are adjustments on the wage dimension versus the quantity dimension depends on the supply response of workers and depends on whether firms and households can easily substitute away from caregiving labor.

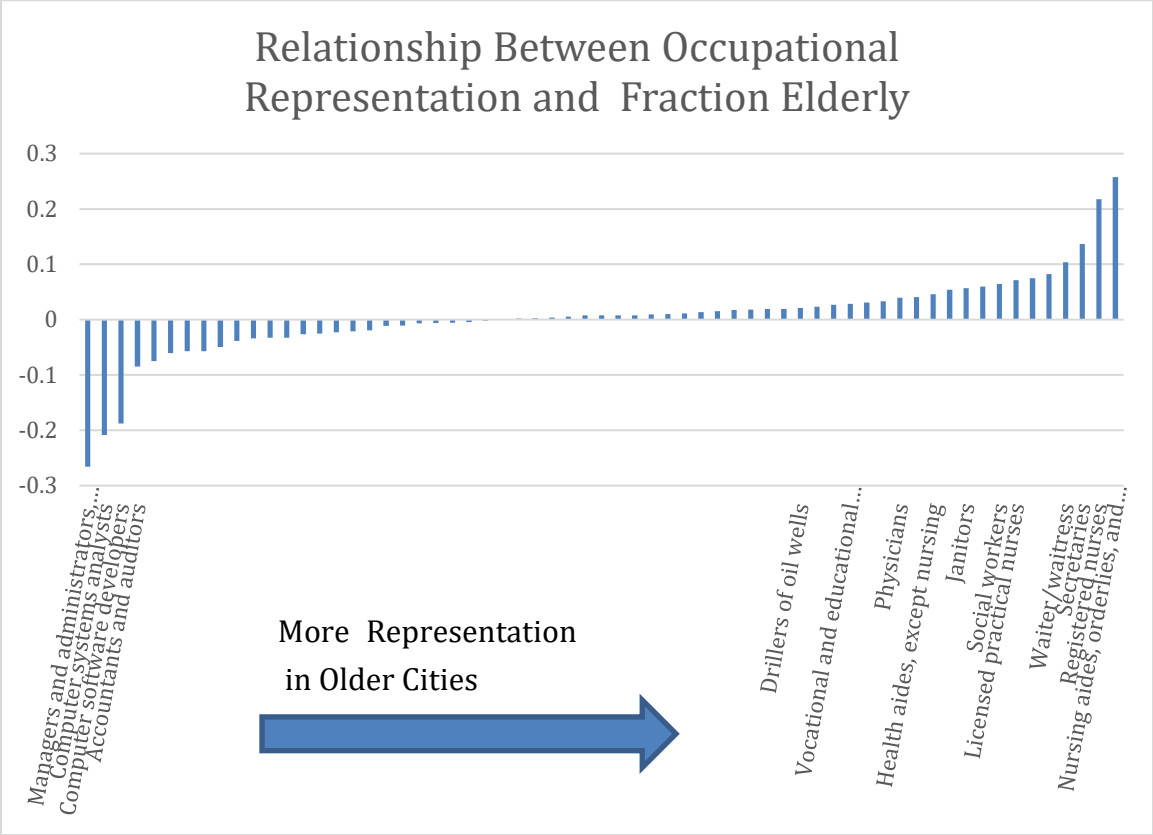
As a first cut at understanding how labor market *quantities* might respond, we use current variation across metropolitan areas in the elderly population. In particular, we predict the fraction of the working age population employed in various fields as a function of the overall share of the elderly in the metropolitan area. We expect that areas with more elderly residents might have more health aides and fewer preschool teachers, for example. To quantify the association, we estimate the following equation for a variety of occupations:

$$\frac{EmpOccX_{jt}}{EmpAll_{jt}} = B_0 + B_1 \frac{PopAge80plus_{jt}}{TotPop_{jt}} + B_2 year_t + u_{jt},$$

where *EmpOccX* refers to the number employed in occupation X among 16-to-64 year-olds in metropolitan area *j* in time period *t*, *EmpAll* refers to the number employed among 16-to-64 year-olds*, PopAge80plus* refers to the number of people ages 80 and up, *TotPop* refers to the total population, and *year* is an indicator for the time period. There are two time periods used, year 2000 and combined ACS years 2012-2016, for a total of 518 observations per occupation. We do not include metropolitan area fixed effects so our estimates rely on cross-sectional variation as well as time variation. Standard errors are clustered at the metropolitan area level. A control for time is included to purge the estimates of variation due to national trends in labor market structure that may not relate to demographic change. Nevertheless, it is important to recognize that these estimates reflect associations and a causal interpretation may be inappropriate.

