The Forgotten Middle: Housing & Care Options for Middle-Income Seniors in 2033

August 2022

Methods Supplement

Data Sources and Model Development

This analysis forecasted the size of the senior population (i.e. individuals age 75+) in 2033 and estimated their demographic, health, cognitive and functional status, and financial resources distributions.[1] Having examined many possible data sources, this analysis used the Health and Retirement Study (HRS)—a nationally representative, longitudinal survey of individuals aged 50 years and over—conducted by the University of Michigan's Institute for Social Research and funded by the National Institute on Aging. The HRS comprehensively covers the topical areas necessary for the analyses (health status and functioning, financial resources, socio-demographics) and has large sample sizes for individuals 75 and above. Self-reports in many domains of the HRS have been validated using tax records, pension files, clinical assessments, medical claims, and other external data sources. For this analysis, we used the RAND HRS Longitudinal File 2018 (v1), the HRS 1994, 1998, and 2018 core files, and the HRS Cross-Wave Tracker File 2020 (v1). The cross-sectional weights[1] in the HRS were used to produce nationally representative estimates of today's (i.e., 2018) senior population and of the individuals who are projected to be seniors by 2033.

The analytic model was developed in three stages:

(1) construction of a per-capita financial resource measure that includes income from several sources and annuitized household assets;
(2) forecasting the size and demographic characteristics of the senior population in 2033; and
(3) projecting per-capita financial resources and select health and functional characteristics of the forecasted senior population. Below, we present a detailed discussion of the methods for each stage.

Measuring financial resources per-capita

A distinguishing feature of our analytic approach is the measure of individual-level financial resources, which includes income, assets, as well as housing equity. Though most studies related to housing, which use household income as a measure of financial status, we believe that use of individual-level financial resources offers several advantages. Specifically, because women have a longer life expectancy than men, measuring financial resources of seniors at the individual level (rather than the household level) provides a more accurate estimate of affordability of senior housing and care. Additionally, measuring financial resources at the individual level also allows us to link it to other individual-level measures of health and functional

[1] The cross-sectional weights were created by combining the community-dwelling, respondent-level weights (xWGTR) and the nursing home sampling weights (xWGTRNH) as per HRS guidelines to represent the national population of seniors residing in the community or a nursing facility.

status to understand financial resource availability as it relates to long-term care needs.

We included annuitized assets and housing equity, in addition to income, to create a more comprehensive measure of the financial resources on which people may draw from in their post-retirement years. Specifically, we included self and spousal pre-tax income from wages/salary, Social Security (retirement, disability, supplemental security income, spouse/widow benefits) pensions and annuities, Veteran's benefits, unemployment benefits and worker's compensation; household-income from capital gains, welfare, food stamps, and any other sources; household-level assets including vehicles, real-estate (other than primary residence), businesses, IRAs, stocks and securities, bank accounts, lump sum payments (e.g. from insurance, pension, inheritance), and any other savings; as well as household-level housing equity net of mortgage debt and home loans. The financial resources from all sources were annuitized and computed at the individual level using the models proposed by Brown (1999), Love (2008), and Poterba (2011). For each individual in the 2018 HRS sample, we annuitized assets and wealth by multiplying total reported assets and wealth and the annualizing factor

$$(Annuitized\ Assets\ and\ Wealth) = a_t * (Total\ Assets\ and\ Wealth)$$

We defined the annualizing factor as

$$a_t = \left[\sum_{i=1}^{T}\left\{\frac{(\alpha * S^f_{t+i} * S^m_{t+i}) + (S^f_{t+i} * (1 - S^m_{t+i}) + (S^m_{t+i} * (1 - S^f_{t+i}}{(1 + r_{t+i})^i}\right\}\right]^{-1}$$

Where,

$\alpha - Economies\ of\ scale\ for\ individuals\ who\ are\ married\ and\ residing\ with\ their\ spouse$

