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Who Receives Medicaid in Old Age? Rules and Reality*

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Abstract

Medicaid is a government programme that also provides health insurance to the elderly who have few assets and either low income or catastrophic health care expenses. We ask how the Medicaid rules map into the reality of Medicaid recipiency, and we ask what other 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-white people, but, surprisingly, their higher recipiency is concentrated

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in the higher income percentiles. We also find that people with low incomes who have a high-school diploma or higher degree are much less likely to end up receiving Medicaid than their less-educated counterparts. All of these effects are large and depend on retirement income in a very non-linear way.

Policy points

- Medicaid provides health insurance to US households who are poor or who face catastrophic medical expenses.
- Over 30 per cent of the 70-year-old singles in the bottom third of the permanent income distribution are covered by Medicaid.
- Over 10 per cent of singles in the top third of the income distribution end up being covered by Medicaid if they survive into their 90s.
- People in the middle of the income distribution who spend two years in a nursing home are up to nine times more likely to be on Medicaid than people with the same income who are not in a nursing home.
- Factors that are not directly related to Medicaid eligibility are very important determinants of Medicaid recipiency. For example, *ceteris paribus*, single women with low income have a higher probability of receiving Medicaid than other people with low income.

I. Introduction

Medicaid is a means-tested programme that helps to cover the cost of medical goods and services for several demographic groups (including the elderly) who have either low income and few assets, or assets and income that are swamped by catastrophic medical conditions. Its key rules are thus based on assets, income and large medical expenses.

In 1999, 4.87 million enrolled individuals aged 65 and older received an average benefit amount of $12,360, while in 2010 there were 6.36 million elderly individuals enrolled into Medicaid, receiving an average benefit of $12,420 (in 2014 dollars). Although the number of individuals covered by Medicaid is smaller than for young families with children, the average benefit is much bigger. Yet Medicaid for the elderly has been relatively little studied. 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 after they retire.

While the programme rules for Medicaid eligibility have been reported elsewhere,[1] the complexity of the rules makes understanding of eligibility difficult in practice. Furthermore, not everyone who is eligible takes up the

[1] De Nardi et al., 2012; Buchmueller, Ham and Shore-Sheppard, 2016.

benefit. For this reason, we provide an empirical analysis of who receives Medicaid.

The goal of this paper is to help uncover the economic forces that affect Medicaid recipiency. 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 concern the main Medicaid eligibility requirements (income, wealth and large medical expenses) and other factors (including health, 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 programme of helping the poor, over 30 per cent of the 70-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 90s. For instance, after age 96, the fraction of singles in the top third of permanent income who are on Medicaid is 10 per cent. Comparing singles with couples reveals that, for similar age and permanent income, people in couples are less likely to be on Medicaid, although 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 also the middle and upper classes, and it is thus becoming more expensive to administer. In fact, the programme also provides valuable insurance for well-off individuals.[2]

We also display the evolution of other key determinants of Medicaid recipiency: net worth and limitations to activities of daily living (ADLs) by age, cohort, permanent income and marital status. 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 (PI) tercile, despite the fact that a non-negligible fraction of these individuals end up on Medicaid. To capture large medical expenses, we study the number of ADL limitations (which are also an important criterion for Medicaid nursing home admission), and we find that the fraction of people with at least two ADLs increases from less than 10 per cent at age 76, to about 60 per cent for the survivors live

[2]De Nardi, French and Jones, 2016a.

beyond age 96. In addition, we also show that singles and couples who have higher permanent incomes 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); however, 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 recipiency 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 point reduction in the probability of receiving Medicaid, the baseline probability being 16 per cent. Among the possible family structures, being a single woman increases the probability of receiving Medicaid, on average, by 4 percentage points. Impairments in ADLs and residency in a nursing home have a large effect on the probability of receiving Medicaid, as the average marginal effect of having two or more ADL impairments increases the probability by 6 percentage points, while being a resident in a nursing home increases the probability of receiving 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.

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 receiving Medicaid by 9 percentage points up to the 20^{th} percentile of the PI distribution compared to an increase of 2 percentage points above the 80^{th} percentile of permanent income. In terms of the effects of residing in a nursing home and the interaction with permanent income, people in the 50^{th}–70^{th} PI percentiles who spend two years in a nursing home are up to nine times more likely to be receiving Medicaid than people with the same permanent income who are not in a nursing home.

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, white people have a lower probability of receiving Medicaid than non-white people. 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 with low incomes have a higher probability of receiving Medicaid than other people with low incomes, with the gap in probabilities topping 8 percentage points at the lower-income levels. Finally, education reduces the probability of receiving Medicaid, and especially so at low-income deciles. For instance, at the lowest decile of permanent income, a college education reduces the probability of receiving Medicaid by 13 percentage points compared to having less than a high-school education.

II. Some institutional background

In the United States, there are two major public health insurance programmes for the elderly: the first is Medicare, a federal programme that provides health insurance to most people over the age of 65; the second is Medicaid, a means-tested programme that is run jointly by the federal and state governments. Although Medicaid also covers some categories of people of all ages, this paper focuses on Medicaid recipiency by the elderly. An important feature of Medicaid is not only that it is asset[3] and income tested, but also that it is the payer of last resort: Medicaid contributes only after Medicare and private insurance have paid their shares and when individuals have reduced their 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 it 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 insurance to cover long-term care. As a result, Medicaid covers almost all nursing home costs of poor elderly recipients. More generally, Medicaid now assists more than 60 per cent of nursing-home residents,[4] 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 2010, Medicaid spent $79 billion on 6.36 million elderly enrollees.[5]

Although the Medicaid programme 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, the income and assets of individuals or families fall below certain thresholds. Supplemental Social Insurance (SSI) recipients typically qualify under the categorically needy provision, although some states have more restrictive rules. The second group comprises the medically needy,

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

[4]This figure is taken from Kaiser Family Foundation (2013).

[5]These figures are taken from the Medicaid Statistical Information System (adjusted to 2014 dollars). We thank Jeff Silverman and Joshua Volosov for helping to extract these.

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.

