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Abstract

Today, 25 percent of all caregivers of elderly are adult children. However, while the parents of the Baby Boom generation had three children per household on average, the Boomers themselves only have two. This project uses the *Health and Retirement Study* to assess how the number of children a person has affects the demand for formal long-term care, i.e. Long-term services and supports (LTSS), using ordinary linear regression, a Cox proportional hazard model, and an instrumental variable approach. Results suggest that the lower fertility of the Baby Boom generation is likely to lead to greater demand for LTSS in the coming decades. For example, the instrumental variable estimates indicate that having one fewer child increases the probability of having spent a night in a nursing home in the last two years from 10.7 percent to 12.4 percent among those with two or more Activities of Daily Living limitations.

Introduction

As people age, difficulty performing basic activities can result in the need for residential care, either long-term or short-term, for instance following an acute medical episode. LTSS, paid long-term care services that compensate for functional deficits – e.g., long-term residence in a nursing home, home care and personal care, assisted living facilities – represent a major expenditure for households as well as federal, state, and local governments. In 2013, the amount spent on LTSS in the U.S. totaled $310 billion, of which 51 percent was paid by Medicaid (Reeves and Musumeci 2015).[1] On top of that, Medicare spent another $48 billion on skilled nursing services for post-acute care, e.g., skilled nursing facilities (SNFs), in 2016 (CMS 2016).

While these monetary costs are already quite high, the LTSS system may come under significant strain in the next few decades, with costs on LTSS alone predicted to balloon from 1.3 percent of GDP in 2010 to more than 3 percent in 2050 (Congressional Budget Office 2013). Of course, the major cause is simple – as members of the large Baby Boom generation age into their late 80s, the demand for care will increase substantially due to growth of the elderly population alone. However, a smaller, but potentially aggravating factor, is that the Baby Boom generation also experienced much lower fertility than preceding generations (e.g., Bongaarts 2002; Bloom and Luca 2016), resulting in a decline in the number of children per household from three for the Silent Generation to two for the Boomers. Indeed, projections indicate that the ratio of individuals over age 85 to those in peak caregiving years (45-64) will increase from 1-to-7 today to 1-to-3 by 2050 (Houser, Fox-Grage, and Ujvari 2018). Furthermore, this lower fertility may be here to stay (Munnell, Chen, and Sanzenbacher 2018).

Lower fertility could exacerbate any increase in demand for LTSS caused by population growth alone since, currently, adult children make up one quarter of all caregivers and the literature has shown that formal care – LTSS – and informal care are generally substitutes (Mommaerts 2016; 2018). This paper explores the implications of lower fertility for the demand for paid care, particularly the most intensive form – stays in a nursing home or skilled-nursing facility either for the longer-term or for a shorter period of time. The paper finds that the decline in fertility for the Baby Boom generation is likely to lead to increased demand for LTSS, above and beyond the increase in demand due to the sheer size of this cohort.

[1] The total LTSS expenditures include spending on residential facilities, nursing homes, home health services, and home and community-based waiver services (Reeves and Musumeci 2015).

The paper uses the 1992 to 2014 waves of the *Health and Retirement Study* (HRS) to conduct three related analyses of the relationship between the number of children an individual has and the probability of a nursing home stay.[2] The first is a descriptive ordinary least squares (OLS) regression. This approach can provide insight into the relationship between fertility and LTSS use for the entire population with the highest statistical precision.

However, such a correlational approach is not well-suited for forecasting the effect of declining fertility on future demand for LTSS, since it confounds the effect of children on demand for LTSS with the effect of other unobservable characteristics that are correlated with high fertility. For example, if low cognitive ability – which is poorly measured by standard measures of education – is correlated with both high fertility and with an increased likelihood of severe cognitive decline in old age (e.g., as in Russ 2018), then estimates from the OLS analysis may be biased towards showing a smaller (absolute) effect of children. This smaller estimated effect would not accurately describe how much children reduce the likelihood of a nursing home stay, because it would partially reflect the fact that people with many children were more likely to experience severe cognitive decline and thus require more LTSS. And while controlling for the level of cognitive decline would eliminate this source of bias, the HRS only asks detailed cognitive questions of a small subsample of participants.

To isolate the causal effect of children on the likelihood of a nursing home stay, the paper uses a second analytical approach, a two-stage least squares (2SLS) analysis. In particular, the paper relies on the "gender mix" instrumental variable (IV) first developed by Angrist and Evans (1998), which is based on the observation that parents tend to prefer a mix of genders among their children. As a result, among those with at least two children, those whose first two children have the same gender are more likely to have additional children. Because the gender mix of the first two children is essentially random, this approach mimics a natural experiment in which some households are randomly assigned to a state more conducive to higher fertility than other households.

The two approaches described above are complementary, as the OLS approach provides much greater precision and estimates applicable to the entire population at the expense of potential bias, while the 2SLS estimates are consistent for those with at least two children but

[2] The HRS has been used to study the lifetime risk of nursing home use (Hurd et al. 2013) and the related out-of-pocket spending (Hurd et al. 2017).

suffer from larger standard errors. Nevertheless, both approaches find that having fewer children increases the use of nursing homes (although the OLS estimate is of small magnitude), with the causal estimates from the 2SLS indicating that having one fewer child leads to an increase in the probability of using a nursing home in a two-year period of 1.7 percentage points. For an individual with two or more limitations of Activities of Daily Living (ADLs), this effect represents an increase of 17 percent, from a baseline nursing home stay probability of 10.7 percent.

While the HRS dataset used is rich in terms of the availability of information on LTSS use and on the respondents' children, a known shortcoming of the data is that they do not distinguish between long-term nursing home stays and shorter stays for post-acute care (Kelley et al. 2014). Nevertheless the HRS is the only available dataset that has information on nursing home stays combined with information on respondents' children, gender of the children, and birth order. Furthermore, any increase in the demand for nursing home facilities, whether long- or short-term, will impose real economic costs which will need to be paid either by individuals, Medicaid, or Medicare. Therefore, the first two analyses abstract away from the specific reason of nursing home use, but focus on nursing home stays in general, including SNFs. To attempt to study *long-term* nursing home stays, the paper follows a third approach and estimates a Cox proportional hazard model, where the outcome is whether the respondent reports *living* in a nursing home. The results from the hazard model also suggest that having an additional child is associated with a lower hazard of living in a nursing home.