To assess whether our hypothesis that caregiving jobs are more prevalent in areas with an older population is consistent with the data, we perform this metropolitan area regression separately for each of the 321 occupational codes (1990 occupational code version) in the American Community Survey. In Figure 11, we plot the coefficients from occupation-specific regressions for each occupation with at least 500,000 employees nationally. A large positive coefficient implies that workers are more likely to be represented in that occupation when the share of the population aged 80 and up is higher. The occupations with relationships to the elderly share that are statistically significant are labelled in the figure.

Figure 11. Relationship Between Occupational Representation and Fraction Elderly.



Source: Authors' analysis of Census American Community Survey Data. Each bar represents coefficient from metropolitan-area-level regression for one occupation. Labeled occupations have statistically significant relationships with the fraction elderly in a metropolitan area.

Of all occupations, nursing aides have the strongest relationship with the age of the population. The coefficient implies that a five percentage point increase in the population share over 80 (roughly the change expected between now and 2050) would be associated with a 1.2 percentage point increase in the share of the workforce that are nurses aides, a 50 percent increase over the current average of about 2.4 percent. Other caregiving and health care occupations including non-nursing health aides, registered nurses, licensed

practical nurses, physicians and others are also disproportionately represented in areas with more older adults.

We also looked at professions that might assist the elderly to age in place, such as housekeepers, gardeners, and taxi drivers. Housekeeping and gardening occupations had a positive, though statistically insignificant, association with the fraction elderly in a metropolitan area, and the relationship with taxi drivers was positive and significant at the five percent significance level. Fields such as preschool teachers and construction supervisors had negative and statistically insignificant relationships with the share elderly.

VIII. Foreign-Born Representation in Occupations

Using the ACS 2012-2016, we consider the concentration of the foreign born in several occupations that might be particularly important for the elderly. These include those that we have identified as caregiving and health care occupations significantly related to the share elderly in the prior section (nursing aides, LPNs, RNs, non-nursing health aides, and physicians) as well as several that might facilitate aging in place (housekeepers, gardeners, and taxi drivers). As shown in Table 1, all of these occupations have a substantial and growing proportion of foreign born.

Table 1. Foreign-Born Representation in Occupations

Occupation	1990 Immigrant Share	2012-2016 Immigrant Share
Nursing Aides	0.118	0.246
Non-nursing health aides	0.091	0.145
LPNs	0.067	0.150
RNs	0.095	0.160
Physicians	0.214	0.292
Housekeepers	0.237	0.520
Gardeners	0.463	0.646
Taxi Drivers and Chauffeurs	0.286	0.477
All Eight Occupations Above	0.142	0.270

Source: Authors' analysis of Census and American Community Survey data.

To consider what the future may bring, we imagine that the regressions in the prior section offer a good indicator of how the labor force might shift as the population ages. (The regressions are an imperfect indication because there may be unobserved factors that are related to both the elderly population of a place and the occupational distribution, but they offer a useful starting point.) We assume the size of the employed working-age population will increase at the pace that the Census projects for the working-age population overall, and will shift towards occupations that are currently more prevalent in metropolitan areas with more elderly. The results of this exercise are presented in Table 2. For example, we project there will be about 5.7 million nurses'

aides, up from 3.2 million today. Combined, the eight professions of particular interest – those we have deemed important to elderly care-giving - will grow from 8.4 percent of the workforce to around 12 percent.