III. Related literature

The papers most closely related to ours study the observable factors associated with Medicaid enrolment. Pezzin and Casper (2002) use the 1996 Medicare Current Beneficiary Survey (MCBS) data to study the factors associated with Medicaid enrolment among low-income, community-dwelling elderly people and to evaluate the effects of Medicaid enrolment on the use of health care services by elderly people, taking into account selection into programme participation. They find that less than half of all community-dwelling elderly people with incomes at or below 100 per cent of the federal poverty line were enrolled in Medicaid in 1996.[6] They also find no effects of state-level Medicaid generosity on the probability of living in the community as opposed to residing in a nursing home, they find that Medicaid eligibility does not appear to have strong effects on service usage, and they find that state-level Medicaid generosity increases the likelihood of Medicaid enrolment. Compared with Pezzin and Casper (2002), we not only study the panel data over a much longer time period, but we also study Medicaid enrolment across the whole population and permanent income, because Medicaid insurance is becoming more appealing to middle- and upper-income elderly people.[7] Perhaps, most importantly, using the HRS data we evaluate the importance of assets as a determinant of Medicaid recipiency, something Pezzin and Casper (2002) 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 behaviour, 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 non-married elderly people with low assets. Because they found

[6]It should be noted that Medicaid eligibility is based on both asset and income tests and that Pezzin and Casper (2002) 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 datasets thus sharply understate the income of poor households.

[7]Brown and Finkelstein, 2008; De Nardi, French and Jones, 2015.

that state-level variation in programme 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 details on state-level variation in Medicaid rules.[8] Willink 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 enrolments over the retirement period conditional on a person's 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 programme, which appears to have only a modest effect on Medicaid recipiency, we focus on the commonalities of the Medicaid programme in the 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 optimising behaviour takes place.

Our paper is also related to the work that studies the incentives to enrol on Medicaid. At one extreme, some papers find that there is a large stigma about enrolling on Medicaid, or an aversion to public care. At the other extreme, other works discuss Medicaid moral hazard or strategic spend-down of assets by people who want to become eligible for Medicaid. In the first group, for instance, Ameriks et al. (2011) use a dataset from Vanguard that samples individuals who have middle to high incomes and also asks hypothetical questions to study the determinants of lack of asset run-down and under-annuitisation. They conclude that aversion to Medicaid 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 becoming eligible for Medicaid. Finally, Taylor, Sloan and Norton (1999) find that four out of ten community dwellers could qualify for Medicaid by establishing a trust, but that less than 10 per cent actually had a trust. In addition, for those with trusts, avoidance of probate and controlling assets was a stronger motivation for trust creation than achieving Medicaid spend-down;

[8]Differences across states have been widely used in the literature to identify the effect of Medicaid policies on the various groups covered (children, adults, disabled, and aged). Buchmueller, Ham and Shore-Sheppard (2016) survey the literature and recommend caution in using state variation due to the limitations of this approach.

thus, there was little evidence of strategic trust-setting to become eligible for Medicaid. Other works, in contrast, stress that Medicaid imposes strong incentives for households to spend down their savings[9] and not to purchase insurance to cover long-term care,[10] which thus has a large effect on both savings and portfolio choice. Bassett (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 they interpret this as evidence supporting strategic behaviour to achieve eligibility for Medicaid. We do not attempt to address these questions and, separately, we try to identify aversion to Medicaid or strategic spend-down; instead, 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 these differences point to the importance of thinking about those characteristics when studying Medicaid recipiency. For instance, Guner, Kulikova and Llull (2014) find that married people are healthier than unmarried people, that this gap widens with age, and that there is a health-protective role of marriage at older ages. In addition, the death of a spouse has been associated with spikes in medical expenditures and with large drops in assets for the surviving spouse.[11] We adopt the insights from these contributions when looking at Medicaid recipiency and its determinants.

There are also several papers that survey the Medicaid programme. For instance, Gruber (2000) examines the history, rules and economic implications of the Medicaid programme. De Nardi et al. (2012) focus on the two main pathways to Medicaid eligibility after age 65: that is,being categorically needy (having low income and assets) and being categorically needy (having high medical bills). Bitler and Zavodny (2014) and Buchmueller, Ham and Shore-Sheppard (2016) have updated Gruber's paper after over 14 years of Medicaid history, changes and research on Medicaid.

IV. The data

To study US 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 HRS data known as the Assets and Health Dynamics Among the Oldest Old (AHEAD).

Data for the AHEAD cohorts were collected starting in late 1993/early1994, with wave 2 of the HRS. However, because Rohwedder, Haider and Hurd (2006) found that income and wealth variables are underreported in that wave,

[9] Hubbard, Skinner and Zeldes, 1995.

[10] Brown and Finkelstein, 2008.

[11] See, for instance, Poterba, Venti and Wise (2011), French et al. (2006) and De Nardi, French and Jones (2016a).

we discard it and use data from 1996 (wave 3) onwards. Thus, we have a total of nine waves, which are collected every two years, spanning the 1996–2012 period. Because we select people born before 1924, we have a distribution of people who, in 1996, were at least 73 years 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 Online Appendix A for details on the selection of the initial sample).

The AHEAD data are of very good quality. For example, De Nardi, French and Jones (2016a) and French, Jones and McCauley (2017) show that the AHEAD income data closely match up with income from other high-quality surveys. Nonetheless, the AHEAD Medicaid data are not perfect, but understate Medicaid recipiency for the elderly by about 20 per cent. However, this is low relative to the problem of underreporting of programme recipiency rates, which has been documented in other surveys.[12]

We divide our observations into two groups, according to marital status. More specifically, the first group, the singles, includes individuals who were single at the beginning 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, from the time they became 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 remain married or in a couple. Thus, some observations will start in group 2 and transition to group 1 when their partner dies or if the couple splits up. Hence, we show graphs for two groups: singles and couples. Our data are thus an unbalanced panel, whose size becomes smaller over time as people die or become single (in the case of couples).[13]

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.[14]

In our graphical analysis, we also group our data according to PI terciles. See Online Appendix A for a detailed discussion of how we measure

[12]De Nardi, French and Jones (2016a) find that the AHEAD data match extremely well with both the Panel Study of Income Dynamics and the MCBS, and they also find that the AHEAD Medicaid recipiency rate is 22 per cent below the recipiency rate in the MCBS. De Nardi et al. (2016b) show that the Medicaid recipiency rate in the MCBS matches 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.