The remainder of the paper proceeds as follows. Section 2 briefly describes the existing LTSS and informal care environments, and the fertility characteristics of the current elderly and the Baby Boom generation. Section 3 describes the HRS data and the analytical approaches taken in the paper. Section 4 lays out the results of the analysis. Section 5 concludes that the demand for LTSS is likely to increase as the United States approaches mid-century, and that the small family size of the future elderly will contribute to the already large expected increases in demand for LTSS driven by the aging of the population.

Background

This section briefly describes the LTSS environment today, the interaction of LTSS and informal care, and the expected future trajectory of each. Second, it gives an overview of

fertility patterns over the mid-20th century to allow comparisons of the completed fertility of the Silent Generation – those in their late 70s, 80s, and 90s today – with that of the Baby Boom generation.

LTSS and Informal Caregiving Today

LTSS is provided through multiple layers of providers with different levels of intensity and cost suited to different levels of impairment. Mild impairments may require a small amount of help from a child, or only periodic support from home health care providers in the comfort of an individual's own home. More limiting conditions or post-acute recovery may require more intensive help from a non-impaired spouse or a child living nearby and visiting frequently, or even more comprehensive and skilled care, such as that provided in an assisted living or a nursing facility. And as the ability to perform ADLs, which include basic functions such as walking, dressing, or bathing, and Instrumental Activities of Daily Living (IADLs), which include activities such as preparing meals, taking medications, or shopping for groceries, declines more round-the-clock care is required, either from an especially dedicated child or family member or formally in a nursing home.

While care for individuals with two or more of these limitations often takes place in a nursing home, studies have shown that residence of adult children with elderly parents can serve as a substitute (Charles and Sevak 2005; Mommaerts 2018). Recently, the trend among policymakers and individuals has been to try to prolong the duration of this kind of care and to postpone entrance into nursing homes (Rowles and Teaster 2016). This trend partially reflects the high cost of nursing home care – an average of $97,450 per full year in a private room in 2017 (Genworth 2017) – and the prevalent preference among those needing care to remain in the community.[3] As a consequence of this trend, the demand for institutional care, as evidenced by the number of nursing home beds and their occupancy rates, has been slightly declining over the last ten years, despite an increase in the proportion of the population over age 85, the age at which ADL and IADL limitations usually begin to manifest (Centers for Medicare and Medicaid

[3] In one survey of seriously ill patients, 30 percent reported they would "rather die" than live permanently in a nursing home (Mattimore et. al 1997).

Services 2015). A primary question of this paper is whether changing fertility patterns could reverse or at least slow this trend.[4]

The Baby Boom and Bust

Following World War II, much of the world, including the United States, experienced a baby boom. Members of the Silent Generation, cohorts born roughly between 1925 and 1944, had average completed fertility rates of three children per woman. In contrast, the Baby Boom generation, cohorts born between 1945 and 1964, had much lower completed fertility rates, of two children per woman (see Figure 1). The consequences of the Baby Boom for the age structure of the U.S. population are well-known, as are its implications for age-related programs and services such as Social Security, Medicare, and the health services industry. For example, it has long been recognized that the wave of individuals becoming eligible in the next few years will place a strain on the finances of the Social Security program (Social Security Administration 2018).

Since so much of the care provided to the elderly is supplied by their children, the decline in the number of children per household of Boomers will likely lead to an increase in reliance on paid sources of care.[5] Such a shift may be unwelcome both in terms of monetary costs, and because the preferred mode of care for most is the more personable care provided by family. The next section describes the data and methods employed to estimate whether such a shift towards more LTSS is likely to occur.

[4] Another thing to note is that nursing homes provide three types of services: 1) skilled nursing (medical care and related services); 2) rehabilitation (needed due to injury, disability, or illness); and 3) long term care (health-related care and services not available in the community, and needed regularly due to a mental or physical condition (Centers for Medicare and Medicaid Services 2018), which have different payer profiles. Even though a nursing facility may provide each of the types of services on location, the first two are covered by Medicare if the care is delivered within 15 days after discharge from a hospital stay of at least three nights and the facility is certified as a Medicare SNF. For residential nursing home services, individuals must pay out-of-pocket or through Long Term Care insurance, or, if the individual has exhausted their assets, by Medicaid. While the current paper focuses on nursing home use in general, an increase in demand for LTSS due to a decline in fertility will potentially increase the financial burden on all the payers.

[5] The Baby Boom generation also experienced elevated rates of divorce relative to previous generations. Increasing divorce rates may also contribute to increased demand for LTSS, as spouses are generally the first informal care provider. Furthermore, divorcees with children who reach old age, may receive less care as the children who do provide care may face the added strain of splitting their efforts across two households or because they have less strong ties to their children. While the current paper cannot estimate the causal effect of divorce on the demand for LTSS, the analysis includes specifications both controlling and not controlling for current marital status. The results are very similar across these specifications.

Project Methodology and Data

To study the relationship between the number of children a person has and the probability of using paid care, the analysis uses the 1992-2014 waves of the public-use HRS. The HRS is a longitudinal dataset that surveys people ages 50 or older every two years about their health, their need for help with physical limitations, public benefit receipt, and other relevant characteristics. The core HRS is linked to the RAND HRS family data files which have information about respondents' children, including the total number of children, birth dates and gender.