Table 2. Projections for Eight Key Occupations

Occupation	Number in Occupation (Thousands)	Proportion of U.S. Workforce in Occupation	Implied Effect of a 5 p.p. Increase in Fraction Elderly	2050 Projected Proportion of U.S. Workforce in Occupation	2050 Projected Number in Occupation (Thousands)	2050 Projected Number of Immigrants in Occupation (Thousands)
Nursing Aides	3,278	0.023	0.013	0.036	5,711	1,405
Non-nursing health aides	860	0.006	0.002	0.008	1,328	193
LPNs	734	0.005	0.004	0.009	1,389	208
RNs	3,029	0.021	0.011	0.032	5,114	818
Physicians	806	0.006	0.002	0.008	1,218	356
Housekeepers	1,478	0.011	0.001	0.012	1,875	975
Gardeners	1,263	0.009	0.003	0.012	1,883	1,216
Taxi Drivers/Chauffeurs	391	0.003	0.001	0.003	548	261
All Eight Occupations	11,839	0.084	n/a	0.120	19,065	5,432

We also examine the role immigrants might play in these occupations. The current mix of immigrants and natives in a given occupation depends on many things, including the wages and working conditions in a particular occupation, the relative education levels of immigrants and native born, as well as immigration policy. Again, we make an admittedly stringent assumption: that the ratios of immigrants to the total number of workers is fixed

within occupations. In other words, we ask: how many immigrant workers would be in these occupations in 2050 if we hold constant the fraction immigrant in each of these occupations?

For example, we expect the proportion of the workforce that are nursing aides to grow from 2.4 percent to 3.6 percent, and expect the overall working age employment to grow by about 12 percent, for a total of 5.7 million workers. Today, about 25 percent of nursing aides are foreign born, so we project there will be about 1.4 million foreign-born nursing aides if the share of the occupation that is foreign-born stays constant. Combining all eight occupations, we would expect about 5.4 million foreign-born individuals to be working in caregiving-related occupations in 2050, relative to about 3.2 million today, assuming no change in their representation in each occupation.

Needless to say, not all foreign-born individuals are expected to work in these eight occupations in the future. Currently, about 13 percent of all foreign-born individuals work in these professions. Holding that proportion constant, the foreign-born working-aged workforce would need to increase by about 63 percent, from 25 million to 42 million. (It is also possible that immigrant workers would shift away from other occupations such as agriculture and construction to respond to market forces, which would imply a smaller "target" number.)

The most recent Census projections suggest that a foreign-born workforce of 42 million may be out of reach. The total foreign-born population aged 18-to-64 is projected by the Census to grow by 23 percent between now and 2050, from 34 million to 43 million, assuming total net international migration of just under 1.1 million per year. However, at a given point in time, only about 67 percent of working-aged immigrants are employed – others are students, full-time homemakers, disabled, or between jobs. The implication is that 29 or 30 million immigrants would be in the working in the U.S in 2050 if Census projections are correct, not the 42 million "target" – the number of foreign-born workers required according to our back-of-the envelope calculations to maintain current immigrant representation in the eight professions of interest without shifting immigrant workers away from other occupations.

Needless to say, the Census projection is not necessarily illustrative of what the future will bring. In its Social Security Trustees Report, the Social Security Administration projects higher rates of net immigration (around 1.4 million per year) than the Census, a number that would yield something closer to the target of 42 million in the workforce by 2050. But the Social Security Trustees also publish a "high cost" projection, which assumes net immigration of only around one million per year, and would yield fewer working-aged immigrants than projected by Census. (This is considered a "high cost" scenario from the perspective of the Social Security Trust Fund because immigrants are a net fiscal benefit to the Social Security system.)

In sum, immigration policy regarding legal immigration and approaches to undocumented immigration will substantially affect future immigrant inflows, and therefore affect the labor force available in occupations with elderly caregiving. Unless immigration is expanded well beyond current Census projections, the provision of elderly caregiving will need to adapt significantly to respond to a growing need.

IX. Margins of Adjustment and Implications of Immigration for Elderly Outcomes

How would a lack of immigration affect caregiving services? It is likely that we would see some combination of increased wages in these sectors, fewer formal caregivers per elderly person in 2050, and changes in the production of care for the elderly. These factors in turn may have implications for the quality of care the elderly receive, and their health and well-being.

a. Effects on Wages in Caregiving Occupations

The debate about the impact of immigration on native wages is ongoing and unresolved. Many economists believe that immigration puts some degree of downward pressure on native wages at the low end of the skill distribution (Borjas, Grogger, and Hanson 2010), but may open up opportunities for specialization such that most natives are better off as the result of immigration (Lewis 2011). A different question is how immigration affects wages in specific occupations such as those emphasized in this paper, and therefore how the cost of caregiving services might adjust in response to immigration flows.