$t - Age\ of\ the\ respondent$

T – *Maximum attainable age (assumed to be 119 years as per SSA guidelines)*

$S^f_{t+i} - Survival\ probability\ of\ a\ female\ respondent\ of\ age\ t\ to\ live\ an\ additional\ i\ years$

$S^m_{t+i} - Survival\ probability\ of\ a\ male\ respondent\ of\ age\ t\ to\ live\ an\ additional\ i\ years$

$r - Real\ interest\ rate$

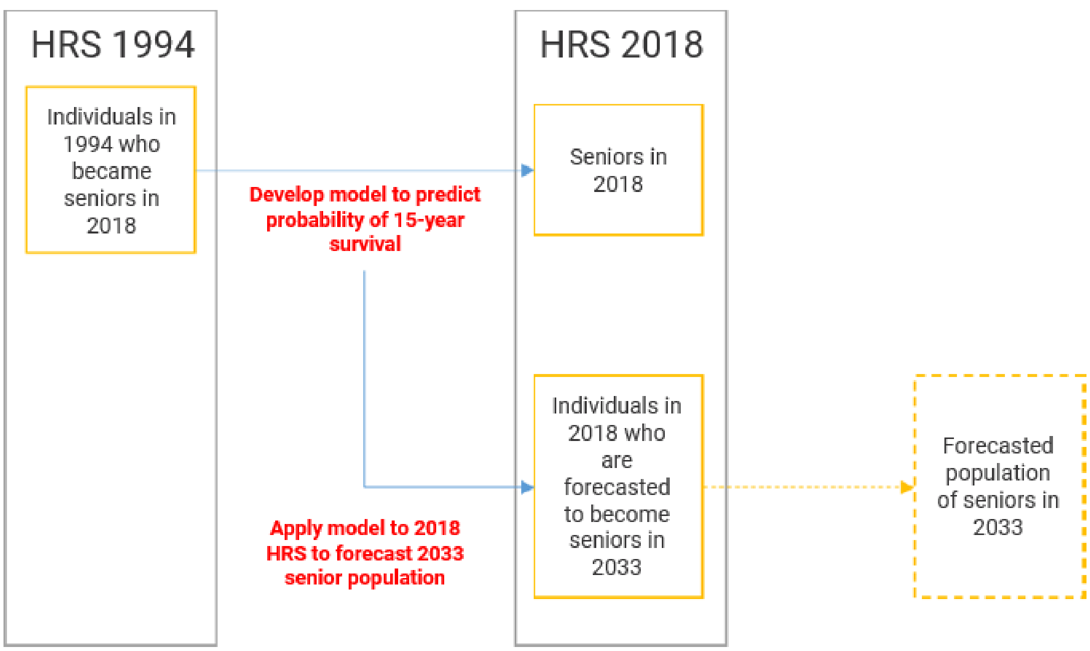
The following assumptions were used to annuitize household stocks of assets and wealth into annual income streams measured at the individual level:

- Nominal and real interest rate projections from the Social Security Administration 2016 Trustees report. The rate of return is assumed to be similar for all asset types.
- Actuarial life tables from the Social Security Administration's Office of the Chief Actuary
- Living situation of the respondent (i.e., single or married)
- Age of the respondent and spouse in 2018
- Maximum attainable age by an individual (assumption: 119 years)
- Economies of scale factor, which inflates the value of joint financial resources of married respondents who live together (assumption: 1.67 Krueger (2007)).

Forecasting the size and demographic characteristics of the senior population in 2033

We used information on individuals in the HRS who were sampled in 1994 and followed up in each subsequent wave to determine whether the individual survived at least 15 years. We fit a multivariate logit model[2] predict probability of 15-year survival using factors commonly accounted for in other life expectancy models (Favreault, 2015), including demographic, socio-economic, education, physical health, and functional status, as well as an indicator for HRS survey self- vs. proxy-respondent status.[3] We then used the Census population projections[4] as an external benchmark to determine gender-specific probability thresholds for survival. Finally, we applied the model coefficients and gender-specific survival probability thresholds to the 2018 HRS data to identify those who survive to 2033 and applied the 2018 cross-sectional weights to projected survivors aged 75+ in 2033 to estimate the size of the 2033 senior population (henceforth, referred to as the forecasted sample of the senior population in 2033).