This project first explores how the number of children a person has is associated with the demand for nursing facilities by estimating the following equation in an OLS model:

$$Care_{i,t} = \alpha_0 + \alpha_1 NrOfChildren_{i,t} + X'_{i,t}\rho + \varepsilon_{i,t} \quad (1)$$

where $Care_{i,t}$ is an indicator for having had any overnight stays in a nursing home since the last interview. This outcome variable is taken to represent the demand for LTSS. As described above, a trend towards greater reliance on in-home care is depressing the use of nursing homes; however in the period up to 2014 it is a useful proxy for paid care more generally, and it is interpreted in that way.[6] $NrOfChildren_{i,t}$ is the number of living children respondent i and their spouse have in year t; and $X'_{i,t}$ is a vector that contains fixed effects for age, year, race, place of birth, number of ADLs, number of IADLs, self-reported health, marital status, education, and religion, as well as a continuous control for household income.[7]

As discussed above, the project hypothesizes that the causal effect of the number of children is negative, so that having more children reduces the need for paid care. However, the sign of α_1 could be positive or negative as people with more children may differ in unobservable

[6] In terms of the public programs financing care, Medicare covers the cost of stays in SNFs for post-acute needs lasting under 100 days, while private-out-of-pocket payment and Medicaid programs pay for long-stay nursing home care. Therefore, some of the nursing home stays counted by this outcome measure of at least one night of a nursing home stay will burden Medicare, rather than Medicaid.

[7] The models are weighted using person-level weights, are estimated with robust standard errors to correct for potential heteroskedasticity in the error terms, and are clustered at the household level to control for serial correlation of the error terms. It is important to note that person-level weights are 0 in the HRS for individuals in nursing homes at the time of their interview. Analytical weights for institutionalized individuals exist in the HRS, but only from wave 5 (year 2000) onward. To maintain a large enough sample, the analysis therefore focuses on individuals who are not in a nursing home at the time of the interview. In results not presented here the sign and general magnitude of the estimated effects are consistent across different choices of weights, although statistical significance is more sensitive.

ways from people with fewer children that might be correlated with the nursing home use. For example, as described above, if low cognitive ability is associated with having more children and also with severe cognitive decline in old age, the sign on α_1 may incorrectly show that more children lead to more nursing home use.[8]

To isolate the causal effect of the number of children, the project employs an instrumental variables approach. This approach uses an instrument first developed by Angrist and Evans (1998), which exploits the fact that the gender of a child is randomly assigned and that parents have a preference for having children of both genders, in a 2SLS model. Because the instrument relies on the gender of the first two children, the 2SLS sample is limited to people with two or more children.[9]

The first stage of the 2SLS model uses an indicator for whether a person had two initial children of the same gender to predict the number of total children the person has, among people with two or more children.[10]

$$NrOfChildren_{i,t} = \beta_0 + \beta_1 SameGender_i + X_i'\pi + \varepsilon_i \quad (2)$$

The other controls contained in $X_{i,t}'$ in equation (2) are the same as in equation (1). In the second stage, the project estimates a similar equation to equation (1):

$$Care_{i,t} = \theta_0 + \theta_1 \widehat{NrOfChildren}_{i,t} + X_{i,t}'\gamma + \eta_{i,t} \quad (3)$$

where $\widehat{NrOfChildren}_{i,t}$ is the predicted number of children from the first stage and the other variables are as defined above. The project hypothesizes that θ_1 will be negative, i.e., that each additional child causally reduces the likelihood that a person will experience a stay at a nursing home.

[8] For example, as found in OLS, but not IV, estimates in Charles and Sevak (2005).
[9] Furthermore, the sample is limited to people who have the same number of children in the family file as the number of children they report as ever being born, to rule out that the observed gender mix is affected by adopted, deceased, or step-children.
[10] In the original specification in Angrist and Evans (1998) the endogenous variable was an indicator for whether a person had three or more children, instead of the number of children. The analyses also include estimates of this alternative specification.

It is worth noting that the identification strategy in this analysis fundamentally isolates the effect of a change specifically from three children to two children. While, it is certainly possible that the effect of going from one child to childlessness is quite different from the effect of going from three children to two, this shift closely reflects the change in fertility actually experienced between the elderly of today and tomorrow (see Figure 1). In other words, while the 2SLS approach places some restrictions on the analysis, those restrictions are appropriate given the actual change in fertility.

As described earlier, because the HRS does not distinguish between nursing home stays for post-acute care versus long-term care stays, the previous analyses study the effect of an additional child on any nursing home stay. To assess whether fertility is associated specifically with *long-term* care nursing home stays, the next analysis estimates a Cox proportional hazard model of *living* in a nursing home (presumably for an extended period). For simplicity, the analysis estimates a "reduced form" version of the instrumental approach, using a hazard model to estimate how having two initial children of the same gender is associated with the hazard of living in a nursing home.

The next section presents the results of the analysis and applies them to estimating how future demand for LTSS will change relative to today given the decline in fertility experienced by the Baby Boom generation.

Results

This section first presents the descriptive differences in nursing home utilization by number of children and discusses the other descriptive statistics of the sample. The OLS and 2SLS regression results are presented next, followed by the results from the Cox proportional hazard model of living in a nursing home. Finally, the implications of the estimates for 2050 demand for LTSS are drawn under certain simplifying assumptions about social and demographic changes by then.

Descriptive Results

Before reporting results on the relationship of interest, Table 1 shows the characteristics of the respondents in our sample. Column 1 displays the full OLS sample, column 2 shows the characteristics for the IV sample (people who have two or more children), and column 3 has the

characteristics of those with two or more ADLs in the IV sample. Columns (1) and (2) are quite similar in terms of the probability of having stayed in a nursing home, age, education, ADLs, IADLs, and health. Comparing column (2) to column (3), the people in column (3) are, as expected, older, more likely to be widowed, and less healthy.

Figure 2 looks at the relationship of interest and shows the probability of using a nursing home in the two years prior to the interview by the number of children a person has, among people with two or more ADLs. It shows that the risk of using a nursing home falls as the number of children rises.