[13]About 15 per cent of women and 10 per cent of men are observed in all nine waves, with an average yearly attrition rate of about 20 per cent for women, who are more likely to survive, and 25 per cent for men. Overall, attrition for reasons other than death is modest. Of a total of 5,417 individuals who were removed, 1,269 left for reasons other than death.

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

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 such that it does not change with age or with demographic status (part of a couple or single) during our sample period. Most of the income is from either Social Security or defined-benefit pension benefits. Because both Social Security and defined-benefit pension benefits are rising with income when working, this measure captures the concept of average lifetime income. Online 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 Figures 1–3, the numbers refer to the PI tercile (1 = lowest; 2 = middle; 3 = richest). The youngest cohort median year of birth is 1920 and it is represented by a thick, continuous line; the middle cohort median year of birth is 1913 and it is represented by a grey, dashed line; the oldest cohort median year of birth is 1906 and it is represented by a thin, dotted line.

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

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, Michaud and Rohwedder (2014) 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.

V. Some important facts

Because Medicaid recipiency depends on income, assets and health in that it provides health insurance, in this section we show some key facts on Medicaid recipiency, net worth and health by age, cohort, marital status and permanent income. In Online 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 US data. Second, the death of a spouse has been associated with spikes in medical expenditures and large drops in assets for the surviving spouse.[15] More specifically, we perform our analysis for singles (i.e., those who are single or who become single during our sample period) and for couples (i.e., those who start out in our sample as couples, for as long as they remain in a couple).[16] This enables us to better understand how family structure affects important economic variables, including Medicaid eligibility.

1. Medicaid recipiency

The upper panel in Figure 1 reports the fraction of single people on Medicaid after age 75, by age, cohort and permanent income, and it displays several interesting patterns. First, there is a big gap in Medicaid recipiency between the people in the bottom PI tercile and the people in the two higher PI terciles. The fraction of people receiving Medicaid in the lower PI tercile starts higher at age 76, at 33 per cent, compared with under 3 per cent for the singles in the second and third PI terciles, and it grows fast with age, reaching 60 per cent for those who survive to age 99. Second, the fraction of survivors receiving Medicaid in the second and third PI terciles also rises significantly, going from 3 per cent at age 76 to 25 per cent at age 99 for those in the second PI tercile, and from 1 per cent at age 76 to 10 per cent at age 99 for those in the third PI tercile. These findings confirm those by De Nardi, French and Jones (2016a), even though they used different PI bins and different cohorts. Thus, although Medicaid, as intended, is a programme that mainly helps the elderly poor, even the elderly in the top two PI groups often receive benefits if they live long enough.

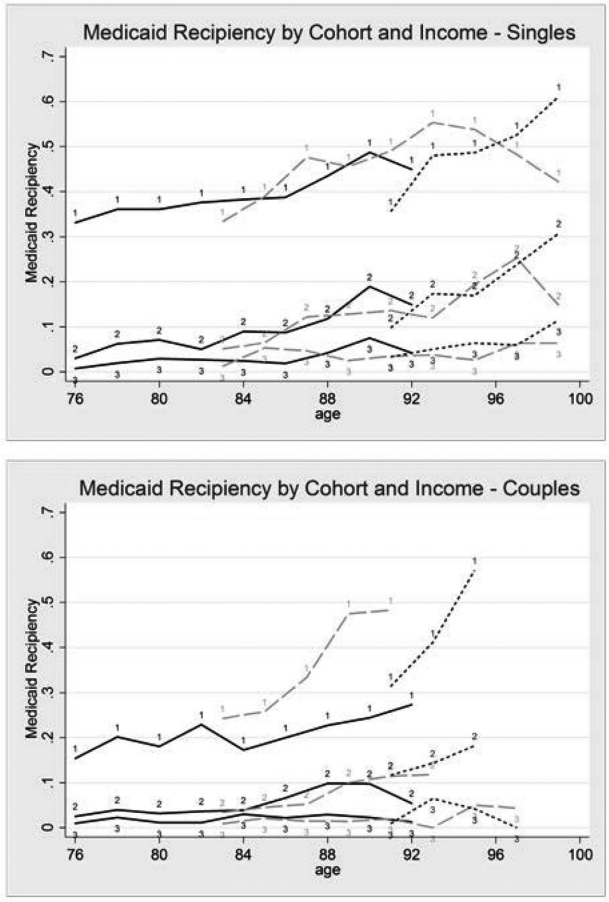
The lower panel in Figure 1 reports the fraction of people in couples who are on Medicaid after age 75, by age, cohort and permanent income. The fraction of people in couples in the lowest PI tercile receiving Medicaid at age 76 is 15 per cent, which is less than half of the corresponding fraction for singles in the lowest PI tercile; however, this number climbs fast as the survivors age, reaching 60 per cent, as for singles. Finally, the fraction of individuals in couples in the two highest PI terciles who are receiving Medicaid is lower than the corresponding terciles for singles and well below the fraction for singles at all ages.

[15] French et al., 2006; Poterba, Venti and Wise, 2011.

[16] We do not distinguish between individuals who are single at the beginning of the survey and individuals who become single during the sample period, because we find that people who lose their spouse rapidly become very similar – in their Medicaid recipiency and other important observable characteristics – to people who have been single for much longer, once we condition on birth cohort, age and permanent income as we do in the figures.