Exhibit D1. Forecasting the Senior Population in 2033



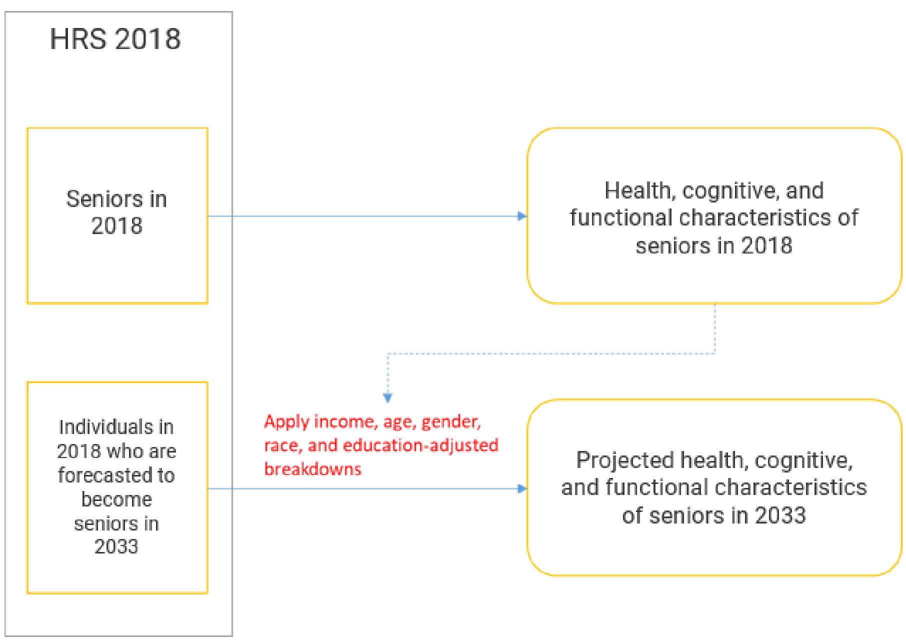
[2] A logit model was used in the estimation to account for right-censoring; since 2018 HRS was the latest available dataset, the maximum years of life remaining for individuals in the 1998 dataset was 20 years.
[3] The multivariate logit model included the following predictors: age, gender, race, education, race/ethnicity, whether respondent had a spouse or partner, number of children in contact, indicators for chronic conditions (high blood pressure, diabetes, cancer, lung disease heart problems, stroke, arthritis), self-reported health status, number of ADL limitations (getting dressed, walking across room, bathing/showering, getting in/out of bed, and eating), and number of mobility difficulties (walking several blocks, walking across room, lifting/carrying 10 pounds, picking up a dime, and pushing a large object), and whether the survey was conducted via a proxy respondent.
[4] 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.

Projecting per-capita financial resources and select health and functional characteristics of the forecasted senior population

Since demographics and certain socio-economic characteristics, such as gender, race/ethnicity, and education, can be considered time-invariant for individuals 55 and older, we simply applied the 2018 cross-sectional weights to the forecasted senior population to estimate distributions of these characteristics. Similarly, we projected the marital status of individuals to be unchanged from 2018 to 2033, unless they were forecasted to be widowed during that timeframe (i.e., we assumed no new marriages or divorces between 2018 and 2033).

Health, cognitive, and functional status of the forecasted senior population in 2033 were estimated based on subgroup-specific distributions of these characteristics in seniors in 2018. Specifically, we first segmented the 2018 senior sample by income cohort, age group, gender, and race. Next, we estimated the health, cognitive, and functional distributions in each of these sub-groups. Finally, we segmented the forecasted 2033 sample by the same characteristics and applied the estimated group-specific health, cognitive, and functional status distributions to the respective subgroups.