OLS Regression Estimates

Table 2a shows the estimates from the linear regression that controls for other personal characteristics, stratified by whether the person reports any ADLs or has two or more ADLs. The results for the full sample indicate that, after controlling for age, year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, religion, and household income, one fewer child a person has is associated with a 0.1-percentage-point higher likelihood of having spent a night in a nursing home. The size of the association doubles for people with any ADLs, and triples among people who have two or more ADLs. All estimates are statistically significant.

For comparability with the 2SLS results below, Table 2b shows the results from a linear regression model when the sample is limited to the IV sample – i.e., those with two or more children. The results in column (1) confirm that the IV sample and the full sample are quite similar: as in column (1) of Table 2a, the results indicate that one fewer child is associated with a 0.1-percentage-point increase in the probability of spending a night in a nursing home. Among people with more than one ADL, one fewer child is associated with an increase of 0.4 percentage points, while it is associated with an increase of 1 percentage point among people with two or more ADLs. While all estimates are statistically significant at the 1-percent level, they are fairly small in magnitude. This small magnitude may reflect bias relative to the causal effect of children. The next part of the analysis addresses such bias through the use of an instrumental variable that plausibly randomly assigns individuals more or fewer children.

2SLS Regression Estimates

To account for the fact that people who have more children may be different from people who have fewer children for other reasons that cannot easily be controlled for, the analysis exploits the gender mix of the first two children as an instrument in a 2SLS framework. But first, for gender mix to be a viable instrument, it must effectively predict additional children among those who had two children to begin with. Figure 3 illustrates this first stage in the raw data, with no controls. The figure shows that of those with at least two children, those whose first two children had the same gender are 5 percentage points more likely to have additional children.

The results in column (1) of Table 3a show the 2SLS estimates for the full IV sample and in columns (2) and (3) are restricted to those with one or more or two or more ADLs respectively, since these individuals may be more sensitive to the presence of children. For the full sample, these estimates indicate that one fewer child increases the probability of having spent any nights in a nursing home in the last two years by 1.7 percentage points. The estimate is statistically significant at the 10-percent level. While the estimated effects for the subsamples with ADLs are actually larger, the results are not significant at conventional levels, perhaps due to the smaller number of observations.[11]

To place these results in context, Figure 4 compares the preferred estimate of the effect of one fewer child on the probability of nursing home care to the estimated effect of other personal characteristics that can be expected to affect the need for paid care.[12] The figure demonstrates that the effect of one fewer child is comparable to the effect of having one more ADL or IADL limitation, the effect of going from excellent to poor self-reported health, or the effect of being ten years older. Thus, the effect of one fewer child is quite meaningful in substantive terms, on par with major impairments in health.

[11] The F-statistic from the first stage is 20.1, indicating that the instrument is not weak. The first-stage effect of having two first children of the same gender on the probability of having three or more children is an increase of 8 percentage points (see Table 3b). This result is quite similar to the first stages estimated in Angrist and Evans (1998).

[12] The estimated effects of these characteristics on the probability of nursing home use come from a regression similar to equation 3, except that number of ADLs, number of IADLs, self-reported health, and age are controlled for linearly rather than through indicator variables for their different levels, in order to allow for a comparison of a unit change in these characteristics to the effect of an additional child. Notably, the estimated effect of a child in this regression is virtually identical to the result of the preferred specification.

Although the estimates of interest do not reach statistical significance at standard levels in the models estimated on smaller sub-samples, the sign on the coefficients is consistently negative. For example, when the regression is estimated only among people with one ADL or two or more ADLs (in columns 2 and 3 of Table 3a, respectively), the point estimates are not statistically significant anymore, but their magnitude is substantially larger and their sign still suggests that the relationship is negative.

Although the results from Table 3a show how nursing home use varies based on the predicted *number* of children, the original use of the gender-mix in the literature was to instrument for whether a person had three or more children (Angrist and Evans 1998). To ensure the results are not driven by the linearization of number of children, Table 3b shows the 2SLS results using a binary variable for having three or more children. The coefficient from this model estimated on the full IV sample also shows that having fewer children increases nursing home use. Specifically, having fewer than three children increases the risk of using a nursing home by 3 percentage points (statistically significant at the 5-percent level).[13]

Robustness Checks

Because instrumental variable regressions can be more sensitive than OLS to the underlying assumptions of the analysis, this section describes some robustness checks to ensure that the results hold up to changes in the assumptions. The results of these checks are in Table 4a and 4b, again showing estimates using the number of children or having three or more children and with column (1) showing the original result for comparison. The next two columns remove health controls and then controls like religion or income that may be endogenous to number of children. Column (4) shows the result among people ages 85 and older as these individuals' nursing home use may be more sensitive to the number of children they have. Across the specifications the sign of the estimate is robust, although statistical significance is inconsistent.

Columns (5) and (6) are meant to capture the fact that the literature on family caregivers has found that daughters provide more care than sons.[14] Thus, it is possible that the effect of

[13] The F-statistic of 39 from the first stage again indicates that the instrument is not weak. The results in columns (2) and (3), for people with one or two or more ADLs, respectively, are again not significant, but their sign suggests that the relationship remains negative.

[14] See, for example, Charles and Sevak (2005) and Do et al. (2015).

having an additional child provides fewer incremental benefits to households where the first two children of the same-gender were daughters versus sons. To examine this hypothesis, the columns show results from models estimated on people who initially have two daughters versus two sons, respectively. As expected, among those who start out with two daughters, the estimate is smaller (and not statistically significant) relative to the effect among those starting out with two sons. Among those who start out with two sons, having an additional child reduces the probability of being in a nursing home by 2.7 percentage points (statistically significant at the 10-percent level).

As hypothesized, having an additional child, conditional on having two daughters who are already more likely to provide informal care, does not reduce the likelihood of being in a nursing home much more. This finding supports the interpretation of the results as indicating that children reduce nursing-home utilization through substitution for informal care.

