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ABSTRACT

Medicaid is a government program that provides health insurance to the old who are sick and have little assets and income compared to their medical needs. Thus, it explicitly tests for income, assets, and health or medical needs to determine eligibility. We ask how these rules map into the reality of Medicaid recipiency and what observable characteristics are important to determine who ends up on Medicaid. The data show that both singles and couples with high retirement income can end up on Medicaid at very advanced ages. We find that, conditioning on a large number of observable characteristics, including those that directly relate to Medicaid eligibility criteria, single women are more likely to end up on Medicaid. So are non-whites, but, surprisingly, their higher recipiency is concentrated above the lower income percentiles. We also find that low-income people with a high school diploma or higher are much less likely to end up on Medicaid than their more educated counterparts. All of these effects are large and depend on retirement income in a very non-linear way.

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1 Introduction

Medicaid is a means-tested program that, among several mandates, helps cover the cost of medical goods and services for the U.S. elderly who are sick and have either low income and assets, or assets and income that are swamped by catastrophic medical conditions. Its key rules are thus based on assets, income, and health. In 2010, 6.3 million individuals aged 65 and older received an average benefit amount of $11,620. Given the ever-present pressure on government budgets and the increasing costs of providing medical goods and services, we need to better understand why people do or do not end up on Medicaid at some point during retirement.

The goal of this paper is to help uncover the economic forces that tend to increase or decrease Medicaid recipiency and determine its heterogeneity across people. We start by describing facts about Medicaid recipiency by age, cohort, permanent income, and marital status. Next, we turn to a rich multivariate analysis, which allows us to distinguish two possible set of determinants: "rules," which have to do with the main Medicaid eligibility requirements (income, wealth, and health) and "other" factors (including age, education, race, region of residence, and being in a couple). We then measure the strength of each of these factors by keeping all of the other observables constant.

All of our analysis uses the Health and Retirement Study (HRS) data. We find that, consistently with the goal of the Medicaid program of helping the poor, over 30% of the seventy year old singles in the bottom third of permanent income are on Medicaid. However, as single people age, even the survivors with high permanent income end up on Medicaid in their nineties. For instance, after age 96, the fraction of singles in the top third of permanent income that is on Medicaid is 10%. Comparing singles with couples reveals that, for similar age and permanent income, people in couples are less likely to be on Medicaid but that the increases in Medicaid recipiency by permanent income and age follow a broadly similar pattern for couples and singles.

Our findings on Medicaid recipiency by permanent income are consistent with the observation that, even though Medicaid is intended for poor households, middle- and higher-income households with high medical expenses might also qualify for assistance. In fact, given the ongoing growth in medical expenditures, Brown and Finkelstein (2008) have noted that Medicaid is increasingly covering not only the poor, but is increasingly covering the middle and upper classes as well, and is thus becoming more expensive to administer. In fact, the program also provides valuable insurance for well-off individuals (De Nardi et al., 2016a).

We also display the evolution of two key determinants of Medicaid recipiency as determined by the Medicaid rules: net worth and health (measured by the number of the Activities of Daily Living impairments (ADLs) by age, cohort, permanent income, and marital status. Regarding wealth, we find that couples and singles with permanent income below the top third tend to decumulate assets as they age and survive. In contrast, there is little decumulation of assets for both couples and singles in the top permanent income tercile, despite the fact that a non-negligible fraction of them end up on Medicaid. Regarding health, as measured by ADLs (which are also an important criterion for Medicaid nursing home admission), we find that the fraction of people with at least two ADLs increases from less than 10% at age 76, to about 60% for the survivors that make it after age 96. In addition, we also show that higher permanent income singles and couples are less likely to have two or more ADLs (and to end up in a nursing home or to self-report being in bad health), but that the increase in ADL incidence by permanent income and age is broadly similar for singles and couples.

To disentangle and measure the role of various observable factors on Medicaid recipiency, we then turn to a rich multivariate analysis. More specifically, we study how the probability of being covered by Medicaid is influenced by demographic, economic, geographical, and health factors, using a logit probability model. Permanent income and other variables capturing economic background have a major role in determining Medicaid coverage and in explaining the observed differences in Medicaid recipiency between singles and couples. For instance, a 1 percentile increase in permanent income implies a 0.4 percentage points reduction in the probability of being on Medicaid. Among the possible family structures, being a single woman increases the probability of being on Medicaid, on average, by 3 percentage points. Impairments in the activities of daily living and residency in a nursing home have a large effect on the probability of being on Medicaid, as the average marginal effect of having two or more ADL impairments increases the probability by 6.4 percentage points, while being resident in a nursing home increases the probability of being on Medicaid by 15 percentage points. Both of these findings are consistent with Medicaid eligibility rules.

These findings, however, refer to the average marginal effect of each factor under consideration. Because our multivariate analysis finds evidence for important non-linearities in observables and their interactions, the last step of our analysis studies the effect of the most important and interesting variables *along the whole distribution of a given variable* and its interaction with other important observables.

While the average marginal effect of an additional percentile in the permanent income distribution reduces the probability of being on Medicaid by 0.4 percentage points, the

marginal effect for a person in the first permanent income decile is a reduction in Medicaid recipiency of 0.6 percentage points. More generally, in absolute terms, Medicaid rules have an especially large effect on recipiency at the bottom of the permanent income distribution.

The interaction of permanent income and other observables related to Medicaid eligibility is important: the marginal effect of having two or more ADL limitations increases the probability of being on Medicaid by 9 percentage points up to the 20th percentile of the permanent income distribution compared to an increase of 2 percentage points above the 80th percentile of permanent income. While the absolute effect of ADL limitations on Medicaid recipiency is bigger for those in the bottom of the income distribution, the effects are bigger in percentage terms for those at the top, since those at the top have much smaller recipiency rates. In terms of the effects of being in a nursing home and its interaction with permanent income, people in the 50-70th permanent income percentiles who spend two years in a nursing home are up to nine times more likely to be on Medicaid than people with the same permanent income who are not in nursing home. At the 90th percentile of permanent income, this increase levels off to a factor of two times, compared to people not in a nursing home for two years.

We also find that other factors that are not directly related to Medicaid eligibility are very important determinants of Medicaid recipiency, even keeping all other observable factors fixed. For instance, whites have a lower probability of being on Medicaid than non-whites. The surprising aspect is that this effect is zero or negligible for income percentiles below the 30th while it increases with permanent income and reaches 5 percentage points at higher income levels. In contrast, low income single women have a higher probability of being on Medicaid than other low income people, with the gap in probabilities topping up at 4 percentage points at the lower income levels. Finally, education reduces the probability of being on Medicaid, and especially so at low income deciles. For instance, at the lowest decile of permanent income, a college education reduces the probability of being on Medicaid by 12 percentage points compared to having less than a high school education.

2 Related literature

The papers most closely related to ours study the observable factors associated with Medicaid enrollment. Pezzin and Casper (2002) use the 1996 Medicare Current Beneficiary (MCBS) data to study the factors associated with Medicaid enrollment among low-income, community-dwelling elderly persons and to evaluate the effects of Medicaid enrollment on the use of health care services by elderly persons, taking into account selection into program

participation. They find that less than half of all community-dwelling elderly persons with incomes at or below 100% of the federal poverty line were enrolled in Medicaid in 1996.[1] They also find no effects of state-level Medicaid generosity on the probability of living in the community as opposed to in a nursing home, that Medicaid eligibility does not appear to have strong effects on service usage, and that state-level Medicaid generosity increases the likelihood of Medicaid enrollment. Compared with Pezzin and Casper, not only do we study a much longer panel, but we also study Medicaid enrollment across the whole population and permanent income, because Medicaid insurance is becoming more appealing to the middle- and upper-income elderly (Brown and Finkelstein (2008) and De Nardi et al. (2015)). Perhaps most importantly, using the HRS data we evaluate the importance of assets as a determinant of Medicaid recipiency, something Pezzin and Casper were unable to do because their data did not include assets.

Gardner and Gilleskie (2012) use data from the 1993-2000 waves of the HRS to estimate a dynamic empirical model of health insurance coverage, long-term care arrangements, asset and gift behavior, and health transitions over time. Their main result is that most Medicaid eligibility and generosity policy variables associated with nursing home services have no effects on Medicaid recipiency and savings. Instead, they find that policies related to home- and community-based services have a small but significant influence, especially on the non-married elderly with low assets. Because they found that state-level variation in program rules did little to explain Medicaid recipiency, we focus on other variables. We add many more variables that could be relevant for predicting Medicaid recipiency, including for instance the number of children, and we consider the role of permanent income and cohabitation in a much richer way. See also De Nardi et al. (2012) for more on state-level variation in Medicaid rules. Willing et al. (2016) also use the HRS data to analyse the characteristics of Medicaid beneficiaries.

Compared with the previous papers, we use HRS panel data from 1996 to 2012, resulting in nine waves of data every two years over a long period. This long time span allows us to follow the evolution of Medicaid enrollments over the retirement period conditional on a persons characteristics and to document important differences by permanent income (rather than just current income) for singles and couples. Instead of focusing on the differences across states in the implementation of the Medicaid program, which appears to have only a modest effect on Medicaid recipiency, we focus on the commonalities of the Medicaid program in the

[1]It should be noted that Medicaid eligibility is based on both assets and income tests and that these authors do not use asset data to determine Medicaid eligibility. In addition, Meyer and Mittag (2015) find that survey data respondents underreport support from public assistance and that these data sets thus sharply understate the income of poor households.

United States. In addition, our descriptive analysis highlights the most important aspects of assets, income, health, and Medicaid eligibility that couples and singles in different income categories experience. Finally, our regression analysis describes Medicaid recipiency as a function of (mostly predetermined) variables, once people's optimizing behavior takes place.

Our paper is also related to the work that studies the incentives to be on Medicaid. At one extreme, some papers find large Medicaid stigma, or public care aversion. At the other extreme, other works discuss Medicaid moral hazard or strategic spend-down of assets by people who want to become Medicaid eligible. In the first camp, for instance, Ameriks et al. (2011) use a data set from Vanguard that samples middle- to high-income people and also asks hypothetical questions to study the determinants of lack of asset run-down and under-annuitization. They conclude that Medicaid aversion is an important determinant of the observed savings patterns. In addition, Norton (2005) argues that the elderly do not spend down to qualify for Medicaid but that, on the contrary, some of them might actually save and/or receive transfers to avoid Medicaid eligibility. Finally, Taylor et al. (1999) find that four out of ten community dwellers could qualify for Medicaid by establishing a trust, but that less than 10% actually had a trust. In addition, for those with trusts, avoidance of probate and controlling assets were stronger motivations for trust creation than achieving Medicaid spend-down; thus, there was little evidence of strategic trust-setting to become Medicaid eligible. Other works, in contrast, stress that Medicaid imposes strong incentives for households to spend down their savings (Hubbard, Skinner and Zeldes, 1995) and not to purchase long-term-care insurance (Brown and Finkelstein, 2008), and thus has large effects on both savings and portfolio choice. Basset (2007) and Baird, Hurd, and Rohwedder (2014) find that the self-assessed probability of entering a nursing home is a significant determinant of the likelihood of making an asset transfer and interpret this as evidence supporting strategic behavior to achieve Medicaid eligibility. We do not attempt to address these questions and separately try to identify Medicaid aversion or strategic spend-down, but rather, we study Medicaid recipiency in old age and its predictors.

