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INCOME AND THE UTILIZATION OF LONG-TERM CARE SERVICES: EVIDENCE FROM THE SOCIAL SECURITY BENEFIT NOTCH

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Income and the Utilization of Long-Term Care Services: Evidence from the Social Security Benefit Notch
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ABSTRACT

This paper estimates the impact of income on the long-term care utilization of elderly Americans using a natural experiment that led otherwise similar retirees to receive significantly different Social Security payments based on their year of birth. Using data from the 1993 and 1995 waves of the AHEAD, we estimate instrumental variables models and find that a positive permanent income shock lowers nursing home use but increases the utilization of paid home care services. We find some suggestive evidence that the effects are due to substitution of home care for nursing home utilization. The magnitude of these estimates suggests that moderate reductions in post-retirement income would significantly alter long-term utilization patterns among elderly individuals.

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I. Introduction

The financing of long-term care is an increasingly important issue for the elderly. Nearly 70% of individuals living to age 65 will require some long-term care assistance, with over one-third requiring some time in a nursing home (Kemper, Komisar, and Alecxih 2005). On average, the present discounted value of lifetime long-term care expenditures is $47,000 (in 2005 dollars), but the distribution is heavily skewed with 16% of elderly individuals incurring over $100,000 in lifetime expenditures and 5% incurring over $250,000. Although many individuals receive some long-term care coverage under Medicaid and a small number of individuals purchase private coverage, long-term care represents, on average, the largest source of out-of-pocket health care spending for elderly individuals.

In this context, future reductions in post-retirement income could dramatically alter elderly individuals' patterns of long-term care service utilization. Moreover, individuals generally prefer long-term care in the least restrictive, most home-like setting possible (Kane and Kane 2001), suggesting important welfare effects as individuals transition across long-term care settings. For example, Mattimore and colleagues (1997) found that 30% of elderly survey respondents would rather die than enter a nursing home and an additional 26% indicated they were very unwilling to move to an institutional setting. Similarly, Grabowski and Gruber (2007) have shown that state Medicaid payment rules have no effect on overall nursing home utilization, suggesting that demand for nursing home care is relatively inelastic with respect to public program generosity.

Surprisingly however, little is known about how income influences formal long-term care utilization. Using data from the Channeling Demonstration, higher income was found to be associated with a greater probability of formal care (Kemper 1992). Using National Long-Term Care Survey data, income did not have a statistically meaningful effect on nursing home entry, but it had a positive association with paid home care (Ettner 1994). However, a potential problem with these earlier studies is that unobserved characteristics may be correlated with both an individual's income and the propensity to use long-term care services. For example, an individual in poorer health may have both lower income and higher long-term care utilization, or individuals with higher incomes may have unobservable preferences for living independently. In this study, we address this issue of endogeneity by relying on a natural experiment that generated large, plausibly exogenous variation in permanent Social Security income for otherwise similar individuals based on their year of birth. The Social Security benefits "notch", which is described in detail below, has been used by others to examine the effect of income on labor supply (Krueger and Pischke 1992), prescription drug use (Moran and Simon 2006), mortality (Snyder and Evans 2006) and elderly living arrangements (Engelhardt, Gruber, and Perry 2005). The goal in this study is to use the variation based on the notch to examine the effect of permanent income on long-term care utilization across settings.

The conceptual framework for this paper is based on economic models of household decision-making in the care of a disabled individual (e.g., Pezzin, Kemper, and Reschovsky 1996). In this model, utility is a function of private goods, leisure, the elderly person's functioning and the household's preferences (e.g., for independence). Under this framework, households jointly choose long-term care services and living arrangements. Households are assumed to maximize their utility subject to constraints on their budget and their time. The effect of income on overall long-term care utilization depends on how income influences the choice of long-term care services and living arrangement. That is, certain long-term care services may be normal goods while others may be inferior, due, perhaps, to the levels of independence associated with different types of services. Paid home care is typically considered a normal good, suggesting higher household income is expected to increase the use of paid care use. However, given the disutility associated with nursing home entry discussed above, nursing home care is likely an inferior good, suggesting higher income will lead to less nursing home care, ceteris paribus. Thus, we predict greater household income will increase the use of paid home care, but lead to less use of nursing home care.

We develop estimates of the effect of a permanent shock in Social Security income on formal long-term care utilization among households headed by beneficiaries with less than a high school education, approximately 45 percent of our sample. Using data from the 1993 and 1995 waves of the Assets and Health Dynamics among the Oldest Old (AHEAD), our IV estimates suggest that a permanent Social Security income shock had a moderate but statistically insignificant effect on overall formal long-term care utilization.

However, we find this overall effect masks the effects of income on different types of long-term care utilization. When we decompose the total effects, we find evidence that positive Social Security income shocks had a negative effect on nursing home entry, but a positive effect on the use of paid home care. Specifically, a $1,000 (or 10 percent) increase in annual Social Security income for those in this low-education group would decrease the likelihood of any nursing home use by 24%-34% (relative to mean) and increase the likelihood of receiving any paid home care use by 15%-16%.

Although several pathways may lead to the increased use of home care and lower use of nursing home care, we find some support for the hypothesis that higher permanent Social Security income causes individuals to substitute home care for nursing home care rather than inducing home care use among individuals who would not have otherwise used long-term care.

The substitution hypothesis behind our findings appears more likely than explanations related to income-induced improvements in health or resulting changes in Medicaid eligibility.

This paper is organized as follows. In Section II, we provide a brief description of the Social Security benefits notch. In Section III, we describe our data and empirical strategy. In Section IV, we present our results, and in Section V, we test the hypothesis that higher permanent Social Security income leads individuals to substitute different types of care for one another. In Section VI, we discuss the implications of our results for Social Security reform and other shocks to post-retirement permanent income. Finally, Section VI provides a brief conclusion.

II. Social Security Benefits Notch

This section provides a brief overview of the Social Security benefits notch (see papers cited in the previous section for more detailed accounts). Social Security payments are based on lifetime earnings. Prior to 1972, neither lifetime earnings nor post-retirement payments were indexed for inflation, but rather periodically adjusted by Congress. In 1972, Congress amended the Social Security Act to provide automatic indexation of credited earnings for those workers who had not yet retired, which created an unanticipated windfall for workers from certain birth cohorts because of an error that led the prior earnings of these workers to be doubly indexed for inflation. The high rate of inflation over the following years led to a large increase in benefits for the affected cohorts. In 1977, Congress passed another law to eliminate the double indexation for future cohorts of retirees. This law change created a large reduction in Social Security payments for those cohorts born in 1917 or later relative to the preceding cohorts. Importantly however, cohorts born prior to 1917 (near retirement in 1977) retained doubly indexed benefits under a grandfather provision. Taken together, these law changes and the high rate of inflation over the mid 1970s created a large and permanent difference in Social Security payments across birth cohorts, which came to be called the Social Security Benefits Notch. Because these benefits changes were unanticipated and otherwise outside the control of retirees, they are a valid natural experiment for examining income/wealth effects among elderly individuals.