Cox Proportional Hazard Model Estimates

To assess whether having more children is also associated with a lower hazard of living in a nursing home, the paper estimated a Cox proportional hazard model. The results shown in column (1) of table 5 confirm findings from above and show that in the basic model, an additional child is associated with a 3-percent lower hazard of living in a nursing home. When additional controls are included for marital status, religion, education, and income, the estimate is not statistically significant anymore (column (2)). Similarly, the estimates in column (3) and (4) show the instrument used in the 2SLS, the indicator for having two initial children of the same gender, is insignificantly associated with the hazard of nursing home entry.

Implications for 2050

By 2050, even the youngest of the Baby Boomers will be in their late 80s. Based on population aging alone, the demand for LTSS among those over age 85 can be expected to roughly triple due simply to the fact that the number of Americans over age 85 is projected to increase from about 6 million in 2012 to 18 million in 2050 (Ortman, Velkoff, and Hogan 2014). At these ages, reliance on nursing homes (for both long-term and post-acute care) is very common: among those over age 85, 18.7 percent of individuals report having had a nursing home stay in the last two years.

Above and beyond this increasing size of the at-risk population, the analysis above shows that the decline in family size for this population will also increase the need for paid care per elderly person. To get a rough estimate of how large a role this factor will play in driving aggregate demand for paid care, the drop in children from 3.00 to 2.05 between the Silent Generation and the Baby Boomers can serve as a benchmark.[15] First, the tripling of the population over age 85 will roughly increase the need for nursing homes by a factor of 3 by 2050 relative to today. Additionally, the decline in fertility of this population is predicted to increase the demand per person by an extra (0.017*0.95/0.187=) 8.6 percent. So when the elderly population triples the projected future quantity of paid care demanded, due to both the population growth and the fertility decline, will be (3*(1+0.086)=) 3.26 times the current quantity of residential care demanded.

Of course, these projections come with caveats. First, while trends in health, morbidity, and mortality will also undoubtedly play a role in the future demand for care, they are held constant in this analysis. Second, though the analysis controls for marital status, the projections do not account for changes in marriage, divorce and re-marriage rates across cohorts, which are expected to play an important role in care needs as spouses are the first line of defense when a person starts needing care. Indeed, declines in marriage and increases in divorce may worsen the issues discussed here. Third, the projections also do not account for changes in female labor force participation. While the rise in female labor force participation has likely affected the informal care HRS respondents in the sample received, changing patterns suggest longer careers among younger cohorts of women may exacerbate the situation further (Goldin and Mitchell 2017). Fourth, the causal estimates presented above are only relevant for the margin of moving from three to two children; while this is the average change, the effects may differ depending on the distribution of the decline in fertility and the non-linearity of the effect across different numbers of children. Finally, the inability to distinguish long-term from post-acute care in the HRS means these estimates pertain to the overall utilization of any kind of nursing home care, including Medicare SNF services, but cannot break out how much is due to an increase in the prevalence of short stays in SNFs versus long-stays in nursing home residences. As those admitted into a SNF for post-acute care need skilled care, e.g. dressing of wounds or intensive

[15] For simplicity, this analysis ignores potential differential mortality trends among those with fewer versus more children.

cardiac rehab, this may be less substitutable by informal care from a child as long-stay nursing home use might be. Furthermore, as greater reliance on in-home care has depressed the use of nursing homes, the use of nursing homes is interpreted as a proxy for paid care more generally. Nevertheless, the current analyses provide the closest estimates of how declining fertility may affect the demand for LTSS over the next decades.

Conclusion

By 2050, even the youngest living members of the Baby Boom generation will have entered into advanced old age, a period of life when the need for care is very prevalent. It is often cited that the sheer size of this generation will lead to a substantial increase in the demand for LTSS. However, less is known about what demographic changes might contribute to these already large increases in demand for paid care. Today most care is provided informally, by family members, particularly adult children. However, the Baby Boom generation had fewer children than the current generation of elderly. This study analyzes the effect of this decline in fertility on the demand for paid care. The findings suggest that in addition to the likely increase in the demand for LTSS due only to the large projected elderly population, small family size will lead to a further increase in demand.

Further research with more detailed data that can distinguish between post-acute versus long-stay nursing home use is needed to provide more precise projections on the effects of fertility on these distinct types of uses of care. Future studies may also want to consider the joint effects of trends in health, marriage rates, and female labor force participation. Despite the limitations listed above, the overall sign and general magnitude of the projected change in the need for paid care are unambiguous. As policymakers weigh their approach to dealing with the demand for LTSS in the future, and as private enterprises calculate their entry into this fast-growing market, it will be important to consider not only the obvious demand stemming from the size of the future elderly population, but also from the limited availability of their potential informal caregivers.