Important differences in wealth, income, and health have been documented between couples and singles and point to the importance of thinking about those characteristics when studying Medicaid recipiency. For instance, Guner at al. (2014) find that married people are healthier than unmarried ones, this gap widens by age, and there is a health protective role of marriage at older ages. In addition, the death of ones spouse has been associated with spikes in medical expenditures and with large drops in assets for the surviving spouse. See for instance, Poterba Venti and Wise (2011), French et al. (2006), and De Nardi et al. (2016a). We adopt the insights from these contributions in looking at Medicaid recipiency

and its determinants.

There are also several papers that study the Medicaid program. For instance, Gruber (2000) examines the history, rules, and economic implications of the Medicaid program. De Nardi et al. (2012) focus on the two main pathways to Medicaid eligibility after age 65: being categorically needy (having low income and assets) and being categorically needy (having high medical bills). Bitler and Zavodny (2014) and Buchmuller et al. (2015) update Gruber's paper after over 14 years of Medicaid history, changes, and research on Medicaid.

3 Some institutional background

In the United States, there are two major public health insurance programs for the elderly. The first one is Medicare, a federal program that provides health insurance to most people over the age of 65. The second one is Medicaid, a means-tested program that is run jointly by the federal and state governments. Although Medicaid also covers some specific categories of people of all ages (and these categories expanded under the Affordable Care Act), this paper focuses on Medicaid recipiency by the elderly. An important feature of Medicaid is that not only it is asset[2] and income tested, but it is also is the payer of last resort: Medicaid contributes only after Medicare and private insurance pay their shares and the individual spends down his assets to a disregard amount. In contrast, almost all seniors qualify for Medicare.

Medicare is the main provider of medical care for the elderly and disabled, but does not cover all medical costs. In particular, Medicare reimburses only a limited amount of long-term care costs, and most elderly people do not have private long-term care insurance. As a result, Medicaid covers almost all nursing home costs of poor elderly recipients. More generally, Medicaid now assists 70% of nursing home residents[3], who face nursing home costs of the order of $77,000 to $88,000 a year (in 2014). Medicaid helps the elderly poor pay for other medical services as well. In 2009, Medicaid spent $74 billion on 6.3 million elderly beneficiaries.[4]

Although Medicaid program requirements are established by each state, the federal government defines some general guidelines for eligibility. Eligibility groups include the categorically needy and the medically needy. In the categorically needy group, individuals or families income and assets fall below certain thresholds. Supplemental Social Insurance (SSI) recip-

[2]See De Nardi et al. (2012) for more on income and asset eligibility criteria of the Medicaid program.

[3]Figure taken from Kaiser Family Foundation (2010).

[4]Figures taken from the Medicaid Statistical Information System. We thank Jeff Silverman and Joshua Volosov for helping with these extracts.

ients typically qualify under the categorically needy provision, although some states have more restrictive rules. The second group comprises the medically needy, who are individuals whose income is above the categorically needy threshold, but who face such high medical expenditures that their financial resources are insufficient.

The categorically needy provision thus provides insurance to people who have been poor throughout most of their lives. The medically needy provision, instead, provides insurance to people with higher income and assets who are still at risk of being impoverished by expensive medical conditions.

4 The data

To study the U.S. retirees, including the very old, we select individuals (and their partner if present) born before 1924. This group of people comes from a subset of the Health and Retirement Study (HRS) data known as the Assets and Health Dynamics of the Oldest Old (AHEAD).

Data for the AHEAD cohorts were collected starting in late 1993/early1994, with wave 2 of the HRS. However, since Rohwedder et al. (2006) found that income and wealth variables are underreported in that wave, we discard it and use data from 1996 (wave 3) onwards. We thus have a total of nine waves, which are collected every two years, spanning the 1996 to 2012 period. Since we select people born before 1924, we have a distribution of people that in 1996 were at least 73 year old and we follow these people over time, until 2012. Our initial sample consists of 3,045 singles and 2,049 initially married individuals, for a total of 5,994 individuals (see Appendix A for details on the selection of the initial sample).

The AHEAD data are of extremely high quality. For example, De Nardi et al. (2016a) show that the AHEAD income data closely match up with income from other high quality surveys. Furthermore, the AHEAD Medicaid data is not perfect, but only understates Medicaid recipiency for the elderly by about 20%. This is low relative to the problem of underreporting of program recipiency rates that has been documented in other surveys.[5]

We divide our observations into two groups, according to their marital status. More specifically, the first group, the singles includes individuals who were single at the beginning

[5]De Nardi et al. (2016a) find that the AHEAD data lines up extremely well with both the Panel Study of Income Dynamics and with the Medicare Current Beneficiary Survey, and also find that the AHEAD Medicaid recipiency rate is 22% below the recipiency rate in the Medicare Current Beneficiary Survey. De Nardi et al. (2016c) show that the Medicaid recipiency rate in the Medicare Current Beneficiary Survey lines up almost exactly with the aggregate statistics. These results are especially reassuring given that Meyer and Mittag (2015) find that survey data respondents underreport support from certain types of public assistance.

of our sample (wave 3) and who remain single thereafter. It also includes those who were initially married in wave 3 but became single later, since they become single and as long as they are alive. The second group, the couples, includes married individuals and people who are in a couple as of wave 3, as long as they stay married or in a couple. Thus, some observations will start in group 2 and transition to group 1 when their partner dies or the couple splits up. Hence, we show graphs for two groups: singles and married. Our data are thus an unbalanced panel, whose size becomes smaller over time as people die or become single (in the case of couples).

We also group our data according to the year of birth to form three cohorts: the youngest cohort includes individuals born between 1917 and 1923, the middle cohort includes individuals born between 1910 and 1916, and the oldest cohort includes individuals born between 1900 and 1909.[6]

In our graphical analysis, we also group our data according to permanent income terciles. See Appendix A for a detailed discussion of how we measure permanent income. Our measure is non-asset income over the time we see these individuals, regression adjusted for changes in age and family structure using a fixed effects procedure. Given our fixed effects procedure, our permanent income measure is that it does not change with age or with demographic status (coupled, or single) during our sample period. Most of income is from either Social Security or defined benefit pension benefits. Since both Social Security and defined benefit pension benefits are rising in income when working, this measure captures the concept of average lifetime income. Appendix B repeats our descriptive analysis by education level, and the comparison of the two sets of results shows that our conclusions are very similar regardless of whether we use our measure of permanent income or education as a measure of lifetime income.

In the following graphs, the numbers refer to the permanent income tercile (1 = lowest; 2 = middle; 3 = richest). The youngest cohort was born on average in 1920 and is represented by a thick, continuous line; the middle cohort was born on average in 1913 and is represented by a dotted line; the oldest cohort was born on average in 1905 and is represented by a thin, continuous line.

One consideration to keep in mind when looking at our graphs is that people who are institutionalized are not included in the initial sample of the HRS/AHEAD data set. However, once people are in the data set, they stay in the data set as long as they are alive, including when institutionalized. Due to this sample design, two things are important to mention.

[6]The oldest cohort spans a larger interval as mortality implies a smaller number of individuals at advanced ages.

First, the set of people that we initially observe at each age tends to be healthier than the representative population of the same age, and this selection is especially pronounced at older ages when the probability of being sick and in a nursing home or hospital is higher. Second, as people in the same cohort age, their health tends to revert to the mean to some extent, thus lessening this initial selection problem. French and Jones (2004) and Hurd et al. (2015) show that the HRS/AHEAD data are representative of the fraction of people in a nursing home by the third wave. As a result of these features of the survey design, our cohort outcomes are different not only because of cohort effects, but also because of the differential selection by age and over time.

5 Some important facts

Because Medicaid eligibility crucially depends on income, assets and health, in this section we show some key facts on Medicaid recipiency, net worth, and health by age, cohort, marital status, and permanent income. In Appendix B, we show that the results by education are very similar to those by permanent income.

It is important to distinguish between couples and singles for several reasons. First, important differences in wealth, income, and health have been documented between couples and singles in the U.S. data. Second, the death of ones spouse has been associated with spikes in medical expenditures and large drops in assets for the surviving spouse (French et al., 2006; Poterba et al., 2011). More specifically, we perform our analysis for singles, that is, those who are or become single during our sample period; and for couples, that is, those who start out in our sample as couples, as long as they stay in a couple[7]. This enables us to better understand how family structure affects important economic variables, including Medicaid eligibility.

5.1 Medicaid recipiency

The graph on the left in Figure 1 reports the fraction of single people on Medicaid after age 75, by age, cohort, and permanent income, and displays several interesting patterns. First, there is a big gap in Medicaid recipiency between the people in the bottom permanent income tercile and the people in the two higher permanent income terciles. The fraction of

[7]We do not distinguish between individuals who are singles at the beginning of the survey and individuals who become single during the sample period because we find that people who just lost their spouse rapidly become very similar in their Medicaid recipiency and other important observable characteristics to people who have been single for much longer.

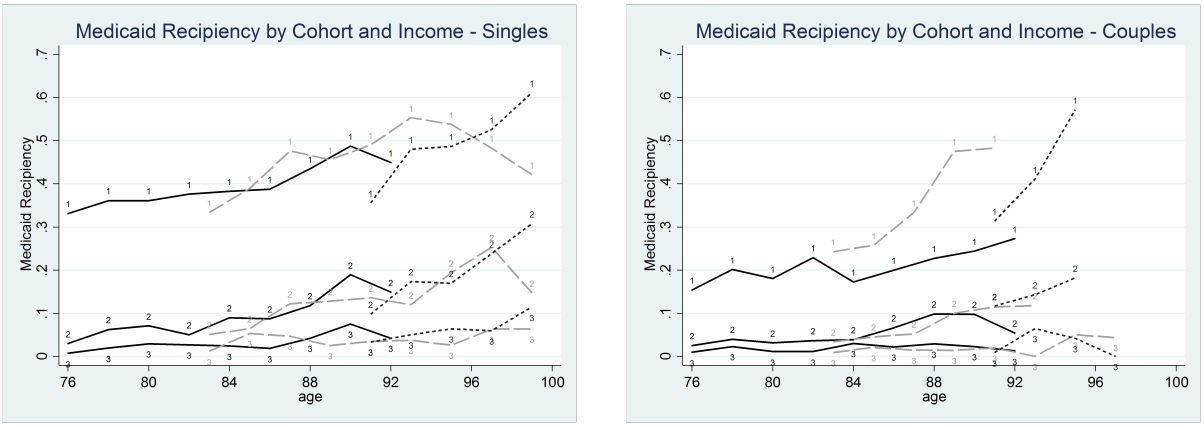

Figure 1: Fraction of people on Medicaid among those who are single (left), and in couples (right) after age 75, by age, cohort, and permanent income.

people on Medicaid in the lower permanent income tercile starts higher at age 76, at 33%, compared with under 3% for the singles in the second and third permanent income terciles and grows fast with age, reaching 60% for those who survive to age 99. Second, the fraction of survivors on Medicaid for those in the second and third permanent income terciles also rises significantly, going from 3% at age 76 to 25% at age 99 for those in the second permanent income tercile, and from 1% at age 76 to 10% at age 99 for those in the third permanent income tercile. These findings confirm those by De Nardi et al. (2016a), even though that paper used different permanent income bins and different cohorts. Thus, although Medicaid, as intended, is a program that mainly helps the elderly poor, even elderly in the top two permanent income groups often receive benefits if they live long enough.