FIGURE 1

Fraction of people on Medicaid among those who are single (upper panel) and those in couples (lower panel) after age 75, by age, cohort and permanent income



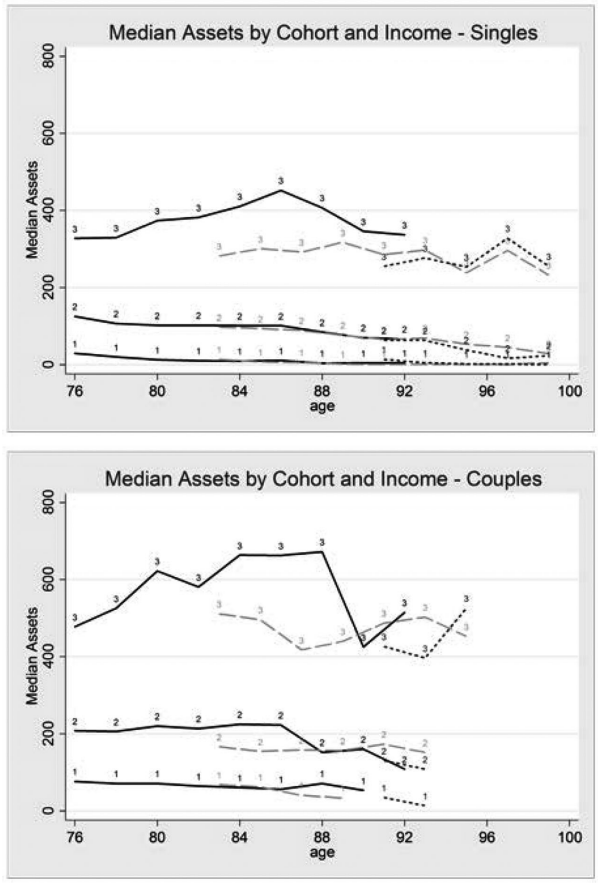
Note: The numbers refer to the PI tercile (1 = lowest; 2 = middle; 3 = richest). The thick, continuous lines refer to the youngest cohort (born in 1920); the grey, dashed lines represent the middle cohort (born in 1913); the black, dotted lines represent the oldest cohort (born in 1906).

2. Net worth

Because Medicaid is a means-tested programme that takes into account both assets (or net worth) and income, and because our aim is to understand the effect of its rules, we now display median assets by age, cohort, PI 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 (upper panel) and those in couples (lower panel) after age 75, by age, cohort and permanent income



Note: The *y*-axis units are in thousands of dollars. The numbers refer to the PI tercile (1 = lowest; 2 = middle; 3 = richest). The thick, continuous lines refer to the youngest cohort (born in 1920); the grey, dashed lines represent the middle cohort (born in 1913); the black, dotted lines represent the oldest cohort (born in 1906).

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 (upper panel in Figure 2) in the lowest PI tercile enter our sample at age 76 with under $30,000 in median assets; 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 PI 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 90s. 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 they still hold almost $200,000 in their late 90s. These findings also confirm those by De Nardi, French and Jones (2010), who also pointed to the importance of out-of-pocket medical expenses in generating these savings patterns.[17]

Turning to couples, the lower 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 the net worth of male individuals to avoid duplicating 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-90s. Singles in the same group start out with $30,000, which also declines to zero by the same age. Second, with the exception of those in the lowest PI tercile, couples also tend to hold more assets as they age. For instance, couples in the highest income tercile start out with over $470,000, compared with $320,000 for singles, and the survivors still hold $420,000 at age 95, compared with just above $230,000 for singles. Thus, although couples do not start out with twice as much in assets as singles, those in the two highest income terciles who survive with their spouse to 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.

Online 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 PI tercile are zero at age 76 and remain at zero for both couples and singles. In contrast, the liquid assets of those in the highest PI tercile start out high at age 76, remain substantial at very advanced ages, and exhibit less decumulation by couples than by singles.

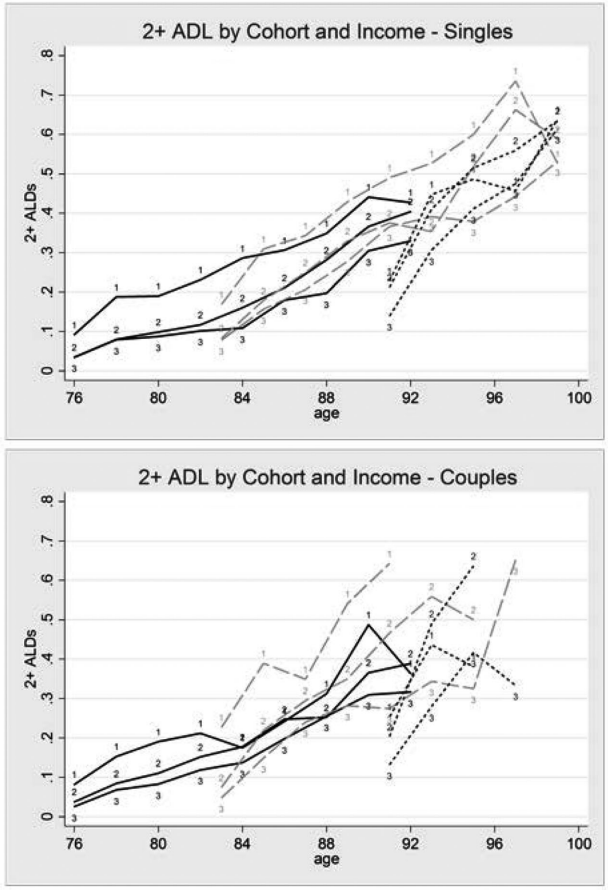
[17] After someone dies, the HRS/AHEAD follows up with the spouse, children or executor of the estate to discover what was left of the decedent's assets. Previous literature has pointed out two important observations in this regard. First, people can incur large medical expenses in the period before death; see, for instance, Marshall, McGarry and Skinner (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, Venti and Wise (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 Online Appendix A.

3. Health

Although health is not, per se, a criteria to be eligible for Medicaid, Medicaid provides good and services to the unhealthy based on various health measures. For instance, to be eligible for a Medicaid nursing home, an individual needs to satisfy criteria based on ADL impairments, and high medical expenses are required to be medically eligible. Hence, we also describe the evolution of

FIGURE 3

Fraction of people with at least two ADL impairments who are single (upper panel) and in couples (lower panel) after age 75, by age, cohort and permanent income



Note: The numbers refer to the PI tercile (1 = lowest; 2 = middle; 3 = richest). The thick, continuous lines refer to the youngest cohort (born in 1920); the grey, dashed lines represent the middle cohort (born in 1913); the black, dotted lines represent the oldest cohort (born in 1906).

health after age 75 for our subgroups. To do so, we look at three different measures of health and we mainly report results on ADLs in this section. We report more results on other health measures in Online Appendix D.

