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THE EFFECTS OF WEALTH ON HEALTH CARE SPENDING: EVIDENCE FROM THE HOUSING MARKET

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ABSTRACT

The U.S. healthcare system requires substantial out-of-pocket payments by most consumers, which can prevent some from receiving needed medical services. Recent policy proposals seek to address this problem by increasing government health care spending in order to reduce out-of-pocket costs. The social value of these policies rests in part on the extent to which consumers face credit constraints in financing medical spending. We present a novel analysis of whether elderly households face such credit constraints by estimating the effects of wealth variation from home price changes on out-of-pocket medical expenditures. Using data from the Health and Retirement Study and various measures of home price changes, we find no evidence that housing wealth impacts out-of-pocket medical spending. The estimates are universally small and precise, allowing us to rule out even modest-sized effects. Effects are zero across the expenditure distribution, for specific categories of expenditure, and for different types of consumers split by health insurance status and SES. Our results suggest that further subsidizing health care for elderly homeowners, the majority of older Americans, would increase moral hazard costs without increasing access to needed care.

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1. Introduction

The U.S. healthcare system is characterized by high overall costs as well as large out-of-pocket costs to consumers. In 2022, total national expenditures on health care were about $4.5 trillion ($13,493 per capita). Out-of-pocket expenditures were $471.4 billion ($1,425 per capita), which is 10.6% of total health care expenditures.[1] High levels of out-of-pocket spending reflect relatively large co-insurance rates in most U.S. health plans as well as sizable deductibles, copays, and premiums.[2] A small proportion of the population also is not covered by any form of health insurance, and many use health services that are not covered by their insurance plan. While these features may be desirable to reduce moral hazard, they can lead to a substantial financial burden on consumers and, as a result, limit consumers' access to needed medical care. For instance, over 25% of adults under age 65 report difficulty in paying medical bills, and medical debt is a leading cause of consumer bankruptcy (Dickman, Himmelstein, and Woolhandler 2017). Other evidence indicates that due to Medicare's limited scope of benefits and uncapped cost-sharing, Medicare beneficiaries face out-of-pocket costs of $3,024 per year on average. More than 25% of all Medicare beneficiaries expend 20% or more of their income on health care (Schoen, Davis, and Willink 2017).

Although health care subsidies are smaller in the U.S. than in other industrialized countries, the U.S. government still spends a large amount of money on health care. In 2022, the U.S. government spent $1.9 trillion on public health insurance (Medicare, Medicaid, CHIP, and veterans benefits), which is 42.0% of total national health care spending. Intense debate remains over the proper level of government subsidies and interventions in health care markets, with many proposals such as "Medicare for All" seeking to substantially increase government spending and reduce out-of-pocket costs. Recent versions of these proposals contain universal and comprehensive health care coverage inclusive of long-term care and dental care, which

[1] These tabulations are from the National Health Expenditure Accounts (NHEA), available through the Centers for Medicare & Medicaid Services (CMS): https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.

[2] Medicare Part A covers inpatient hospital care, skilled nursing facilities, hospice care, and some home health visits. In 2024, the co-insurance payments for Medicare Part A for each benefit period of inpatient stays are $0 per day after paying part A deductible for days 1-60, $408 per day for days 61-90, and $816 per each lifetime reserve day for days 91 and beyond. A Medicare beneficiary has a total of 60 lifetime reserve days, after which they are responsible for all costs. Medically necessary services and preventive services are covered by Medicare Part B. The co-insurance rate for Medicare Part B usually is 20%. The rates for plans sold on the ACA exchanges tend to range from 20% to 30%.

currently are not covered by Medicare, without any cost-sharing. If adopted, these policies would lead to large increases in federal subsidization of health care utilization.

The optimal level of government health care subsidization requires balancing the tradeoff between allowing for broader access to needed medical care and moral hazard costs of insurance. If a substantial portion of consumers under the current system face credit constraints that lead to unmet medical needs, further subsidization could be efficiency-enhancing. This argument is aligned with prior research showing that health insurance is more valuable for credit-constrained consumers (Handel, Hendel, and Whinston 2015; Malani and Jaffe 2018; Ericson and Sydnor 2018). Conversely, further subsidization could lead to more wasteful health care consumption by distorting the relative prices of health care services, thus raising costs without commensurate health benefits. A critical aspect of this policy debate thus rests on whether a significant portion of the population is credit constrained with respect to health care consumption. In the absence of such credit constraints, more targeted policies to constrained groups may be more efficient.

In this paper, we examine the extent to which elderly people are constrained in their consumption of health care by estimating the effects of wealth on out-of-pocket medical spending. If health is a normal good, higher wealth should lead to more health care consumption. This effect will be larger if consumers face binding credit constraints. A positive effect of wealth increases on health care expenditures thus could reflect health being a normal good[3] as well as the existence of binding credit constraints. Conversely, a null effect, as we find in this paper, would allow us to rule out binding credit constraints for the population we study. A null effect also is consistent with the large subsidization of health care in the U.S., which can reduce or eliminate the marginal willingness to pay out of one's income or assets.

We provide an examination of the effect of wealth changes on out-of-pocket health care expenditures using wealth variation from the housing market combined with nationally-representative data on older Americans and their spouses or partners from the Health and Retirement Study (HRS). Our focus on the housing market is driven by several factors. First, housing wealth is a large component of asset portfolios. In our sample of homeowners, almost

[3] Another implication of health being a normal good is that higher wealth could allow people to improve their health by investing in their health in ways that reduce the demand for health care. This would bias our estimates towards zero. We rule out this mechanism by showing below that that home price changes do not affect reported or predicted health.

50% of net household wealth is comprised of net housing wealth. Second, the past several decades have witnessed large fluctuations in home prices, due in part to the housing boom and bust of the early-mid 2000s. Third, housing wealth is increasingly liquid, with the possibility of home equity loans, home equity lines of credit, and reverse mortgages. Mian and Sufi (2011) estimate that consumers extract 25% of home equity increases through these mechanisms. We show evidence below that home equity is similarly liquid for older Americans. Hence, the variation in home prices experienced over the past 30 years has generated substantial changes in liquid housing wealth, including for the elderly, which is a large component of total household wealth. The empirical approach in this paper is to understand whether this large source of wealth variation affects health care expenditures. We concentrate on older Americans since they exhibit the largest demand for health care as a group.

We construct a panel of HRS respondents from 1998 to 2018 that includes detailed information on out-of-pocket health care expenditures overall and for several specific categories, such as prescription drugs, nursing home stays, outpatient visits, and home health care. The sample consists of those who own a home consecutively for 2 or 4 years. We then estimate how 2- or 4-year changes in home prices impact reported health care expenditures. We use both reported home price changes as well as "simulated" home price changes that interact the baseline price of the house with a county-level home price index from Zillow. The simulated home price changes are useful in addressing concerns about selection from idiosyncratic variation in home prices across households within each housing market. The HRS data allow us to control for a rich set of observables, including age, marital status, annual household income, net household wealth excluding housing, coverage by different health insurance plans, health status, and individual fixed effects that account for time-invariant characteristics (e.g., race, gender, and educational attainment). We additionally control for unemployment rates, median household income, and poverty rates at the county-year level as well as county and year fixed effects that account for unobserved fixed differences across areas that are correlated with home price variation and for common secular trends over time. Our focus on homeowners captures the majority of older Americans: among the observations in the HRS without missing health care expenditure data and control variables, 76.5% are 2-year consecutive homeowners and 73.9% are 4-year consecutive homeowners.

Our empirical approach is similar to those used in prior analyses to identify the causal effects of housing wealth on important life outcomes (e.g., Lovenheim 2011; Lovenheim and

Reynolds 2013; Fichera and Gathergood 2016; Zhao and Burge 2017; Lovenheim and Mumford 2013; Dettling and Kearney 2014; Daysal et al. 2021; Hotz et al. 2023). The main identification assumption we invoke is that home price changes are conditionally exogenous with respect to health care expenditures. This would be violated if home price changes were correlated with the cost of health care services or with the demand for health care. The latter correlation is less of a concern in this context, since we control for health directly and individual health shocks are unlikely to be systematically correlated with county-wide home price changes. A mechanical positive correlation between the cost of health care services and home price changes is possible, which would bias our estimates upward. We argue that the pattern of results we find are inconsistent with this story, however.

Our empirical estimates indicate no effect of wealth on medical expenditures. For total out-of-pocket medical expenditures, we find a consistent and precisely estimated null effect of housing wealth. Regardless of whether we measure 2- or 4-year home price changes or whether we use reported or simulated home price changes, we can rule out anything other than small impacts that are not economically significant. In our preferred model, we find that a $10,000 increase in home prices over 2 years leads to a not statistically significant decrease in total out-of-pocket medical expenditures of $5.02 (-0.13% compared to the mean). The upper bound of the 95% confidence interval is $5.16 (0.13%), so we can rule out even small increases in expenditures. Similarly, the effect for 4-year home price changes is -$0.50 (-0.01%) with an upper bound of $8.04 (0.20%). Average total out-of-pocket expenditures in our sample are $3,867, which underscores the small magnitude of these estimates.

Medical expenditures exhibit a large right tail, which could render mean effects less relevant (Finkelstein and McKnight 2008). We further estimate the effects of home price changes on total out-of-pocket expenditures for each quartile of the expenditure distribution and find no evidence of meaningful impacts. These average effects may mask important variation across different types of individuals, however we continue to find null effects when we split the sample by Medicare enrollment status, health insurance status, household income, net household wealth, and net housing wealth. Finally, we examine effects on four categories of out-of-pocket medical expenditures: overnight hospital and nursing home stays; doctor visits, dental visits, and outpatient surgery; prescription drugs; and home health care and special health facilities. For each outcome, the point estimates are very close to zero and are precisely estimated such that we can exclude economically-meaningfully-sized effects in all

specifications. Taken together, we find robust and clear evidence that housing wealth does not affect out-of-pocket medical spending by older Americans.

This paper contributes to several strands of the literature. First, we add to the prior research on the effects of housing wealth on household behaviors. A growing set of studies demonstrates a link between home price variation and educational investments (Lovenheim 2011; Lovenheim and Reynolds 2013; Charles, Hurst and Notowidigdo 2018; Hotz et al. 2023), retirement behavior (Zhao and Burge 2017), consumer debt (Brown, Stein, and Zafar 2015), fertility (Lovenheim and Mumford 2013; Dettling and Kearney 2014; Daysal et al. 2021), and consumption (Zeldes 1989; Hurst and Stafford 2004; Campbell and Cocco 2007; Browing, Gortz, and Leth-Petersen 2013; Aladangady 2017; Guren et al. 2021). We extend this literature by examining out-of-pocket health care expenditures. That we find no evidence of a medical spending effect of home price changes despite prior findings of large responses along other dimensions such as human capital investments, consumption, retirement, and fertility is striking. Homeowners do increase spending when home equity increases. The fact that they do not increase health expenditures, even in a setting where out-of-pocket spending is large, suggests that older homeowners do not face constraints in financing needed health care services.

Our paper also contributes directly to a small set of studies that estimates the causal effect of household resources on health care utilization or health care expenditures of adults.[4] The two papers most closely related to this study are Tran, Gannona, and Rose (2023) and Costa-Font, Frank, and Swartz (2019). Tran, Gannona, and Rose (2023) estimate the effects of housing wealth on older Americans' health care utilization using HRS data from 1996 to 2016. Using county-level home prices as an instrument for total wealth or housing wealth, they find that higher wealth leads to increases in the number of doctor visits, prescription drugs, outpatient surgery, and dental services. Costa-Font, Frank, and Swartz (2019) use 1996-2010 HRS data and a similar empirical strategy to estimate the impact of housing wealth on the utilization of long-term care by older Americans. Their findings indicate that an increase in

[4] There also is a body of work that examines how wealth affects health (Schwandt 2018; Lindqvist, Östling, and Cesarini 2020; Cesarini et al. 2016; Erixson 2017; Fichera and Gathergood 2016). While these studies present some evidence of a positive impact of wealth on health, they do not address the question of whether consumers face credit constraints in health care consumption. This question only can be examined using expenditure data. In addition, in contrast to the findings of some of these studies, we find no evidence of the effects of home price changes on health.

housing wealth results in an increase in the utilization of paid home health care, nursing home, and unpaid informal care.

This paper was begun independently of both of these papers, however there are clear similarities in the data used and the questions posed. Nonetheless, our results contrast from the findings of these prior papers and suggest that housing wealth variation is not meaningfully related to health care expenditures. A key difference between our approach and these prior papers is the alignment between the measurement of home price changes and health care expenditures/utilization. Both Tran, Gannona, and Rose (2023) and Costa-Font, Frank, and Swartz (2019) estimate the effects of housing wealth in year t on health care utilization reported in the same survey year (t). However, in year t, the HRS survey asks about health care expenditures/utilization between years $t-2$ and t.[5] Thus, these papers effectively examine how health care utilization over the past 2 years relates to current home prices, which will not isolate the causal effect of wealth on expenditures. We thus argue that our paper provides new and novel evidence on the causal effect of housing wealth on health care spending. The contribution of our paper is underscored by the differences in findings between our work and this prior research. As well, we provide a distributional analysis that examines how housing wealth affects expenditures across the expenditure distribution and a heterogeneity analysis that estimates effects by key respondent characteristics, such as Medicare enrollment status, health insurance status, household income, and household wealth. Our results provide clear evidence that housing wealth variation does not affect health care expenditures overall or for any relevant subgroup.

Our results align more closely with Cesarini et al. (2016), who find no effects of wealth on adult health care utilization among Swedish lottery winners. Sweden has universal health care that requires little to no out-of-pocket expenditures. Hence, it is not surprising that there are no effects of wealth shocks on health care utilization in that setting. Estimating these effects in the U.S. system that requires more direct consumer payments is of independent importance. Furthermore, homeownership is more ubiquitous than is lottery participation, and housing

[5] Specifically, both papers use HRS data, and thus their dependent variables are health care utilization "for the past 2 years" reported in each survey year of the HRS analysis samples. As well, both papers report using home prices over the same time period as the survey years included in their analyses. Hence, it appears that they link housing prices in each survey year to medical care utilization over the prior 2 years. There is no discussion in either paper of using lagged housing price measures or of adjusting for the differences in timing between when home prices and health care utilization are measured.

wealth is far larger than lottery-based wealth on average. Examining effects of this source of wealth on health care expenditures is of high interest.

Additionally, several prior studies show evidence linking housing wealth with demand for medical care services among the elderly. Using HRS data, Butrica and Mudrazija (2016) find that median home equity values decline more for households that experience a health-related event over a 10-year period. Other studies show that home equity falls after a health shock (Gilligan et al. 2018; Gupta et al. 2018; Poterba, Venti, and Wise 2018). According to Dalton and LaFave (2017), home equity is second only to formal health insurance as a financial resource for health-related consumption after a health shock in old age. Notably, these papers provide evidence that older people use their housing wealth to fund medical expenditures, but they do not examine how *changes* to home equity impact health care expenditures. Changes to home equity are likely to have the largest effect on expenditures when people face credit constraints.[6] Hence, our results contribute to this literature by suggesting that while housing wealth is used to fund out of pocket health care needs, elderly households do not face financial constraints in their ability to fund these expenditures.