The graph on the right in Figure 1 reports the fraction of people in couples who are on Medicaid after age 75, by age, cohort, and permanent income. The fraction of people in couples in the lowest permanent income tercile who are on Medicaid at age 76 is 15%, which is less than half of the corresponding fraction for singles in the lowest permanent income tercile, but then climbs fast as the survivors age, reaching 60%, as for singles. Finally, the fraction of individuals in couples in the two highest permanent income terciles that are on Medicaid is lower than the corresponding terciles for singles and well below the fraction for singles at all ages.

5.2 Net worth

Because Medicaid is a means-tested program that takes into account both assets (or net worth) and income, and we aim at understanding the effect of its rules, we now turn to

displaying median assets by age, cohort, permanent income tercile, and marital status. We use the terms assets and net worth interchangeably because most people at this age have very little debt.

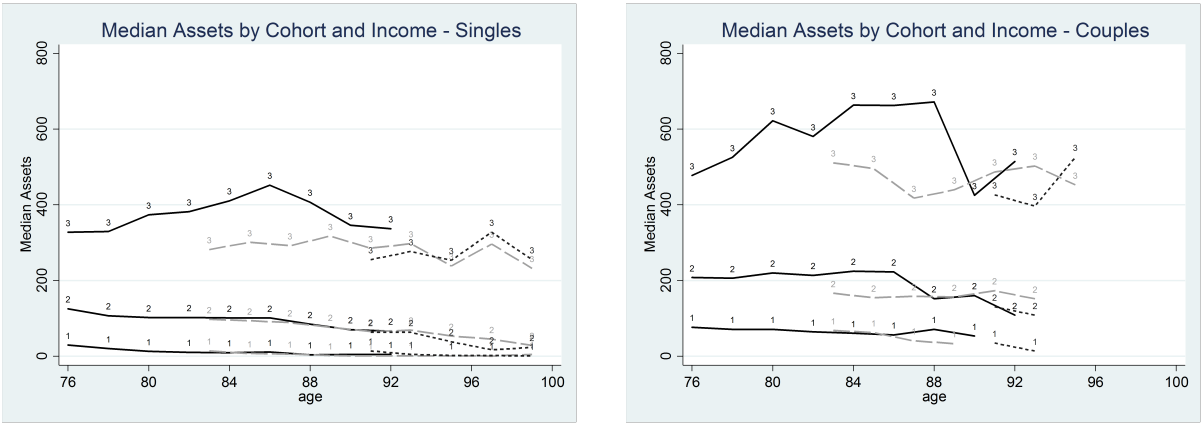

Figure 2: Median assets for those who are single (left), and in couples (right) after age 75, by age, cohort, and permanent income.

The first thing to notice compared with the Medicaid graphs that we have just discussed is that people in the lowest income tercile have the highest Medicaid recipiency and the lowest assets. Similarly, median assets tend to be higher for people with higher permanent income for each cohort and age. More specifically, the singles (graph on the left in Figure 2) in the lowest permanent income tercile enter our sample at age 76 with under $30,000 in median assets; and if they survive into their 90s, they consume all of their assets and live off Social Security, Medicaid, and other government transfers. Those in the second permanent income tercile start out age at 76 with median assets just above $120,000, which also gradually decline for the survivors to $15,000 once they reach their late nineties. Finally, the singles in the highest income tercile, start out at age 76 with $320,000 in median assets and also spend down their savings, but still hold almost $200,000 in their late nineties. These findings also confirm those by De Nardi et al. (2010), who also pointed to the importance of out-of-pocket medical expenses in generating these savings patterns.[8]

[8]After someone dies, the HRS/AHEAD follows up with either the spouse, or children, or the executor of the estate to figure out what was left of the decedents assets. Previous literature has pointed out two important observations in this regard. First, people can incur large medical expenses in the period before death (see for instance, Marshall et al. (2011) and French et al. (2006)). Second, it appears that assets drop before death for reasons that go beyond medical expenses and that are not yet completely understood (see for example, French et al. (2006) and Poterba et al. (2011)). For these reasons, to have a complete picture of someone's net worth, it is important to take into account what happens immediately before death, which would be overlooked if one were not to use the exit and post-exit interviews. We include all of these additional data. We describe our data work more in more detail in Appendix A.

Turning to couples, the right panel of Figure 2 reports median household assets for males in couples after age 75, by age, cohort, and permanent income. Because net worth is only measured at the household level, we plot males' net worth to avoid duplicating of the same family unit. There are several things worth noticing. First, couples tend to start out in our sample with more household assets than their single counterparts. For instance, couples with the lowest permanent income level start out in our sample at age 76 with $75,000 in median net worth, which they largely exhaust if they survive into their mid-nineties. Singles in the same group start out at $30,000 and also decline to zero by the same age. Second, with the exception of those in the lowest permanent income tercile, couples also tend to hold more assets as they age. For instance, couples in the highest income tercile start out at over $470,000, compared with $320,000 for the singles, and the survivors still hold $420,000 at age 95, compared with just above $230,000 for the singles. Thus, although couples do not start out with twice as much in assets as singles, those in the two highest income terciles that survive with their spouse at very old ages have almost twice the assets of the surviving singles. In contrast, couples with low permanent income seem to rely on government transfers as much as singles once they reach a very advanced age.

Appendix C reports the graphs for median wealth when the main residence is excluded from net worth. They show that median liquid assets of those in the lowest permanent income tercile are zero at age 76 and stay at zero for both couples and singles. In contrast, the liquid assets of those in the highest permanent income tercile start out high at age 76, remain substantial at very advanced ages, and exhibit less decumulation by couples than by singles.

5.3 Health

Because Medicaid provides good and services to the unhealthy based on various health measures, we also describe the evolution of health after age 75 for our subgroups. To do so, we look at three different measures of health and mainly report results on ADLs in this section. We report more results on other health measures in Appendix D.

The ADLs variable that we use is based on indicators of difficulties performing six basic tasks: eating, dressing, walking across a room, getting in and out of bed, bathing, and using the toilet. We construct an indicator variable which is equal to 1 if the person has difficulties in performing two or more ADLs, and we include data for the exit and post-exit interviews to complete the period before death. Individuals with at least two ADLs are often considered sufficiently disabled to be eligible for Medicaid nursing home care assistance (although the specific rules are complex and display some variability from state to state).

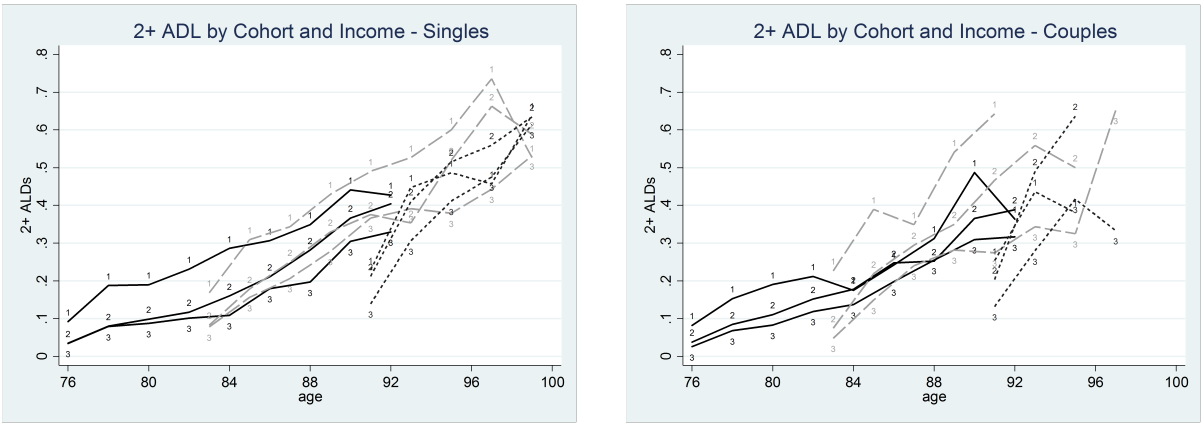

Figure 3: Fraction of people with at least two ADL impairments who are single (left), and in couples (right) after age 75, by age, cohort, and permanent income.

The graph on the left in Figure 3 displays the fraction of singles with at least two ADL impairments after age 75, by age, cohort, and permanent income. It shows that the fraction of people with ADLs at age 76 is under 10% for all permanent income terciles and that it increases fast by age, surpassing 50% for those who survive past age 95. A similar pattern holds for people in couples (graph on the right).

6 Multivariate analysis: the role of Medicaid rules and other observable factors

In this section, we first analyze the probability of being on Medicaid in the context of a descriptive multivariate analysis. Then, we use the regressions results to study the implications of Medicaid rules, other observable factors, and their interactions in determining Medicaid eligibility.

6.1 Multivariate Logit regressions

To study the probability of being on Medicaid and its determinants in the context of a descriptive multivariate analysis, we estimate a logistic probability model, with a binary dependent variable equal to 1 if the individual is covered by Medicaid and zero otherwise.