Figure 1 displays a measure of Social Security benefits that differ across birth cohort only due to legislative changes in benefits rather than differences in observable characteristics by birth cohort. Each birth cohort's benefits were computed with identical real earnings histories and the Social Security Administration's ANYPIA program as detailed in Engelhardt et al. (2005). We also depict the best fit line between birth cohort and average household Social Security benefits, separately for low and high education groups. For both high and low education individuals, the figure clearly shows that beneficiaries who differed only in birth cohort received significantly different levels of Social Security benefits due to these legislative changes to the Social Security Act. The benefits for cohorts born between approximately 1911 and 1917 are significantly above the trend line, designating beneficiaries who benefitted from the double indexation of benefits.

The 1977 law raised the covered earnings maximum such that the fraction of earnings used to calculate Average Indexed Monthly Earnings (AIME) was greater for high-income workers with no change in the AIME for low-income workers. This law introduced earnings-level-by-year-of-birth variation in Social Security benefits. This variation can be observed in Figure 1 with the relatively large increase in average annual Social Security income for high education individuals beginning with cohorts born after 1920. Indeed, individuals born in 1930 have roughly equal Social Security income to the notch cohorts. Given this issue, the notch is much more powerful for low-wage earners when including a broader set of birth cohorts (1900-1930) in the sample. We formally test the predictive power of the notch in Section III.

III. Data and Empirical Strategy

A. Data

The Asset and Health Dynamics among the Oldest Old (AHEAD) is a longitudinal survey of community-based elderly individuals born in 1923 or earlier and their spouses, regardless of age. The data that comprise the 1993 wave of the AHEAD survey were collected between October 1993 and July 1994 on 8,223 individuals from 6,046 households for a response rate of just over 80%. African Americans, Mexican-Hispanics, and residents of the state of Florida were sampled at about 1.8 times the probability of the general population, but sample weights are available to adjust for this and other non-representative aspects of the sample design. A follow-up AHEAD survey was conducted in 1995, and exit interviews were conducted by relatives of AHEAD respondents who died before the 1995 survey.

Our primary reference period of analysis is between the 1993 and 1995 waves (Waves 1 and 2) of the AHEAD survey.[1] We choose this time period for a number of reasons. First, the initial wave of the AHEAD survey sampled only community-dwelling individuals. Therefore, using only the 1993 wave would lead to a downward bias in the level of long-term care utilization (particularly nursing home utilization) prior to the 1993 interview. Second, we are unable to pool the 1993 and 1995 waves together because of variable concordance issues.[2]

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[1] If a respondent died before the 1995 wave, the reference period is from the 1993 interview date to the date of death.

[2] The 1993 wave asked about utilization over the prior 12 months, and subsequent AHEAD interviews asked about utilization since the last interview. AHEAD respondents were re-interviewed in 1995, and then merged into the HRS sample in 1998. Therefore, the length of the reference period is approximately 2 years for 1995 respondents, and 3 years for 1998 respondents.

Finally, using only the 1995 wave would omit respondents who died between the two waves, a population that is perhaps more likely to use long-term care services. Similar data limitations inhibit the use of data collected on AHEAD cohorts after the survey was merged with the Health and Retirement Study in 1998.[3]

We are unable to measure informal care over this time period due to survey limitations; however, we report the relationship between income and informal care utilization over the four weeks prior to the 1993 survey in the appendix.[4] Finally, because exit interviews among decedents who died in a nursing home did not ask about home care utilization, these individuals are not included in our sample when we examine paid home care use between the 1993 and 1995 waves. Therefore, we also perform our analysis of paid home care use over the period 12 months prior to the 1993 interview. These results are also reported in the appendix.

B. Estimation Sample

Because the AHEAD collects information from both respondents and their spouses, we have multiple observations in certain households. The unit of observation in our analyses is the individual, but the key independent variable in our study, Social Security income, is measured at the level of the household based on the primary Social Security beneficiary. In terms of constructing our benefits notch instrument, the key issue is the year of birth for the primary beneficiary. Thus, we employed a series of rules for identifying the primary beneficiary (Moran and Simon 2006; Snyder and Evans 2006). Because the majority of married women in these cohorts qualified for benefits through their husband's earnings history, the male member of two-

[3] In the HRS/AHEAD waves of 1998 and 2000, weak instrument bias becomes a serious concern due to diminished sample size and changes in the age composition of the sample. F-statistics range from 1.93 to 8.02, levels that are not strong enough to obtain reliable IV estimates. We also encounter weak instrument problems in the 1995 wave if we restrict the sample to those with forward-looking measures of long-term care utilization (i.e. between the 1995 and 1998 wave) and have problems with model convergence.

[4] We are unable to use measures for informal care in 1995 because these questions were only asked of those who screened in for disability, and the informal care questions excluded care from spouses (the most important source of informal care).

person households was designated as the primary beneficiary and his birth year was used to assign individuals within those households to our treatment and control groups. In the case of widowed/divorced females, the deceased or former husband was designated as the primary beneficiary. However, because the AHEAD does not provide information on the birth year of deceased/former husbands, we subtracted three years from the female's year of birth to generate a birth year for the deceased/former husband.[5] For never-married females, the female is designated as the head of the household and her year of birth is used to establish whether she is in the treatment or control group.

Following previous research, we also restricted our sample to individuals in households in which the primary Social Security beneficiary was born between 1901 and 1930 (Krueger and Pischke 1992; Moran and Simon 2006), eliminating 288 individuals. Also following previous research, we excluded 380 individuals in households that report Social Security income below $100 per month (in 1993/1994 dollars) and 1,101 individuals with Social Security income that was imputed.[6,7] Thus, these restrictions, along with other observations lost to missing data and non-zero sampling weights, resulted in a sample of 5,305 individuals from 4,136 households. As described below, we also follow prior research in splitting our sample by household education level, with our analyses focusing on the low education subsample.

C. Empirical Specification

In order to examine the effect of permanent Social Security income on long-term care utilization, we estimate equations of the following form:

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[5] Based on the 1982 New Beneficiary Survey, three years was found to be the median difference in spousal ages for widowed/divorced elderly as calculated by Engelhardt and colleagues (2005).

[6] The vast majority of household with Social Security income under $100 per month reported zero Social Security income.