2. Data

The data for this analysis come from the Health and Retirement Study, which is a nationally-representative sample of people aged 50 or older and their spouses or partners in the United States. The HRS is a longitudinal household panel study implemented by the Institute for Social Research at the University of Michigan. It is composed of seven cohorts: Initial HRS cohort, Asset and Health Dynamics among the Oldest Old (AHEAD) cohort, Children of Depression (CODA) cohort, War Baby (WB) cohort, Early Baby Boomer (EBB) cohort, Mid Baby Boomer (MBB) cohort, and Late Baby Boomer (LBB) cohort.[7] Interviews were carried out every year

[6] Home equity increases can increase health care expenditures if health is a normal good, even in the absence of credit constraints. If anything, this will bias our estimates away from zero, which is notable given that we do not find any evidence that home price changes affect medical expenditures. As discussed above, wealth also can improve health by increasing health investments in ways that would lead to lower health care expenditures. This might bias our estimates toward zero. We address this concern by showing that home price changes do not impact self-reported or predicted health.

[7] The Initial HRS cohort consists of those born between 1931 and 1941. The AHEAD cohort comprises those born before 1924. The CODA cohort is composed of those born between 1924 and 1930. The WB cohort is comprised of those born between 1942 and 1947. The EBB cohort consists of those born between 1948 and 1953. The MBB cohort is composed of those born between 1954 and 1959. The LBB cohort includes those born between

from 1992 to 1996 and every two years from 1996 to 2020. Between 1992 and 1996, the respondents in the Initial HRS cohort and their spouses or partners participated in the interviews in 1992, 1994, and 1996. During the same period, the respondents in the AHEAD cohort and their spouses or partners took the surveys in 1992, 1993, and 1995. The respondents in the other cohorts and their spouses or partners started to take part in interviews in 1998, 2004, 2010, or 2016, sequentially according to their birth years.

We use the RAND version of the HRS panel, which is a user-friendly version of the HRS supplied by the RAND Center for the Study of Aging. These data are ideal for this study because they contain information on out-of-pocket medical expenditures, the value of one's primary residence, and individual-level socioeconomic characteristics of each respondent. In addition, we obtained approval to access restricted-use HRS data, which provide information on each respondent's county of residence. We merge the RAND HRS data with the county-level information described below.

The RAND HRS data include detailed information on health care expenditures, such as total out-of-pocket medical spending, out-of-pocket expenditures for overnight hospital stays and overnight nursing home stays, out-of-pocket expenditures for doctor visits, dental visits, and outpatient surgery, out-of-pocket expenditures for prescription drugs, and out-of-pocket expenditures for home health care and special health facilities. Total out-of-pocket medical expenditures are calculated as the sum of these four components.[8] In the main regression analysis, we use all of these variables as dependent variables, however we focus on total out-of-pocket spending as our main outcome of interest. Each of these expenditure variables reflects the amount spent over the prior 2 years (i.e., between surveys) and does not include the amount spent on health insurance premiums.

Beginning in 2002, the RAND HRS data provide more disaggregated information on out-of-pocket expenditures for overnight hospital stays, nursing home stays, doctor visits, dental visits, outpatient surgery, home health care, and special health facilities. We use these seven variables as dependent variables in additional regression analyses.

The main independent variables in our models are 2-year and 4-year home price changes. This approach aligns with prior research that examines how housing wealth affects

1960 and 1965.

[8] Due to data limitations, it is not possible to identify how much respondents spend on medical services that are not covered by Medicare versus services that are covered by Medicare.

household behaviors (e.g., Lovenheim 2011; Lovenheim and Reynolds 2013; Lovenheim and Mumford 2014; Daysal et al. 2021). Importantly, the timing of these changes aligns with how medical spending is reported in the HRS: we examine how changes in housing wealth over the prior 2 or 4 years affect out of pocket medical spending over the prior 2 years. We measure home price changes in two ways. First, we use changes in reported value of the primary residence over each time period. Since this question is asked in every survey, we simply subtract the value of the home price in year t from the value in year $t-2$ or $t-4$. Using these home price change measures has the benefit of maximizing the amount of home price variation in the sample, but it also may introduce a bias in the estimates depending on why home prices change by different amounts across homeowners living in the same housing market.

To address this concern, we construct a "simulated" home price change that uses county-level variation in the value of residential houses. We construct this measure by merging the county-level Zillow Home Value Index with the RAND HRS data using the information on the county of residence in the restricted-use HRS data. The Zillow Home Value Index, which is supplied by Zillow Group, Inc., offers information on the typical value for homes between the 35th percentile and the 65th percentile range at the county level. To construct the simulated home price change, we first calculate a predicted price, $\widehat{P_{ict}}$, of the home owned by individual i in county c in year t using the following equation:[9]

$$\widehat{P_{ict}} = \frac{housing\ \ price_{ct}}{housing\ \ price_{ct-a}} \cdot P_{ict-a},\ a \in \{2,4\}, \tag{1}$$

where $housing\ \ price_{ct}$ is the Zillow Home Value Index. The simulated 2-year home price changes are calculated as $\Delta^2 P_{ict}=\widehat{P_{ict}} - P_{ict-2}$, while the simulated 4-year home price changes are calculated as $\Delta^4 P_{ict}=\widehat{P_{ict}} - P_{ict-4}$. Thus, we construct four different home price change measures that we use throughout the paper: reported 2-year home price change, reported 4-year home price change, simulated 2-year home price change, and simulated 4-year home price change.

[9] When we calculate the simulated 2-year home price change, subscript c indicates individual i's county of residence in year $t-2$. Likewise, when we generate the simulate 4-year home price change, subscript c indicates individual i's county of residence in year $t-4$.

Measures of changes in home prices over a 2- and 4-year period only are valid for homeowners. Hence, when examining 2-year changes in home prices, the sample includes only those who are homeowners in years t and $t-2$. Similarly, in models that use 4-year home price changes, the sample includes only those who are homeowners in years t, $t-2$, and $t-4$. In other words, we include only 2- or 4-consecutive-year homeowners in our samples.

A potential concern with focusing on 2- or 4-consecutive-year homeowners is the endogeneity of home ownership. To address this concern, we conduct robustness checks using homeowners in year $t-2$, $t-4$ or the baseline year as our sample. When we use homeowners in year $t-2$ or $t-4$, we calculate the simulated 2- or 4-year home price changes for all homeowners regardless of whether they sell their homes between year $t-2$ or $t-4$ and year t. When homeowners in the baseline year are used, the baseline years are 1996 for the Initial HRS cohort, 1998 for the AHEAD, CODA, and WB cohort, 2004 for the EBB cohort, 2010 for the MBB cohort, and 2016 for the LBB cohort.[10] To generate the simulated 2- or 4-year home price changes for these homeowners, first, we calculate the predicted home price in year t:

$$\widehat{P_{ict}} = \frac{housing\ \ price_{ct}}{housing\ \ price_{cb}} \cdot P_{icb}, \tag{2}$$

where the subscript b indicates the baseline year. We then calculate simulated 2-year home price changes, $\Delta^2 P_{ict}$=$\widehat{P_{ict}} - \widehat{P_{ict-2}}$, and simulated 4-year home price changes, $\Delta^4 P_{ict}$=$\widehat{P_{ict}} - \widehat{P_{ict-4}}$, and use them as our independent variables in these robustness checks.

Figure 1 shows trends in reported home price changes, simulated home price changes, and county-level home price changes[11] for 2-year (Panel A) and 4-year (Panel B) changes. On average, these series track one another closely. This is strong evidence that people are able to accurately predict the value of their home and that home price changes are salient to homeowners, which has been found in other datasets as well (e.g., Lovenheim 2011). There

[10] The Initial HRS cohort and the AHEAD cohort participated in the survey in 1996 and 1995 respectively. Since the Zillow Home Value Index starts in 1996, we can calculate the simulated 2-year home price changes between 1996 and 1998 only for the Initial HRS cohort but not for the AHEAD cohort. This is the reason why the baseline years are 1996 for the Initial HRS cohort and 1998 for the AHEAD cohort.

[11] The county-level home price changes are calculated as $\Delta^a housing\ \ price_{ct} = housing\ \ price_{ct} - housing\ \ price_{ct-a},\ a \in \{2,4\}$.

also are minor differences across the different measures. It is not ex-ante clear which is the best measure of home price changes, and so we show all estimates using reported and simulated changes.

One benefit of using the RAND HRS data for this analysis is that they contain extensive information on respondents' and their spouses' or partners' socioeconomic status. These variables include age, marital status, annual household income, net household wealth, net value of the primary residence,[12] coverage by several types of health insurance plans, self-reported health status, gender, race, Hispanic origin, and educational attainment. Among these variables, we control for the time-varying individual-level characteristics[13] in our empirical models, which helps to account for any correlation between the demand for medical services or the ability to pay for medical services and factors that influence home price variation.

Specifically, we create indicators for each age in years as well as for whether a respondent is married, married but spouse is absent, partnered, separated or divorced, widowed, or never married. We calculate the value of net household wealth excluding housing as the value of net household wealth less the net value of the primary residence. Using the information on each respondent's ownership of several types of health insurance plans, we create indicators for whether a respondent is covered by Medicare, Medicaid, CHAMPUS/VA, employer-provided health insurance, long-term care insurances, or other insurance. The dummy variables for whether a respondent is covered by long-term care insurance consists of three indicators: whether a respondent's nursing home care is covered by long-term care insurance, whether a respondent's in-home care is covered by long-term care insurance, and whether a respondent is covered by other long-term care insurance.[14] Based on each respondent's self-reported health status, we generate an indicator variable equal to 1 if a respondent's self-rated health is "Fair" or "Poor" and is 0 otherwise.[15]

It is possible that home price increases affect health care spending through altering

[12] The net value of primary residence is calculated as the value of the primary residence less the value of mortgages and other home loans based on the primary residence.
[13] Time-invariant individual-level characteristics (gender, race, Hispanic origin, and educational attainment) are used to generate the predicted probabilities of poor health and to implement some robustness checks that do not include individual fixed effects.
[14] Note that the indictors for the ownerships of several types of health insurance plans are not mutually exclusive.
[15] In the RAND HRS data, there are 5 categories for self-rated health status: "Excellent," "Very Good," "Good," "Fair," and "Poor."

health.[16] We examine the effect of home price changes on health in order to address this alternative, non-financial channel that could influence our findings. We estimate the effect of home price variation on the likelihood of reporting being in poor health as well as on the predicted probability of being in poor health (Bound et al. 1999; Insler 2014). The RAND HRS data provide information on doctor-diagnosed health conditions,[17] BMI, difficulties in daily living activities,[18] difficulties in instrumental activities of daily living,[19] and other functional limitations[20] of respondents. With respect to doctor-diagnosed health conditions, the HRS asks the survey respondents about whether they have "ever" had each specific condition. We use this information to generate the predicted probabilities of poor health.

To construct predicted probabilities of poor health, we follow the prior literature (e.g., Bound et al. 1999; Yun 2020) to estimate the following equation:

$$H_{it} = \gamma_0 + \gamma_1 HP_{it} + \gamma_2 X_{it} + u_{it}. \quad (3)$$

In equation (3), subscript i denotes individual i, subscript t indicates year t, and X_{it} represents individual-level control variables.[21] H_{it} is an indicator for self-reported poor health and HP_{it} is a vector containing the above-described information on specific health problems. We first include only doctor-diagnosed health conditions and obesity[22] in HP_{it} (Poor Health 1). We then add difficulties in daily living activities, difficulties in instrumental activities of daily living, and other functional limitations in HP_{it} (Poor Health 2). We estimate each regression separately for males and females and cluster standard errors at the individual level.

[16] For instance, as discussed above, wealth can result in health improvements by increasing health investments in ways that would decrease medical care spending.
[17] These doctor-diagnosed health conditions include high blood pressure, diabetes, cancer, lung disease, heart problems, stroke, psychological problems, and arthritis.
[18] The variables for difficulties in daily living activities include indicators for whether respondents have some difficulty dressing, walking across a room, bathing, eating, getting in or out of bed, and using the toilet.
[19] The variables relevant for difficulties in instrumental activities of daily living include dummy variables for whether respondents have some difficulty using a map, using a telephone, managing money, taking medications, shopping for groceries, and preparing a hot meal.
[20] The variables related to other functional limitations contain indicators for whether respondents have some difficulty walking several blocks, jogging approximately a mile, walking one block, sitting for two hours, standing up from a chair after sitting for long periods, climbing several flights of stairs without a rest, climbing one flight of stairs without a rest, stooping/kneeling/crouching, lifting or carrying weight over 10 pounds, picking up a dime from a table, reaching or extending the arms above shoulder level, and pulling or pushing large objects.
[21] These individual-level control variables include age, race (White, Black, other), Hispanic origin, educational attainment (less than high school, GED, high school graduation, some college, BA+), marital status, and being foreign born. In the regressions for males, veteran status is included as an additional control variable.
[22] Obesity is defined as having a BMI over 30.

Online Appendix Table A-1 shows the logistic coefficients and average marginal effects from these regressions that use the 2- or 4-consecutive-year homeowner samples.

We additionally merge several county-level control variables into our analysis dataset, using the restricted-use county codes in the HRS. We obtain unemployment rates by county and year from the U.S. Bureau of Labor Statistics and median household income and poverty rates by county and year from the U.S. Census Bureau's Small Area Income and Poverty Estimates program. Since the outcomes on which we focus are out-of-pocket medical expenditures over the past 2 years, we calculate 3-year averages of county-level unemployment rates, county-level median household income, and county-level poverty rates across years t, $t-1$, and $t-2$. These variables are used as county-level control variables in our regressions.

In the RAND HRS data, there are 42,406 respondents and 280,343 observations from 1992 to 2020. The Zillow Home Value Index begins in 1996. Therefore, the sample years start in 1998 when we use the 2-year home price changes as independent variables and in 2000 when we utilize the 4-year home price changes as independent variables. For the most disaggregated expenditure measures, the sample begins in 2002 because that is the first year in which these measures are included in the HRS.

We drop observations with 0 or missing weights from our main analysis samples, which includes all observations in 2020 since the data do not provide weights for observations in that year. As a result, the sample years are 1998 to 2018 when 2-year home price changes are used as independent variables and 2000 to 2018 when we use 4-year home price changes as independent variables. To focus on older Americans, we drop respondents under the age of 50. These observations are young spouses or partners of HRS respondents. We additionally exclude respondents from our main analysis samples if any information on total out-of-pocket medical expenditures, the four components of out-of-pocket spending, or the abovementioned control variables is missing. We keep only 2- or 4-consecutive-year homeowners in our samples. Observations with any missing values for the four kinds of home price changes are excluded from our main analysis samples. We also drop singleton observations, since we control for individual fixed effects in our main specifications. As a result, the analysis sample for 2-consecutive-year homeowners includes 19,003 respondents and 103,748 observations, while the analysis sample for 4-consecutive-year homeowners consists of 16,395 respondents and 82,911 observations. Online Appendix Table A-2 shows how many respondents and observations are left in our analysis samples when we impose each of these sample conditions.

Among the RAND HRS observations who are 50 years old or older and do not have any missing dependent variables or control variables, 76.5% are 2-consecutive-year homeowners and 73.9% are 4-consecutive-year homeowners. After excluding homeowners with any missing independent variables and singleton observations, the 2-year sample and the 4-year sample include 66.3% and 64.4% of the RAND HRS observations, respectively. Hence, our sample of homeowners represents a large majority of older Americans.