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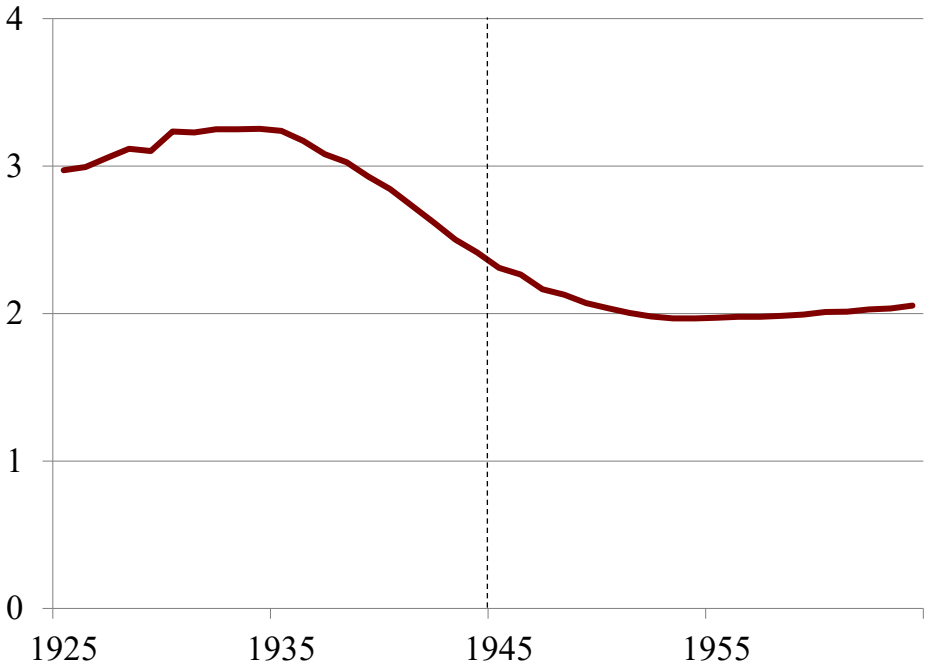
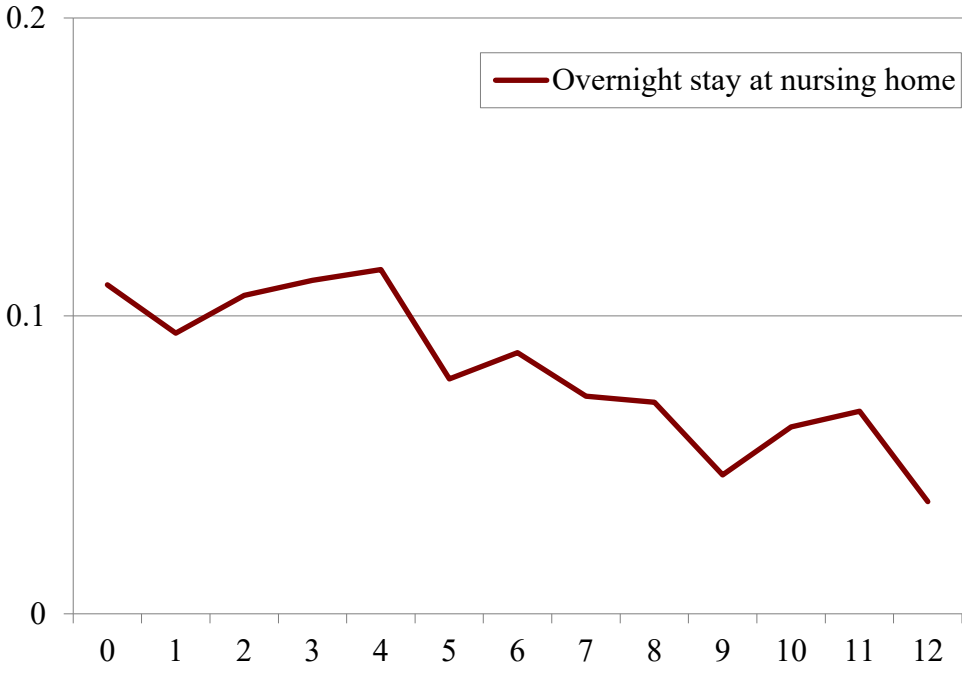
Figure 1. *Completed Fertility Rates for Cohorts Born 1925-1964*



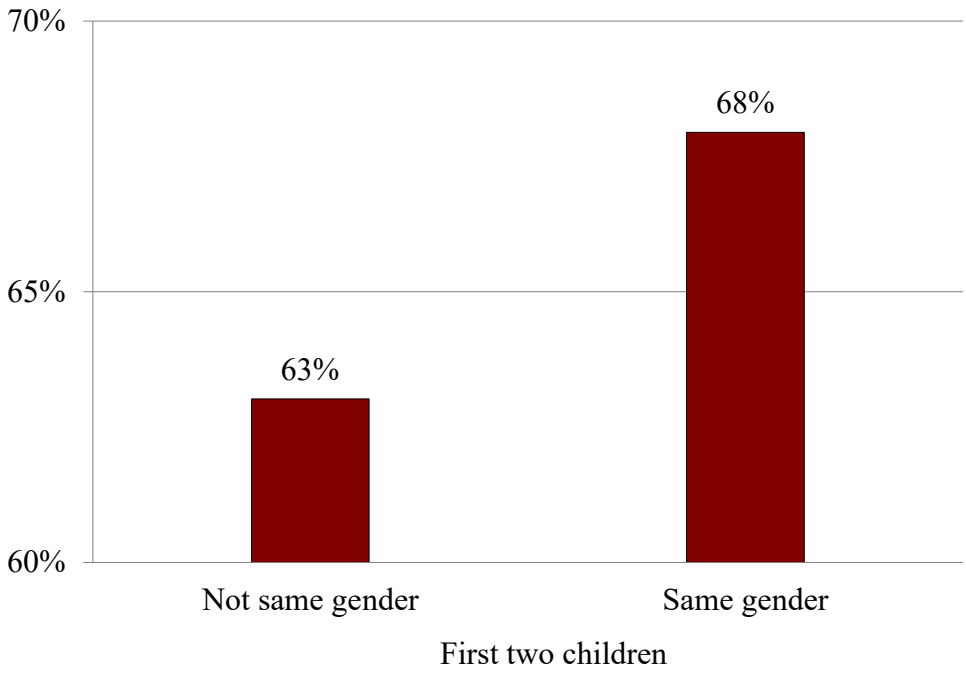
Notes: Cohorts born 1925-1944 are the Silent Generation, while those born 1945-1964 are the Baby Boom generation.
Source: Reproduced from Munnell, Chen, and Sanzenbacher (2018).