The ADL 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 variabl,e 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).

The upper panel 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 per cent for all PI terciles, and that it increases fast by age, surpassing 50 per cent for those who survive past age 95. A similar pattern holds for people in couples (lower panel).

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

In this section, we first analyse the probability of receiving 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.

1. Multivariate logit regressions

To study the probability of receiving 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 receiving Medicaid. Starting from the variables capturing the key Medicaid eligibility rules, we include a second-order polynomial in PI percentile, which is the percentile of our measure of permanent income, liquid wealth measured in 1996 (in 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 two or more ADL impairments, and a dummy for being resident in a nursing home in the current wave. In addition, we include a second-order polynomial

in age, dummies for gender/marital status[18] (single man, married woman and single woman, with married man thus being the excluded category),[19] number of children, a dummy for being white, regional dummies[20] (Mid Atlantic, EN Central, WN Central, S Atlantic, ES Central, WS Central and Mountain, with New England excluded), 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 experimented with interactions between PI, initial wealth, family structure, being white and other variables, finding statistically significant effects for the interactions of PI with variables capturing health (self-reported health status, difficulties with two or more ADLs, being resident in a nursing home), family structure, being white, education and wealth (both initial liquid wealth and housing wealth). Descriptive statistics of the variables used in the analysis are shown in Online Appendix E.

In Table 1, we present the average marginal effects for each variable included. These are computed by leaving all the other explanatory variables at their observed values, starting in column 1 with a specification that includes all the variables just described. In column 2, we use a different variable to measure nursing-home stays, which is the 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 Online Appendix E we report the complete table of the coefficients. The results in column 1 show that the PI percentile (our measure of permanent income) has a large impact on the probability of receiving Medicaid and one additional percentile reduces this probability, on average, by 0.43 percentage points, where the average probability of receiving Medicaid is 16 per cent. Conditional on the 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 $100,000. Liquid wealth has about the same impact on Medicaid recipiency as housing wealth: on average, increasing liquid (housing) wealth by $100,000 reduces

[18]More specifically, being in a couple has some direct effects on Medicaid eligibility rules, but it is likely that they are not meant to benefit either couples or singles, and thus they are neutral among the two groups. In contrast, there are important reasons why 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 rather than explicit Medicaid rules.

[19]Among the singles, 88 per cent are widowed, 4 per cent 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.

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

TABLE 1

Predictors of Medicaid recipiency: average marginal effects (resulting from logistic estimates)

Regressor	*Specification 1* b/se	*Specification 2* b/se
PI percentile	–0.0044*** (0.00017)	–0.0044*** (0.00018)
Initial liquid wealth/100,000	–0.0525*** (0.00590)	–0.0524*** (0.00603)
Initial housing wealth/100,000	–0.0474*** (0.00786)	–0.0458*** (0.00803)
Self-reported health		
Very good	0.0020 (0.01034)	0.0014 (0.00926)
Good	0.0108 (0.01018)	0.0110 (0.00908)
Fair	0.0192** (0.01040)	0.0176** (0.00930)
Poor	0.0179*** (0.01058)	0.0221** (0.00964)
ADL 2+	0.0633*** (0.00616)	0.0644*** (0.00622)
Nursing home		
Yes	0.1537*** (0.00904)	–
Number of days	–	0.0002*** (0.00001)
Age	0.0023*** (0.00047)	0.0020*** (0.00045)
White	–0.0389*** (0.00801)	–0.0357*** (0.00788)
Family structure		
Single man	0.0073 (0.00845)	0.0069 (0.00860)
Married woman	0.0145 (0.00999)	0.0124 (0.00996)
Single woman	0.0423*** (0.00697)	0.0355*** (0.00709)
Number of children	0.0056*** (0.00113)	0.0049*** (0.00109)
Census divisions		
2. Mid Atlantic	–0.0104 (0.01313)	–0.0113 (0.01368)
3. EN Central	–0.0404*** (0.01296)	–0.0380*** (0.01359)
4. WN Central	–0.0436*** (0.01478)	–0.0395*** (0.01559)
5. South Atlantic	–0.0246** (0.01246)	–0.0249** (0.01313)
6. ES Central	–0.0351** (0.01721)	–0.0325** (0.01796)
7. WE Central	0.0052 (0.01326)	0.0054 (0.01376)
8. Mountain	–0.0225 (0.01682)	–0.0177 (0.01729)
9. Pacific	0.0401*** (0.01480)	0.0420*** (0.01545)
Education		
2. High school	–0.0231*** (0.00592)	–0.0217*** (0.00591)
3. College	–0.0708*** (0.01375)	–0.0573*** (0.01327)
Cohort		
Born in 1910–16	–0.0136** (0.00592)	–0.0092* (0.00589)
Born in 1900–09	–0.0137 (0.00872)	–0.0075 (0.00890)
N	29,753	27,771
Pseudo R^2	0.395	0.396

Note: ***, ** and * indicate significance at the 1, 5 and 10 per cent levels, respectively. Clustered standard errors (at the individual level) are given in parentheses.

the probability of receiving Medicaid by about 0.52 (0.46) percentage points. This may be surprising because, in many circumstances, an individual with a home can be eligible for Medicaid, whereas an individual with more than a small amount of liquid assets is not eligible.[21] However, people run down their housing wealth and rebalance their portfolios as they experience health shocks and the death of a spouse.[22] Thus, it is not surprising that these effects are similar in the presence of optimising behaviour about the level and the composition of savings.

Among the variables capturing health, reporting poor or fair health increases the probability of receiving Medicaid by about 1.8 percentage points, on average, compared to reporting excellent health. Having two or more ADL 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 receiving Medicaid by 15 percentage points.

As for the other factors affecting Medicaid recipiency, older age, conditional on the included covariates, increases the probability of receiving 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 receiving Medicaid by about 3 percentage points, on average, relative to all other family structures. Being white reduces this probability by 4 percentage points, on average, while the number of children has a positive although small effect, with the probability of receiving Medicaid increasing by 0.5 per cent for each additional child. Census division turns out to be a significant predictor. 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 receiving Medicaid by almost 7 percentage points.