Table 1 presents summary statistics of analysis variables in our samples. All dollar values are converted to real 2020 dollars using the Consumer Price Index from the Federal Reserve Bank of St. Louis. Elderly out-of-pocket medical spending is about $3,900 on average over a 2-year period. The expenditure distribution is highly skewed, with median out-of-pocket medical spending at approximately $1,700. The average expenditure is under $210 in the bottom quartile and is over $11,500 in the top quartile (see Table 8). As Table 1 shows, most of the expenditures are for doctor visits, dental visits, outpatient surgery, and prescription drugs. The average home price change experienced by homeowners in our sample is modest, ranging from $6,300 to $7,900 over 2 years and $9,800 to $15,100 over 4 years. These averages mask large changes driven by the housing boom and bust, as shown in Figure 1 and the large standard deviations of the home price change variables in Table 1.

About 50% of the observations in our samples are Medicare beneficiaries, and the average respondent age is about 67. The distributions of annual household income and non-housing wealth also are highly-skewed. While average annual household income is over $100,000 and average non-housing wealth is over $540,000, median household income is approximately $70,000 and median non-housing wealth is about $170,000. With standard deviations larger than the mean, there is a lot of variation in household economic circumstances in our data that we will use to examine heterogeneous responses to home price fluctuations below.

3. Empirical Strategy

Our empirical approach is to relate changes in housing wealth over a 2- or 4-year period to out-of-pocket medical expenditures over the prior 2 years using the following regression equation:

$$y_{ict} = \beta_0 + \beta_1 \triangle P_{ict} + \beta_2 X_{ict} + \beta_3 Z_{ct} + \phi_i + \gamma_c + \theta_t + \varepsilon_{ict}, \quad (4)$$

where subscript i denotes individual i, subscript c indicates individual i's county of residence, and subscript t denotes the calendar year. In the main analysis, y_{ict} is the total out-of-pocket medical expenditures or out-of-pocket expenditures on the four categories of expenditures discussed in Section 2. The main independent variable of interest is $\triangle P_{ict}$, which is the 2-year or 4-year change in home prices. We use both reported and simulated changes in the results below. The vector X_{ict} consists of time-varying individual-level control variables that are explained in Section 2. Because the dependent variables in equation (4) are out-of-pocket medical expenditures during the past 2 years, the time-varying individual-level control variables are measured in year $t-2$ to avoid any potential bias from reverse causality. The vector Z_{ct} represents county-level control variables, including 3-year averages of unemployment rates, median household income, and poverty rates in the individual's county of residence. Finally, ε_{ict} is an error term.

We focus on changes in home prices rather than on home price or equity levels for several reasons. First, home price or equity levels are more likely to be endogenous than are changes, since home price growth has a strong regional component that is unlikely to be correlated with individual variation in health care spending. Second, people can own high-price homes but have little equity in them. Changes in home prices translate directly into housing wealth and are more likely to be exogenous, which is why we follow the prior literature in using this measure of housing wealth variation (e.g., Lovenheim 2011; Lovenheim and Mumford 2013; Daysal et al. 2021). Third, by using changes in home prices in the past 2 or 4 years as our independent variables, our specifications align the timing of the family resource change with the timing of the health care expenditures.

Mullahy and Norton (2022) show that, even when dependent variables are non-negative, follow right-skewed distributions, and have a large probability mass at zero, OLS regressions that use untransformed dependent variables yield correct marginal effects. Furthermore, they show that using a log or inverse hyperbolic sine transformation of dependent variables in these settings yield biased estimates. Thus, in the main analysis, we use the out-of-pocket medical expenditures in levels (including zeros) as our dependent variable.[23] We conduct robustness

[23] We are unable to estimate the two-part model suggested by Mullahy and Norton (2022). Instead, we estimate robustness checks that follow the spirit of the two-part model.

checks to examine whether our results are driven by a small number of outliers by using different transformations of the dependent variable, and we also examine effects by quartile of out-of-pocket spending. These estimates indicate that our results and conclusions are not sensitive to the specific way in which we specify the dependent variable.

The main identification assumption embedded in equation (4) is that conditional on the control variables, home price changes are exogenous with respect to out-of-pocket medical expenditures. Bias in our model comes from any correlation between home price changes and either the demand for health care or the cost of health care services. With regard to the correlation between home price changes and the demand for health care, there are two potential sources of such bias in this model: 1) people who will have higher out-of-pocket medical expenditures in the future sort into neighborhoods where home prices are anticipated to increase more, and 2) contemporaneous shocks might affect both the demand for health care and home prices.

Focusing on the demand side, we do not think it is likely that the first concern will induce a bias in our estimates because future health shocks are very difficult to predict. There is a positive health-wealth correlation, but it is not strong and does not appear to be causal in nature (Meer, Miller, and Rosen 2003; Adams et al. 2003; Apouey and Clark 2015). The controls we include in the model for health status, health insurance status, household income, non-housing wealth, and individual fixed effects should account for any bias from the cross-sectional relationship between health and wealth. Furthermore, the use of simulated home price changes helps to address this source of bias by using county-wide measures of home price changes. County-level variation in home prices is unlikely to be correlated with any unobserved shocks, behaviors, or preferences of individual homeowners.

Contemporaneous shocks that affect both the demand for medical care and home prices could bias our estimates. These shocks are most likely driven by factors like macroeconomic variation, where recessions could simultaneously reduce home prices and the demand for health care. We control for the county unemployment rates, median household income, and poverty rates in order to help address this concern. We are unaware of other sources of shocks that would affect both the demand for medical services and home prices. There still may be other economic conditions or state-wide policies we do not capture that are correlated both with home price changes and the demand for health care. To address this concern, in robustness checks, we control for state by year fixed effects instead of year fixed effects. We are unable to

control for state-year and individual fixed effects in the same model, however, so these estimates exclude individual fixed effects and include the time-invariant individual controls (gender, race, Hispanic origin, and educational attainment).

While it is unlikely that home price variation is endogenous with respect to the demand for health care, there could be a positive correlation between the cost of health care services and home prices that is driven by cost-of-living variation. As housing becomes more expensive, the price of services in the local economy may increase. This would bias our estimates upward. Any such relationship is likely to be small in magnitude, however, because many prices are negotiated between health care and insurance providers (most notably Medicare) and do not exhibit much spatial variation. Our results are inconsistent with such a bias, as they are universally close to zero. If anything, the estimates presented below represent an upper bound of the effect of wealth on out-of-pocket medical spending.

The Great Recession occurs during the middle of our analysis sample, which could drive some of our estimates and limit external validity. We thus conduct robustness checks in which we drop survey years 2008, 2010, and 2012 from the analysis. In other robustness checks, we include only the survey years beginning in 2012 to concentrate on periods with the most recent financial circumstances. These sample changes do not impact our results.

Another concern related to unobserved shocks is how they affect the control variables. In order to examine whether our estimates are biased by individual-level shocks correlated with home price changes, we conduct robustness checks that use control variables measured in year t rather than in year $t-2$. Our results are robust to changes in the timing of when control variables are measured.

Endogenous mobility could bias our estimates if those experiencing an adverse health shock or an increase in need for out-of-pocket medical spending sell their house and move between years $t-2$ or $t-4$ and year t. To produce a bias, such behavior would have to be correlated with home price changes. We emphasize that the simulated home price change measure should not be influenced by movers, as we use the county-level home price change interacted with lagged home price from the home that was owned in year $t-2$ or $t-4$. This is akin to an intent-to-treat estimate, where we leverage the expected growth of the house owned in prior periods. Subsequent mobility will not affect this measure, and so the fact that the results using this home price change measure is so similar to our main estimates indicates that mobility does not bias our conclusions. In order to further mitigate concerns related to

mobility, we estimate models that use a sample of homeowners who do not move between survey waves. That is, we exclude respondents who move across counties or neighborhoods.[24] Excluding movers has no impact on our results and conclusions.

Similarly, there might be some concern related to the endogeneity of the homeowner sample, if those experiencing a negative health shock or growth in need for out-of-pocket medical expenditures sell their house between year $t-2$ or $t-4$ and year t. To address this concern, we conduct robustness checks using homeowners in year $t-2$, $t-4$, or in the baseline years explained in Section 2 as our samples. In these robustness checks, we use the simulated 2- or 4-year home price changes as the independent variables and do not condition on owning a home over a consecutive 2- or 4-year period. We show that our results are robust to not conditioning on continuous home ownership. Finally, we examine how total out-of-pocket medical expenditures varies with different leads and lags of home price changes by estimating a version of equation (4) that includes the lag of home price changes ($\triangle P_{ict-2}$ or $\triangle P_{ict-4}$) or the lead of home price changes ($\triangle P_{ict+2}$ or $\triangle P_{ict+4}$) as independent variables in addition to the main home price change variables ($\triangle P_{ict}$). Controlling for leads and lags of home price changes suggests that our estimates are not biased by differential pre-existing trends and does not alter our main conclusions.

We interpret our null results as evidence that older Americans are not credit constrained with respect to health care spending. However, it is possible that home price increases induce investments that lead to improved health and thus lower health care expenditures. This would bias our estimates towards zero. To address this possibility, we investigate the effects of home price changes on older Americans' health. We use a dummy variable for poor health created using self-reported health status as well as the predicted probabilities of poor health (explained in Section 2) as dependent variables in equation (4). These estimates exclude the control for poor health in year $t-2$ that is part of the control set in the main estimates of equation (4). The results do not provide any evidence that home price variation affects health.

[24] We use the HRS Public Survey data to identify movers. The HRS Public Survey data supply information on whether a respondent's household moved since the previous wave. There are 7,537 movers among the 2-consecutive-year homeowners and 10,331 movers among the 4-consecutive-year homeowners. However, there is a small number of respondents who are reported as non-movers in the HRS Public Survey data but whose state or county of residence changed between survey years: 540 among the 2-consecutive-year homeowners and 535 among the 4-consecutive-year homeowners. We code these respondents as movers and exclude them from these samples.

To examine potential heterogenous effects of home price changes, we also estimate equation (4) splitting our samples by quartiles of the spending distribution, Medicare enrollment status, health insurance status, household income, net household wealth, and net housing wealth. We also split the samples by quartiles of the spending distribution among non-Medicare beneficiaries, Medicare beneficiaries, those without health insurance, and those with health insurance.[25]

Throughout, we cluster standard errors at the county level because of the strong correlation in local home price movements within county. Since the smallest number of clusters (i.e., counties) is 63 and the numbers of clusters are much larger in most models, it is reasonable to assume that the sampling distribution of β_1, the coefficient of interest, asymptotically follows a Gaussian distribution (Cameron, Gelbach, and Miller 2008; Cameron and Miller 2015). Hence, we do not suffer from problems associated with inference on a small number of clusters. We use individual-level weights from the RAND HRS in all models and estimates. As well, we obtain qualitatively similar results when we use home price changes in percent terms as our independent variables.

4. Results

4.1. Descriptive Evidence on the Liquidity of Housing Wealth for Older Americans

Interpreting our estimates as providing insight into the extent of credit constraints older Americans face with respect to health care consumption requires that housing wealth be liquid. That is, older individuals need to be able to tap this wealth in order to fund expenditures. Previous research shows that housing wealth is liquid on average (Mian and Sufi 2011) and is used to help fund large life events, like college enrollment, retirement, and having a child (e.g., Lovenheim 2011; Lovenheim and Reynolds 2013; Zhao and Burge 2017; Lovenheim and Mumford 2013; Dettling and Kearney 2014; Daysal et al. 2021; Hotz et al. 2023). Aside from retirement, these events tend to occur earlier in the lifecycle. In this section, we provide

[25] Since more singleton observations are excluded from these samples, the sum of observations in each split sample does not always equal the total number of observations.

descriptive evidence that housing wealth is similarly liquid for older and younger households.

Figure 2 shows tabulations of home loan applications and originations among younger (age $\leq$ 54) and older households (age $\geq$ 55). The data are from the Dynamic National Loan-Level Dataset, 2018 to 2020, which are comprised of information collected through the National Home Mortgage Disclosure Act (HMDA). These files contain mortgage applications and originations in the HMDA datasets for all HMDA reporters, including demographic information of the borrower. We exclude loans for which the information on the purpose or the information on the age of applicants is missing from our analysis samples. For the histograms of loan-to-value (LTV) ratios and combined LTV ratios, we drop the top 1% to exclude extreme values. Importantly, the LTV ratios show, compared to the value of their property (home) relied on in making the credit decision, how much cash people actually extract through home loans, rather than the maximum amount of cash people can extract.

Panel A of Figure 2 shows the composition of loan purposes among all loan applications. Overall, most loan applications are for refinancing or a new home purchase; 22.2% of loan applications are for cash (cash-out refinancing and other purpose). Among those 55 and older, 31.8% of applications are for cash, compared to 17.9% of applications for younger households. Hence, older people are relatively more likely to extract cash from their home equity than are younger households.

Older households are not substantially less likely to have their loans approved: the proportion of originated loans among all loans applications is 0.59 for all Americans, 0.60 for young Americans, and 0.55 for older Americans. The proportion of originated loans among all loan applications for cash is 0.52 overall, 0.54 for young households, and 0.51 for older households. While older households are slightly less likely to originate loans, it is not much harder for them to obtain home loans for cash relative to their younger counterparts. Panel B reinforces this point by showing the distribution of home loan originations by age. Overall, 19.9% of originations are for cash, while for the elderly this percentage is 29.3 (compared to 16.0 for younger households). These tabulations indicate that older households are actually more likely to extract their home equity through originating cash-out home loans than are those under age 55. Therefore, our null findings below are likely not a reflection of illiquid housing wealth for the elderly.

Panels C and D show loan-to-value (LTV) ratios for the current loan and for all loans,

respectively. All of the loans in Panels C and D are for cash. The mean and median of LTV ratios for all originated loans for cash are 57.0 and 63.0 for all Americans, 58.9 and 67.2 for young Americans, and 54.5 and 57.9 for old Americans in Panel C. The distributions of LTVs by household age are similar, other than a larger spike at 80% among households under 55. Older people extract somewhat smaller shares of their home equity, but their LTV ratios still are quite high and suggest a large proportion of equity extraction for cash. In Panel D, which shows combined LTV distributions among all originated loans for cash, the mean and median of combined LTV ratios are 79.3 and 70.0 for all Americans, 76.4 and 74.0 for younger Americans, and 83.1 and 64.4 for older Americans. Again, these results suggest that housing wealth is liquid for older individuals and households and that liquidity does not vary much with household age.

One limitation of the Dynamic National Loan-Level Dataset is that we only have information from 2018 to 2020, while the sample years of the RAND HRS data are from 1998 to 2018. Especially because our estimates span the Great Recession, there might be concern that the estimates in Figure 2 are not reflective of housing liquidity earlier in the sample. Figure 3 provides additional evidence on housing wealth liquidity from the HRS. In the RAND HRS, 3 types of home loans are reported: first mortgage, second mortgage, and other home loans. We classify the second mortgage and other home loans as home loans for cash. Panel A of Figure 3 shows that the proportion of the people who have home loans for cash is not lower in earlier years. It rises during the housing boom and then declines during and after the Great Recession, but it is not lower in earlier periods than in 2018. Panel B of Figure 3 shows that the combined LTV ratios for these loans are highly stable over time. These data reinforce the findings from Figure 2 that a substantial share of elderly households extract a significant proportion of their home equity through home loans for cash, making home equity a liquid form of wealth for this population.[26]

4.2. Baseline Estimates

Table 2 presents results from estimation of equation (4) on the RAND HRS data, using total

[26] As discussed in Section 1, a number of prior papers have found evidence that older people use their housing wealth to fund health care expenditures (Butrica and Mudrazija 2016; Gilligan et al. 2018; Gupta et al. 2018; Poterba, Venti, and Wise 2018; Dalton and LaFave 2017). These findings provide further evidence that housing wealth is liquid for older people with respect to health care expenditures.

out-of-pocket medical spending as the dependent variable. The first two columns in Table 2 present estimates using 2-year home price changes, and the second two columns present results using 4-year home price changes. As well, columns (1) and (3) employ reported home price changes, while columns (2) and (4) use simulated home price changes based on the Zillow county-level home price index. The tables below follow a similar layout. All estimates include the full set of controls shown in equation (4) and discussed in Sections 2 and 3.