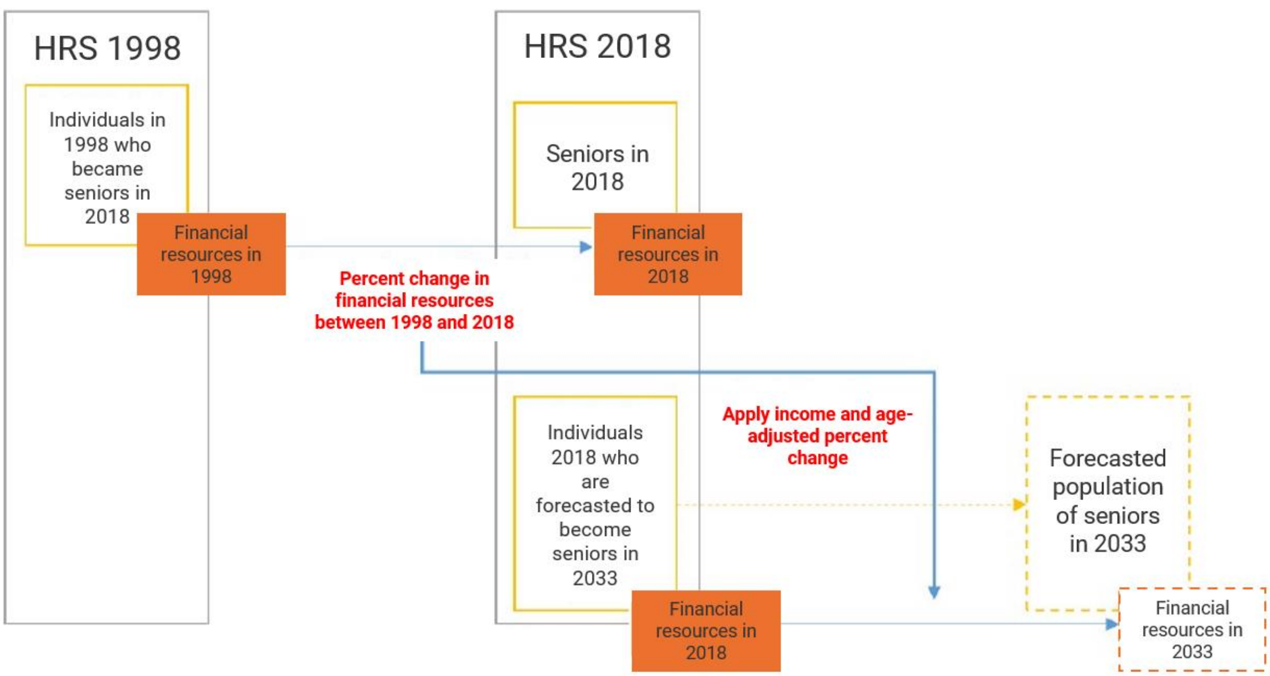
Exhibit D2. Projecting Demographic and Health Characteristics of the 2033 Population



To predict the annuitized individual financial resources (henceforth, referred to as income) of seniors in 2033, we began with a baseline of the actual, total financial resources for the cohort of 2018 individuals who are forecasted to become seniors in 2033. Then, we projected forward the *change* in those total resources between 2018 and 2033, based on the expected percent change (i.e., the trend factor) in income over a fifteen-year period. To do so, we began with the 1998 HRS sample, which we segmented into subgroups by income cohort and age group. Within each subgroup, we calculated the average annual inflation-adjusted change for each component of income (i.e., income; annuitized assets; and annuitized housing equity) between 1998 and 2018 for seniors in 2018. The income cohort and age-group specific annual trend factors were applied to individuals in the 2018 sample who are expected to be seniors in 2033. As such, our approach assumed that the annual rate of change in assets between 1998 and 2018 and 2018 and 2033 would be the same.