As residency in a nursing home proved to be an important factor determining the probability of receiving Medicaid, we also re-estimate our model with the number of days spent in a nursing home between two interviews, an indicator that allows us to estimate whether longer stays tend to have a bigger impact on the probability of receiving Medicaid. In column 2, we estimate the same specification as in column 1, 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 of 100 days in a stay increases the probability of receiving Medicaid by 2 percentage points, on average. The effect and significance of all other variables are unchanged when using the number of days in a nursing home rather than being in a nursing home.

[21] De Nardi et al., 2012.
[22] Poterba, Venti and Wise, 2010.

2. Medicaid recipiency and the marginal effects of the rules and other observables

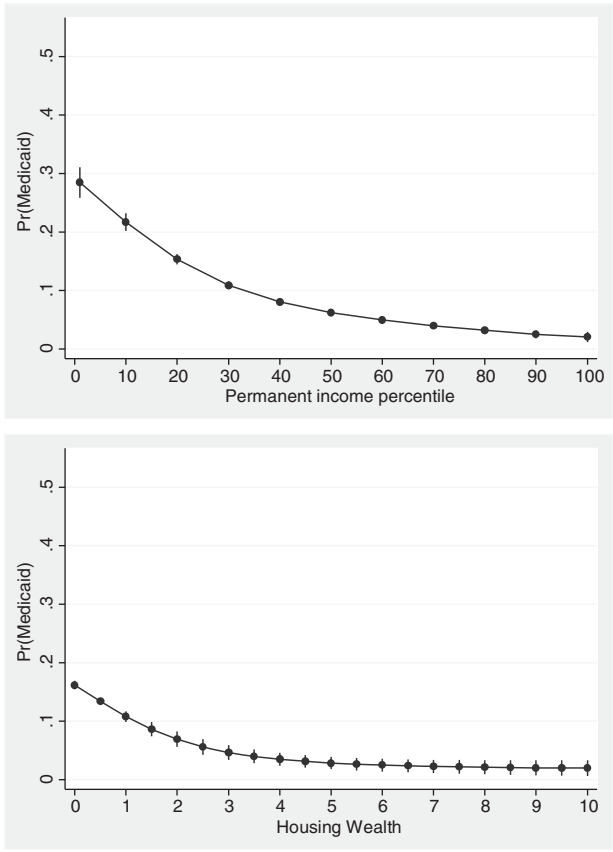
Our estimated model is non-linear and the marginal effects of the explanatory variables are not constant over the range observed in the sample. To better quantify our results, we start by showing the average predicted probability of receiving Medicaid, plotted as a function of the variables that capture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

To be more precise, we report the average predicted probabilities as a function of that variable alone, with all other characteristics held constant. More specifically, we take our sample of people and we apply their own other observable characteristics and regression coefficients when one variable (e.g. PI) is changed from the lowest to the highest level. Then, at each PI level, we compute the average probability of receiving Medicaid, integrating over all other characteristics other than the one that we are considering. The vertical bars refer to the 95 per cent confidence interval. We use estimates from the specification shown in column 2 of Table 1; figures plotted using coefficients from column 1 are virtually identical.

Turning to Figure 4, the first point in the figure starting from the left, for example, represents the average predicted probability of receiving 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 the sample. Subsequent points are computed in a similar way. The figure shows that the average predicted probability of receiving Medicaid is a negative function of PI, ranging from 28 per cent at the first percentile, declining fast as PI increases, and reaching 2 per cent at the highest PI percentile. The average marginal effect of PI is equal to 0.43 percentage points for each percentile, as reported in 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 receiving Medicaid by 6.3 percentage points, while when PI increases from the 50^{th} to the 60^{th} 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 90^{th} to the top percentile reduces the probability of receiving Medicaid by half a percentage point. Similarly, in the lower panel of Figure 4 we report the average predicted probability as a function of initial housing wealth. The average predicted probability of receiving Medicaid turns out to be 16 per cent for housing wealth equal to zero, and then declines gradually with wealth to 2 per cent. The marginal effect, which on average is about 0.5 percentage points every $100,000, is quite high at low values of wealth, with the difference in the probability of receiving Medicaid being

FIGURE 4

Effect of PI (upper panel) and of housing wealth (lower panel) on the probability of receiving Medicaid



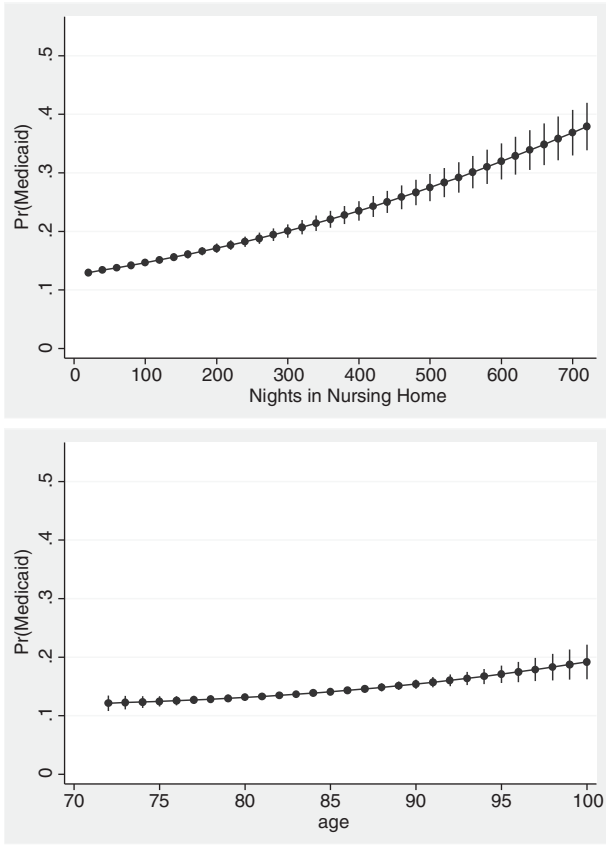
Note: Average predicted probability of Medicaid receipt, using the estimates in Table 1, holding all other variables at their observed values.