[7] The HRS's imputation of Social Security income accounts for cohort trends in Social Security income, but not the Social Security Notch. As such, including the imputed values of Social Security income would inappropriately depress our first-stage estimates of the effect of the notch on Social Security income.

$$U_{hi} = \beta I_h + \delta X_h + \varepsilon \qquad (1)$$

where U refers to the long-term care utilization measure for individual *i* in household *h*, **I** refers to annual household Social Security income, **X** includes an intercept and a set of exogenous controls, and ε is the residual. Following earlier studies examining the notch (Moran and Simon 2006; Snyder and Evans 2006), we use Social Security income rather than total income. The notch is expected to be more important in predicting Social Security income because it may have led to other offsetting behavioral changes which affected total income, as noted by Snyder and Evans (2006). We come back to this issue at the end of Section III.

In this study, long-term care utilization **U** is represented by several measures. We first examine the use of any formal long-term care services (including nursing home use and paid home care use) between the first and second AHEAD waves. This measure combines responses from the core 1995 AHEAD survey about nursing home use and paid home care use since 1993, along with responses from the 1995 exit interview for those who died between 1993 and 1995.

We then consider different types of long-term care use separately to investigate the composition of long-term care services and how they changed for those with a positive income shock. First, we created an indicator for whether the individual had any nursing home use over the two-year period between the first and second AHEAD waves. Next, we created a measure of any home care service use based on whether any medically-trained person assisted the respondent at home between the AHEAD waves.

Using the first wave of the AHEAD, we create two additional measures of long-term care use for a set of secondary analyses (reported in the appendix). We first create an indicator for the receipt of any informal (unpaid) care related to ADL/IADL limitations over the four weeks prior to the survey. We also measure paid home care during the 12 months prior to the 1993 survey.

A series of exogenous variables **X** at the household level were included as controls in this study. In particular, we included indicators for the type of household (male head—married or cohabitating; male head—single; female head—never-married; female head—widowed; and female head—divorced), age of the head, race of the head (white, African American or other), Hispanic ethnicity of the head, whether the household is located in a metropolitan statistical area, and location (indicators for each of the nine census regions). Similar to our coding of the birth cohort variable, we define education based on the education of the household head. For households of widowed or divorced women, we use survey information on the schooling of their former husbands to assign the household education level. Other potential covariates, such as physical functioning, work status or Medicaid coverage, were excluded because they were thought to be endogenous to Social Security income. As such, our estimates of β can be thought of as the total effect of a positive income shock on long-term care utilization, including all the behavioral changes following a shift in permanent Social Security income.

We first estimate equation 1 using a probit model. However, this approach may suffer from bias due to the suspected endogeneity of permanent income and long-term care utilization. As noted in the introduction, the error term in equation 1 is likely to include unobserved health status or preferences for independent living that may be correlated with Social Security income. As such, we next estimate equation 1 using an instrumental variables probit estimator. Assume that Social Security income **I** has the following reduced form:

$$I_h = \lambda N_h + \gamma X_h + \mu_h \qquad (2)$$

where **X** is the same set of variables that appeared in the utilization equation, **N** is a variable correlated with income but not the error term in the utilization equation, and μ is the residual. Our instrument **N** is an indicator variable that takes on the value of "one" for households with a primary Social Security beneficiary who was born during the notch years of 1915-17, and a "zero" for households in which the primary beneficiary was born in any other year between 1901 and 1930. Following previous researchers (e.g., Moran and Simon 2006), we used the period 1915-1917 because these years represent the peak of the benefits notch (see Figure 1).[8] Thus, the identifying assumption is that the benefits notch N is correlated with I, Social Security income, but is not correlated with ε, the error term in the utilization equation. The quality of our instrument is discussed below.

Given our use of a single cross-section for the majority of our analyses, presence in the Benefits notch (based on birth-year) and age are collinear. Previous research has addressed this issue by employing large datasets with lots of individuals near the notch (Snyder and Evans 2006) or by exploiting variation in age by year of birth (Krueger and Pischke 1992; Engelhardt, Gruber, and Perry 2005). The AHEAD is a relatively small sample and we do not know the exact birth date to exploit variation in age by birth year. As such, we follow the approach of Moran and Simon (2006) by presenting results based on different specifications of the age variable. Specifically, we enter age as a polynomial function with the order ranging from one (linear) to three (cubic).

All analyses presented in this paper are weighted using the AHEAD person-level weights. We adjust our standard errors for clustering based on year of birth of the household head. All of our instrumental variables probit models are estimated using Stata's ivprobit.do routine, which produces estimates using two-stage residual inclusion methods that are prescribed for estimating instrumental variables models with a binary dependent variable and a continuous endogenous variable (Terza, Basu and Rathouz (2008).

[8] We perform sensitivity analysis using other definitions of the benefits notch and obtain the strongest F-statistics for the 1915-1917 cohort definition.

Table 1 summarizes the long-term care utilization and exogenous variables in the AHEAD that we use in our analysis by the completed education of the household head. Approximately 21 percent of the full sample received any long-term care services between the first and second waves of the AHEAD survey, with approximately 7.5 percent receiving care in a nursing home. Overall, almost 9 percent received paid home care over the 12 months prior to the survey, and 16 percent received paid home care between the first and second waves. The proportion of the sample receiving informal care over the past four weeks before the survey is higher, roughly 23 percent. The average annual Social Security income is $10,926 (in 1993 dollars) but this figure is higher for the high education group than the low education group. Overall, 19 percent of the respondents were born in the notch years of 1915-1917. The average age is 77 years old, and 57 percent of the sample completed high school or more. The majority of our sample consists of two-person households and the remaining are either never-married, widowed, or divorced.

D. Effect of the Notch: Specification Tests

Problems with weak instruments are well-known (Staiger and Stock 1997; Stock and Yogo 2005) and Bound and colleagues (1995) have argued that the use of instruments that jointly explain little of the variation in the endogenous variables can do more harm than good. Previous research using the Social Security benefits notch as exogenous variation in permanent income has shown that the notch is a much more powerful instrument for low-income relative to high-income beneficiaries (Engelhardt, Gruber, and Perry 2005; Moran and Simon 2006).

This point can be illustrated by splitting the sample based on those households whose heads have less than high school education and those heads have at least a high school diploma (see Table 2). For the low education group, the instrument meets the standard of Staiger and

Stock, with the F-statistics ranging from 14.02 to 23.75 depending on the specification. These estimates suggest that beneficiaries born during the peak notch years had between $1,149 and $1,448 higher annual Social Security income in 1993 dollars. Relative to a mean annual household Social Security income of $9,993 for this group, this suggests roughly an 11-14 percent increase in permanent Social Security income for the notch cohorts. By comparison, the high education group has a relatively low F-statistic (less than 1), and presence in the notch cohort only increased household Social Security income by between $0 and $284 (2.4 percent). Given these results, we focus our analyses on only those households in which the primary beneficiary has less than a high school education, resulting in 2,283 individuals in our sample.