We include a broad set of explanatory variables to identify the main factors influencing the probability of being on Medicaid. Starting from the variables capturing the key Medicaid eligibility rules, we include a polynomial in permanent income (PI) percentile, which is the percentile of our measure of permanent income, liquid wealth measured in 1996 (in

Regressor		Specification 1 b/se	Specification 2 b/se
PI percentile		-0.0043***	-0.0042***
		(0.00017)	(0.00018)
Initial liquid Wealth/100,000		-0.0519***	-0.0517***
		(0.00587)	(0.00599)
Initial housing Wealth/100,000		-0.0464***	-0.0448***
		(0.00773)	(0.00789)
Self reported health:			
	Very Good	0.0017	0.0012
		(0.01023)	(0.00918)
	Good	0.0097	0.0100
		(0.01005)	(0.00897)
	Fair	0.0188**	0.0173**
		(0.01028)	(0.00920)
	Poor	0.0179**	0.0222***
		(0.01046)	(0.00954)
ADL2+		0.0641***	0.0652***
		(0.00615)	(0.00622)
NH:			
	Yes	0.1534***	–
		(0.00905)	–
	no. of days	–	0.0002***
		–	(0.00001)
Age		0.0023***	0.0020***
		(0.00047)	(0.00045)
White		-0.0386***	-0.0355***
		(0.00795)	(0.00781)
Family structure:			
	Single man	0.0072	0.0066
		(0.00864)	(0.00881)
	Married woman	0.0018	-0.0001
		(0.01076)	(0.01076)
	Single woman	0.0301***	0.0231***
		(0.00816)	(0.00832)
Number of children		0.0054***	0.0046***
		(0.00112)	(0.00108)
Census divisions:			
	2. Mid Atlantic	-0.0094	-0.0111
		(0.01321)	(0.01375)
	3. EN Central	-0.0400***	-0.0381***
		(0.01307)	(0.01370)
	4. WN Central	-0.0439***	-0.0402***
		(0.01488)	(0.01569)
	5. South Atlantic	-0.0251**	-0.0260**
		(0.01253)	(0.01318)
	6. ES Central	-0.0364**	-0.0343**
		(0.01719)	(0.01793)
	7. WE Central	0.0043	0.0043
		(0.01334)	(0.01381)
	8. Mountain	-0.0234	-0.0187
		(0.01671)	(0.01713)
	9. Pacific	0.0380***	0.0393***
		(0.01473)	(0.01536)
Veteran (yes=1)		-0.0379***	-0.0383***
		(0.00874)	(0.00861)
Education:			
	2. High-school	-0.0221***	-0.0205***
		(0.00591)	(0.00590)
	3. College	-0.0691***	-0.0558***
		(0.01360)	(0.01309)
Cohort			
	Born in 1910-16	-0.0146**	-0.0103**
		(0.00593)	(0.00590)
	Born in 1900-09	-0.0159	-0.0097
		(0.00871)	(0.00884)
N		29,751	27,770
Pseudo R2		0.3969	0.3982

Table 1: Predictors of Medicaid recipiency. Logistic estimates, Average Marginal Effects. ***1% significance level; **5% significance level; *10% significance level. Clustered standard errors (at the individual level) in parentheses.

hundreds of thousands dollars), house wealth measured in 1996 (in hundreds of thousands dollars), dummies for self-perceived health status (poor, fair, good, and very good, with the excluded category being excellent), a dummy indicating if the individual has 2 or more ADL impairments, a dummy for being resident in a nursing home in the current wave. In addition,

we include a polynomial in age, dummies for gender/marital status[9] (single man, married woman, and single woman, with married man thus being the excluded category)[10], number of children, a dummy for being white, regional dummies[11] (Mid Atlantic, EN Central, WN Central, S Atlantic, ES Central, WS Central, and Mountain, with New England excluded), veteran status, dummies for own education (high school graduate, college and above, with the excluded category being lower than high school), cohort dummies, and a constant. We also added interactions between PI, initial wealth, family structure and other variables, finding statistically significant effects for the interactions of PI with variables capturing health (self-reported health status, difficulties with 2 or more ADLs, being resident in a nursing home) and wealth (initial liquid and housing wealth). Descriptive statistics of the variables used in the analysis are shown in Appendix E.

In Table 1, we present the average marginal effects for each variable included, computed leaving all the other explanatory variables at their observed values, starting in column (i) with a specification that includes all the variables just described. In column (ii), we use a different variable to measure nursing home stays, that is number of days in a nursing home in the last two years. As the estimated specification includes many interactions terms, in the table we report the average marginal effects for the variables included, while in Appendix E we report the complete table of the coefficients. The results in column (i) show that PI percentile (our measure of permanent income) has a large impact on the probability of being on Medicaid and 1 additional percentile reduces this probability, on average, by 0.43 percentage points. Conditional on PI percentile, other significant variables capturing the rules for eligibility include initial liquid and housing wealth, both with a (small) negative effect, conditional on other factors, as they are measured in $100,000s. Liquid wealth has about the same impact on Medicaid recipiency as housing wealth: on average, increasing liquid (housing) wealth by $100,000 reduces the probability of being on Medicaid by about 0.52 (0.46) percentage points. This may be surprising because, in many circumstances, an

[9]More specifically, being in a couple has some direct effects on Medicaid eligibility rules, but they are likely meant not to benefit neither couples, nor singles, and to thus be neutral among the two groups. In contrast, there are important reasons while being in a couple should be included in the "other" important factors determining Medicaid recipiency. For instance, one of the spouses might take care of the other, ailing, spouse and could thus postpone (or even avoid, in some cases), expensive nursing home stays and thus Medicaid recipiency. For these reasons, we interpret being in a couple as mainly belonging to "other" factors than explicit Medicaid rules.

[10]Among the singles, 88% are widowed, 4% never married, and the rest are separated/divorced. We also allow for a separate indicator for recently widowed men or women, which turns out to be insignificant given the other variables already included in the analysis.

[11]Medicaid rules display some variation by state. We do not have state-level residency information, so it is possible that some our our results by region might also capture some variation in the details of Medicaid generosity at the state level.

individual with a home can be eligible for Medicaid, whereas an individual with more than a small amount of liquid assets is not eligible (De Nardi et al., 2012). However, people run down their housing wealth and rebalance their portfolios as they experience health shocks and death of the spouse (Poterba et al., 2010). Thus, it is thus not surprising that these effects are similar in presence of optimizing behavior about the level and the composition of savings.

Among the variables capturing health, reporting poor or fair health increases the probability of being on Medicaid by about 1.8 percentage points on average compared to reporting good or excellent health. Having two or more ADLs impairments increases the probability by 6.4 percentage points on average. The dummy capturing current residency in a nursing home also has a large and positive effect on average, increasing the probability of being on Medicaid by 15 percentage points.

As for the other factors affecting Medicaid recipiency, older age, conditional on the included covariates, increases the probability of being on Medicaid, with an average marginal effect of about 0.2 percentage points for every additional year during retirement. As for family structure, we find that being a single woman increases the probability of being on Medicaid by about 3 percentage points on average relative to all other family structures. Being white reduces, on average, this probability by 4 percentage points, while the number of children has a positive although small effect, with the probability of being on Medicaid increasing by 0.5 per cent for each additional child. Census Division turns out to be a significant predictor, while being a veteran reduces the probability of being on Medicaid by 4 percentage points on average. We also include the education level, which has a significant and negative effect, even conditional on permanent income and wealth. For instance, having a college degree reduces the probability of being on Medicaid by almost 7 percentage points.

As residency in a nursing home proved to be an important factor determining the probability of being on Medicaid, we also re-estimate our model with the number of days spent in a nursing home between two interviews, an indicator that allows to estimate whether longer stays tend to have a bigger impact on the probability of being on Medicaid. In column (ii) we estimate the same specification as in column (i) except that we capture the effect of nursing home stays by including the number of days spent in a nursing home between two interviews. Its marginal effect is precisely estimated and indicates, for example, that an increase in a stay of 100 days increases the probability of being on Medicaid by 2 percentage points on average. The effect and significance of all other variables in unchanged when using number of days in a nursing home rather than being in a nursing home.

6.2 Medicaid recipiency and the marginal effects of the rules and other observables

Our estimated model is non-linear and the marginal effects of the explanatory variables are not constant over the range observed in the sample. To better quantify our results, we start by showing the average predicted probability of being on Medicaid, plotted as a function of the variables that capture the rules governing eligibility: permanent income, wealth, and health. Then, we look at the other observable factors and their interactions with various Medicaid rules.

To be more precise, we report the average predicted probabilities as a function of that variable alone, with all other characteristics held constant and averaged out. More specifically, we take our sample of people, we apply their own other observable characteristics and regression coefficients when one variable, for instance PI, is changed from the lowest to the highest level. Then, at each PI level, we compute the average probability of being on Medicaid, integrating over all other characteristics other than the one that we are considering. The vertical bars refer to the 95% confidence interval. We use estimates from the specification shown in column (ii) of Table 1; figures plotted using coefficients from column (i) are virtually identical.

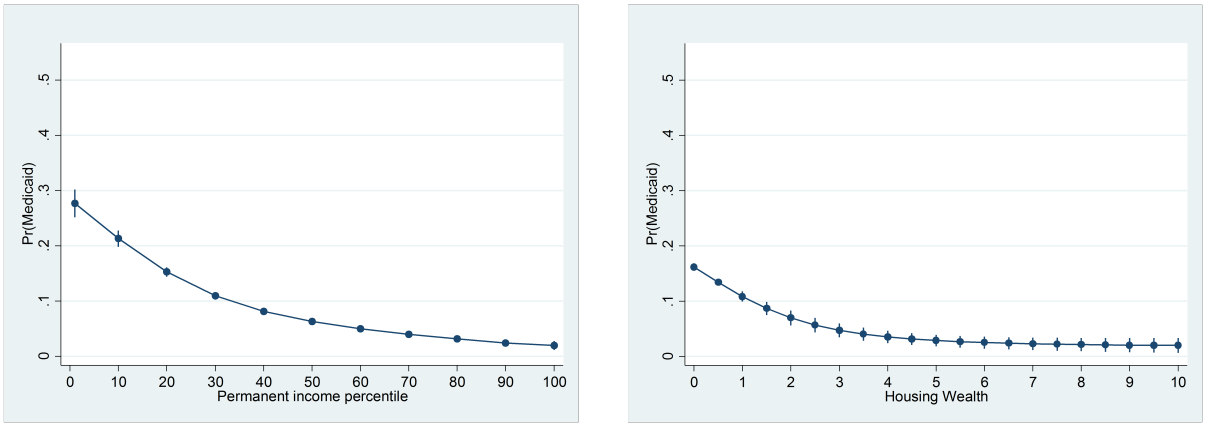

Figure 4: Effect of PI on the probability of being on Medicaid.