The results in Table 2 point to no effect of home price changes over the 2- or 4-year interval on out-of-pocket medical spending. The coefficients are very close to zero, and they are precisely estimated. The brackets below each point estimate and standard error present the 95% confidence intervals, and in each column we can rule out all but very small impacts. Indeed, in all four columns the point estimates are negative. Given concerns about potential bias from observed variation in home price changes, the simulated home price change estimates are our preferred results. In column (2), the point estimate indicates that each $10,000 increase in home equity leads to a $5.02 decrease in medical spending, which translates to -0.13% relative to the mean (5.02/3866.83). The upper bound of the 95% confidence interval is $5.16, or 0.13%. Similarly, in column (4) there is a point estimate of -0.50 (-0.01%) with an upper bound of $8.04 (0.20%). The estimates using reported home price changes are similar and more precise, indicating an even smaller 95% confidence interval. Across the columns of Table 2, we can rule out anything but minor effects of home price changes on out-of-pocket medical spending.

Table 3 shows that our results and conclusions are robust to different ways of specifying the dependent variable. Out-of-pocket medical expenditures are right-skewed while also exhibiting a large mass at zero. Mullahy and Norton (2022) show that using the dependent variable in levels in these cases, as we do in Table 2, yields unbiased marginal effects. Furthermore, they show that using a log or inverse hyperbolic sine transformation in these cases is problematic. In order to show that our results are not being driven by a particular functional form assumption, Table 3 presents several different transformations of the dependent variable. Columns (1)-(4) use a binary variable for any out-of-pocket medical expenditures, showing that housing wealth variation does not impact the extensive margin. In columns (5)-(8), we use only positive expenditures in levels, with results that closely match those in Table 2. Together, even though we use linear probability models instead of logit models in columns (1)-(4), columns (1)-(8) show the components of the two-part model suggested by Mullahy and Norton

(2022).

Next, we use a log transformation in columns (9)-(12). We include only the observations with positive health care expenditures in the samples for these columns. The simulated 2-year estimate is negative and statistically significant, though still small in magnitude, while the null effects persist in the other columns. There continues to be no evidence of positive effects of home price changes on out-of-pocket medical expenditures. Columns (13)-(16) show estimates using the inverse hyperbolic sine of the dependent variable, and the final four columns use expenditures in levels but excluding the top 5% of the distribution to assess the role of outliers. The estimates are universally close to zero and rule out anything but a minor positive relationship between home price changes and out of pocket medical expenditures. We conclude from Table 3 that our findings in Table 2 are not driven by functional form assumptions of our dependent variable.

Table 4 presents estimates that show the robustness of our results and conclusions to state-by-year fixed effects and to the exclusion of different sample periods. A central identification assumption underlying equation (4) is that home price changes are uncorrelated with state-level economic conditions or other state-level policies that might also impact out of pocket medical spending. The Affordable Care Act was implemented during our sample period, which is the policy of highest concern. We include state-by-year fixed effects in columns (1)-(4), which show that our estimates are unaffected by state-level economic conditions or state-level policies. The results are very similar to baseline.

In columns (5)-(8), we exclude the years of the Great Recession, since housing became less liquid during this period because of changes to financial markets. Our results do not meaningfully change when we exclude these years. Finally, we estimate our models only for the post-recession years beginning in 2012 to focus on periods with the most recent financial environment. None of the estimates is statistically significant, however the simulated home price change effects are larger in magnitude. They still only represent a non-significant $20.62 (0.59%) and $24.46 (0.70%) increase in out-of-pocket medical spending, however, with $53.53 (1.54%) and $70.97 (2.03%) upper bounds of the 95% confidence intervals. These results do not point to even modest effects of home equity changes.

Table 5 explores the robustness of our results to when we measure the control variables and to how we treat movers. In columns (1)-(4), we present estimates that use control variables measured in year t rather than in year $t-2$. In columns (5)-(8) we use control variables

measured identically to those in Table 2 while excluding all movers, and in the final columns we drop all movers from the sample and use controls measured in year t. As discussed in Section 3, movers are defined as those who switch counties or neighborhoods between survey waves. All results are very similar to baseline.

The next set of robustness checks in Table 6 relaxes the sample criteria of requiring consecutive 2- or 4-year home ownership. We only require that the respondents own a home in year $t-2$, $t-4$, or the baseline years, and then we estimate equation (4) using the simulated home price changes explained in Sections 2 and 3. The results and conclusions match those in Table 2 closely, suggesting that our estimates are not being driven by requiring consecutive home ownership during the time period of the home price change.

Finally, we examine how the timing of home price changes relates to reported out-of-pocket medical spending between years $t-2$ and t. Spending over the prior 2 years should not be affected by future home price changes, while it could be affected by lagged home price changes if there are time-varying effects. Table 7 shows estimates that include home price changes between years $t-4$ and $t-2$ as well as between years t and $t+2$ in the 2-year change models (columns (1)-(6)). For the 4-year change models (columns (7)-(12)), we include home price changes between years $t-8$ and $t-4$ as well as between years t and $t+4$. The lag and lead estimates are universally small in magnitude, suggesting our results are not biased by correlated trends in the treatment and outcome variables. As well, the main estimates are similar to baseline, which indicates that our results are robust to the inclusion of leads and lags.

One concern with our preferred interpretation of the results as reflecting a lack of credit constraints among older homeowners is that wealth increases could lead people to make investments in their health that could reduce medical expenditures. This would attenuate our estimates, making it difficult to disentangle the role of alternative health investments from credit constraints. In Online Appendix Table A-3, we directly examine whether home price changes affect reported and predicted health in order to provide evidence on this potential source of bias. Columns (1)-(4) report results that use an indicator for poor health in year t as the dependent variable. In columns (5)-(8), the dependent variable is the predicted probability of poor health 1 generated using the results in columns (1)-(4) in Online Appendix Table A-1. In columns (9)-(12), the dependent variable is the predicted probability of poor health 2 created

using the estimates in columns (5)-(8) in Online Appendix Table A-1. Across columns, the estimates in Online Appendix Table A-3 show no evidence that home price changes impact health, which supports our preferred interpretation of the main results.

4.3. Heterogeneous Effects

Out-of-pocket medical expenditures are highly skewed, exhibiting a large right tail: the average of total out-of-pocket medical expenditures is under $210 in the bottom quartile and is over $11,500 in the top quartile. Average effects may mask large changes high up in the distribution. To assess whether there are larger impacts higher up in the expenditure distribution, Table 8 shows estimates of equation (4) separately for each quartile of out-of-pocket spending.[27] None of the estimates is economically meaningful in magnitude. The only statistically significant positive effect (at the 10% level) is in column (3) of Panel A, and it is $0.09 (0.04%). Table 8 indicates that even the top of the out-of-pocket medical expenditure distribution is unaffected by housing wealth.

We next turn to an examination of whether there are heterogeneous effects by household characteristics. Those who are 65 and over are eligible for Medicare. As discussed above, more than 25% of adults under age 65 report that they experience difficulties in paying for health care services (Dickman, Himmelstein, and Woolhandler 2017). Medicare beneficiaries also spend substantial amounts of money on medical care owing to Medicare's bounded scope of benefits and unlimited cost-sharing.[28] These are the reasons why policy proposals such as "Medicare for All" suggest universal and comprehensive health insurance without cost-sharing. Table 9 presents estimates separately by whether respondents are Medicare beneficiaries. Neither Medicare beneficiaries nor non-beneficiaries exhibit significant out-of-pocket spending reaction to home price changes. All estimates are close to zero and are precisely estimated.[29]

Most of the non-Medicare beneficiaries have other forms of health insurance that may

[27] Since we use individual-level weights from the RAND HRS to determine the cutoffs for each quartile, the numbers of observations are not the same across quartiles.

[28] While Schoen, Davis, and Willink (2017) report that Medicare beneficiaries expend $3,024 per year on health care services on average, Medicare beneficiaries in our sample spend a somewhat smaller amount on medical care. Table 9 shows that the average out-of-pocket medical expenditures for the past 2 years among Medicare beneficiaries is about $4,300 (or $2,150 per year).

[29] Online Appendix Tables A-4 and A-5 present estimates by quartile of expenditure for non-Medicare beneficiaries and for Medicare beneficiaries, respectively. There is no evidence that any part of the expenditure distribution is affected by home equity variation for either group.

make private wealth less relevant for spending decisions. In Table 10, we present estimates separately by the health insurance coverage of the respondent. Panel A contains results for those without health insurance, which comprise only 4% of the overall sample. The estimates in both panels are universally small in magnitude and negative. They are less precise in Panel A because of the smaller sample size, but even these estimates can rule out an effect larger than $40.61 (1.16%). Table 10 shows null effects in line with the baseline estimates regardless of health insurance status.[30]

Table 11 explores heterogeneity by household income. We split the samples into three approximately equal-sized groups based on annual household income: $40,000 or less, between $40,000 and $90,000, and $90,000 or more. For no group is there a meaningful positive relationship between home price changes and out-of-pocket expenditures. In particular, the group for which we would expect the largest effect – low-income households – are unresponsive to home price changes. We can rule out effects larger than $44.38 (1.11%) for each $10,000 increase in home equity across the columns of Panel A in Table 11. This is in contrast to other settings, such as education, where investments among low-income households are the most responsive to home equity variation (Lovenheim 2011; Lovenheim and Reynolds 2013).

Tables 12 and 13 investigate heterogeneous impacts by net household wealth and net housing wealth. We split the sample in Table 12 by whether their net household wealth is equal to or lower than $500,000 and the sample in Table 13 by whether their net housing wealth is equal to or lower than $300,000. In both tables, for both higher and lower wealth households, the point estimates are small and none is statistically significantly different from zero at even the 10% level. We can rule out effects larger than $35.55 (0.94%) for each $10,000 increase in home price in each table.

The null effects we document for total out-of-pocket medical spending could be masking important impacts among specific categories of expenditure that require more or less

[30] Online Appendix Tables A-6 and A-7 present estimates by quartile for those without health insurance and with health insurance. In the top quartile among those without health insurance, the effects range from $20.32 (0.18%) to $146.74 (1.4%) and are not statistically significant. The small sample sizes lead to less precise estimates, however the small point estimates align with the findings throughout the paper of no meaningful effect of home price changes on medical expenditures even for the uninsured. The estimates in Table A-7 for those with health insurance are universally close to zero and are precisely estimated.

out-of-pocket spending because of how different types of expenditures are treated by health insurance plans. Table 14 shows estimates for four separate categories of expenditure: overnight hospital and nursing home stays (Panel A), doctor visits, dental visits, and outpatient surgery (Panel B), prescription drugs (Panel C), and home health care and special health facilities (Panel D). In no panel is there evidence that medical spending responds positively to changes in home equity. Even in Panels B and C, where mean out-of-pocket spending is over $1,500, housing wealth has no detectable effect.

Online Appendix Tables A-8 through A-10 present estimates that disaggregate these categories even further, examining overnight hospital stays, overnight nursing home stays, doctor visits, dental visits, outpatient surgery, home health care, and special health facilities. For none of these disaggregated expenditure categories do we see any evidence that home price increases affect out of pocket medical spending. Aggregating expenditures into the categories shown in Table 14 does not mask effects of home equity on more specific medical expenditures.

5. Conclusion

We present novel evidence using variation in the housing market that, even though home price changes are salient to homeowners, substantial housing wealth changes have no effect on out-of-pocket medical spending. Using data from the Health and Retirement Study combined with reported and simulated variation in home prices among homeowners, we examine how 2- and 4-year changes in home prices (and thus in housing wealth) impact overall out-of-pocket medical spending as well as four constituent categories of expenditures. We also examine heterogeneous treatment effects by quartiles of the expenditure distribution, Medicare enrollment status, health insurance status, household income, net household wealth, and net housing wealth. Across all specifications, subsamples, and at each quartile of the spending distribution, we find no evidence that medical spending is impacted by housing wealth changes. Our estimates are precise, allowing us to rule out any economically significant effects.

These findings are in contrast with prior research on consumer responses to home prices, which has documented large effects on higher education investments (Lovenheim 2011; Lovenheim and Reynolds 2013; Charles, Hurst and Notowidigdo 2018; Hotz et al. 2023), fertility (Lovenheim and Mumford 2013; Dettling and Kearney 2014; Daysal et al. 2021), consumption (Zeldes 1989; Hurst and Stafford 2004; Campbell and Cocco 2007; Browing,

Gortz, and Leth-Petersen 2013; Aladangady 2017; Guren et al. 2021), and retirement (Zhao and Burge 2017). These findings imply that, when home prices increase, homeowners spend more on key consumption goods, potentially because of a relaxation of credit constraints. Our results also are surprising in light of the large out-of-pocket medical expenditures by the elderly in the U.S.: the average respondent in our sample spends about $3,900 on medical care over a 2-year period, and the right tail of this distribution is quite large. One important implication of this finding is that, at least with respect to health care expenditures, credit constraints are unlikely to bind for the population we study. If credit constraints were binding, then wealth changes should affect out-of-pocket spending. Instead, our results are aligned with elderly homeowners having sufficient resources to cover their medical care, even high up in the distribution. That health is a normal good only reinforces this conclusion, as the normality of health should lead to a positive relationship between wealth increases and health care expenditures. That we find consistent null effects strongly indicates that the elderly in our sample, who represent the vast majority of elderly households, do not face credit constraints in being able to fund out-of-pocket medical expenditures. While this interpretation could be compromised by other expenditures on health that would lead to lower health care expenditures, we find no evidence that home price changes impact self-reported or predicted health.

Although subsides for medical care are smaller in the U.S. than in other industrialized countries, they still are substantial. Further subsidizing medical care, as suggested by policy proposals such as "Medicare for All," can be justified in part by relaxing credit constraints that consumers may face. However, this also comes with a cost in terms of moral hazard because of distortions of the relative prices of medical services. Our findings indicate that elderly homeowners do not face constraints in their ability to pay out-of-pocket costs for medical care in the current system. Further subsidization of this group is likely to induce more costs in terms of moral hazard without increasing access to needed services. As described above, in the RAND HRS data, about 75% of respondents without any missing dependent or control variables own a home. Since homeowners are the majority of older Americans, the costs incurred by further subsidization of this group is likely to be large.

Nevertheless, homeowners are positively selected, and credit constraints for lower-SES households still may bind.[31] If so, more targeted subsidies to these disadvantaged groups may

[31] Our data provide evidence that 2- or 4-consecutive-year homeowners are much wealthier than 2- or 4-

be desirable from a policy perspective. As we focus on housing wealth, this question is outside the scope of our study. More work examining which groups face credit constraints with respect to health care expenditures is needed to more fully inform optimal health care subsidization policies.

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consecutive-year non-homeowners. In the RAND HRS data, the mean and median of 2-consecutive-year non-homeowners' annual household income are about $43,000 and $23,800. The mean and median of 2- or 4-consecutive-year homeowners' annual household income are shown in Table 1 and are substantially higher.