Figure 2. *Probability of Nursing Home Use in Last Two Years, by Number of Children*



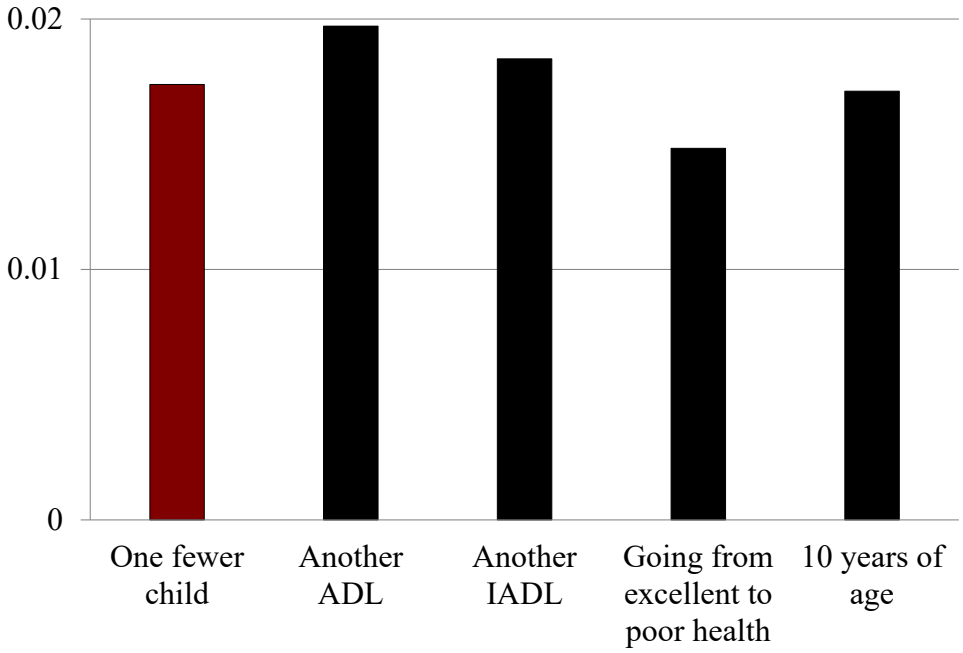
Notes: The sample consists of people with two or more ADLs. Means are weighted.
Source: Authors' calculations from *the Health and Retirement Study* (1992-2014).

Figure 3. *Probability of Having More than Two Children, by Same Gender Status of First Two Children*



Source: Authors' calculations from the HRS (1994-2014).

Figure 4. *Comparison of the Effect of One Fewer Child to Other Changes*



Notes: One fewer child is the coefficient on number of children from the preferred 2SLS specification (Column (1) in Table 3a). The others are from a similar regression, where the controls for ADL, IADL, self-reported health, and age are added linearly.
Source: Authors' calculations from the HRS (1992-2014).

Table 1. *Characteristics of the Sample Population*

	(1)	(2)	(3)
	Full sample	IV sample	IV sample, 2+ ADLs
		Shares	
Overnight stay in a nursing home	1.9%	1.8%	10.7%
Female	54.6	56.0	64.1
Married/partnered	65.7	68.3	49.5
Never married	4.6	1.0	2.6
Divorced/separated	12.9	13.4	16.5
Widowed	16.8	17.3	31.5
Black	9.6	6.7	12.2
Hispanic	7.3	7.2	12.9
Less than college	76.6	75.5	87.6
College or more	23.3	24.5	12.4
		Mean/SD	
Number of children	2.97	3.03	3.35
	(2.03)	(1.34)	(1.62)
Number of ADLs	0.29	0.26	2.94
	(0.84)	(0.79)	(1.04)
Number of IADLs	0.26	0.23	1.81
	(0.81)	(0.76)	(1.64)
Self-reported health (1= Excellent, 5=Poor)	2.79	2.74	4.11
	(1.12)	(1.09)	(0.93)
Age	65.75	66.39	71.23
	(10.34)	(10.17)	(11.94)
Observations	203,142	80,514	5,778

Notes: Weighted means.
Source: Authors' calculations from the HRS (1992-2014).

Table 2a. *OLS Regression of Overnight Stay in a Nursing Home, Full Sample*

	(1)	(2)	(3)
	Overnight stay nursing home		
	Full sample	1+ ADLs	2+ ADLs
Number of children	-0.001***	-0.002**	-0.003**
	(0.000)	(0.001)	(0.001)
Observations	180,960	30,465	15,295
R-squared	0.07	0.07	0.08

Notes: All models include fixed effects for age, year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, and religion, and control for household income. The regressions are weighted. Robust standard errors, clustered at the household level, in parentheses. *** p<0.01, ** p<0.05.
Source: Authors' calculations from the HRS (1992-2014).

Table 2b. *OLS Regression of Overnight Stay in a Nursing Home, IV Sample*

	(1)	(2)	(3)
	Overnight stay nursing home		
	IV sample	1+ ADLs	2+ ADLs
Number of children	-0.001***	-0.004***	-0.010***
	(0.000)	(0.002)	(0.003)
Observations	80,328	12,082	5,762
R-squared	0.07	0.08	0.10

Notes: All models include fixed effects for age, year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, and religion, and control household income. The regressions are weighted. Robust standard errors, clustered at the household level, in parentheses. *** p<0.01.
Source: Authors' calculations from the HRS (1992-2014).

Table 3a. *2SLS Regression of Overnight Stay in a Nursing Home, Number of Children*

	(1)	(2)	(3)
	Overnight stay nursing home		
	IV sample	1+ ADLs	2+ ADLs
Number of children	-0.0173*	-0.0415	-0.0624
	(0.009)	(0.033)	(0.046)
Observations	80,328	12,082	5,762
R-squared	0.05	0.04	0.03
First stage			
F-statistic	20.1	10.7	9.3
Coefficient same gender	0.135***	0.186***	0.221***
	(0.030)	(0.057)	(0.073)

Notes: All models include fixed effects for age, year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, and religion, and control household income. The regressions are weighted. Robust standard errors, clustered at the household level, in parentheses. *** p<0.01.
Source: Authors' calculations from the HRS (1992-2014).

Table 3b. *2SLS Regression of Overnight Stay in a Nursing Home, Three or More Children*

	(1)	(2)	(3)
	Overnight stay nursing home		
	IV sample	1+ ADLs	2+ ADLs
Three or more children	-0.0298**	-0.1280	-0.1800
	(0.015)	(0.104)	(0.135)
Observations	80,328	12,082	5,762
R-squared	0.06	0.03	0.02
First stage			
F-statistic	39.2	11.0	11.0
Coefficient same gender	0.0814***	0.0660***	0.0832***
	(0.0130)	(0.0199)	(0.0251)

Notes: All models include fixed effects for age, year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, and religion, and control for household income. Robust standard errors, clustered at the household level, in parentheses. *** p<0.01, ** p<0.05.
Source: Authors' calculations from the HRS (1992-2014).