Turning to Figure 4, the first point in the figure starting from the left, for example, represents the average predicted probability of being on Medicaid as if everyone belonged to the first percentile of permanent income, while all the other variables are at their observed values in the whole sample and then averaged out across people. Subsequent points are computed in a similar way. The figure shows that the average predicted probability of being on Medicaid is a negative function of PI, ranging from 28% at the first percentile, declining

fast as PI increases, and reaching 2% at the highest PI percentile. The average marginal effect of PI is equal to 0.43 percentage points for each percentile, as reported in Table 1: in terms of Figure 4, this marginal effect is given by the difference between any two adjacent points in the curve and is clearly not constant over the range of PI. Increasing PI from the first to the tenth percentile, for example, reduces the probability of being on Medicaid by 6.3 percentage points, while when PI increases from the 50th to the 60th percentile, the probability is reduced by 1.3 percentage points. The effect is small but still sizeable even at the upper end of the distribution, where an increase of PI from the 90th to the top percentile reduces the probability to be on Medicaid by half percentage point. Similarly, in the right panel of Figure 4 we report the average predicted probability as a function of initial housing wealth. The average predicted probability of being on Medicaid turns out to be 16% for housing wealth equal to zero, and then declines gradually with wealth to 2%. The marginal effect, which on average is about 0.5 percentage points every $100,000 , is quite high at low values of wealth, with a difference in the probability of being on Medicaid of 5 percentage points when initial housing wealth raises from $0 to $100,000, is about 0.5 percentage points between $500,000 and $600,000, and becomes negligible after that amount.

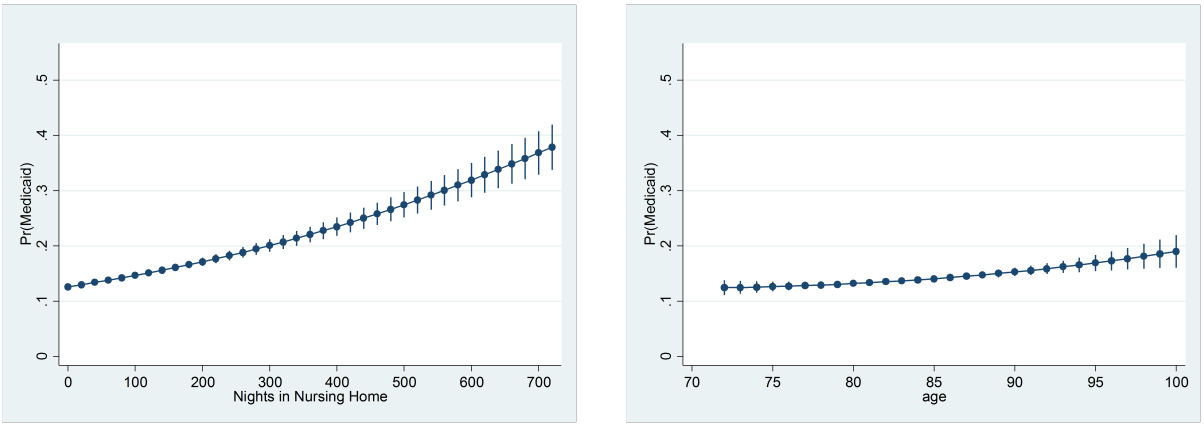

Figure 5: Effect of nursing home nights (right) and age (right) on the probability of being on Medicaid.

Figure 5 shows the pattern of the average predicted probability of being on Medicaid by health and age. In the left panel, the probability of being on Medicaid is plotted as a function of the number of nights in a nursing home in the previous two years. The average predicted probability of being on Medicaid is on average 13% when the number of nights is equal to zero and grows to 38% when the number of nights is 730, or two years. In the right panel, the probability of being on Medicaid is plotted as a function of age. The average probability is also increasing in age, going from about 12% at age 72 to 19% at age 100.

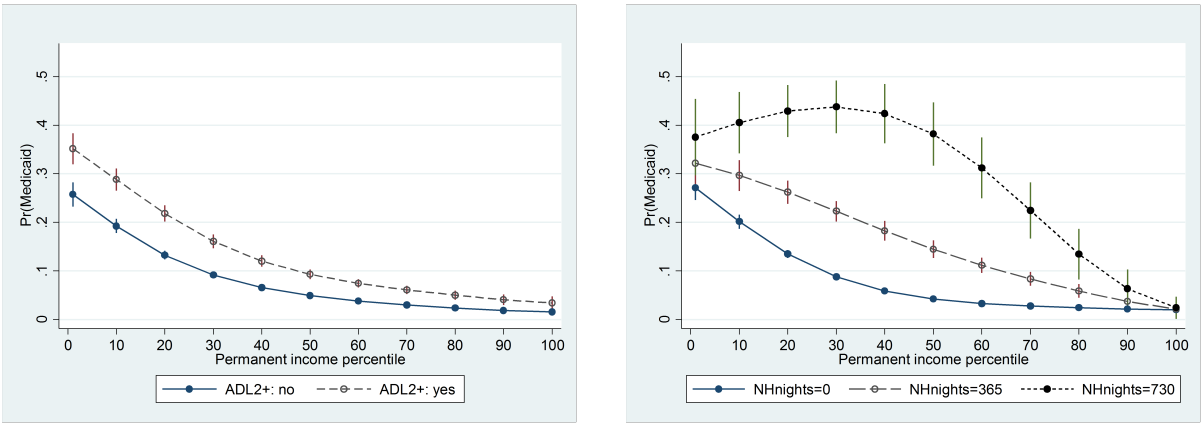

Figure 6: Effect of ADL (left) and of nursing home nights (right) on the probability of being on Medicaid, as a function of PI percentile.

Our estimates have shown that the interactions between permanent income percentile, health, and other characteristics are quantitatively important. To analyze these interactions, Figure 6 plots the predicted probabilities as a function of both permanent income percentile and ADLs impairments (left panel) or PI percentile and number of nights spent in a nursing home (right panel). The marginal effect of having two or more ADLs limitations is given by the difference in the two functions plotted in the left panel of Figure 6. Especially at low income percentiles, the effect of this variable is sizable, increasing the predicted probability of being on Medicaid from 26% to 35%. Although at the upper end of the permanent income distribution its effect is much smaller in absolute terms, for instance it increases the probability of being on Medicaid by 2.5 percentage points at the 8th decile and by 2 percentage points thereafter, the effect is still precisely estimated and it implies that the probability of being on Medicaid doubles in the presence of two or more ADLs. On the right panel, we plot the effect of the number of nights spent in a nursing home during the last two years on the probability of being on Medicaid, for three values: 1) zero nights; 2) 365 nights; 3) 730 nights, or two years. The average predicted probability when the number of nights in a nursing home is zero goes from 27% at the lowest PI percentile to 2% at the highest PI percentile. When the number of nights in a nursing home is 365, the average predicted probability of being on Medicaid increases to 32% at the lowest PI percentile and to 22% at the 30th PI percentile. For stays as long as two years, the average predicted probability increases dramatically, reaching 37% at the lowest PI percentile, 44% at the 30th percentile, and 13% at the 80th percentile. Hence, longer nursing home stays substantially increase the probability of being on Medicaid. This effect is especially large between the 2nd and the 8th permanent income decile.

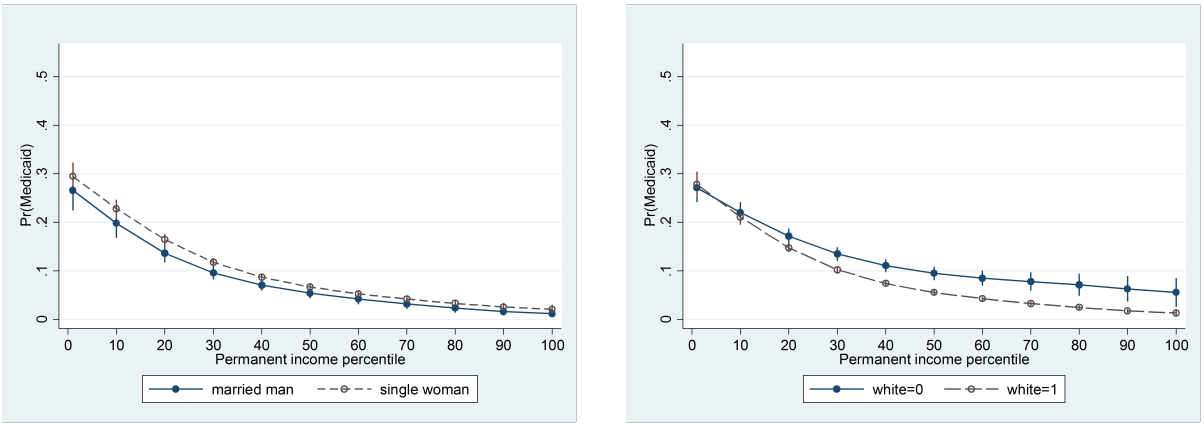

Figure 7: Effect of family structure (left) and of race (right) on the probability of being on Medicaid, as a function of PI decile.

We also show the average predicted probabilities by permanent income and variables capturing other factors influencing the probability of being on Medicaid. In Figure 7, we start with the effect of family structure on the probability of being on Medicaid. The marginal effect of being a single woman relative to the reference category of being a married man is the difference between the two functions. As it is apparent from the figure, being a single woman significantly raises the probability of being on Medicaid, with respect to the reference category, but only in the three lowest PI deciles. In the lowest permanent income percentile, the probability of being on Medicaid is 0.26 for married men and 0.30 for single women. Conditional on the other covariates included in the analysis, gender and family structure influence the probability of being on Medicaid only at low permanent income percentiles, while the effect vanishes at higher percentiles.

In the right panel of Figure 7, we plot the predicted probability of being on Medicaid by race: the marginal effect of being white, that is the difference between the two functions, is zero at the first permanent income percentile, 2 percentage points at the 20th percentile, and it increases to about 5 percentage points in the upper half of the distribution of permanent income. It is surprising that this effects is only active at higher PI percentiles.

Lastly, in Figure 8 we analyse the effect of education and Census division. In the right panel, we plot the predicted probabilities as a function of PI and education. The difference between having no high school degree, a high school or a college degree is very large in the first two deciles of permanent income. In particular, at the first permanent income percentile, having a college degree reduces the probability of being on Medicaid by 12 percentage points with respect to not having any degrees.

In the left panel of Figure 8, we plot the predicted probabilities as a function of three

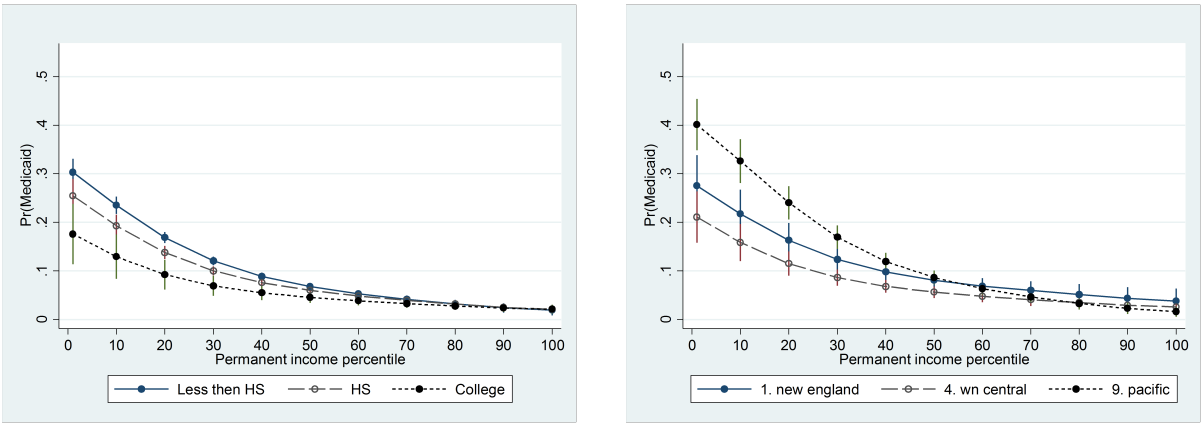

Figure 8: Effect of education (left) and region (right) on the probability of being on Medicaid, as a function of PI decile.