5 percentage points when initial housing wealth increases from $0 to $100,000, about 0.5 percentage points between $500,000 and $600,000, and negligible after that amount.

Figure 5 shows the pattern of the average predicted probability of receiving Medicaid by health and age. In the upper panel, the probability of receiving Medicaid is plotted as a function of the number of nights spent in a nursing home over the previous two years. The average predicted probability of receiving Medicaid is, on average, 13 per cent when the number of nights is equal to zero, and this grows to 38 per cent when the number of nights is 730, or two years. In the lower panel, the probability of receiving Medicaid is plotted as a

FIGURE 5

Effect of the number of nights in a nursing home (upper panel) and age (lower panel) on the probability of receiving Medicaid



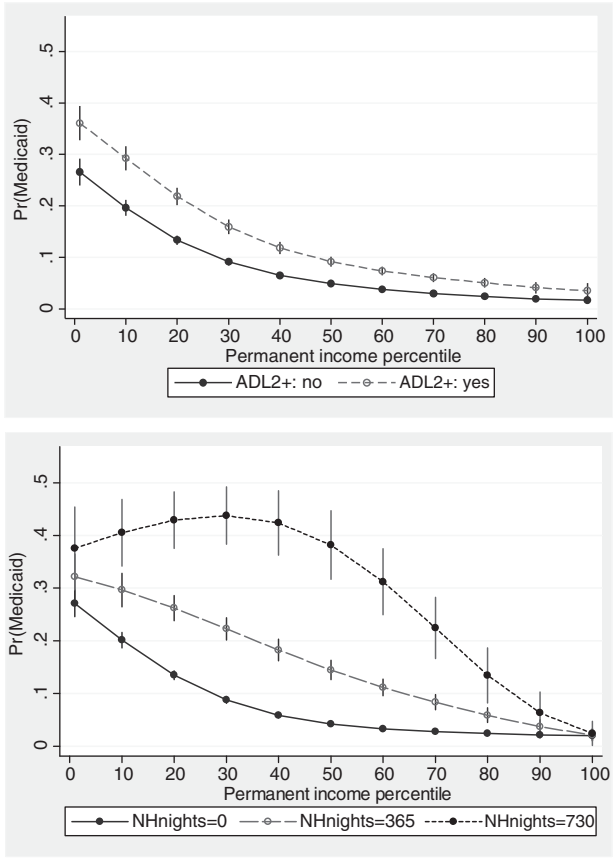
Note: Average predicted probability of Medicaid receipt, using the estimates in Table 1, holding all other variables at their observed values.

function of age. The average probability is also increasing in age, increasing from about 12 per cent at age 72 to 19 per cent at age 100.

Our estimates have shown that the interactions between PI percentile, health and other characteristics are quantitatively important. To analyse these interactions, Figure 6 plots the predicted probabilities as a function of both PI percentile and ADL impairments (upper panel) or PI percentile and the number of nights spent in a nursing home (lower panel). The marginal effect of having two or more ADLs is given by the difference in the two functions plotted in the upper panel of Figure 6. Especially at low income percentiles, the effect of this variable is sizeable, increasing the predicted probability of receiving Medicaid from 26 to 35 per cent. Although, at the upper end of the permanent income

FIGURE 6

Effect of ADLs (upper panel) and the number of nights in a nursing home (lower panel) on the probability of receiving Medicaid, as a function of PI percentile



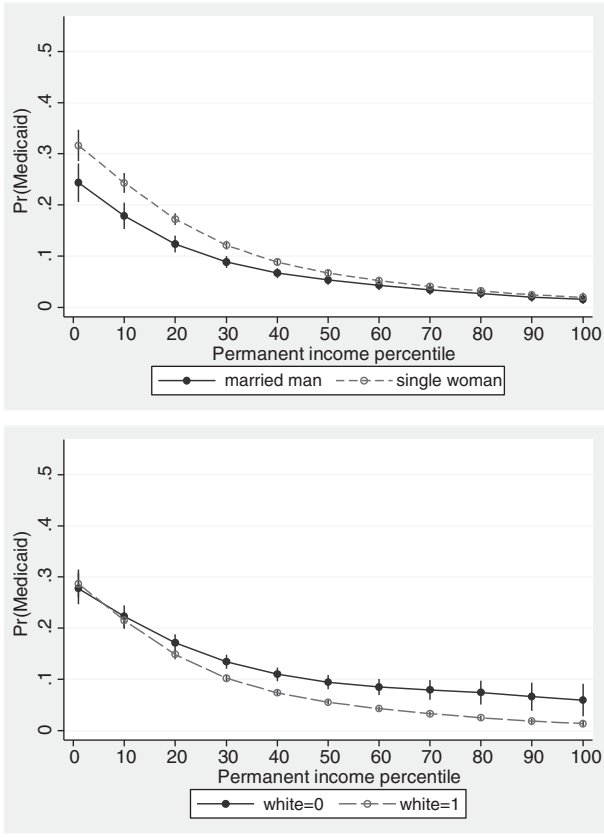
Note: Average predicted probability of Medicaid receipt, using the estimates in Table 1, holding all other variables at their observed values.

distribution, its effect is much smaller in absolute terms (e.g. it increases the probability of receiving Medicaid by 2.5 percentage points at the 8th decile and by 2 percentage points thereafter), the effect is still precisely estimated. Thus, it implies that the probability of receiving Medicaid doubles in the presence of two or more ADLs.