In addition to the assumption regarding the instruments being strongly associated with the endogenous variable, there is also the requirement that the instrument must not be correlated with the error term in the second stage of IV estimation. If it is still correlated, then the instrumented variable will still be endogenous. Although it is impossible to confirm the null hypothesis that these instruments are uncorrelated with the error term in the utilization equation, a standard practice within the literature is to report whether the instrument is correlated with those observable factors believed to be correlated with the unobservable factors that affect the second-stage error term. Thus, Table 3 divides the variables used within this study by those observations that are in the notch cohort and those that are not. Table 3 presents the means for Social Security income, explanatory and utilization measures across these two groups for the low education subsample. As expected, Social Security income is $1,452 higher for the notch cohort. The table shows that there are statistically significant differences across the two groups in nursing home use and informal care use. Correcting for the difference in ages across the two groups, we find that the samples are more balanced.[9] We also perform robustness checks using a more extensive set of health controls to account for any health differences among the two groups not captured by age and other control variables (described in section IV.B.).

We also separately investigate the effect of the notch on non-Social Security income to aid the interpretation of our results. If a positive shock in Social Security income led to offsetting behavioral responses on other sources of income, our results would have to be scaled appropriately in order to be interpreted as shocks in total income. Moreover, if the offsetting response was large enough that it left total income unchanged, we would not expect to see a response of long-term care utilization to positive Social Security income shocks. We find that cohorts born during the Benefits notch have slightly lower levels of non-Social Security income; however, the magnitude of the effect is small and the relationship is not statistically significant. This result, namely that notch cohorts did not have detectable changes in non-Social Security income, is not surprising given the importance of Social Security income to individuals in the low-education subsample: on average, Social Security income is 68 percent of the total household income for these respondents. In addition, these results are consistent with Krueger and Pischke (1992) which point to a negligible labor supply response to rising Social Security wealth, and are available upon request from the authors.

IV. Results

A. Main Results

The estimates of the effect of permanent Social Security income on long-term care utilization are presented in Tables 4-6. In each table, we present both the standard probit models

[9] The difference in nursing home use between the groups drops from 0.053 to 0.025 after adjusting for quadratic age, and the difference in informal care use drops from 0.055 to 0.006 after adjusting for quadratic age.

that treat income as exogenous, and the IV probit models that treat income as endogenous. The results are dramatically different across these two sets of models. Across all our outcomes, the probit findings suggest a negative correlation between (endogenous) Social Security income and long-term care use, which is consistent with the idea that poorer health is correlated with both lower Social Security income and greater LTC utilization.

We first examine the effect of positive Social Security income shocks on any formal long-term care use between Waves 1 and 2 of the AHEAD (Table 4). With this broad outcome variable, we find a statistically significant negative correlation between Social Security income and any formal long-term care use. However, once we instrument for income, we obtain a positive point estimate of the effect of Social Security income on formal long-term care use on the order of 5 percent of formal long-term care utilization, but this effect is not statistically significant.

The weak results for any long-term care use may mask offsetting effects for the components of formal long-term care services, home care and nursing home care. We therefore investigate the effects of different types of care separately. Treating income as exogenous, we find a statistically significant negative effect of Social Security income on any paid home care between the first two AHEAD waves (Table 5). Once we instrument for Social Security income, we obtain a statistically significant positive effect of Social Security income on paid home care in the linear and cubic age specifications. Specifically, the cubic age specification shows that a $1,000 permanent income shock raises the likelihood of home care by 3.1 percentage points (or 15.8% relative to the mean).[10]

[10] As a robustness check, we also estimate a model of paid home care using a measure any paid assistance by a medically trained caregiver over the past 12 months (see Table A2). This model suggests that a $1,000 increase in permanent income raises the likelihood of paid home care by a statistically significant 3-4 percentage points.

Table 6 presents results based on nursing home utilization between the first two AHEAD waves. In this specification, we obtain a statistically significant effect of Social Security income on nursing home utilization when we instrument for income. Specifically, a $1,000 increase in annual Social Security income decreases the likelihood of nursing home use by two to three percentage points (or 24-34% of the mean). These results, combined with those in Table 5, indicate that while positive Social Security income shocks appear to have a weak positive effect on overall formal long-term care utilization, they have opposite effects on nursing home and home care use.[11]

All of the above results evaluate long-term care utilization along the extensive margin (whether the individual used any long-term care), but utilization along the intensive margin (how much care the individual used) may also be important. In order to assess this issue, we ran two-stage residual inclusion (2SRI) generalized linear models examining the effect of Social Security income on number of nursing home days between waves 1 and 2 of the AHEAD.[12] The results for all these models are available in the Appendix and were generally consistent with the results reported above in sign and suggested that an additional $1000 in Social Security income reduced stays in nursing home by 4.3-5.7 days, but they lacked statistical precision.

B. Robustness checks

Though we exclude covariates that are potentially endogenous to Social Security income such as Medicaid eligibility and health status variables (i.e., number of ADLs; number of IADLs;

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[11] When we analyzed informal care, the probit model indicates a negative and statistically significant effect of Social Security income on the likelihood of informal care use (see Table A1). However, once we instrument for income, this result falls away in the quadratic age specification, and we obtain a positive effect of Social Security income on informal care utilization, although this result is not statistically meaningful. Taken with the linear and cubic age specification results, we cannot conclude that there is a causal effect of Social Security income shocks on the likelihood of informal care use. However, a limitation is that we can only measure informal care by any unpaid assistance for an ADL or IADL over the previous four weeks.

[12] The AHEAD did not ask about the amount of paid home care used after the baseline interview among decedents, precluding us from estimating the analogous model for home care.

self-rated health; hypertension; diabetes; cancer; lung disease; heart disease; stroke; psychiatric problems), we perform robustness checks including these covariates and find that the signs and magnitudes of the coefficients and marginal effects are very similar. The results are also robust to eliminating spouses from the analysis and performing the analysis without the weights from the HRS. Finally, our results are robust to including interactions between household structure and age and dropping non-white and Hispanic observations.