Recent work by Furtado and Ortega (2018) sheds some light on this issue using U.S. data from 1980-2012. They report that immigrant inflows to a local area do not change the wages of registered nurses, but do substantially reduce the wages and increase the employment of less-skilled nursing occupations such as nurses' aides. If the same relationship holds true in the future, the cost of caring for an elderly person in 2050 will be highly dependent on immigration decisions that are made in coming decades.

b. Number of Formal Caregivers per Elderly Person

As noted above, the demand for caregivers will increase substantially by 2050. The higher wages described above are expected to increase the cost of care and therefore reduce the number of caregivers hired per elderly person. Reductions in the number of formal caregivers per elderly person will occur even with substantial immigration, and are expected to be more severe if immigration is curtailed.

It is possible that informal care provided by family members could expand to meet the gap in formal caregiving. There are limitations to the feasibility of this solution, however. The coming generation of elderly will have fewer children and grandchildren to care for them, and those children and grandchildren may have to reduce their own labor supply if they provide unpaid care for their aging parents (Mudrazija 2019). These fertility changes will increase the demand for paid caregiving, either at home or in institutions (Wettstein and Zulkarnain 2019), suggesting that the caregiving challenge will be greater than implied by our projections.

c. Technology

Our analysis makes projections about the number of caregivers needed based on the likely changes in the number of elderly living with disabilities. Of course, rapid technological change in the ways that we care for the elderly could throw off these projections. Technological changes are expected to affect labor demand and supply in profound ways (Holzer 2019). And indeed, technology in elder care is widely discussed: from alert systems and remote video monitoring that can help family members ensure that their loved ones are being cared for (Miskelly 2001), to smart homes that can order food when stocks are running low (Sponselee et al 2008), to cat-like robots[10] that can simulate the companionship of a pet for people who can no longer care for a live animal, the possibilities seem endless.

Nonetheless, the general trend in jobs and technology has been one of job "polarization" (Autor and Dorn 2013; Autor 2015; Goos and Manning 2007). Jobs have been growing at the high end of the skill distribution and at the low end. Jobs in the middle that are easily routinized (searching for connecting flights by computer versus a travel agent, for example) have been more rapidly replaced by technology than personal services. The services that the elderly need are characterized by both very high skills (medical providers) and lower skills (personal care services), but neither of these are jobs that are easily routinized.

[10] https://gerontology.usc.edu/resources/articles/how-technology-will-impact-aging-now-and-the-near-future/

In sum, although we are likely to witness meaningful change in the technology of caregiving, it seems likely that human caregivers will continue to be critically important in elder care for the foreseeable future. We expect that even with technological change the number of caregivers needed in 2050 as a fraction of the workforce will be higher than it is today.

d. Implications

What impacts might these changes in caregiving markets have on the health and well-being of the elderly? We believe the challenge of meeting caregiving needs will be better met with high levels of immigration over the next two decades.

Research supports a link between immigration and outcomes for the elderly. Our ongoing NIH-supported work attempts to identify a causal impact of immigration flows on institutionalization of the elderly today. Preliminary results support the hypothesis that the elderly are less likely to be institutionalized when there are more immigrants in a local area. It appears that immigration flows do allow the elderly to "age in place" (Moran 2017). Immigration may also have implications for the quality of institutional care. Furtado and Ortega (2018) report the expanded supply of nursing aides associated with immigration is linked to fewer falls in nursing homes and other measures of institutional quality. In sum, evidence suggests that today immigrants affect the health and well-being of the elderly population.

X. Conclusion

This project explores the implications of immigration for the elderly caregiving needs that will arise with the growth in the elderly population between now and 2050. The coming demographic shift has profound implications for the number of people in the U.S. living with health-related difficulties and living in institutions.