Census divisions that cover the range of possible effects: New England, WN central, and Pacific. Other divisions are included in the range drawn by WN central and New England, with the exception of WS Central, which lies between New England and Pacific, and are not shown for clarity. The effect of Census division is decreasing with permanent income decile, and it is at its peak at the first percentile, where the difference in the predicted probability between being resident in the WN Central division and the Pacific division is 28 percentage points.

7 Conclusions

We use the Health and Retirement Study (HRS) data to study the evolution and possible determinants of Medicaid recipiency of U.S. households during retirement.

Our descriptive analysis uncovers several interesting findings. First, even at higher percentiles of permanent income, the Medicaid recipiency rate is high for old age survivors. Second, in the raw data couples are less likely to end up on Medicaid than singles, especially at higher permanent income levels. Third, the evolution of health by age and permanent income is similar for singles and couples. Fourth, impairments related to having difficulties in at least two basic activities of daily living (ADLs) grow fast with age after age 75 and display much less variation in permanent income than self-perceived bad health. Fifth, people living in a couple are much less likely to experience long nursing home stays than singles or to have two or more impairments in ADLs at old ages.

Then, we study how the probability of being covered by Medicaid is influenced by demographic, economic, and health factors, using a logit probability model to quantify the

various effects. Permanent income (PI) percentile has a large impact on the probability of being on Medicaid: one additional percentile reduces this probability, on average, by 0.4 percentage points. Conditional on PI percentile, other significant variables include initial liquid and housing wealth: on average, increasing liquid (housing) wealth by $100,000 reduces the probability of being on Medicaid by about 0.5 percentage points. These findings are consistent with the nature of Medicaid eligibility rules: In most states, people with low income can enroll on Medicaid, while people with higher income can only become Medicaid eligible if they experience high medical expenses, which are likely to stem from severe health conditions. Permanent income also explains much of the difference in Medicaid recipiency between singles and couples. In fact, holding other factors constant, single women are only 3 percentage points more likely to receive Medicaid than people in other family structures. Health status also has a large impact: compared to being in good or better health, being in fair or poor health increases on average the probability of being on Medicaid by 1.8 percentage points. Having two or more ADL impairments increases the probability of being on Medicaid by 6.4 percentage points on average, while those currently residing in a nursing home are 15 percentage points more likely to receive Medicaid than other groups.

Our analysis also shows that these effects are highly nonlinear and interact with income during retirement in interesting ways. While the average marginal effect of an additional percentile in the permanent income distribution reduces the probability of being on Medicaid by 0.4 percentage points, the marginal effect for a person in the first permanent income decile is a reduction in Medicaid recipiency of 0.6 percentage points, a reduction which is 50% larger than the average effect. More generally, in absolute terms, Medicaid rules have an especially large effect on recipiency at the bottom of the permanent income distribution.

The interaction of permanent income and other observables related to Medicaid eligibility is important: the marginal effect of having two or more ADLs limitations increases the probability of being on Medicaid by 9 percentage points up to the 20th percentile of the permanent income distribution compared to an increase of 2 percentage points above the 8th decile of permanent income. Thinking about the size of these reductions in proportion to the probability of ending up on Medicaid, however, we find that individuals with permanent income above the median who have two or more ADLs limitations are twice as likely to end up on Medicaid than individuals in the same permanent income percentile with less than two ADLs limitations. Thus, while the effects of having two or more ADLs increase the probability of being on Medicaid much more in absolute terms at the lower end of the permanent income distribution, its relative increase is largest for people in the upper part of the distribution. In terms of the effects of being in a nursing home and its interaction with

permanent income, people in the 50-70th permanent income percentiles who spend two years in a nursing home are up to nine times more likely to be on Medicaid than people with the same permanent who are not in nursing home. At the 90th percentile of permanent income, this increase levels off to a factor of two times, compared to people not in a nursing home for two years.

We also find that other factors that are not directly related to Medicaid eligibility are very important determinants of Medicaid recipiency heterogeneity and that their effect varies with permanent income, even keeping all other observable factors fixed. For instance, whites have a lower probability of being on Medicaid than non-whites. The surprising aspect is that this effect is zero or negligible for income percentiles below the 30th while it increases with permanent income and reaches 5 percentage points at higher income levels. In contrast, single women at low income deciles have a higher probability of being on Medicaid, with the gap in probabilities topping up at 4 percentage points at the lower income levels. Finally, education reduces the probability of being on Medicaid, and especially so at low income deciles. For instance, at the lowest income decile of permanent income, a college education reduces the probability of being on Medicaid by 12 percentage points compared to having less than a high school education.

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Appendix A. Data

Data selection

While the AHEAD cohort starts in late 1993/early 1994 (which we refer to as 1994) with 8,222 individuals, our initial sample in late 1995/early 1996 (which we refer to as 1996) comprises all those who are still alive in wave 1996 and have a non-missing marital status and labor force status, that is 7,006 individuals (753 individuals are reported to die between 1994 and 1996). We further drop 47 individuals who are single in 1996 and get married at some point in the panel, leaving us with 6,959 individuals. We further select individuals born between 1900 and 1923 (6,125 individuals) and drop those with missing information on variables used in our analysis, causing us to drop 131 individuals: our final sample consists of 5994 individuals, of whom 3,045 were singles and 2,949 initially married individuals. Because not all of the initially married individuals have a spouse born between 1900 and 1923, not all spouses are included in our sample. We use data available from the exit interviews to recover information of individuals who died during the sample period. All monetary values are expressed in 2010 prices.

How we construct our key variables

Total household income (respondent + spouse) includes: individual income from employer pension or annuity; individual income from Social Security disability or SSI (supplemental security income); individual income from Social Security retirement; individual unemployment or workers compensation; individual income from other government transfers; individual earnings (note: respondents earnings are zero because (s)hes retired, but spouse may be working. In our sample, only 5% of households report positive earnings; for them, labor income represents 24% of total income); household capital income (business or farm income, self-employment, dividend and interest income); all other household income (alimony, other income, lump sums from insurance, pensions, and inheritance).

Wealth includes wealth at death, as reported in the exit interviews. Our measure of wealth coincides with total net household wealth, which includes IRAs and primary home but excludes secondary home as it was not available in 1996. Performing all the calculations with total net wealth starting from 1998 produces virtually identical results.

Estates. We compute estate value using information from the surviving spouse (when available) or from the exit interviews. When a member in a couple dies, we impute as net total wealth the corresponding value for the surviving spouse. When a single individual dies, we use estate information when available from exit/post exit interviews. As some

respondents in the exit or post-exit interviews declare that the value of the (primary) house was not included in their response, we add the value of the house from the previous wave to the estate value. While the value of the house may obviously change because of price volatility, we think this procedure is better than excluding it altogether.

ADL. As long-term care insurance policies and Medicaid nursing home eligibility require needing help with two or more activities of daily living to trigger benefits, we define an indicator equal to 1 if a respondent declares difficulties in two or more ADL. The six ADL are: bathing, eating, dressing, walking across a room, getting in or out of bed, and using the toilet. As for measuring ADL, we rely on the RAND sample for individuals alive; and for dead individuals we use the exit interviews to extract information on the decedents ADL needs before death.

Medicaid recipiency. This indicator variable takes a value equal to 1 if the respondent indicated he/she was covered by Medicaid since the previous interview. The exact wording of the question is: Have you been covered by health insurance through Medicaid at any time since last interview (or in the last two years)? For dead individuals, we use information from the exit interviews.

Permanent Income. As customary in the literature, we assume log household income for individual i can be written as:

$$lny_{it} = X_{it}\beta + \alpha_i + w_{it},$$

where $X_{it}\beta$ captures the common life cycle component, α_i is a household-specific effect that is fixed over time, and w_{it} is an idiosyncratic error term. We follow Altonji and Doraszelski (2005) and De Nardi, French, and Jones (2015) in assuming that the serial correlation in wit is sufficiently weak to be ignored in computing permanent income on the basis of α_i. Since permanent income is a summary measure of lifetime income at retirement, it should not change during retirement and is thus a fixed effect over our sample period. Although permanent income will not change, current income could change as a household ages and potentially loses a family member.

We model the life cycle component $X_{it}\beta$ as depending on age, cohort, gender, and family status. As income is measured at the individual level for singles but is the sum of income of the two spouses in couples, we explicitly include marital status in our regression, distinguishing in particular between one- or two-person households.

We define permanent income as the individual effect α_i, estimated as the average residual of our regression computed for each individual over time. We then classify individuals in

terciles based on their estimated α_i, and take the percentile rank of it to compute the permanent income percentiles used in the logistic regressions.

Appendix B. Medicaid recipiency and net worth by education

We now report some key graphs, namely Medicaid recipiency and median assets, by stratifying the households by education rather than by our measure of permanent income. The three education groups that we distinguish are: 1) Less than high school + GED (General Education Diploma); 2) High school graduates; and 3) College dropouts and college graduates.

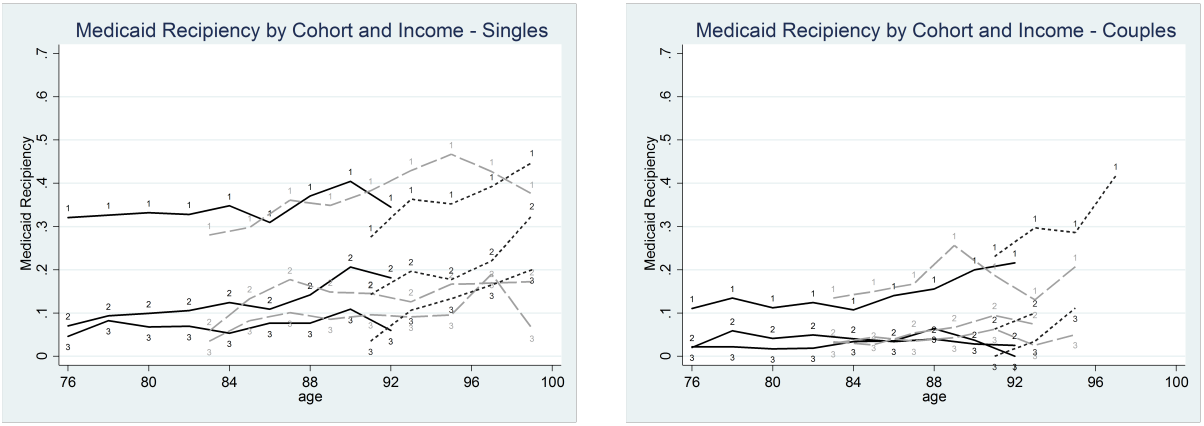

Figure 9: Fraction of people on Medicaid among those who are single (left), and in couples (right) after age 75, by age, cohort, and education.