In addition, we perform robustness checks to various sample restrictions, following Moran and Simon (2006). For instance, our method of imputing birth year for the household head of widowed and divorced women may introduce measurement error into our analysis. Excluding these two groups provides results that are similar to those reported here, though the magnitude of the home care utilization effects are smaller and no longer statistically significant. Our results are also not sensitive to whether we conduct our analyses at the household level (available upon request), where the dependent variables correspond to whether anyone in the household used long-term care services (similar to Moran and Simon (2006)). We also examine the sensitivity of our results to the specific birth cohorts included in our study. First, we exclude cohorts born during the flu pandemic in 1918 and 1919. Next, we limit the range of the cohorts included in the study to those born between 1910 and 1920 due to possible cohort effects in long-term care utilization for reasons unrelated to differences in permanent income stemming from changes in Social Security legislation. In both of these cases, we find results (available upon request) that are qualitatively and quantitatively similar to our base results. Finally, we test whether our results are robust to the choice of functional form for Social Security income by estimating our models using logged Social Security income. These results (available upon request) are also qualitatively similar to our base results and are estimated with even more precision.

V. Mechanisms behind Reported Effects

Our results indicate that a positive Social Security income shock would lead seniors to increase their utilization of home care services, and reduce nursing home stays. In this section, we briefly explore several mechanisms which may underlie these findings. One hypothesis is that increased Social Security income leads to substitution away from nursing home care and towards home care use. Another pathway that may lead to the results we observe is improved health. That is, an increase in Social Security income will lead to better health which ultimately decreases the need for nursing home care. A third explanation relates to Medicaid: more Social Security income could lead to less reliance on Medicaid and therefore more home care. Medicaid is a means-tested program that requires individuals to meet income and asset eligibility standards in order to qualify for coverage. During our period of study, Medicaid coverage was fairly biased in favor of institutional nursing home coverage. We visit each of these hypotheses in turn.

A. Substitution between Types of Care

The results in the previous section suggest that a positive Social Security income shock decreases nursing home use but increases home care use. However, the estimates do not clearly indicate whether individuals substitute home care for nursing home care or whether those who would not have received long-term care are more likely to use home care. To address this question, we categorize individuals into one of four categories: no long-term care use, only home care use, only nursing home use, and both home care and nursing home care use. We then perform a multinomial logit regression while accounting for the endogeneity of Social Security income using the 2SRI method (Terza, Basu and Rathouz 2008).

Table 7 summarizes our results. We report both the estimated coefficients as well as the marginal effects of an additional $1,000 of Social Security income on the predicted probabilities of being in each category, where no long-term care use is the base category. The results provide some support for the hypothesis that the increase in the use of home care due to higher Social Security income was a result of individuals substituting away from nursing home care. The estimated marginal effect for choosing home care use and no nursing home care use from an increase in $1,000 in annual household Social Security income varies from a 3.1 to a 3.5 percentage point increase, while the marginal effect for choosing nursing home care use and no home care use varies from a 0.6 to 0.7 percentage point decrease. The marginal effect on the predicted probability of using no long-term care varies from a 2.6 to a 2.9 percentage point decrease, while the marginal effects on using both nursing home and home care are negligible. Overall, the results suggest that while higher Social Security income does cause some individuals to use home care who would not have otherwise received long-term care, it does also lead some individuals to substitute home care for nursing home care.[13]

These results provide suggestive evidence that higher Social Security income reduces demand for nursing home care when home care is an available substitute. These results, together with the finding from Engelhardt and colleagues (2005) that greater income increased the likelihood of elderly individuals living alone, are consistent with the idea that living

[13] Note the drop in sample size in Table 7 is due to skip patterns in the HRS that led to current residents of nursing home not being asked questions about home care use. We perform robustness checks that include these individuals in either the "nursing home only" category and the "nursing home plus home care" category and get qualitatively similar results.

independently is a valued good. Given the preference for care in the least restrictive setting possible, we find this hypothesis quite plausible.

B. Effects through Improved Health

An alternate pathway of income leading to increased home care use and reduced nursing home use might be through improved health. That is, an increase in Social Security income could lead to better health and a less severe need for long-term care which may be more easily provided through home care services rather than in a nursing home. This explanation is less plausible due to the evidence of the causal link between income or wealth and health which suggests modest effects (e.g., Meer, Miller, and Rosen 2003; Lindahl 2005; Adda, Banks, and von Gaudecker 2009), or even negative effects (Snyder and Evans 2006). However, we investigate this hypothesis by examining whether positive income shocks from the Social Security notch led to improvements in self-reported health status or declines in the presence of ADL/IADL limitations.

Table 8 reports our results. Although higher Social Security income is correlated with a lower probability of disability in the probit results, positive Social Security income shocks have no clear statistically powerful effects on either ADL or IADL limitations. The same pattern is visible in self-reported health status. Moreover, the direction of the results is generally opposite the intuition that higher income would improve health outcomes. These results, combined with our earlier finding that our estimates were insensitive to including extensive health status covariates, make it unlikely that the results we see in the Section IV were due to improved health or reduced disability.

C. Effects through Changes in Medicaid Eligibility

Finally, we acknowledge the possibility that our results may work through Medicaid in that more income will lead to less reliance on Medicaid and therefore result in more home care. Although state Medicaid programs have increased their coverage of home- and community-based services in recent years, the coverage of these services was relatively minimal during our study period. Thus, the strong institutional bias in the Medicaid benefit during the early-to-mid 1990s may be part of the explanation for how greater income led to less nursing home care. However, given that the majority of states have a "medically needy" program with no restrictions on income for eligibility, we believe this explanation is less likely because assets, rather than income, generally present the biggest barrier to Medicaid eligibility (Norton 1995). In models where Medicaid enrollment was the dependent variable, we found no statistically significant effect of the notch.[14] Combined with our robustness checks that included Medicaid enrollment in our models which did not alter our main results on long-term care utilization, we conclude that Medicaid eligibility is unlikely to be an important mechanism for explaining our findings.

VI. Simulated Policy Impacts

In order to examine the effects of a change in Social Security benefits on long-term care utilization, we first convert our preferred coefficient estimates from Table 5 and Table 6 of the effect of an increase in Social Security income on home and nursing home care (IV Probit estimates from the quadratic age specification) to 2009 dollars. This involves dividing our estimates by 1.485, the cumulative change in the CPI between 1993 and 2009.[15] After doing so, our estimates suggest that a $1,000 increase in annual household Social Security benefits (in 2009 dollars) leads to a 1.9 percentage point increase in the use of home care, and a 2.0

[14] These tables are available upon request.
[15] See http://www.bls.gov/cpi/home.htm.

percentage point decrease in the use of nursing home care. Although many aspects of our long-term care system have changed since the early waves of the AHEAD survey, our results suggest that a moderate change in annual retirement income would still have important effects on long-term care utilization.