If human caregiving labor continues to be critical in elder care, then immigration is likely going to be one key factor in meeting the demand for elder care. Currently, many caregiving occupations are disproportionately staffed by the foreign-born. Our analysis suggests that the need for nurses' aides and other health aides, for example, will substantially increase as the population ages. If immigrants maintain their current representation in these occupations, demand for immigrant labor will rise significantly. Prior literature documents an important relationship between immigration and the supply of care-giving labor, and in turn an impact on the health and well-being of the elderly.

In recent years, the United States has witnessed net immigration of about one million individuals per year (including both authorized and unauthorized), but that number changes based on economic conditions in the United States, the economic and social situations in sending countries, and immigration policy. Reforms to the legal immigration system, for example, could dramatically alter the number of legal immigrants admitted, and change their skills and characteristics. Undocumented immigration may also respond

to factors such as border tactics and internal enforcement of immigration law. Ultimately, the size of the caregiving workforce in 2050 will be directly influenced by immigration policy decisions that are made in the coming decades, in turn affecting the health and well-being of the elderly population. Immigration policy is a key input into how successfully the United States meets the needs of an aging population.

XI: References

Ansberry, Clare, "America Is Running Out of Family Caregivers, Just When it Needs Them Most, *Wall Street Journal*, July 20, 2018. https://www.wsj.com/articles/america-is-running-out-of-family-caregivers-just-when-it-needs-them-most-1532094538

Autor, David H., and David Dorn, "The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market, " *American Economic Review,* August 2013, v. 103, iss. 5, pp. 1553-97.

Autor, David H., "Why Are There Still So Many Jobs? The Hitory and Future of Workplace Automation," Journal of Economic Perspectives, Summer 2015, vol. 29, no. 3, pages 3-30.

Borjas, George, Jeffrey Grogger, and Gordon Hanson, 2010. "Immigration and the Economic Status of African-American Men," Economica, 77(306): 255-82.

Butcher, Kristin, and Tara Watson, 2019. "Are Immigrants Aiding the Elderly?: The Impact of Immigration on the Living Arrangements and Health of the Elderly," manuscript in progress.

Case, Anne and Angus Deaton, 2017. "Mortality and Morbidity in the 21st Century," *Brookings Papers on Economic Activity Spring 2017*: 397-443.

Cortes, Patricia, and Jose Tessada, 2011. "Low-Skilled Immigration and the Labor Supply of Highly Skilled Women," *American Economic Journal: Applied Economics*, 3(3): 3:88-123.

Cortes, Patricia, and Jessica Pan, 2015. "The Relative Quality of Foreign-Educated Nurses in the United States," *Journal of Human Resources*, 50(4): 1009-1050.

Choi, HwaJung, and Robert F. Schoeni, 2017. "Health of Americans Who Must Work Longer to Reach Social Security Retirement Age," *Health Affairs*, 36(0): 1815-1819.

Ericksen, Michael D., Nadia Greenhalgh-Stanley, and Engelhardt, 2015. "Home safety, accessibility, and Elderly Health: Evidence from Falls," *Journal of Urban Economics*, 87:14-25.

Engelhardt, Gary V. and Nadia Greenlaugh-Stanley, 2010. "Home Health Care and the Housing and Living Arrangements of the Elderly," *Journal of Urban Economics*, 67(2): 226-238.

Engelhardt, Gary V., Jonathan Gruber, Cynthia D. Perry, 2005. "Social Security and Elderly Living Arrangements: Evidence from the Social Security Notch," *Journal of Human Resources*, 40(2): 354-372.

Farre, Lidia, Libertad Gonzalez, and Francesc Ortega, 2011. "Immigration, Family Responsibilities and the Labor Supply of Skilled Native Women," *B.E. Journal of Economic Analysis and Policy*, 11(1):1-48.

Goos, Maarten and Alan Manning, "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain," *Review of Economics and Statistics,* February 2007, v. 89, iss. 1, pp. 118-33.

Golberstein, Ezra, David C. Grabowski, Kenneth M. Langa, and Michael E. Chernew, 2009. "The Effect of Medicare Home Health Care Payment on Informal Care," *Inquiry*, 46(1):58-71.