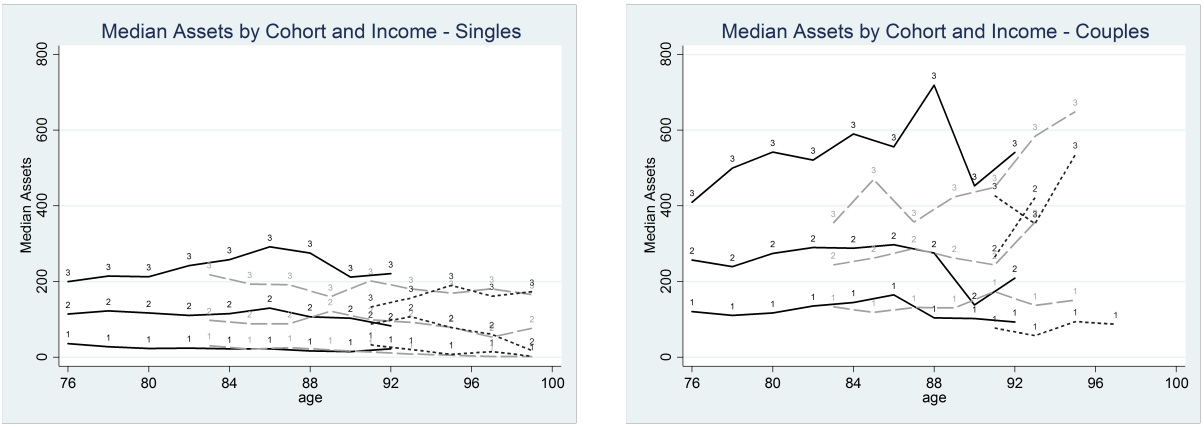

Figure 10: Median assets for people after age 75, who are single (left), and in couples (right), by age, cohort, and education.

Appendix C. Net worth without main residence

Figure 11 reports net worth without main residence.

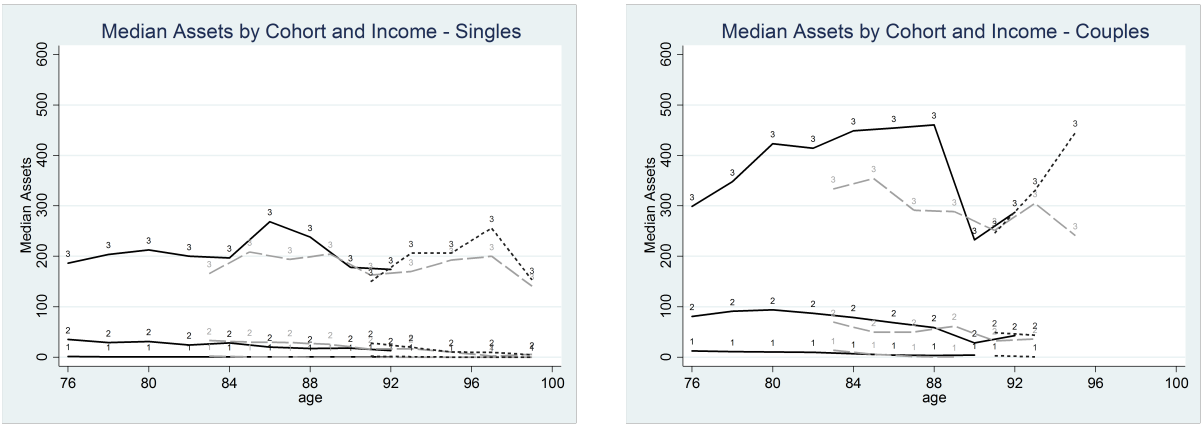

Figure 11: Median assets (excluding main residence) for people after age 75, who are single (left), and in couples (right), by age, cohort, and education.

Appendix D. Descriptive analysis of other health indicators

Self-reported health is a subjective indicator that takes values from 1 to 5 (excellent, very good, good, fair, poor). For this measure, we construct an indicator variable that is equal to 1 if health is fair or poor (or if the individual has just died), and we report the fraction of people in this category (which we label bad health) by the same observables that we have used in the previous graphs.

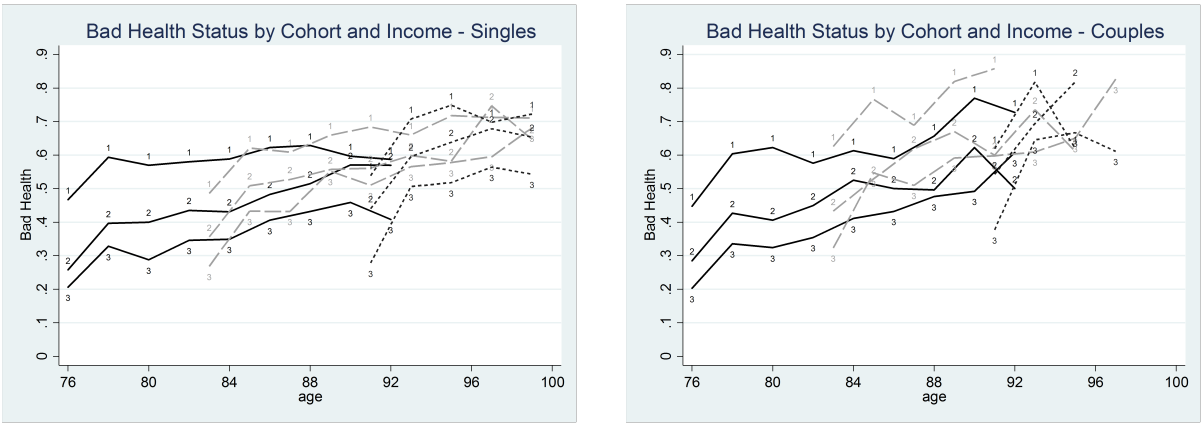

Figure 12: Fraction of people in bad health who are single (left), and in couples (right) after age 75, by age, cohort, and permanent income.

The graph on the left in Figure 12 reports the fraction of single people in bad health after age 75, by age, cohort, and permanent income. This graph confirms the previous findings by Waldron (2007), Gan et al. (2003), Attanasio and Emerson (2003), Hurd et al. (2001), and De Nardi et al. (2009, 2016b), among others, according to which higher income people tend to be healthier (and live longer). In fact, at age 76, 46%, 25%, and 20% of the lowest, middle, and highest permanent income terciles, respectively, report being in bad health. The health/permanent income gradient for the survivors that make it into their late nineties is only a bit narrower (the fraction of people in bad health at that time is 72% for the lowest permanent income level, 67% for the middle, and 60% for the highest; and outside of cohort effects and possibly linked to the initial sample selection that we have discussed earlier, these profiles seem to increase in parallel fashion over time for people with different permanent income levels. The graph on the right in Figure 12 reports the fraction of people in couples in bad health after age 75, by age, cohort, and permanent income. Interestingly, over all ages, the fraction of people reporting bad health by permanent income is remarkably similar for singles and couples.

As other health indicators, we report information on nursing home residency, including incidence of nursing home stays and duration.

We turn to analyzing the pattern of nursing home stays in our sample. Approximately 62% of Medicaid transfers for the elderly in 2009 were for nursing home payments (Kaiser Foundation, 2013). Nursing homes are expensive, and nursing home stays often lead people to be sufficiently impoverished to become eligible for Medicaid. We report the fraction of individuals living in nursing homes at the time of interview and the (unconditional) average number of days spent in a nursing home between two interviews. Figure 13 displays the

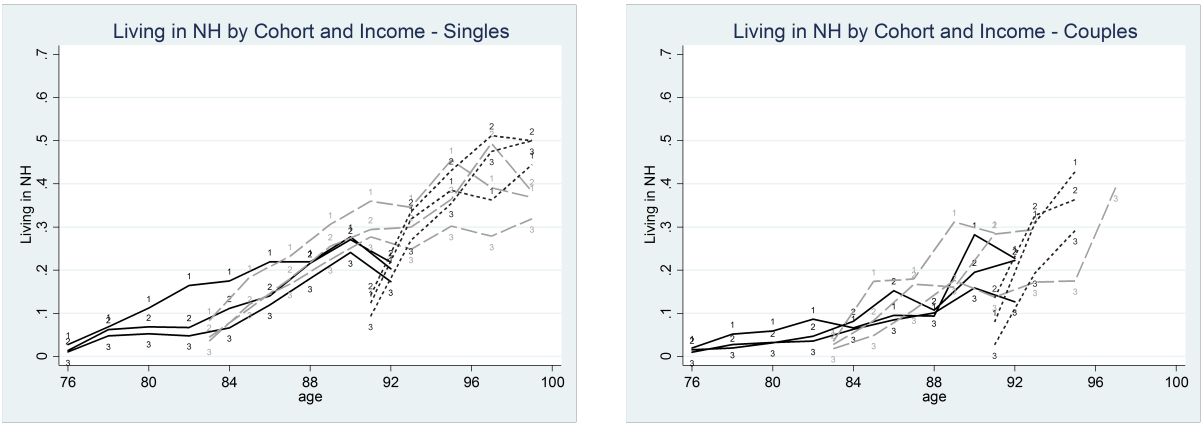

Figure 13: Fraction of people living in a nursing home at the time of the interview who are single (left), and in couples (right) after age 75, by age, cohort, and permanent income.

fraction of people living in a nursing home at the time of the interview and shows that the incidence is remarkably similar by permanent income. It should be noted that the original HRS/AHEAD sample interviewed in 1993-94 consists of non-institutionalized individuals, and that our graphs use information from wave 1996 onwards. While at the beginning of each segment there is a great increase in the fraction of individuals living in a nursing home due to this sample design, in later waves the age effect is still quite steep and similar to that documented by Hurd et al. (2015). From the figure, it appears that people living in a couple are less likely to be resident in a nursing home than singles. For example, at age 90, on average 26% of singles are residents of a nursing home at the time of the interview, while for people in couples the average is 21%. At age 95, the percentage raises to 39% for singles, and 32% for couples.

Figure 14 reports the average number of days spent in a nursing home between interviews, for any reason, and it highlights how people in couples spend much shorter periods in nursing homes. At age 90, the average number of days spent in a nursing home is 84 for singles, and only 36 for people in a couple. If we compute the conditional average stay, to take into account that people in couples are less likely to have a stay in a nursing home, we find that the average length is about 300 days for singles and about 200 days for people in couples.