A key issue is the plausibility of the magnitude of these estimates. For comparison, Van Houtven and Norton (2004) find that a 10 percent increase in hours of informal care lead to a 0.77 percentage point reduction in the probability of home care use and a 0.83 percentage point reduction in the probability of nursing home use after taking into account the endogeneity of informal caregiving. However, a key point in interpreting our estimates is that the $1,000 in additional Social Security income is an annual amount. Using our first stage estimates from Table 2 coupled with Social Security data, we can calculate the present discounted value of being in the notch cohort for an individual at age 65. The annuity value for a 65 year old born in 1916 is 10.91 for males and 13.33 for females.[16] Thus, a $1,200 annual increase (from Table 2) in Social Security income amounts to a $13,092 lump sum for men and a $15,996 lump sum for women. Because Social Security pays 100% of the primary earner's benefit to the surviving spouse, the correct annuity value is a joint, second-to-die annuity that pays until the second death. Thus, $16,000 is a good estimate of the present discounted value for a 65-year old of being in the notch cohort. As a benchmark, the average present discounted value of projected lifetime *out-of-pocket* long-term care expenditures for individuals turning 65 in 2005 was $21,100 out of the total expenditures of $47,000 (Kemper et al., 2005). When evaluated in this context, the magnitude of our estimates of the effect of income on long-term care utilization is quite plausible.

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[16] This value assumes a 2.9% interest rate and "Alternative 2" mortality probabilities (the middle scenario) that Social Security used in their 2007 Trustees Report.

VI. Conclusion

This study exploits an arguably exogenous change in income that led retirees born in different years to receive significantly different amounts of income to determine the effect of income on long-term care utilization and its composition. Our results indicate that while overall formal long-term care use is only weakly higher, a positive shock in Social Security income would lead seniors to significantly increase their utilization of home care services and reduce nursing home stays. We explore several mechanisms which may underlie these findings, including substitution from nursing home care to home care, changes in health, and changes in Medicaid eligibility. Our findings suggest that the most likely explanation for these effects is that independence is a valued good which leads elderly individuals to choose less restrictive settings for long-term care services when afforded by higher income.

An important caveat is that our results pertain only to low-wage workers. Due to the 1977 law raising the covered earnings maximum, the notch is relatively weak for high wage workers when using a wider set of birth cohorts (1900-1930). Unfortunately, the AHEAD survey does not have large enough sample directly around the notch to isolate the effect of the notch for high-wage workers. Presumably, a different set of mechanisms may be important for high-wage earners such as the role of private long-term care insurance. Future research using a larger sample may also investigate whether the effects we observe are heterogenous by family structure. Engelhardt and colleagues (2005) found that the effect of Social Security income on independent living was strongest among unmarried households, and it is thus plausible that our results on long-term care utilization may be strongest among unmarried households.

In addition, data limitations prohibit our analysis from disentangling the effects of income on long-term care from post-acute rehabilitative care. Because a positive income shock may have different effects on post-acute care (which is often covered by Medicare), examining claims data is a fruitful area for future research. Such data could also estimate the effects of income on payer-specific expenditures on long-term care, an important public policy issue because of the major role of Medicaid, and to a lesser extent, Medicare, in financing long-term care. Finally, future research may investigate whether more income also leads to more use of assisted-living services which allow for greater independence than nursing homes and have grown in prominence since the period that we study.

Nevertheless, we have found an important effect of income on long-term care utilization for low wage workers. These findings suggest that Social Security benefit cuts could have a large impact of the utilization of long-term care services, leading more individuals to stay in nursing homes over receiving care in their homes. Moreover, these results may also have indirect implications for changes in other sources of retirement income such as pensions and asset income.

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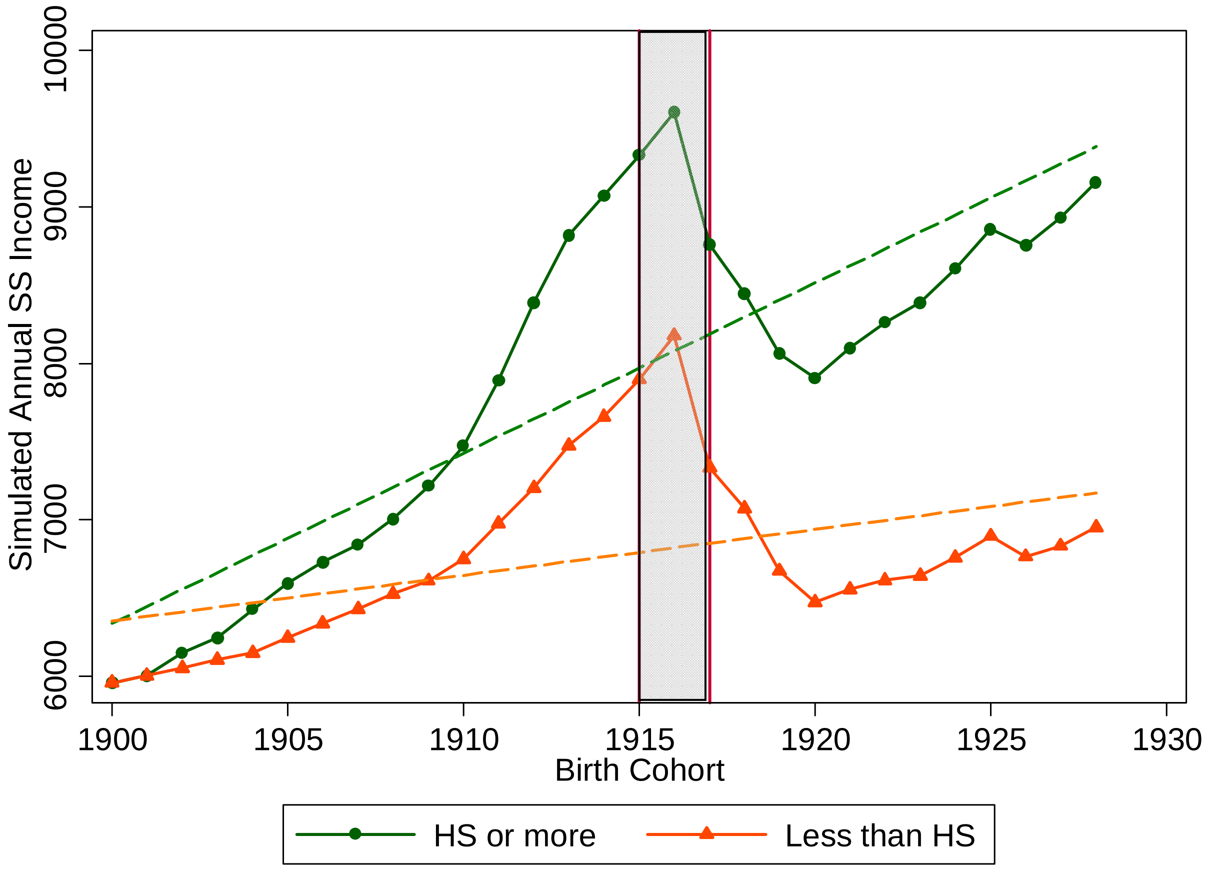
Figure 1



Notes: Each birth cohort's benefits were computed with identical real earnings histories and the Social Security Administration's ANYPIA program as detailed in Engelhardt, Gruber, and Perry (2005). Benefits differ across birth cohort only due to legislative changes in benefits. Shading indicates notch years of 1915-1917.