Two particular assumptions may limit the accuracy of our projections. First, the trend factors used in our projection was based on the period 1998-2018, which includes the Great Recession of 2008, potentially leading to under-projection of growth in financial resources from 2018 to 2033. On this point, we note that even including the Great Recession, trends in real income, home prices, and return on financial assets such as securities over the 1998 to 2018 period were similar to longer historical trends such as over the past 50 years. A second potential limitation relates to a significant shift from defined benefit to defined contribution retirement benefits. Traditional theory holds that individuals' savings behavior in their 40s and 50s (i.e., midlife) is based on their retirement income expectations, which are in turn informed by the type of retirement benefits earned during midlife. Since our approach applied asset-specific trend factors to individuals' actual asset holdings in 2018, our estimates should incorporate a meaningful portion of the transition in retirement benefits between the two cohorts of seniors.

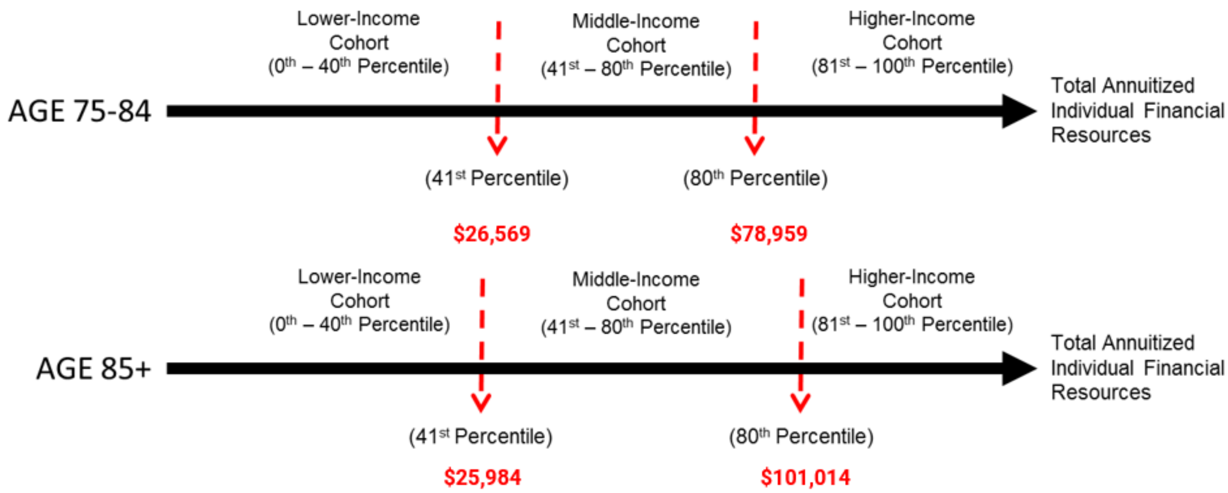
Exhibit D3. Projecting Financial Resources of the 2033 Population



Defining the Middle-Income Cohort

Our analysis focused on middle-income seniors, from the perspective of seniors' housing affordability. To define the middle-income cohort, we segmented the 2018 senior population (separately for those aged 75 – 84, and those aged 85+) into three groups according to their annuitized individual financial resources (excluding housing equity), defining a "middle-income" cohort as ranging from the 41st percentile to the 80th percentile of the individual financial resource distribution of 2018 seniors. By default, the lower-income cohort is then the portion of the population with individual financial resources between the 0th and 40th percentiles, while the higher-income cohort is defined as those at the 81st percentile or higher (Exhibit D4).