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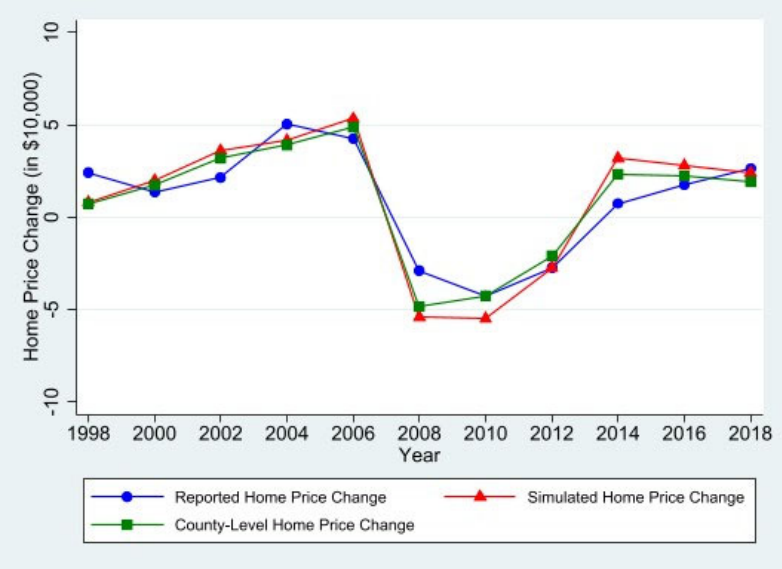
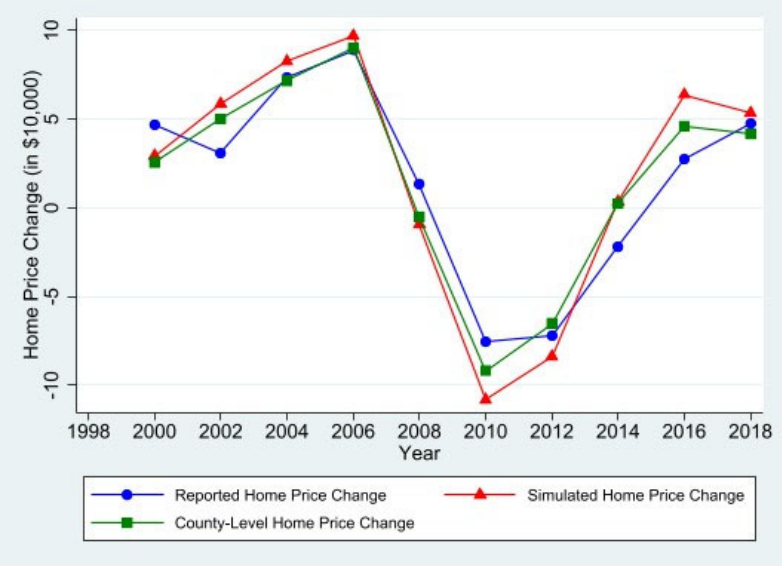
Figure 1. Home Price Changes by Year

Panel A: 2-Year Home Price Changes



Panel B: 4-Year Home Price Changes

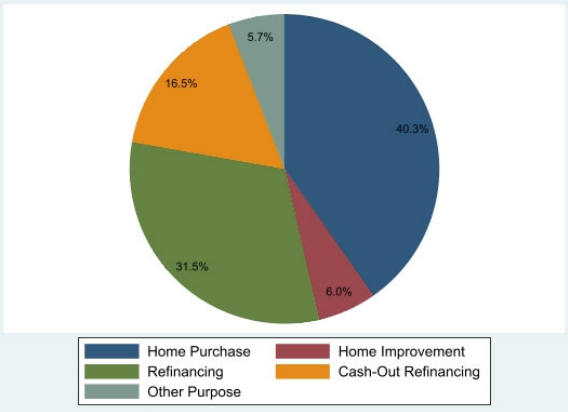


Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. The blue lines (circles) show home price changes reported by respondents. The red lines (triangles) present simulated home price changes. The green lines (squares) display county-level home price changes. We use individual-level weights provided by the RAND HRS for these calculations.

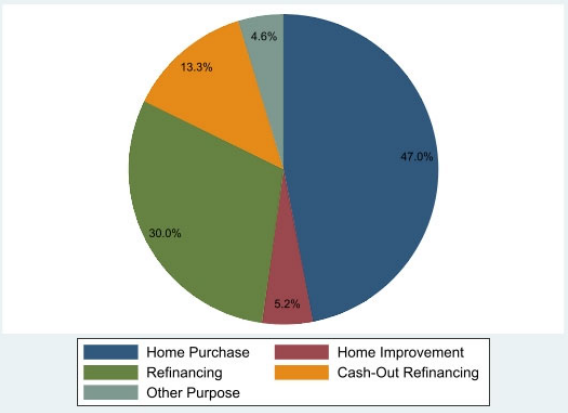
Figure 2. The Liquidity of Housing Wealth by Age

Panel A: The Composition of Loan Purpose among All Loan Applications

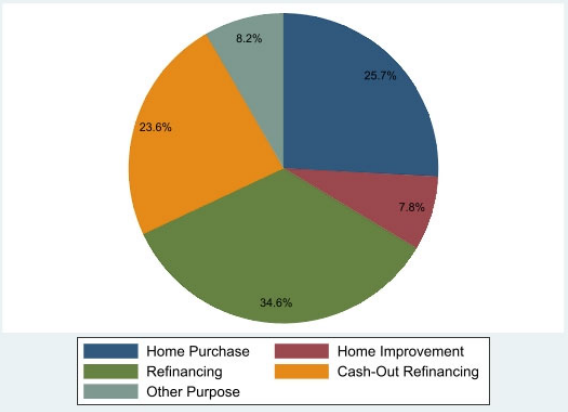
All



Young (Age $\leq$ 54)

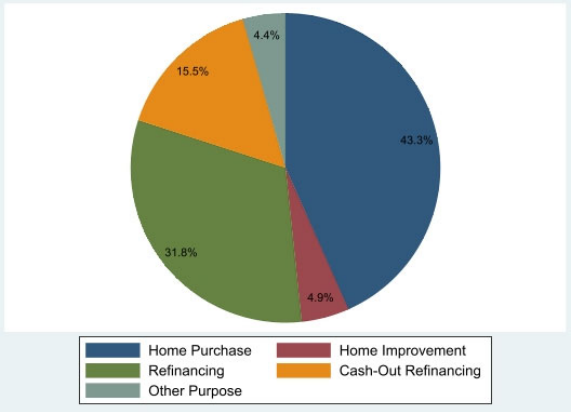


Old (Age $\geq$ 55)

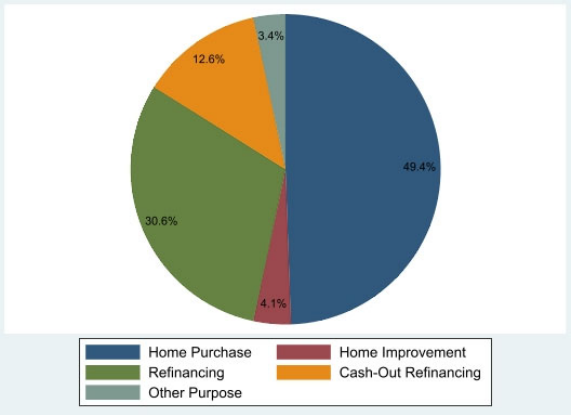


Panel B: The Composition of Loan Purpose among All Originated Loans

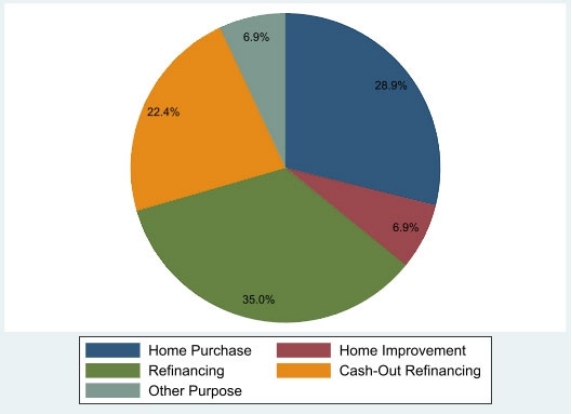
All



Young (Age $\leq$ 54)

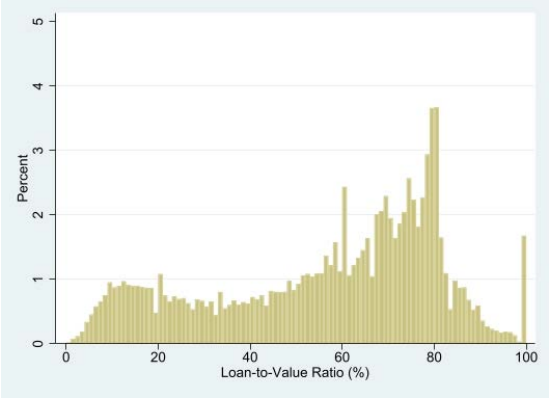


Old (Age $\geq$ 55)

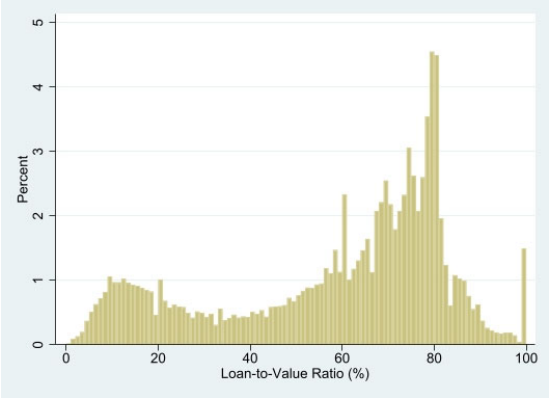


Panel C: Loan-to-Value Ratios among All Originated Loans for Cash

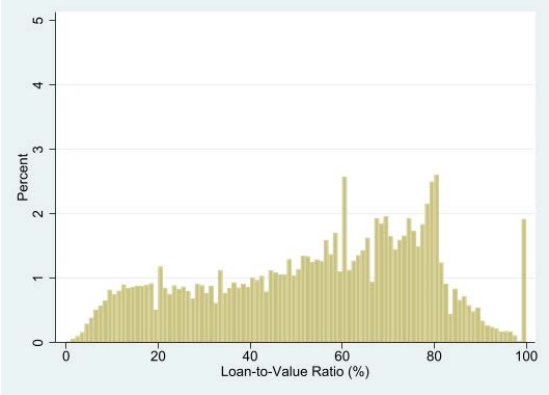
All



Young (Age $\leq$ 54)

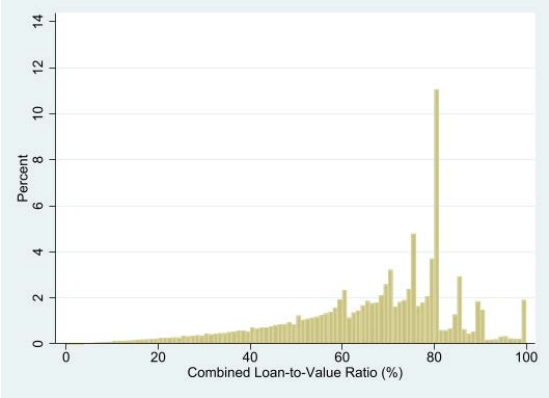


Old (Age $\geq$ 55)

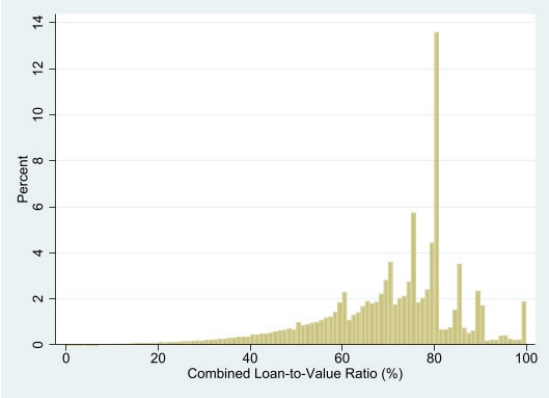


Panel D: Combined Loan-to-Value Ratios among All Originated Loans for Cash

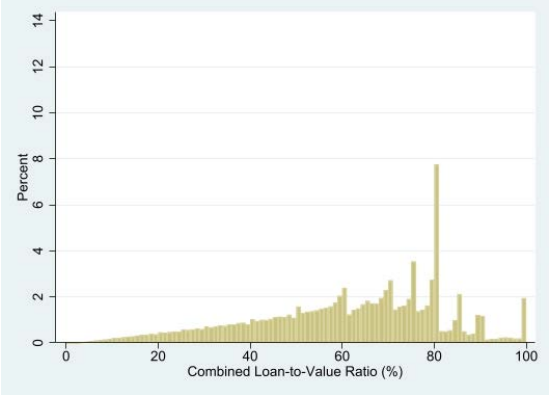
All



Young (Age $\leq$ 54)



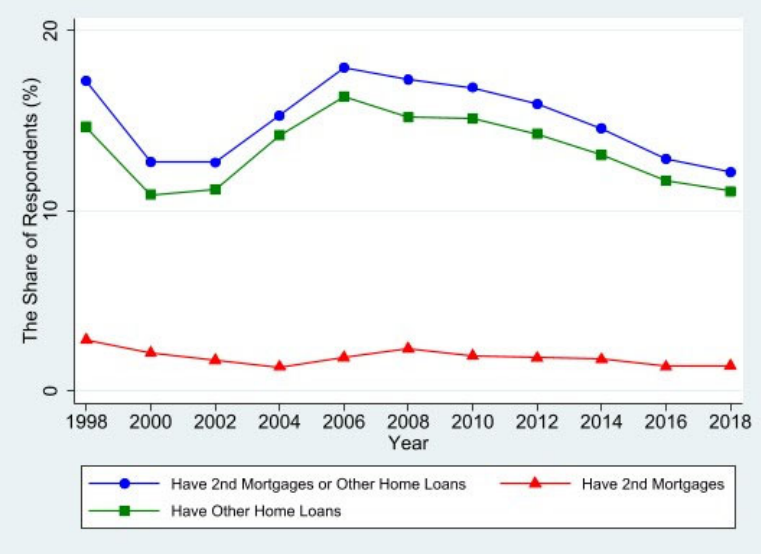
Old (Age $\geq$ 55)



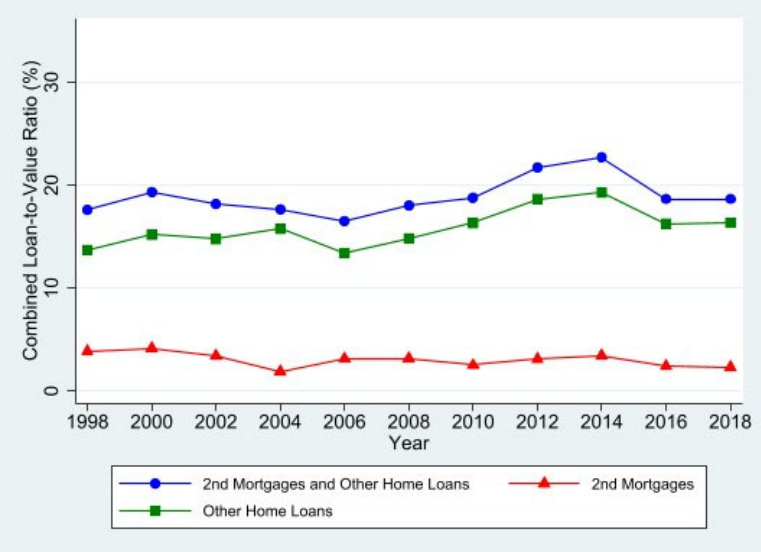
Notes: We use the Dynamic National Loan-Level Dataset. The targeted periods are 2018 to 2020. We exclude loans for which the information on the purpose or the information on the age of applicants is missing from the samples. The loans for cash-out refinancing or other purpose are classified as the loans for cash. For the histograms of loan-to-value (LTV) ratios and combined LTV ratios, we exclude top 1% from the samples.