Table 1: Summary Statistics by Education of Household Head

Variable	Low Education Group: Less than High School (N=2,283)				High Education Group: High School or More (N=3,022)			
	Mean	Standard Deviation	Min	Max	Mean	Standard Deviation	Min	Max
Any Formal Long-Term Care Use (between Waves 1 and 2)	0.253	0.435	0	1	0.179	0.384	0	1
Nursing Home Use (between Waves 1 and 2)	0.089	0.285	0	1	0.066	0.248	0	1
Home Care Use (between Waves 1 and 2)[a]	0.196	0.397	0	1	0.138	0.345	0	1
Home Care Use (prior 12 mos.)[b]	0.109	0.311	0	1	0.072	0.258	0	1
Informal Care Use (prior 4 weeks)	0.294	0.456	0	1	0.182	0.386	0	1
Household Social Security Income (1993 $)	9,993	4,429	1,308	30,000	11,630	5,428	1,392	48,000
Head born between 1915-1917	0.180	0.385	0	1	0.197	0.398	0	1
Age of Head	77.7	5.4	63	93	76.7	5.1	64	92
Head is married male	0.565	0.496	0	1	0.582	0.493	0	1
Head is single male	0.105	0.307	0	1	0.089	0.284	0	1
Head is never-married female	0.014	0.119	0	1	0.021	0.142	0	1
Head is female widow	0.292	0.455	0	1	0.284	0.451	0	1
Head is divorced female	0.024	0.153	0	1	0.025	0.155	0	1
Head's race is white	0.871	0.336	0	1	0.962	0.192	0	1
Head's race is African American	0.107	0.309	0	1	0.030	0.170	0	1
Head's race is other	0.023	0.149	0	1	0.009	0.093	0	1
Head's ethnicity is Hispanic	0.058	0.234	0	1	0.014	0.119	0	1
Household is located in a MSA	0.621	0.485	0	1	0.765	0.424	0	1

Note: All variables are weighted using the AHEAD household weights. Indicators for nine Census regions are not shown but are included in the regressions. [a] N=2,142 (low education) and 2,898 (high education). [b] N=2,280 (low education) and 3,022 (high education).

Table 2: Effect of the Benefits Notch on Social Security Income by Educational Attainment

	Low Education Group: Less than High School			High Education Group: High School or More		
	Linear Age Specification	Quadratic Age Specification	Cubic Age Specification	Linear Age Specification	Quadratic Age Specification	Cubic Age Specification
Notch Cohort: Head born between 1915-1917	1.448***	1.149***	1.210***	0.284	-0.069	-0.010
	(0.297)	(0.298)	(0.323)	(0.453)	(0.466)	(0.485)
F-statistic on notch indicator	23.75	14.87	14.02	0.394	0.022	0.000
Observations	2,283	2,283	2,283	3,022	3,022	3,022

Note: The dependent variable is annual household Social Security income measured in thousands of 1993 dollars. The notch cohort indicator equals one if the household head was born in 1915, 1916, or 1917. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Summary Statistics by Notch Cohort

Variable	Outside of Notch Cohort (N=1,888) Mean	Outside of Notch Cohort (N=1,888) Standard Deviation	Notch Cohort (N=395) Mean	Notch Cohort (N=395) Standard Deviation	Test for Difference in Means (p-value) No Age Adjustment	Test for Difference in Means (p-value) Quadratic Age Adjustment
Any Formal Long-Term Care Use (between Waves 1 and 2)	0.258	0.437	0.232	0.422	0.324	0.711
Nursing Home Use (between Waves 1 and 2)	0.099	0.298	0.046	0.210	0.000	0.092
Home Care Use (between Waves 1 and 2)[a]	0.193	0.395	0.209	0.406	0.521	0.292
Home Care Use (prior 12 mos.)[b]	0.105	0.306	0.127	0.333	0.265	0.064
Informal Care Use (prior 4 weeks)	0.304	0.460	0.249	0.432	0.033	0.812
Household Social Security Income (1993 $)	9,731	4,229	11,183	5,073	0.000	0.000
Age of Head	78.1	5.9	76.0	1.6	0.000	---
Head is married male	0.568	0.495	0.549	0.498	0.530	0.564
Head is single male	0.107	0.309	0.099	0.298	0.659	0.381
Head is never-married female	0.014	0.117	0.016	0.125	0.783	0.733
Head is female widow	0.291	0.454	0.296	0.457	0.842	0.606
Head is divorced female	0.021	0.142	0.040	0.195	0.089	0.218
Head's race is white	0.861	0.346	0.913	0.282	0.000	0.001
Head's race is African American	0.113	0.317	0.076	0.266	0.004	0.004
Head's race is other	0.025	0.157	0.011	0.103	0.011	0.138
Head's ethnicity is Hispanic	0.062	0.241	0.043	0.203	0.042	0.040
Household is located in a MSA	0.629	0.483	0.584	0.493	0.138	0.220

Note: All variables are weighted using the AHEAD household weights. Indicators for nine Census regions are not shown but are included in the regressions. [a] N=1,757 (non-notch cohort) and 385 (notch cohort). [b] N=1,885 (non-notch cohort) and 395 (notch cohort).

Table 4: Effect of Social Security Income on Any Formal Long-Term Care Use between AHEAD Waves 1 and 2

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0293***	0.0430	-0.0312***	0.0410	-0.0313***	0.0430
	(0.0105)	(0.0425)	(0.0106)	(0.0546)	(0.0107)	(0.0555)
Marginal Effects (1,000s of 1993$)	-0.0088	0.0133	-0.0093	0.0127	-0.0093	0.0133
Dependent Variable Mean	0.2530	0.2530	0.2530	0.2530	0.2530	0.2530
Observations	2,283	2,283	2,283	2,283	2,283	2,283

Note: The dependent variable is any nursing home or formal home care use in the two years between waves 1 and 2 of the AHEAD survey (1993 through 1995). The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Effect of Social Security Income on Formal Home Care Use between AHEAD Waves 1 and 2

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0257**	0.1000**	-0.0287**	0.1000	-0.0287**	0.1069*
	(0.0119)	(0.0485)	(0.0118)	(0.0609)	(0.0119)	(0.0603)
Marginal Effects (1,000s of 1993$)	-0.0067	0.0289	-0.0075	0.0288	-0.0075	0.0310
Dependent Variable Mean	0.1958	0.1958	0.1958	0.1958	0.1958	0.1958
Observations	2,142	2,142	2,142	2,142	2,142	2,142