Exhibit D4. Financial Resource Thresholds and Income Cohorts



Our definition of the middle-income cohort is motivated by (1) its relevance to assessing affordability of senior housing and (2) feasibility of conducting the analysis within the sample size constraints of the HRS. We considered the following factors to establish middle income cohort thresholds:

- **Categories of options currently available for senior housing:** We were interested broadly in the middle of the income distribution but recognized that the tails of the income distribution have options that may be inaccessible to the middle of the distribution. Specifically, we opted for a middle-income definition that would be unlikely to overlap with eligibility for Medicaid (which includes long-term care coverage) that may be available to many low-income individuals. At the same time, we took into account that current market-based senior housing options are believed to be used primarily by individuals in the upper tail of the income distribution. (Note that in 2018 the average rent for assisted living was $60,000 per year. Additional average annual out-of-pocket medical costs of $5,000 per year might give some indication of the annual income at which individuals might make use of available senior housing options). Our thresholds for middle-income individuals, extended from the 41st percentile up to the 80th percentile of the income distribution, broadly encompasses the population that lies clearly between Medicaid eligibility and those comfortably accessing the current market offerings for senior housing.

- **Sample size adequacy in the HRS for each study cohort:** Our analytic approach involved examining the characteristics (demographic, health-related, housing-related) of different subgroups of seniors today and as predicted in the future. For this purpose, it is important that we had adequate sample sizes of HRS data in order to analyze middle-income individuals aged 85+ across different characteristics. Data availability is much more constrained for the oldest seniors, mirroring their smaller numbers in the population as a whole. We identified, as a target, having at least 400 HRS cases for the middle-income 85+ group so that we were likely to generate key estimates of interest.

Our proposed segmentation allowed us to generate reliable estimates for each age group and income cohort.

Over the next 10 years, we project that the income distribution of seniors will shift. In order to make direct comparisons between the middle-income cohorts of 2018 and 2033, we projected the 2033 middle-income cohort based on the dollar thresholds used to define the 2018 middle-income group. Applying the 2018 middle-income thresholds to the 2033 income distribution is justified because the projections are presented in constant dollars. In addition, our models assume that senior housing costs will grow at the rate of inflation. Therefore, the 2018 middle-income thresholds, which were established to assess whether individuals are likely to have sufficient individual, annual financial resources to cover the cost of private pay senior housing in 2018, can also be applied to the 2033 income projections to assess affordability of senior housing in 2033. Our approach to defining the middle-income cohort and assessing adequacy of financial resources for senior housing is based on conservative, baseline assumptions of future senior housing and out-of-pocket health care costs. The intent is to provide a basis for an informed discussion. If increased demand for senior housing is not met with a proportionate increase in supply, we can expect senior housing costs to grow faster than inflation. Rapid growth in out-of-pocket health care costs could also significantly limit the amount of available financial resources that will be available to seniors.

Defining Cognitive Impairment & Mobility Needs

Cognitive Impairment: To assess cognitive impairment using HRS data, we used approaches developed Langa, Kabeto, & Weir (2010) to identify seniors having cognitive impairment other than dementia (Cognitive Impairment Not Dementia (CIND)) and those with dementia. For self-respondents, the Langa-Kabeto-Weir method computes a summary score of out of 27 (immediate word recall + delayed word recall + serial 7s + backwards counting) and defines those with a score of 0-6 as having dementia, those with a score of 7-11 as having CIND, and those with a score of 12+ as having no cognitive impairment. For proxy-respondents, the Langa-Kabeto-Weir method computes a summary score out of 11 (number of IADL limitations + proxy-rated memory + interviewer-rated memory) and defines those with a score of 6+ as having dementia, those with a score of 3-5 as having CIND, and those with a score of 0-2 as having no cognitive impairment.

Mobility Limitations: The HRS uses series of questions to gauge a respondent’s mobility. In this analysis, we computed a mobility index based on the following tasks: walking several blocks, walking across a room, lifting/carrying 10 pounds, picking up a dime, and pushing a large object (important indices of whether individuals can remain in their home). The mobility index (0-5) is the sum of the number of tasks that the respondent indicates having some difficulty doing. Any respondent with a score of one or more is coded as having a mobility limitation.

High Needs: Seniors with three or more chronic conditions and at least one Activities of Daily Living (ADL) limitation were defined as having `high needs’ (Hayes, 2016).

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