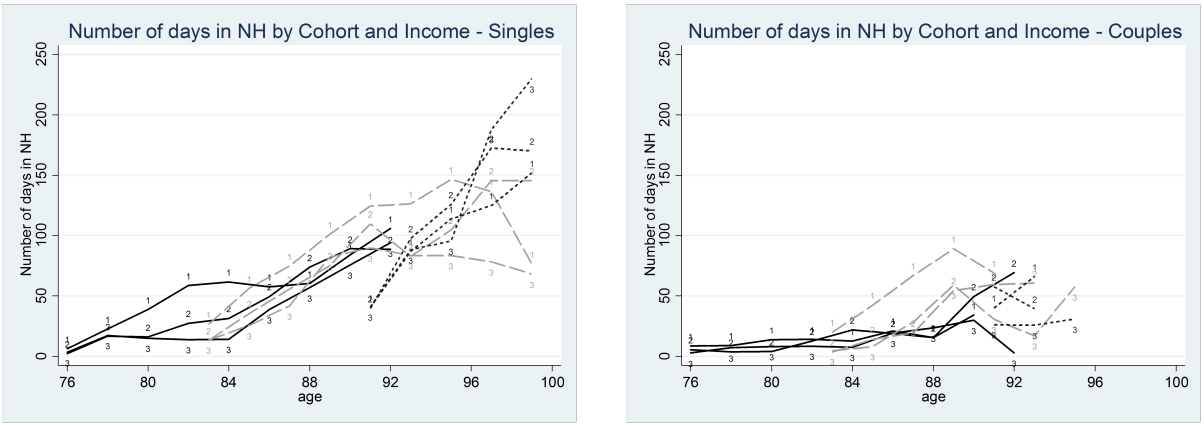

Figure 14: Average number of days spent in a nursing home between interviews by people who are single (left), and in couples (right) after age 75, by age, cohort, and permanent income.

Appendix E. Logistic Estimates

Variable		Mean	standard deviation
Medicaid recipiency		0.14	0.35
PI percentile		51.08	28.83
Initial liquid Wealth/100,000		2.49	5.76
Initial housing Wealth/100,000		1.09	1.69
Self reported health:			
	Excellent	0.06	0.25
	Very Good	0.19	0.40
	Good	0.28	0.45
	Fair	0.24	0.43
	Poor	0.22	0.41
ADL2+		0.18	0.38
NH:			
	Yes	0.08	0.27
	no. of days	37.70	143.86
Age		83.38	5.95
White		0.86	0.35
Family structure:			
	Married man	0.24	0.43
	Single man	0.12	0.33
	Married woman	0.15	0.36
	Single woman	0.49	0.50
Number of children		2.76	2.12
Census divisions:			
	1. New England	0.05	0.21
	2. Mid Atlantic	0.14	0.35
	3. EN Central	0.18	0.38
	4. WN Central	0.08	0.28
	5. South Atlantic	0.23	0.42
	6. ES Central	0.04	0.20
	7. WE Central	0.11	0.31
	8. Mountain	0.04	0.20
	9. Pacific	0.12	0.33
Veteran (yes=1)		0.23	0.42
Education:			
	1. LT High-school	0.40	0.49
	2. High-school	0.47	0.50
	3. College	0.13	0.33
Cohort			
	Born in 1917-23	0.62	0.49
	Born in 1910-16	0.29	0.45
	Born in 1900-09	0.09	0.29
N		29,751	

Table 2: Sample means and standard deviations of the variables used in the analysis.

Regressor	Specification 1 b/se	Specification 2 b/se
Age	-0.0850	-0.1095
	(0.0924)	(0.1013)
age*age	0.0007	0.0008
	(0.0005)	(0.0006)
white=1*married man	0.0000	0.0000
	(.)	(.)
white=1*single man	-0.2239	-0.1421
	(0.2614)	(0.2879)
white=1*married woman	-0.6066**	-0.6811**
	(0.3077)	(0.3304)
white=1*single woman	-0.4930**	-0.4774**
	(0.2207)	(0.2416)
white=0	0.0000	0.0000
	(.)	(.)
white=1	0.4878**	0.4737**
	(0.2226)	(0.2411)
white=0 * PI	0.0000	0.0000
	(.)	(.)
white=1 * PI	-0.0157***	-0.0162***
	(0.0033)	(0.0035)
married man	0.0000 0.0000	
	(.)	(.)
single man	0.1191	0.0525
	(0.2380)	(0.2559)
married woman	0.1457	0.1626
	(0.2977)	(0.3173)
single woman	0.6669***	0.6612***
	(0.2160)	(0.2330)
married man*PI	0.0000	0.0000
	(.)	(.)
single man*PI	0.0072*	0.0087*
	(0.0042)	(0.0045)
married woman*PI	0.0104**	0.0117**
	(0.0052)	(0.0056)
single woman*PI	0.0027	0.0030
	(0.0042)	(0.0048)
Number of children	0.0679***	0.0639***
	(0.0141)	(0.0149)
1. excellent	0.0000	0.0000
	(.)	(.)
2. very good	0.0230	0.0176
	(0.1352)	(0.1343)
3. good	0.1263	0.1429
	(0.1323)	(0.1305)
4. fair	0.2399*	0.2432*
	(0.1345)	(0.1329)
5. poor	0.2288*	0.3073**
	(0.1367)	(0.1367)
ADL2+: no	0.0000	0.0000
	(.)	(.)
ADL2+: yes	0.7472***	0.8100***
	(0.0670)	(0.0704)
NH: no	0.0000	–
	(.)	–
NH: yes	0.3455	0.0018**
	(0.2316)	(0.0007)
NH: yes*single male	-0.2369	-0.0012*
	(0.2182)	(0.0007)
NH: yes*married woman	0.0709	-0.0000
	(0.2653)	(0.0008)
NH: yes*single woman	0.0177	-0.0009
	(0.1788)	(0.0006)
NH: yes*PI	0.0717***	0.0001***
	(0.0087)	(0.0000)
NH: yes*PI*PI	-0.0007***	-0.0000***
	(0.0001)	(0.0000)
1. new england	0.0000	0.0000
	(.) (.)	
2. mid atlantic	0.0559	0.1110
	(0.2836)	(0.3053)
3. en central	-0.6223**	-0.5965*
	(0.2856)	(0.3086)
4. wn central	-0.5713*	-0.5826
	(0.3299)	(0.3610)
5. s atlantic	-0.0687	-0.0463
	(0.2689)	(0.2916)
6. es central	-0.3459	-0.3577
	(0.3613)	(0.3869)
7. ws central	0.5282*	0.5906**
	(0.2746)	(0.2953)

Table 3: Coefficients of estimates presented in Table 1, part 1. ***1% significance level; **5% significance level; *10% significance level. Clustered standard errors (at the individual level) in parentheses.

Regressor	Specification 1 b/se	Specification 2 b/se
8. mountain	-0.3374	-0.2163
	(0.3466)	(0.3672)
9. pacific	1.0162***	1.0912***
	(0.3133)	(0.3350)
1. new england*PI	0.0000	0.0000
	(.)	(.)
2. mid atlantic*PI	-0.0052	-0.0084
	(0.0058)	(0.0062)
3. en central*PI	0.0044	0.0032
	(0.0057)	(0.0061)
4. wn central*PI	0.0010	0.0017
	(0.0067)	(0.0072)
5. s atlantic*PI	-0.0078	-0.0103*
	(0.0056)	(0.0062)
6. es central*PI	-0.0033	-0.0033
	(0.0076)	(0.0080)
7. ws central*PI	-0.0154**	-0.0182***
	(0.0062)	(0.0068)
8. mountain*PI	0.0019	-0.0006
	(0.0067)	(0.0072)
9. pacific*PI	-0.0181***	-0.0200***
	(0.0063)	(0.0067)
Veteran: 0.no	0.0000	0.0000
	(.)	(.)
Veteran: 1.yes	-1.0073***	-1.0618***
	(0.1905)	(0.2057)
Veteran: 0.no*PI	0.0000	0.0000
	(.)	(.)
Veteran: 1.yes*PI	0.0172***	0.0181***
	(0.0041)	(0.0045)
Education: 1. lt high-school	0.0000	0.0000
	(.)	(.)
2. high-school graduate	-0.3492**	-0.4315***
	(0.1378)	(0.1491)
3. college and above	-1.2982***	-1.1874***
	(0.3270)	(0.3311)
Education: 1. lt high-school*PI	0.0000	0.0000
	(.)	(.)
2. high-school graduate*PI	0.0025	0.0053
	(0.0032)	(0.0035)
3. college and above*PI	0.0122**	0.0130**
	(0.0051)	(0.0053)
PI percentile	-0.0954***	-0.0902***
	(0.0092)	(0.0096)
PI percentile*PI percentile	0.0006***	0.0005***
	(0.0001)	(0.0001)
Initial housing Wealth (/100,000)	-1.5197***	-1.5504***
	(0.1819)	(0.1949)
Initial housing Wealth*Initial housing Wealth	0.0523***	0.0536***
	(0.0104)	(0.0099)
Initial housing Wealth*PI	0.0427***	0.0425***
	(0.0070)	(0.0074)
Initial housing Wealth*PI*PI	-0.0003***	-0.0003***
	(0.0001)	(0.0001)
Initial housing Wealth (squared)*PI	-0.0013***	-0.0014***
	(0.0003)	(0.0003)
Initial housing Wealth (squared)*PI*PI	0.0000***	0.0000***
	(0.0000)	(0.0000)
Initial liquid Wealth (/100,000)	-1.1926***	-1.2347***
	(0.1971)	(0.2123)
Initial liquid Wealth*Initial liquid Wealth	0.0044***	0.0047***
	(0.0008)	0.0008)
Initial liquid Wealth*PI	0.0282***	0.0304***
	(0.0049)	(0.0053)
Initial liquid Wealth*PI*PI	-0.0002***	-0.0002***
	(0.0000)	(0.0000)
Initial liquid Wealth (squared)*PI	-0.0001***	-0.0001***
	(0.0000)	(0.0000)
Initial liquid Wealth (squared)*PI*PI	0.0000***	0.0000***
	(0.0000)	(0.0000)
born in 1917-23	0.0000	0.0000
	(.)	(.)
born in 1910-16	-0.1859**	-0.1429*
	(0.0760)	(0.0827)
born in 1900-09	-0.2024*	-0.1344
	(0.1131)	(0.1245)
Constant	2.6917	3.6848
	(3.9066)	(4.2558)
N	29751	27770
R2	0.397	0.398

Table 4: Coefficients of estimates presented in Table 1, part 2.***1% significance level; **5% significance level; *10% significance level. Clustered standard errors (at the individual level) in parentheses.