Table 4a. *Robustness Checks for Overnight Stay in a Nursing Home, Number of Children*

	(1)	(2)	(3)	(4)	(5)	(6)
	Preferred estimate	No health controls	No endogenous controls	85+ sample	Only daughters	Only sons
Number of children	-0.017*	-0.013	-0.017**	-0.083	-0.011	-0.027*
	(0.009)	(0.008)	(0.009)	(0.056)	(0.008)	(0.015)
Health controls	Yes	No	Yes	No	Yes	Yes
Endogenous controls	Yes	No	No	No	No	Yes
Observations	80,328	88,712	80,514	5,155	59,934	60,725
R-squared	0.05	0.02	0.05		0.06	0.01
First stage						
F-statistic	20.4	20.9	21.7	7.1	20.4	9.4
Coefficient same gender	0.136***	0.140***	0.143***	0.202***		
	(0.030)	(0.031)	(0.031)	(0.076)		
Coefficient two daughters					0.177***	
					(0.039)	
Coefficient two sons						0.112***
						(0.037)

Notes: All models include fixed effects for age, year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, and religion, and control for household income. Column (2) does not control for ADLs, IADLs, and self-reported health. Column (3) does not control for marital status, education, religion, or income. The regressions are weighted. Robust standard errors, clustered at the household level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the HRS (1992-2014).

Table 4b. *Robustness Checks for Overnight Stay in a Nursing Home, Three or More Children*

	(1)	(2)	(3)	(4)	(5)	(6)
	Preferred estimate	No health controls	No endogenous controls	85+ sample	Only daughters	Only sons
Three or more children	-0.030**	-0.022	-0.030**	-0.212	-0.022	-0.038**
	(0.015)	(0.015)	(0.015)	(0.146)	(0.017)	(0.018)
Health controls	Yes	No	Yes	Yes	Yes	Yes
Endogenous controls	Yes	No	No	No	No	No
Observations	80,328	88,712	80,514	5,155	59,934	60,725
R-squared	0.06	0.02	0.06		0.07	0.05
First stage						
F-statistic	37.8	39.4	39.3	7.7	28.0	25.0
Coefficient same gender	0.079***	0.082***	0.082***	0.079***		
	(0.013)	(0.013)	(0.013)	(0.028)		
Coefficient two daughters					0.084***	
					(0.016)	
Coefficient two sons						0.080***
						(0.016)

Notes: All models include fixed effects for age, year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, and religion, and control for household income. Column (2) does not control for ADLs, IADLs, and self-reported health. Column (3) does not control for marital status, education, religion, or income. The regressions are weighted. Robust standard errors, clustered at the household level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the HRS (1992-2014).

Table 5. *Cox Proportional Hazard Model of Nursing Home Entry*

	(1)	(2)	(3)	(4)
Number of children	-0.023**	-0.001		
	(0.012)	(0.012)		
Hazard ratio	0.977**	0.999		
Same first two			0.085	0.120
			(0.078)	(0.079)
Hazard ratio			1.088	1.127
Health controls	Yes	Yes	Yes	Yes
Endogenous controls	No	Yes	No	Yes
Observations	197,783	197,200	85,800	85,600

Notes: This table shows coefficients and hazard ratios. All models include fixed effects for year, race, place of birth, ADLs, IADLs, self-reported health, marital status, education, and religion, and control for household income, a dummy for missing month of birth. Column (2) does not control for ADLs, IADLs, and self-reported health. Robust standard errors, clustered at the household level, in parentheses. ** $p<0.05$
Source: Authors' calculations from the HRS (1992-2014).

Appendix Table 1a. *OLS Regression Version of Robustness Checks for Overnight Stay in a Nursing Home, Number of Children*

	(1)	(2)	(3)	(4)	(5)	(6)
	Preferred estimate	No health controls	85+ sample	Only daughters	Only sons	No endogenous controls
Number of children	-0.001***	-0.0004	-0.0016	-0.0011**	-0.0019***	-0.0014***
	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)
Health controls	Yes	No	No	Yes	Yes	Yes
Endogenous controls	Yes	No	No	No	No	No
Observations	80,328	88,712	5,155	59,934	60,725	80,514
R-squared	0.07	0.03	0.02	0.07	0.07	0.07

Notes: All models include fixed effects for age, year, race, place of birth ADLs, IADLs, self-reported health, marital status, education, and religion, and control for household income. Column (2) does not control for ADLs, IADLs, and self-reported health. Column (6) does not control for marital status, education, religion, or income. The regressions are weighted. Robust standard errors, clustered at the household level, in parentheses. *** p<0.01, ** p<0.05.
Source: Authors' calculations from the HRS (1992-2014).

Appendix Table 1b. *OLS Regression Version of Robustness Checks for Overnight Stay in a Nursing Home, Three or More Children*

	(1)	(2)	(3)	(4)	(5)	(6)
	Preferred estimate	No health controls	85+ sample	Only daughters	Only sons	No endogenous controls
Three or more children	0.0000	0.0011	0.0051	0.0007	-0.001	0.000
	(0.001)	(0.001)	(0.010)	(0.001)	(0.001)	(0.001)
Health controls	Yes	No	No	Yes	Yes	Yes
Endogenous controls	Yes	No	No	No	No	No
Observations	80,328	88,712	5,155	59,934	60,725	80,514
R-squared	0.07	0.03	0.02	0.07	0.07	0.07

Notes: All models include fixed effects for age, year, race, place of birth ADLs, IADLs, self-reported health, marital status, education, and religion, and control for household income. Column (2) does not control for ADLs, IADLs, and self-reported health. Column (6) does not control for marital status, education, religion, or income. The regressions are weighted. Robust standard errors, clustered at the household level, in parentheses.
Source: Authors' calculations from the HRS (1992-2014).

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