Figure 3. Second Mortgages and Other Home Loans over Time

Panel A: The Share of Respondents who Have 2nd Mortgages or Other Home Loans among 2- or 4-Consecutive-Year Homeowners by Year



Panel B: The Average of the Combined Loan-to-Value Ratios among 2- or 4-Consecutive-Year Homeowners who Have 2nd Mortgages or Other Home Loans by Year



Notes: Data are obtained from the RAND HRS as described in the text. For the blue line in the figure in Panel B, the combined loan-to-value (LTV) ratio is calculated by dividing the sum of the amount of 2nd mortgages and the amount of other home loans by home price. For the red or green line in the figure in Panel B, we calculate the combined LTV ratio by dividing the amount of 2nd mortgages or the amount of other home loans by home price respectively. For the figure in Panel B, we drop two respondents whose combined LTV ratios for other home loans are higher than 20,000 in 2004 from the samples to exclude outliers. We use individual-level weights provided by the RAND HRS for these calculations.

Table 1. Summary Statistics of Analysis Variables

	(1) 2-Consecutive-Year Homeowners	(2) 4-Consecutive-Year Homeowners
Total Out-of-Pocket Medical Expenditures (in $)	3866.83 [1721.01] (11048.72)	3939.59 [1779.08] (10491.37)
Out-of-Pocket Expenditures for		
Overnight Hospital Stays and Overnight Nursing Home Stays (in $)	528.86 [0.00] (5277.62)	533.18 [0.00] (5254.69)
Doctor Visits, Dental Visits, and Outpatient Surgery (in $)	1582.18 [554.94] (3291.21)	1620.05 [569.71] (3353.76)
Prescription Drugs (in $)	1674.17 [544.20] (8485.45)	1702.29 [577.00] (7745.81)
Home Health Care and Special Health Facilities (in $)	81.63 [0.00] (1456.13)	84.08 [0.00] (1434.65)
Home Price Changes		
Reported 2-Year Home Price Changes (in $10,000)	0.63 [-0.15] (48.83)	-
Simulated 2-Year Home Price Changes (in $10,000)	0.79 [0.45] (7.93)	-
Reported 4-Year Home Price Changes (in $10,000)	-	0.98 [0.02] (55.61)
Simulated 4-Year Home Price Changes (in $10,000)	-	1.51 [0.78] (14.85)
Age	66.98 [65.00] (9.36)	67.89 [66.00] (9.10)
Marital Status		
Married	0.72 (0.45)	0.73 (0.45)
Married, Spouse Absent	0.01 (0.07)	0.01 (0.07)
Partnered	0.03 (0.16)	0.02 (0.15)
Separated or Divorced	0.09 (0.29)	0.09 (0.28)
Widowed	0.12	0.12

	(0.32)	(0.33)
Never Married	0.04	0.03
	(0.18)	(0.18)
Annual Household Income (in $10,000)	10.94	10.88
	[7.09]	[7.01]
	(17.34)	(17.61)
Net Household Wealth Excluding Primary Residence (in $10,000)	54.56	57.09
	[16.74]	[18.19]
	(141.66)	(144.91)
The Ownerships of Health Insurance Plans		
Medicare	0.47	0.51
	(0.50)	(0.50)
Medicaid	0.03	0.03
	(0.17)	(0.16)
CHAMPUS/VA	0.05	0.05
	(0.22)	(0.23)
Employer-Provided Health Insurance	0.59	0.57
	(0.49)	(0.49)
Long-Term Care Insurance for Nursing Home Care	0.12	0.13
	(0.33)	(0.33)
Long-Term Care Insurance for In-Home Care	0.12	0.12
	(0.32)	(0.33)
Other Long-Term Care Insurance	0.00	0.00
	(0.03)	(0.02)
Other Insurance	0.15	0.16
	(0.36)	(0.37)
Poor Health	0.19	0.19
	(0.39)	(0.39)
County-Level Unemployment Rates (%)	6.14	6.19
	[5.63]	[5.70]
	(2.38)	(2.33)
County-Level Median Household Income (in $10,000)	6.33	6.35
	[5.92]	[5.93]
	(1.65)	(1.67)
County-Level Poverty Rates (%)	13.65	13.65
	[13.13]	[13.27]
	(5.50)	(5.39)

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. Data in the first column are for years 1998 to 2018. Data in the second column are for years 2000 to 2018. All dollar values are in 2020 USD. Standard deviations are in parentheses. For selected variables, medians are in brackets. We use individual-level weights from the RAND HRS.

Table 2. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
Home Price Change (in $10,000)	-0.33 (0.44) [-1.20, 0.54]	-5.02 (5.19) [-15.20, 5.16]	-0.59 (0.52) [-1.62, 0.43]	-0.50 (4.35) [-9.04, 8.04]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3866.83	3866.83	3939.59	3939.59
Counties	944	944	844	844
Observations	103,748	103,748	82,911	82,911

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures: Robustness Checks - Different Transformations of the Dependent Variable

	Dependent Variable: Total Out-of-Pocket Medical Expenditures											
	Any Expenditures				Including Only > 0 (in $)				Log Transformation (Including Only > 0)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Home Price Change (in $10,000)	-0.0000 (0.0000) [-0.0000, 0.0000]	0.0001 (0.0001) [-0.0001, 0.0004]	0.0000 (0.0000) [-0.0000, 0.0001]	0.0000 (0.0001) [-0.0001, 0.0001]	-0.57 (0.48) [-1.51, 0.36]	-4.05 (7.41) [-18.59, 10.50]	-0.92 (0.72) [-2.33, 0.49]	-0.96 (4.18) [-9.15, 7.24]	-0.0000 (0.0001) [-0.0002, 0.0001]	-0.0023*** (0.0007) [-0.0037, -0.0010]	-0.0000 (0.0001) [-0.0002, 0.0001]	-0.0005 (0.0005) [-0.0014, 0.0004]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable	0.9222	0.9222	0.9249	0.9249	4206.60	4206.60	4272.85	4272.85	4206.60	4206.60	4272.85	4272.85
Counties	944	944	844	844	927	927	826	826	927	927	826	826
Observations	103,748	103,748	82,911	82,911	93,859	93,859	75,104	75,104	93,859	93,859	75,104	75,104

	Inverse Hyperbolic Sine Transformation					Excluding Top 5% (in $)		
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Home Price Change (in $10,000)	-0.0000 (0.0001) [-0.0002, 0.0002]	-0.0015 (0.0012) [-0.0038, 0.0008]	0.0002 (0.0002) [-0.0002, 0.0005]	-0.0005 (0.0007) [-0.0018, 0.0009]	-0.22 (0.25) [-0.70, 0.27]	-4.42*** (1.71) [-7.77, -1.06]	-0.16 (0.26) [-0.68, 0.36]	-2.18* (1.31) [-4.75, 0.39]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable	3866.83	3866.83	3939.59	3939.59	2524.39	2524.39	2578.13	2578.13

Counties	944	944	844	844	935	935	832	832
Observations	103,748	103,748	82,911	82,911	97,962	97,962	78,128	78,128

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1), (2), (5), (6), (9), (10), (13), (14), (17), and (18), the sample years are 1998 to 2018. In columns (3), (4), (7), (8), (11), (12), (15), (16), (19), and (20), the sample years are 2000 to 2018. In columns (1) through (4), the dependent variable is a dummy variable, which is equal to 1 if total out-of-pocket medical expenditures are positive or 0 otherwise. In columns (5) through (12), we include only respondents whose total out-of-pocket medical expenditures are positive in the samples. In columns (5) through (8), the dependent variables are total out-of-pocket medical expenditures themselves. In columns (9) through (12), the dependent variable is the log of total out-of-pocket medical expenditures. In columns (13) through (16), the dependent variable is the inverse hyperbolic sine of total out-of-pocket medical expenditures. In columns (17) through (20), we exclude respondents whose total out-of-pocket medical expenditures belong to top 5% of the distribution of the total out-of-pocket medical expenditures from the samples. In these columns, the dependent variables are total out-of-pocket medical expenditures themselves. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures: Robustness Checks - State by Year Fixed Effects and Different Sample Years

	Total Out-of-Pocket Medical Expenditures (in $)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Home Price Change (in $10,000)	0.09 (0.33) [-0.55, 0.73]	-1.60 (5.64) [-12.67, 9.47]	0.22 (0.44) [-0.64, 1.08]	3.07 (2.85) [-2.52, 8.67]	-0.56 (0.46) [-1.46, 0.34]	-15.69* (8.45) [-32.27, 0.89]	-0.85 (0.53) [-1.90, 0.19]	-2.77 (4.82) [-12.24, 6.70]	0.26 (1.53) [-2.74, 3.25]	20.62 (16.77) [-12.29, 53.53]	0.86 (2.55) [-4.15, 5.87]	24.46 (23.69) [-22.04, 70.97]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3868.91	3868.91	3941.70	3941.70	3864.20	3864.20	3945.02	3945.02	3475.84	3475.84	3490.09	3490.09
Counties	944	944	844	844	847	847	768	768	828	828	756	756
Observations	103,629	103,629	82,834	82,834	69,798	69,798	55,252	55,252	39,655	39,655	34,906	34,906
State X Year FE	X	X	X	X								
Year $t \neq$ 2008, 2010, and 2012					X	X	X	X				
Year $t \geq$ 2012									X	X	X	X

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. The sample years are 1998 to 2018 in columns (1) and (2), 2000 to 2018 in columns (3) and (4), 1998 to 2006 and 2014 to 2018 in columns (5) and (6), 2000 to 2006 and 2014 to 2018 in columns (7) and (8), 2012 to 2018 in columns (9) through (12). In columns (1) through (4), we control for age, gender, race, Hispanic origin, education, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and county and state by year fixed effects. In columns (5) through (12), we control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures: Robustness Checks - Different Timing of the Measurement of Control Variables and Dropping Movers

	Total Out-of-Pocket Medical Expenditures (in $)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Home Price Change (in $10,000)	-0.42 (0.42) [-1.24, 0.40]	-3.75 (4.78) [-13.13, 5.63]	-0.81* (0.48) [-1.74, 0.13]	-0.17 (4.54) [-9.08, 8.74]	-0.13 (0.53) [-1.17, 0.91]	-4.73 (5.66) [-15.84, 6.37]	-0.45 (0.62) [-1.67, 0.77]	0.71 (5.04) [-9.18, 10.59]	-0.30 (0.50) [-1.29, 0.68]	-3.13 (5.14) [-13.23, 6.97]	-0.86 (0.58) [-2.00, 0.29]	1.45 (5.31) [-8.97, 11.88]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3841.87	3841.87	3919.33	3919.33	3789.26	3789.26	3855.39	3855.39	3775.49	3775.49	3846.47	3846.47
Counties	941	941	842	842	883	883	739	739	881	881	736	736
Observations	103,633	103,633	82,627	82,627	95,087	95,087	71,212	71,212	94,992	94,992	70,969	70,969
Controls Measured in Year t	X	X	X	X					X	X	X	X
Drop Movers					X	X	X	X	X	X	X	X

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1), (2), (5), (6), (9), and (10), the sample years are 1998 to 2018. In columns (3), (4), (7), (8), (11), and (12), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. In columns (1) through (4) and (9) through (12), the control variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year t. In columns (5) through (8), these control variables are measured in year $t-2$. In columns (5) through (12), we exclude movers from the samples as explained in the text. All dollar values are in 2020 USD. Standard errors clustered at the county level are shown in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures: Robustness Checks - Different Definitions of Homeowners

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
Home Price Change (in $10,000)	-5.89 (5.57) [-16.82, 5.03]	-0.95 (4.53) [-9.84, 7.93]	-6.99 (4.87) [-16.57, 2.58]	-6.55* (3.72) [-13.85, 0.76]
Home Price Change Measure	Simulated 2-year	Simulated 4-year	Simulated 2-year	Simulated 4-year
Homeownership in Year $t-2$	X			
Homeownership in Year $t-4$		X		
Homeownership in the Baseline Year			X	X
Mean of Dependent Variable (in $)	3944.46	4143.64	4154.94	4293.22
Counties	946	877	396	383
Observations	107,020	89,907	88,973	75,116

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (3), the sample years are 1998 to 2018. In columns (2) and (4), the sample years are 2000 to 2018. In column (1), the samples are homeowners in year $t-2$. In column (2), the samples are homeowners in year $t-4$. In columns (3) and (4), the samples are homeowners in the baseline year as explained in the text. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures: Including Leads and Lags of Home Price Changes

	Total Out-of-Pocket Medical Expenditures (in $)					
	(1)	(2)	(3)	(4)	(5)	(6)
Independent Variables	*Reported 2-Year Home Price Changes*			*Simulated 2-Year Home Price Changes*		
Home Price Changes between Year $t-4$ and Year $t-2$ (in $10,000)	-0.76 (0.70) [-2.13, 0.61]		-0.60 (0.70) [-1.97, 0.77]	3.96 (9.35) [-14.39, 22.31]		3.37 (11.75) [-19.70, 26.44]
Home Price Changes between Year $t-2$ and Year t (in $10,000)	-0.53 (0.48) [-1.48, 0.41]	-0.33 (0.41) [-1.14, 0.48]	-0.43 (0.48) [-1.38, 0.52]	-7.13 (5.77) [-18.45, 4.19]	-6.56 (5.65) [-17.64, 4.52]	-8.36 (5.53) [-19.23, 2.50]
Home Price Changes between Year t and Year $t+2$ (in $10,000)		-0.00 (0.01) [-0.01, 0.01]	-0.00 (0.00) [-0.01, 0.01]		-0.33 (5.59) [-11.29, 10.63]	-0.25 (8.25) [-16.44, 15.95]
Mean of Dependent Variable (in $)	3936.70	3681.88	3734.27	3936.70	3681.88	3734.27
Counties	853	883	807	853	883	807
Observations	82,519	88,233	70,384	82,519	88,233	70,384
	(7)	(8)	(9)	(10)	(11)	(12)
Independent Variables	*Reported 4-Year Home Price Changes*			*Simulated 4-Year Home Price Changes*		

Home Price Changes between Year $t-8$ and Year $t-4$ (in \$10,000)	-4.33 (4.72) [-13.59, 4.93]		-1.47 (1.66) [-4.73, 1.79]	-4.84 (3.95) [-12.60, 2.92]		-5.98 (4.81) [-15.43, 3.47]
Home Price Changes between Year $t-4$ and Year t (in \$10,000)	-2.01 (1.87) [-5.69, 1.67]	-0.04 (0.78) [-1.57, 1.50]	-1.80 (2.07) [-5.86, 2.27]	4.21 (5.58) [-6.75, 15.16]	-2.25 (3.01) [-8.15, 3.66]	-1.33 (4.07) [-9.32, 6.67]
Home Price Changes between Year t and Year $t+4$ (in \$10,000)		0.02 (0.01) [-0.01, 0.04]	0.02** (0.01) [0.00, 0.03]		-1.92 (2.93) [-7.66, 3.83]	-0.53 (5.81) [-11.95, 10.88]
Mean of Dependent Variable (in \$)	3876.06	3709.01	3665.12	3876.06	3709.01	3665.12
Counties	693	717	583	693	717	583
Observations	47,627	54,515	30,464	47,627	54,515	30,464