In the lower panel of Figure 6, we plot the effect of the number of nights spent in a nursing home during the last two years on the probability of receiving Medicaid, for three values: zero nights, 365 nights and 730 nights, or two years. The average predicted probability when the number of nights spent in a nursing home is zero goes from 27 per cent at the lowest PI percentile to 2 per cent at

FIGURE 7

Effect of family structure (upper panel) and of race (lower panel) on the probability of receiving Medicaid, as a function of PI decile



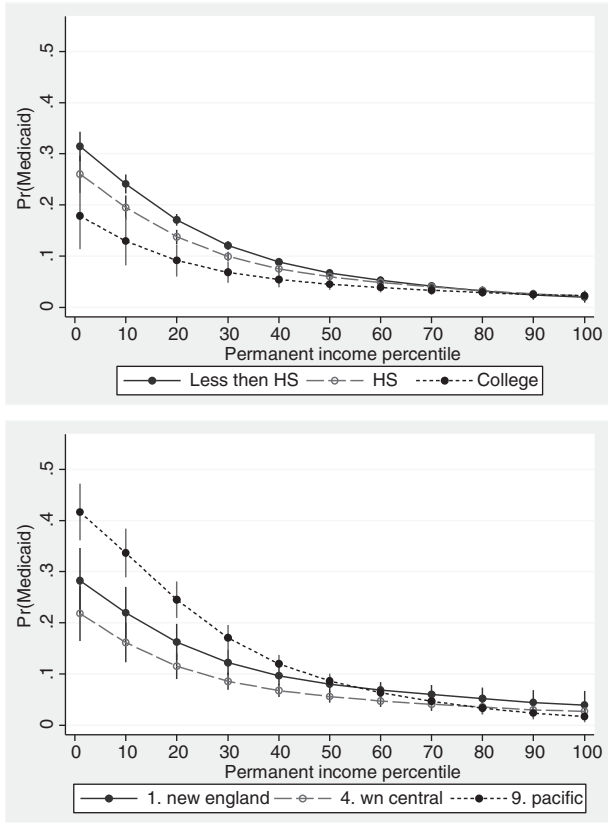
Note: Average predicted probability of Medicaid receipt, using the estimates in Table 1, holding all other variables at their observed values.

the highest PI percentile. When the number of nights spent in a nursing home is 365, the average predicted probability of receiving Medicaid increases to 32 per cent at the lowest PI percentile and to 22 per cent at the 30th PI percentile. For stays that are as long as two years, the average predicted probability increases dramatically, reaching 37 per cent at the lowest PI percentile, 44 per cent at the 30th percentile and 13 per cent at the 80th percentile. Hence, longer stays in a nursing home substantially increase the probability of receiving Medicaid. This effect is especially large between the 2nd and 8th PI deciles.

We also show the average predicted probabilities by permanent income and variables capturing other factors that influence the probability of receiving Medicaid. In Figure 7, we start with the effect of family structure on the

FIGURE 8

Effect of education (upper panel) and region (lower panel) on the probability of receiving Medicaid, as a function of PI decile



Note: Average predicted probability of Medicaid receipt, using the estimates in Table 1, holding all other variables at their observed values.

probability of receiving 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 is apparent from the figure, being a single woman (statistically) significantly raises the probability of receiving Medicaid, with respect to the reference category, but only in the three lowest PI deciles. In the lowest PI percentile, the probability of receiving Medicaid is 0.24 for married men and 0.32 for single women. Conditional on the other covariates included in the analysis, gender and family structure influence the probability of receiving Medicaid only at low PI percentiles, while the effect vanishes at higher percentiles.

In the lower panel of Figure 7, we plot the predicted probability of receiving Medicaid by race: the marginal effect of being white (i.e. the difference between the two functions) is zero at the first PI 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 effect is only active at higher PI percentiles.

Lastly, in Figure 8, we analyse the effect of education and Census division. In the upper panel, we plot the predicted probabilities as a function of PI and education. The difference between having no high-school degree and having a high-school or college degree is very large in the first two PI deciles. In particular, at the first PI percentile, having a college degree reduces the probability of receiving Medicaid by 13 percentage points with respect to not having any degree.

In the lower panel of Figure 8, we plot the predicted probabilities as a function of three Census divisions that cover the range of possible effects: New England, West North (WN) central (which includes the Dakotas and Missouri) and Pacific. Other divisions are included in the range drawn by WN Central and New England, with the exception of West South (WS) Central (which includes Texas and Louisiana), which lies between New England and Pacific, and these are not shown for clarity. The effect of Census division is decreasing with PI 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.

VII. Conclusions

We use HRS data to study the evolution and possible determinants of Medicaid recipiency of US households during retirement. In particular, we ask how the Medicaid rules for elderly individuals map into the reality of Medicaid recipiency, and we explore what other observable characteristics have an important role in determining programme participation.

Our descriptive analysis uncovers several interesting findings. First, even at higher percentiles of permanent income, the Medicaid recipiency rate is high for elderly survivors. Second, in the raw data, couples are less likely to end up receiving 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 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 stays in a nursing home than singles or to have two or more ADL impairments in old age.

Then, we study how the probability of receiving Medicaid is influenced by demographic, economic and health factors, using a logit probability

model to quantify the various effects. The PI percentile has a large impact on the probability of receiving 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; these findings are consistent with the nature of Medicaid eligibility rules.

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 4 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 the probability of receiving Medicaid by 2 percentage points, on average. Having two or more ADL impairments increases the probability of receiving Medicaid by 6 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 the interaction of permanent income and other observables related to Medicaid eligibility is important. For example, we find that having two or more limitations in ADLs increases the probability of receiving Medicaid much more in absolute terms at the lower end of the PI distribution, while 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 50th to 70th PI percentiles who spend two years in a nursing home are up to nine times more likely to be receiving Medicaid than people with the same permanent income who are not in a 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.

Relatively few studies have investigated the insurance role of Medicaid in old age among middle- and higher-income retirees.[23] De Nardi, French and Jones (2016a) focus on singles retirees and find that the rich, by being more likely to live longer, face a higher risk of catastrophic medical expenses at very old ages. As a consequence, they find that Medicaid offers valuable insurance to single individuals in the highest PI deciles.

Our analysis highlights many factors that are important determinants of Medicaid recipiency. In addition, we find that individuals in the upper half of the PI distribution, both singles and couples, and conditional on a large set of observables, have a non-negligible probability of ending up receiving Medicaid, particularly if they face health problems or long stays in a nursing home.

[23] Brown and Finkelstein, 2008; De Nardi et al., 2016a.

Supporting information

Additional supporting information may be found in the online version of this paper on the publisher's website:

- Appendix

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