Goldman, Noreen, 2016. "Will the Latino Mortality Advantage Endure?," *Research on Aging*, 38(3): 263-282.

Grabowski, David, Jonathan Gruber, and Vincent Mor, "You're Probably Going to Need Medicaid," Op-Ed, *New York Times*, June 13, 2017.

Felix, HC, C. Bradway, L. Chisholm, R. Pradhan, R. Weech-Maldonado, 2015. "Prevalence of Moderate to Severe Obesity Among U.S. Nursing Home Residents, 2000-2010," *Research in Gerontological Nursing*, 8(4):173-8.

Furtado, Delia, and Francesc Ortega (2018), "Do Immigrant Inflows Improve Quality of Care in Nursing Homes?," draft December 18, 2018.

Harrington, C., Schnelle, J. F., McGregor, M., & Simmons, S. F. , 2016. The Need for Higher Minimum Staffing Standards in U.S. Nursing Homes. *Health Services Insights*, 9: 13–19.

Howdon, Daniel, and Nigel Rice, "Health care expenditures, age, proximity to death and morbidity: Implications for an ageing population," *Journal of Health Economics,* January 2018, vol. 57, pp. 60-74.

Kaushal, Neeraj, and Robert J. Kaestner, 2015. "Are Foreign-Trained Nurses Perfect Substitutes for U.S.-Trained Nurses?" *Industrial and Labor Relations Review*, 68(5): 1102-1125.

Leggett, Amanda, Philippa Clarke, Kara Zivin, Ryan J. McCammon, Michael R. Elliott, and Kenneth M. Langa, 2017. "Recent Improvements in Cognitive Functioning Among Older Adults: How Much Does Increasing Educational Attainment Explain?," *Journals of Gerontology: Social Sciences*, 00:1-10.

Lewis, Ethan, 2013. "Immigration and Production Technology," *Annual Review of Economics,* 5:165-191.

Lewis, Ethan, 2011. "Immigration, Skill Mix, and Capital Skill Complementarity," *Quarterly Journal of Economics*, 126(2):1029-1069.

McGarry, Kathleen, and Robert F. Schoeni, 2000. "Social Security, Economic Growth, and the Rise in Elderly Widows' Independence in the 20th Century," *Demograph*y, 37:221-236.

McKnight, Robin, 2006. "Home Care Reimbursement, Long-term Care Utilization, and Health Outcomes," *Journal of Public Economics*, 90: 293-323.

Moran, Kelsey, 2017. Wellesley College Senior Thesis.

Orsini, Chiara, 2010. "Changing the Way the Elderly Live: Evidence from the Home Health Care Market in the United States," *Journal of Public Economics,* 94:142-152.

Ruggles, Steven, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas, and Matthew Sobek, 2018.. IPUMS USA: Version 8.0 [dataset]. Minneapolis, MN.: IPUMS 2018. https://doi.org/10.18128/D010.V8.0

Sponselee A., Schouten B., Bouwhuis D., Willems C. (2008) Smart Home Technology for the Elderly: Perceptions of Multidisciplinary Stakeholders. In: Mühlhäuser M., Ferscha A., Aitenbichler E. (eds) Constructing Ambient Intelligence. AmI 2007. Communications in Computer and Information Science, vol 11. Springer, Berlin, Heidelberg

Stevens, Ann H., Douglas L. Miller, Marianne E. Page, Mateusz Filipski, 2015. "The Best of Times, the Worst of Times: Understanding Pro-cyclical Mortality," *American Economic Journal: Economic Policy*, 7(4):279-311.

U.S. Census Bureau, "2012 Population Projections (May 2013 release)," available at http://www.census.gov/population/projections/data/national/2012.html

U.S. General Accounting Office, Testimony Before the Committee on Health, Education, Labor and Pensions, U.S. Senate, "Nursing Workforce: Recruitment and Retention of Nurses and Nurse Aides Is a Growing Concern," Statement of William J. Scanlon, Director, Health Care Issues, May 17, 2001, available at http://www.gao.gov/new.items/d01750t.pdf

Varney, Sarah, "Rising Obesity Rates Put Strain on Nursing Homes," *New York Times*, December 14, 2015.