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. The sample years are 2000 to 2018 in columns (1), (3), (4), and (6), 1998 to 2018 in columns (2) and (5), 2004 to 2018 in columns (7) and (10), 2000 to 2016 in columns (8) and (11), and 2004 to 2016 in columns (9) and (12). We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Quartiles

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. 1st Quartile				
Home Price Change (in $10,000)	0.02 (0.04) [-0.06, 0.09]	-0.38 (0.36) [-1.09, 0.34]	0.09* (0.05) [-0.01, 0.18]	-0.13 (0.20) [-0.52, 0.26]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	193.81	193.81	208.74	208.74
Counties	577	577	515	515
Observations	22,150	22,150	17,327	17,327
B. 2nd Quartile				
Home Price Change (in $10,000)	-0.06 (0.07) [-0.20, 0.08]	0.47 (0.68) [-0.88, 1.81]	-0.06 (0.09) [-0.24, 0.13]	0.07 (0.43) [-0.77, 0.91]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	1108.97	1108.97	1149.02	1149.02
Counties	575	575	521	521
Observations	20,281	20,281	15,687	15,687
C. 3rd Quartile				
Home Price Change (in $10,000)	-0.06 (0.11) [-0.27, 0.14]	0.25 (1.00) [-1.71, 2.21]	-0.11 (0.07) [-0.25, 0.03]	-0.31 (0.48) [-1.26, 0.64]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	2737.82	2737.82	2803.91	2803.91
Counties	600	600	526	526
Observations	20,366	20,366	15,909	15,909
D. 4th Quartile				
Home Price Change (in $10,000)	1.14 (2.10) [-2.99, 5.26]	15.17 (31.24) [-46.18, 76.52]	-0.31 (3.11) [-6.42, 5.80]	-6.14 (10.89) [-27.54, 15.26]

Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	11627.39	11627.39	11814.75	11814.75
Counties	588	588	511	511
Observations	21,337	21,337	16,872	16,872

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. The cutoffs for each quartile also are determined using individual-level weights. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Medicare Enrollment Status

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Non-Medicare Beneficiaries				
Home Price Change (in $10,000)	0.47 (0.43) [-0.37, 1.30]	-6.12 (4.54) [-15.04, 2.79]	0.98* (0.56) [-0.13, 2.08]	-2.87 (3.10) [-8.96, 3.21]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3453.77	3453.77	3527.60	3527.60
Counties	661	661	548	548
Observations	43,281	43,281	31,170	31,170
B. Medicare Beneficiaries				
Home Price Change (in $10,000)	-0.51 (0.57) [-1.63, 0.62]	1.49 (11.08) [-20.26, 23.23]	-1.19* (0.69) [-2.55, 0.16]	8.13 (10.73) [-12.92, 29.19]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	4338.24	4338.24	4354.64	4354.64
Counties	815	815	736	736
Observations	57,369	57,369	48,994	48,994

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 10. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Health Insurance Status

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. No Health Insurance Coverage				
Home Price Change (in $10,000)	-9.93 (11.71) [-32.99, 13.13]	-27.24 (34.44) [-95.08, 40.61]	-10.65 (11.05) [-32.46, 11.16]	-24.91 (21.12) [-66.57, 16.75]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3504.07	3504.07	3222.81	3222.81
Counties	235	235	185	185
Observations	3,367	3,367	2,164	2,164
B. Covered by Health Insurance				
Home Price Change (in $10,000)	-0.34 (0.44) [-1.20, 0.53]	-5.27 (5.20) [-15.48, 4.94]	-0.58 (0.52) [-1.61, 0.44]	-0.53 (4.39) [-9.16, 8.09]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3884.62	3884.62	3967.37	3967.37
Counties	931	931	834	834
Observations	98,561	98,561	79,321	79,321

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 11. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Household Income

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Annual Household Income ≤ $40,000				
Home Price Change (in $10,000)	-0.56 (3.96) [-8.34, 7.22]	10.66 (17.00) [-22.72, 44.04]	-4.78 (5.80) [-16.17, 6.61]	14.12 (15.40) [-16.14, 44.38]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3998.23	3998.23	3994.83	3994.83
Counties	598	598	541	541
Observations	30,568	30,568	24,541	24,541
B. $40,000 < Annual Household Income < $90,000				
Home Price Change (in $10,000)	0.36 (0.50) [-0.62, 1.35]	-8.28 (11.02) [-29.91, 13.35]	0.53 (0.55) [-0.54, 1.61]	0.94 (9.06) [-16.86, 18.74]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3811.37	3811.37	3905.21	3905.21
Counties	639	639	579	579
Observations	32,941	32,941	26,235	26,235
C. Annual Household Income ≥ $90,000				
Home Price Change (in $10,000)	-0.27 (0.57) [-1.40, 0.85]	-10.48** (4.09) [-18.52, -2.44]	-0.68 (0.94) [-2.53, 1.16]	-2.95 (2.91) [-8.66, 2.76]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3743.67	3743.67	3860.99	3860.99
Counties	567	567	500	500
Observations	30,846	30,846	23,864	23,864

Notes: In columns (1) and (2), the HRS sample years are 1998 to 2018. In columns (3) and (4), they are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. Marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 12. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Net Household Wealth

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Net Household Wealth ≤ $500,000				
Home Price Change (in $10,000)	-9.40 (12.47) [-33.89, 15.08]	-22.00 (19.63) [-60.54, 16.54]	-4.85 (10.73) [-25.90, 16.21]	6.69 (13.55) [-19.91, 33.28]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3614.51	3614.51	3719.50	3719.50
Counties	791	791	689	689
Observations	63,963	63,963	49,541	49,541
B. Net Household Wealth > $500,000				
Home Price Change (in $10,000)	-0.21 (0.45) [-1.10, 0.68]	-5.31 (6.11) [-17.31, 6.69]	-0.52 (0.52) [-1.55, 0.51]	-0.58 (4.96) [-10.31, 9.16]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	4164.88	4164.88	4206.89	4206.89
Counties	603	603	545	545
Observations	36,609	36,609	30,566	30,566

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 13. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Net Housing Wealth

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Net Housing Wealth ≤ $300,000				
Home Price Change (in $10,000)	-5.46 (7.44) [-20.06, 9.14]	0.21 (18.01) [-35.14, 35.55]	-0.37 (3.13) [-6.51, 5.77]	7.30 (11.53) [-15.34, 29.93]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	3785.26	3785.26	3842.85	3842.85
Counties	891	891	793	793
Observations	81,777	81,777	63,814	63,814
B. Net Housing Wealth > $300,000				
Home Price Change (in $10,000)	-0.04 (0.46) [-0.94, 0.86]	-4.41 (9.60) [-23.28, 14.47]	-0.26 (0.57) [-1.39, 0.86]	-0.18 (8.07) [-16.05, 15.69]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	4126.79	4126.79	4207.91	4207.91
Counties	404	404	372	372
Observations	19,444	19,444	16,710	16,710

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table 14. The Effect of Home Price Changes on the Components of Out-of-Pocket Medical Expenditures

	Out-of-Pocket Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Out-of-Pocket Expenditures for Overnight Hospital Stays and Overnight Nursing Home Stays				
Home Price Change (in $10,000)	0.08 (0.12) [-0.16, 0.33]	5.88 (5.13) [-4.20, 15.95]	-0.37 (0.38) [-1.11, 0.38]	4.32 (4.27) [-4.06, 12.70]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	528.86	528.86	533.18	533.18
Counties	944	944	844	844
Observations	103,748	103,748	82,911	82,911
B. Out-of-Pocket Expenditures for Doctor Visits, Dental Visits, and Outpatient Surgery				
Home Price Change (in $10,000)	-0.07 (0.19) [-0.44, 0.31]	-6.11*** (2.29) [-10.59, -1.62]	0.09 (0.26) [-0.43, 0.61]	-3.63** (1.47) [-6.51, -0.74]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	1582.18	1582.18	1620.05	1620.05
Counties	944	944	844	844
Observations	103,748	103,748	82,911	82,911
C. Out-of-Pocket Expenditures for Prescription Drugs				
Home Price Change (in $10,000)	-0.24 (0.30) [-0.83, 0.35]	-4.01* (2.17) [-8.26, 0.24]	-0.27 (0.37) [-0.99, 0.45]	-1.11 (1.69) [-4.43, 2.20]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	1674.17	1674.17	1702.29	1702.29
Counties	944	944	844	844
Observations	103,748	103,748	82,911	82,911
D. Out-of-Pocket Expenditures for Home Health Care and Special Health Facilities				
Home Price Change (in $10,000)	-0.10 (0.07) [-0.24, 0.03]	-0.78 (0.61) [-1.98, 0.42]	-0.04 (0.06) [-0.16, 0.08]	-0.08 (0.22) [-0.52, 0.36]

Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	81.63	81.63	84.08	84.08
Counties	944	944	844	844
Observations	103,748	103,748	82,911	82,911

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Online Appendix

Table A-1. Logistic Regressions for Poor Health

	Poor Health 1				Poor Health 2			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Males		Females		Males		Females	
Independent Variables	Coefficient	Average Marginal Effect	Coefficient	Average Marginal Effect	Coefficient	Average Marginal Effect	Coefficient	Average Marginal Effect
Doctor Diagnosed Conditions								
High Blood Pressure	0.263***	0.035***	0.276***	0.036***	0.204***	0.022***	0.173***	0.016***
	(0.052)	(0.007)	(0.050)	(0.007)	(0.058)	(0.006)	(0.060)	(0.006)
Diabetes	0.559***	0.075***	0.598***	0.078***	0.476***	0.051***	0.508***	0.048***
	(0.057)	(0.008)	(0.057)	(0.007)	(0.062)	(0.007)	(0.073)	(0.007)
Cancer	0.584***	0.078***	0.467***	0.061***	0.574***	0.061***	0.539***	0.051***
	(0.061)	(0.008)	(0.060)	(0.008)	(0.069)	(0.007)	(0.071)	(0.007)
Lung Disease	1.204***	0.161***	1.076***	0.140***	0.863***	0.092***	0.665***	0.063***
	(0.084)	(0.011)	(0.076)	(0.010)	(0.094)	(0.010)	(0.084)	(0.008)
Heart Problems	0.726***	0.097***	0.768***	0.100***	0.633***	0.067***	0.601***	0.057***
	(0.053)	(0.007)	(0.052)	(0.007)	(0.059)	(0.006)	(0.066)	(0.006)
Stroke	0.687***	0.092***	0.747***	0.097***	0.364***	0.039***	0.326***	0.031***
	(0.079)	(0.010)	(0.080)	(0.010)	(0.093)	(0.010)	(0.106)	(0.010)
Psychological Problems	0.875***	0.117***	0.799***	0.104***	0.518***	0.055***	0.443***	0.042***
	(0.078)	(0.010)	(0.057)	(0.007)	(0.091)	(0.010)	(0.067)	(0.006)
Arthritis	0.492***	0.066***	0.685***	0.089***	0.052	0.006	0.178***	0.017***
	(0.051)	(0.007)	(0.051)	(0.007)	(0.059)	(0.006)	(0.065)	(0.006)
Obesity	0.246***	0.033***	0.244***	0.032***	0.113*	0.012*	-0.081	-0.008
	(0.052)	(0.007)	(0.048)	(0.006)	(0.059)	(0.006)	(0.058)	(0.006)
Difficulty with Activities of Daily Living								
Walking across Room					0.168	0.018	0.337***	0.032***
					(0.125)	(0.013)	(0.095)	(0.009)
Dressing					0.183**	0.019**	0.223***	0.021***
					(0.087)	(0.009)	(0.085)	(0.008)
Bathing					0.206*	0.022*	0.080	0.008
					(0.122)	(0.013)	(0.094)	(0.009)
Eating					0.067	0.007	0.194	0.018
					(0.164)	(0.018)	(0.154)	(0.015)
Getting in/out Bed					0.358***	0.038***	0.143	0.014
					(0.118)	(0.013)	(0.098)	(0.009)
Difficulty with Instrumental Activities of Daily Living								
Using a Map					0.220**	0.023**	0.209***	0.020***
					(0.099)	(0.011)	(0.068)	(0.006)
Using Telephone					0.126	0.013	-0.204	-0.019
					(0.116)	(0.012)	(0.179)	(0.017)
Managing Money					0.297**	0.032**	0.399***	0.038***
					(0.132)	(0.014)	(0.119)	(0.011)
Taking Medications					0.482***	0.051***	0.221	0.021
					(0.151)	(0.016)	(0.167)	(0.016)
Other Functional Limitations								
Walking Several					0.715***	0.076***	0.767***	0.073***

Blocks					(0.064)	(0.007)	(0.061)	(0.006)
Walking One Block					0.221***	0.024***	0.409***	0.039***
					(0.084)	(0.009)	(0.068)	(0.006)
Sitting for 2 Hours					0.177***	0.019***	0.268***	0.026***
					(0.063)	(0.007)	(0.057)	(0.005)
Getting Up from					0.129**	0.014**	-0.009	-0.001
Chair					(0.054)	(0.006)	(0.054)	(0.005)
Climbing Several					0.542***	0.058***	0.462***	0.044***
Flights of Stairs					(0.056)	(0.006)	(0.058)	(0.006)
Climbing One Flight					0.025	0.003	0.254***	0.024***
of Stairs					(0.077)	(0.008)	(0.059)	(0.006)
Stooping/Kneeling/					0.168***	0.018***	0.273***	0.026***
Crouching					(0.056)	(0.006)	(0.057)	(0.005)
Lifting Weights over					0.317***	0.034***	0.382***	0.036***
10 Pounds					(0.073)	(0.008)	(0.056)	(0.005)
Picking Up a Dime					0.121	0.013	0.053	0.005
					(0.099)	(0.011)	(0.085)	(0.008)
Reaching Arms over					0.322***	0.034***	0.205***	0.020***
Shoulder Level					(0.065)	(0.007)	(0.060)	(0.006)
Pushing Large					0.428***	0.046***	0.478***	0.046***
Objects					(0.067)	(0.007)	(0.056)	(0.005)
Age	-0.000		0.005*		-0.020***		-0.023***	
	(0.003)		(0.003)		(0.003)		(0.003)	
Black	0.300***		0.471***		0.104		0.219**	
	(0.087)		(0.067)		(0.104)		(0.088)	
Other Race	0.117		0.344***		0.073		0.328**	
	(0.138)		(0.118)		(0.154)		(0.139)	
Hispanic Origin	0.709***		0.657***		0.589***		0.577***	
	(0.106)		(0.092)		(0.123)		(0.123)	
Less than High School	0.697***		0.700***		0.659***		0.572***	
	(0.072)		(0.065)		(0.089)		(0.092)	
Some College	-0.275***		-0.284***		-0.171**		-0.237***	
	(0.069)		(0.061)		(0.072)		(0.070)	
College or Above	-0.712***		-0.687***		-0.467***		-0.479***	
	(0.071)		(0.074)		(0.077)		(0.080)	
Married, Spouse	0.413**		0.719***		-0.443		-0.069	
Absent	(0.210)		(0.152)		(0.297)		(0.341)	
Partnered	0.150		0.286*		0.188		0.307	
	(0.126)		(0.154)		(0.150)		(0.197)	
Separated/Divorced	0.264***		0.388***		0.282***		0.290***	
	(0.092)		(0.078)		(0.094)		(0.086)	
Widowed	0.214**		0.104*		0.218**		0.071	
	(0.084)		(0.054)		(0.098)		(0.067)	
Never Married	0.458**		0.118		0.573***		0.167	
	(0.183)		(0.150)		(0.191)		(0.188)	
Foreign Born	0.180*		0.382***		0.417***		0.474***	
	(0.093)		(0.086)		(0.107)		(0.108)	
Veteran Status	-0.007				0.001			
	(0.055)				(0.061)			
Constant	-2.575***		-3.188***		-1.821***		-2.095***	
	(0.200)		(0.184)		(0.219)		(0.214)	
Observations	45,239	45,239	57,430	57,430	37,857	37,857	43,873	43,873

Notes: Data are obtained from the RAND HRS as described in the text. We include 2- or 4-consecutive-year homeowners in the samples. The dependent variable is an indicator for self-reported poor health. We use individual-level weights from the RAND HRS. Standard errors clustered at the individual level are shown in parentheses. Standard errors of the average marginal effects are estimated by the linearization method. *** p<0.01, ** p<0.05, * p<0.1.