Note: The dependent variable is any formal home care use in the two years between waves 1 and 2 of the AHEAD survey (1993 through 1995). The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Effect of Social Security Income on Nursing Home Use between AHEAD Waves 1 and 2

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0168	-0.1306**	-0.0180	-0.1657***	-0.0177	-0.1573***
	(0.0115)	(0.0509)	(0.0113)	(0.0575)	(0.0114)	(0.0604)
Marginal Effects (1,000s of 1993$)	-0.0024	-0.0216	-0.0026	-0.0300	-0.0026	-0.0278
Dependent Variable Mean	0.0892	0.0892	0.0892	0.0892	0.0892	0.0892
Observations	2,283	2,283	2,283	2,283	2,283	2,283

Note: The dependent variable is any nursing home use in the two years between waves 1 and 2 of the AHEAD survey (1993 through 1995). The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the head of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7: Effect of Social Security Income on Type of Long-Term Care Use between AHEAD Waves 1 and 2
2SRI Multinomial Logit Model

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Household Social Security income (1,000s of 1993$)						
Home Care Use Only	0.2033*	0.0308	0.2277	0.0352	0.2238	0.0342
	(0.1139)		(0.1455)		(0.1450)	
Nursing Home Care Use Only	-1.0806*	-0.0058	-1.3549	-0.0065	-1.7059**	-0.0071
	(0.6368)		(0.8250)		(0.7834)	
Both Home Care and Nursing Home Care	0.0863	0.0011	0.0049	-0.0007	0.1103	0.0015
	(0.2037)		(0.3103)		(0.3504)	
Observations	2,142		2,142		2,142	

Note: Results shown are coefficients and marginal effects for annual household Social Security income (in 1,000s of 1993$) from multinomial logit regressions. Omitted category is "No Long-Term Care Use." The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. Marginal effects refer to changes in predicted probabilities due to an additional $1000 in Social Security income. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Effect of Social Security Income on ADL/IADL Limitations and Self-Reported Health Status

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
			Panel A: Any ADL Limitations			
Household Social Security income	-0.0222**	0.0402	-0.0225**	0.2101	-0.0227**	0.0476
(1,000s of 1993$)	(0.0087)	(0.0392)	(0.0090)	(3.9023)	(0.0089)	(0.0495)
Marginal Effects (1,000s of 1993$)	-0.0063	0.0118	-0.0064	0.0655	-0.0065	0.0141
Dependent Variable Mean	0.227	0.227	0.227	0.227	0.227	0.227
Observations	2,283	2,283	2,283	2,283	2,283	2,283
			Panel B: Any IADL Limitations			
Household Social Security income	-0.0489***	-0.0261	-0.0473***	0.0089	-0.0468***	0.0513
(1,000s of 1993$)	(0.0084)	(0.0318)	(0.0086)	(0.0316)	(0.0084)	(0.0317)
Marginal Effects (1,000s of 1993$)	-0.0138	-0.0075	-0.0133	0.0026	-0.0132	0.0153
Dependent Variable Mean	0.243	0.243	0.243	0.243	0.243	0.243
Observations	2,283	2,283	2,283	2,283	2,283	2,283
			Panel C: Self-Reported Health Status Fair or Poor			
Household Social Security income	-0.0371***	0.0331	-0.0389***	0.0294	-0.0388***	0.0438
(1,000s of 1993$)	(0.0085)	(0.0369)	(0.0088)	(0.0537)	(0.0088)	(0.0509)
Marginal Effects (1,000s of 1993$)	-0.0140	0.0126	-0.0146	0.0112	-0.0146	0.0166
Dependent Variable Mean	0.427	0.427	0.427	0.427	0.427	0.427
Observations	2,283	2,283	2,283	2,283	2,283	2,283

Note: The dependent variable is as indicated in the panel. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A1: Effect of Social Security Income on Informal Care Use

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0403***	-0.0145	-0.0382***	0.0300	-0.0379***	0.0558*
	(0.0075)	(0.0242)	(0.0075)	(0.0312)	(0.0074)	(0.0328)
Marginal Effects (1,000s of 1993$)	-0.0127	-0.0046	-0.0120	0.0097	-0.0119	0.0182
Dependent Variable Mean	0.294	0.294	0.294	0.294	0.294	0.294
Observations	2,283	2,283	2,283	2,283	2,283	2,283

Note: The dependent variable is any informal (unpaid) care use for an ADL/IADL limitation use over the 4 weeks prior to the survey. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A2: Effect of Social Security Income on Formal Home Care Use (12 months prior to Wave 1)

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	Probit	IV Probit	Probit	IV Probit	Probit	IV Probit
Household Social Security income (1,000s of 1993$)	-0.0229	0.1347***	-0.0243*	0.1591***	-0.0245*	0.1558***
	(0.0147)	(0.0418)	(0.0147)	(0.0443)	(0.0146)	(0.0492)
Marginal Effects (1,000s of 1993$)	-0.0041	0.0318	-0.0043	0.0396	-0.0043	0.0385
Dependent Variable Mean	0.1087	0.1087	0.1087	0.1087	0.1087	0.1087
Observations	2,280	2,280	2,280	2,280	2,280	2,280

Note: The dependent variable is any paid home care from a medically-trained caregiver over the previous 12 months prior to the survey. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A3: Effect of Social Security Income on Number of Nursing Home Days between AHEAD Waves 1 and 2

	Linear Age Specification		Quadratic Age Specification		Cubic Age Specification	
	GLM	2SRI GLM	GLM	2SRI GLM	GLM	2SRI GLM
Household Social Security income (1,000s of 1993$)	-0.0383	-0.2944	-0.0410	-0.3844	-0.0405	-0.3504
	(0.0503)	(0.2327)	(0.0500)	(0.3039)	(0.0502	(0.3175)
Marginal Effects (1,000s of 1993$)	-0.5691	-4.3777	-0.6094	-5.7171	-0.6025	-5.2117
Dependent Variable Mean	14.912	14.912	14.912	14.912	14.912	14.912
Observations	2,275	2,275	2,275	2,275	2,275	2,275

Note: The dependent variable is the number of days in a nursing home between waves 1 and 2 of the AHEAD. The GLM models are estimated with a poisson family and log link. The age variable refers to the age of the head of the household. All models also include controls for the type of household, race of the household head, Hispanic ethnicity of the head, whether the household is located in a MSA, and region of the country. All regressions are weighted using the AHEAD household weights. Robust standard errors, adjusted for clustering on birth year, are displayed in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$