Table A-2. Sample Constructions

2-Consecutive-Year Homeowners		4-Consecutive-Year Homeowners	
Respondents	Observations	Respondents	Observations
HRS Participants			
42,406	280,343	42,406	280,343
Targeted Years: 1998-2018		*Targeted Years: 2000-2018*	
36,041	206,553	29,850	171,688
Drop Observations with 0 or Missing Weights			
34,368	182,351	29,088	153,743
Drop Observations Whose Age is under 50			
34,346	182,197	29,067	153,639
Drop Observations with Any Missing Dependent or Control Variables			
32,946	164,597	27,812	136,995
Keep only 2-Consecutive-Year Homeowners		*Keep only 4-Consecutive-Year Homeowners*	
25,057	121,802	20,592	97,603
Drop Observations with Any Missing Independent Variables			
23,680	108,490	19,176	85,747
Drop Singleton Observations			
19,003	103,748	16,395	82,911

Notes: Authors' tabulations from the RAND HRS data.

Table A-3. The Effect of Home Price Changes on Health

	Poor Health				Predicted Probability of Poor Health 1				Predicted Probability of Poor Health 2			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Home Price Change (in $10,000)	-0.0000 (0.0000) [-0.0001, 0.0000]	0.0003 (0.0002) [-0.0001, 0.0007]	-0.0000 (0.0000) [-0.0000, 0.0000]	0.0001 (0.0001) [-0.0001, 0.0003]	-0.0000 (0.0000) [-0.0000, 0.0000]	0.0001** (0.0000) [0.0000, 0.0002]	0.0000 (0.0000) [-0.0000, 0.0000]	0.0001** (0.0000) [0.0000, 0.0001]	-0.0000* (0.0000) [-0.0000, 0.0000]	0.0000 (0.0001) [-0.0001, 0.0001]	-0.0000* (0.0000) [-0.0000, 0.0000]	0.0001* (0.0000) [-0.0000, 0.0001]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	0.2110	0.2110	0.2083	0.2083	0.2103	0.2103	0.2142	0.2142	0.1845	0.1845	0.1852	0.1852
Counties	944	944	843	843	942	942	841	841	905	905	801	801
Observations	103,693	103,693	82,865	82,865	102,224	102,224	81,692	81,692	79,794	79,794	64,093	64,093

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1), (2), (5), (6), (9), and (10), the sample years are 1998 to 2018. In columns (3), (4), (7), (8), (11), and (12), the sample years are 2000 to 2018. In columns (1) through (4), the dependent variable is a dummy variable which is equal to 1 if a respondent's reported health is poor in year t or 0 otherwise. In columns (5) through (8), the dependent variable is a predicted probability of poor health generated using the estimation results in columns (1) through (4) in Table A-1. In columns (9) through (12), the dependent variable is a predicted probability of poor health created using the estimation results in columns (5) through (8) in Table A-1. In all the columns, we control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, and the ownerships of several types of health insurance plans are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1

Table A-4. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Quartiles among Non-Medicare Beneficiaries

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. 1st Quartile				
Home Price Change (in $10,000)	-0.02 (0.04) [-0.09, 0.05]	-0.13 (0.61) [-1.34, 1.08]	-0.03 (0.11) [-0.26, 0.19]	-0.36 (0.37) [-1.08, 0.36]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	161.29	161.29	180.17	180.17
Counties	361	361	311	311
Observations	8,710	8,710	6,041	6,041
B. 2nd Quartile				
Home Price Change (in $10,000)	0.04 (0.12) [-0.19, 0.27]	-0.46 (1.34) [-3.10, 2.17]	-0.03 (0.14) [-0.30, 0.24]	0.02 (0.75) [-1.46, 1.50]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	998.65	998.65	1050.01	1050.01
Counties	345	345	302	302
Observations	7,246	7,246	4,862	4,862
C. 3rd Quartile				
Home Price Change (in $10,000)	-0.26 (0.36) [-0.96, 0.45]	-0.34 (2.09) [-4.45, 3.76]	-0.41* (0.23) [-0.86, 0.04]	0.06 (0.80) [-1.50, 1.63]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	2545.50	2545.50	2635.09	2635.09
Counties	362	362	302	302
Observations	7,173	7,173	5,010	5,010
D. 4th Quartile				
Home Price Change (in $10,000)	3.73 (2.37) [-0.94, 8.40]	-7.86 (17.41) [-42.10, 26.38]	5.92 (3.88) [-1.70, 13.55]	-9.66 (11.61) [-32.51, 13.18]

Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	10385.00	10385.00	10547.94	10547.94
Counties	383	383	315	315
Observations	7,729	7,729	5,486	5,486

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. The cutoffs for each quartile also are determined using individual-level weights. *** p<0.01, ** p<0.05, * p<0.1.

Table A-5. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Quartiles among Medicare Beneficiaries

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. 1st Quartile				
Home Price Change (in $10,000)	0.06 (0.11) [-0.15, 0.28]	0.12 (0.57) [-1.01, 1.25]	0.22** (0.09) [0.04, 0.40]	-0.02 (0.51) [-1.02, 0.97]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	233.10	233.10	241.18	241.18
Counties	472	472	436	436
Observations	11,858	11,858	10,151	10,151
B. 2nd Quartile				
Home Price Change (in $10,000)	-0.35 (0.32) [-0.97, 0.28]	-1.28 (0.96) [-3.17, 0.62]	-0.06 (0.26) [-0.58, 0.46]	0.13 (0.71) [-1.26, 1.52]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	1237.92	1237.92	1255.28	1255.28
Counties	481	481	433	433
Observations	10,628	10,628	8,901	8,901
C. 3rd Quartile				
Home Price Change (in $10,000)	-0.29 (0.62) [-1.51, 0.93]	-1.09 (1.60) [-4.24, 2.06]	-0.39 (0.29) [-0.95, 0.17]	-0.45 (0.62) [-1.68, 0.78]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	2976.08	2976.08	2995.39	2995.39
Counties	503	503	453	453
Observations	10,564	10,564	8,890	8,890
D. 4th Quartile				
Home Price Change (in $10,000)	0.44 (2.78) [-5.03, 5.90]	34.80 (60.48) [-84.04, 153.64]	-2.40 (5.03) [-12.28, 7.49]	0.21 (21.00) [-41.07, 41.49]

Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	13170.64	13170.64	13199.52	13199.52
Counties	462	462	417	417
Observations	11,299	11,299	9,604	9,604

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. The cutoffs for each quartile also are determined using individual-level weights. *** p<0.01, ** p<0.05, * p<0.1.

Table A-6. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Quartiles among Older Americans without Health Insurance

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. 1st Quartile				
Home Price Change (in $10,000)	0.20 (0.33) [-0.47, 0.86]	0.19 (0.90) [-1.59, 1.98]	0.38* (0.21) [-0.04, 0.80]	0.36 (0.64) [-0.91, 1.63]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	10.19	10.19	11.05	11.05
Counties	101	101	74	74
Observations	655	655	403	403
B. 2nd Quartile				
Home Price Change (in $10,000)	1.86 (2.40) [-2.90, 6.63]	6.50 (4.92) [-3.28, 16.27]	-1.25 (2.06) [-5.38, 2.87]	3.66 (7.05) [-10.44, 17.76]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	551.20	551.20	577.25	577.25
Counties	87	87	63	63
Observations	444	444	268	268
C. 3rd Quartile				
Home Price Change (in $10,000)	-1.61 (2.72) [-7.02, 3.80]	-1.95 (13.32) [-28.44, 24.53]	-0.23 (4.01) [-8.25, 7.78]	-0.90 (8.18) [-17.25, 15.44]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	2065.15	2065.15	2111.07	2111.07
Counties	85	85	63	63
Observations	429	429	285	285
D. 4th Quartile				
Home Price Change (in $10,000)	-11.98 (56.41) [-124.05, 100.08]	20.32 (210.08) [-397.04, 437.69]	33.18 (144.44) [-255.12, 321.48]	146.74 (367.76) [-587.32, 880.80]

Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	11322.59	11322.59	10537.86	10537.86
Counties	91	91	68	68
Observations	474	474	299	299

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. The cutoffs for each quartile also are determined using individual-level weights. *** p<0.01, ** p<0.05, * p<0.1.

Table A-7. The Effect of Home Price Changes on Total Out-of-Pocket Medical Expenditures, by Quartiles among Older Americans with Health Insurance

	Total Out-of-Pocket Medical Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. 1st Quartile				
Home Price Change (in $10,000)	0.01 (0.04) [-0.06, 0.08]	-0.50 (0.39) [-1.26, 0.27]	0.08 (0.05) [-0.02, 0.17]	-0.11 (0.20) [-0.51, 0.29]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	211.64	211.64	224.39	224.39
Counties	567	567	506	506
Observations	20,811	20,811	16,406	16,406
B. 2nd Quartile				
Home Price Change (in $10,000)	-0.05 (0.07) [-0.19, 0.09]	-0.01 (0.65) [-1.29, 1.26]	-0.05 (0.09) [-0.24, 0.14]	0.12 (0.47) [-0.80, 1.04]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	1134.03	1134.03	1169.46	1169.46
Counties	572	572	514	514
Observations	19,233	19,233	15,032	15,032
C. 3rd Quartile				
Home Price Change (in $10,000)	-0.06 (0.11) [-0.27, 0.16]	0.47 (1.02) [-1.53, 2.48]	-0.12* (0.07) [-0.26, 0.02]	-0.23 (0.46) [-1.13, 0.68]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	2765.77	2765.77	2827.51	2827.51
Counties	587	587	519	519
Observations	19,323	19,323	15,249	15,249
D. 4th Quartile				
Home Price Change (in $10,000)	1.38 (2.04) [-2.63, 5.40]	14.30 (31.50) [-47.57, 76.16]	-0.43 (3.14) [-6.59, 5.74]	-6.90 (10.95) [-28.40, 14.61]

Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	11642.09	11642.09	11845.85	11845.85
Counties	568	568	499	499
Observations	20,249	20,249	16,131	16,131

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. In columns (1) and (2), the sample years are 1998 to 2018. In columns (3) and (4), the sample years are 2000 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. The cutoffs for each quartile also are determined using individual-level weights. *** p<0.01, ** p<0.05, * p<0.1.

Table A-8. The Effect of Home Price Changes on Out-of-Pocket Expenditures for Overnight Hospital Stays and Overnight Nursing Home Stays

	Out-of-Pocket Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Out-of-Pocket Expenditures for Overnight Hospital Stays				
Home Price Change (in $10,000)	0.12 (0.09) [-0.06, 0.30]	-0.11 (1.44) [-2.94, 2.72]	-0.01 (0.08) [-0.17, 0.15]	-0.24 (0.72) [-1.65, 1.16]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	352.75	352.75	338.75	338.75
Counties	931	931	838	838
Observations	89,272	89,272	78,399	78,399
B. Out-of-Pocket Expenditures for Overnight Nursing Home Stays				
Home Price Change (in $10,000)	-0.01 (0.10) [-0.21, 0.19]	7.01 (5.75) [-4.28, 18.30]	-0.37 (0.40) [-1.16, 0.42]	4.66 (4.29) [-3.75, 13.08]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	191.63	191.63	204.62	204.62
Counties	931	931	838	838
Observations	89,272	89,272	78,399	78,399

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. The sample years are 2002 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table A-9. The Effect of Home Price Changes on Out-of-Pocket Expenditures for Doctor Visits, Dental Visits, and Outpatient Surgery

	Out-of-Pocket Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Out-of-Pocket Expenditures for Doctor Visits				
Home Price Change (in $10,000)	-0.22*** (0.06) [-0.34, -0.09]	-2.49 (1.56) [-5.55, 0.57]	-0.02 (0.13) [-0.28, 0.25]	-2.09** (0.96) [-3.97, -0.22]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	610.85	610.85	605.75	605.75
Counties	931	931	838	838
Observations	89,272	89,272	78,399	78,399
B. Out-of-Pocket Expenditures for Dental Visits				
Home Price Change (in $10,000)	0.04 (0.20) [-0.36, 0.44]	-3.66*** (1.37) [-6.35, -0.96]	0.05 (0.19) [-0.32, 0.43]	-1.17 (0.82) [-2.78, 0.44]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	841.18	841.18	862.81	862.81
Counties	931	931	838	838
Observations	89,272	89,272	78,399	78,399
C. Out-of-Pocket Expenditures for Outpatient Surgery				
Home Price Change (in $10,000)	0.02 (0.05) [-0.07, 0.12]	-0.18 (0.62) [-1.39, 1.03]	0.01 (0.06) [-0.11, 0.12]	-0.42 (0.43) [-1.27, 0.44]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	164.87	164.87	161.04	161.04
Counties	931	931	838	838
Observations	89,272	89,272	78,399	78,399

Notes: The HRS data include sample years 2002 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.

Table A-10. The Effect of Home Price Changes on Out-of-Pocket Expenditures for Home Health Care and Special Health Facilities

	Out-of-Pocket Expenditures (in $)			
	(1)	(2)	(3)	(4)
A. Out-of-Pocket Expenditures for Home Health Care				
Home Price Change (in $10,000)	-0.02 (0.03) [-0.07, 0.03]	-0.02 (0.31) [-0.62, 0.57]	-0.02 (0.03) [-0.07, 0.03]	0.00 (0.12) [-0.24, 0.25]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	32.95	32.95	34.01	34.01
Counties	931	931	838	838
Observations	89,272	89,272	78,399	78,399
B. Out-of-Pocket Expenditures for Special Health Facilities				
Home Price Change (in $10,000)	-0.13* (0.08) [-0.28, 0.02]	-0.84 (0.54) [-1.90, 0.22]	-0.02 (0.06) [-0.14, 0.09]	-0.12 (0.19) [-0.49, 0.25]
Home Price Change Measure	Reported 2-year	Simulated 2-year	Reported 4-year	Simulated 4-year
Mean of Dependent Variable (in $)	50.86	50.86	51.61	51.61
Counties	931	931	838	838
Observations	89,272	89,272	78,399	78,399

Notes: Data are obtained from the RAND HRS and the Zillow Home Value Index as described in the text. The sample years are 2002 to 2018. We control for age, marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, health status, county-level unemployment rates, county-level median household income, county-level poverty rates, and individual, county, and year fixed effects. The variables for marital status, annual household income, net household wealth excluding primary residence, the ownerships of several types of health insurance plans, and health status are measured in year $t-2$. All dollar values are in 2020 USD. Standard errors clustered at the county level are in parentheses, and 95% confidence intervals are in brackets. We use individual-level weights from the RAND HRS. *** p<0.01, ** p<0.05, * p<0.1.