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MRDRC WP 2023-457

UM22-09

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October 2022

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Acknowledgements

The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement and Disability Research Consortium through the University of Michigan Retirement and Disability Research Center Award RDR18000002-04. The opinions and conclusions expressed are solely those of the author(s) and do not represent the opinions or policy of SSA or any agency of the federal government. Neither the United States government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States government or any agency thereof.

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Abstract

We study out-of-pocket (OOP) medical expenditure risk of the U.S. population ages 55 and older using data from the Health and Retirement Study and its supplemental survey on household spending. We document trends in individual-level OOP spending from 1998 to 2018, both at the median and 95th percentile, showing a large increase until 2004, followed by rapid declines, so that 2018 OOP was less than 1998 OOP spending. We show how these changes impacted the budget share of OOP as a fraction of total household spending and analyze how households adjust the composition of their spending as OOP expenses vary. Because the distribution of OOP expenses is skewed, households face a non-negligible risk of incurring a large expense. We examined the extent to which OOP medical expenditures contribute to economic hardship among older households, as measured by food insecurity and skipping medications because of cost. We found a weak relationship with respect to food insecurity, suggesting that government programs, like Medicaid, help protect against OOP risk leading to such as an extreme form of hardship. However, we obtained statistically significant and economically meaningful effects with respect to medication insecurity: An increase from the 10th to the 90th percentile in OOP spending would increase the probability of medication insecurity by about 15 percentage points. When asked about their perceived OOP risk, individuals tend to substantially overestimate the chances of large OOP spending, although less so at advanced ages; prior experience with OOP expenses seems to lead to more accurate expectations.

Citation

Rohwedder, Susann, Péter Hudomiet, and Michael D. Hurd. “Risk of Large Medical Expenditures at Older Ages and Their Impact on Economic Well-being.” Ann Arbor, MI. University of Michigan Retirement and Disability Research Center (MRDRC) Working Paper; MRDRC WP 2022-457. https://mrdrc.isr.umich.edu/publications/papers/pdf/wp457.pdf

Introduction

Out-of-pocket (OOP) medical expenditures constitute a significant financial risk faced by the older population. Accumulated over the remaining lifetime, OOP medical expenditures for older households have been estimated to amount to well over $100,000 on average, and the distribution was found to have a long right tail (Jones et al. 2018; Webb and Zhivan 2010). As a result, even among individuals with relatively high retirement income, a non-negligible fraction may rely on Medicaid at advanced old age (Borella et al. 2018). Several studies have documented the skewed distribution, the sharp rise at advanced ages, and the persistence of OOP medical expenditures, with the potential of large shocks leading to financial strain and distress (e.g., French and Jones 2004; Fahle et al. 2016). Especially those needing long-term care services and supports, which are not generally covered by Medicare, run the risk of impoverishment because of the large associated OOP costs (Hurd et al. 2017; Hudomiet et al. 2019; Johnson 2019). According to Levy (2015), 21% of the older population, and 37% of the older population in the lowest income quartile, experienced at least one of five material hardships in 2008/2010. Even if not resulting in hardship, large OOP medical expenditures may force households to reduce other expenses; that is, OOP may crowd-out other types of spending. Of particular note would be crowd-out of necessities such as food and housing.

For retirement financial planning, it would be important for households to have comprehensive information that quantifies OOP medical expenditure risk and its impact on economic well-being. This is not an easy task for a number of reasons, such as changes in trends in OOP medical expenditures among the older population over time

and nonlinearities in the risk exposure due to Medicaid. OOP medical expenditures increased in recent decades, especially in the early 2000s, although they have stabilized in recent years (Peterson-KKF, 2022). Policy changes likely contributed to this leveling. For example, the introduction of Medicare Part D in 2006, providing insurance coverage for drug spending for those over age 65, likely reduced OOP expenditures. The introduction of the Affordable Care Act (ACA, legislated in 2010 and mostly implemented by 2014) substantially reduced the fraction of the population without health insurance among those under age 65. The ACA also mandated the gradual closing by 2020 of a coverage gap in Medicare Part D, the so-called donut hole, resulting in a further reduction in OOP spending risk for those over age 65. In view of these changes in trends, it is not easy to anticipate how OOP spending risk will evolve going forward, although population aging is likely to continue to exert upward pressure overall.

Bad health would appear to be an important risk factor for elevated OOP medical expenditure. Yet, the relationship between health and OOP spending interacts with economic resources in important ways. Those in poor health and with few resources often spend little OOP because of Medicaid, even if their health care utilization is high. Those with substantial economic resources tend to spend a greater fraction of their overall spending on OOP health expenses (despite being in better overall health); that is, spending on health exhibits features of a luxury good. These interactions and nonlinearities due to Medicaid further complicate the empirical characterization of OOP risk in a way that is informative for retirement financial planning.

In this paper, we add to the existing evidence on OOP medical expenditure risk faced by the population over age 55 in several ways. Based on data from the U.S.

Health and Retirement Study (HRS), we first document trends in individual-level OOP spending from 1998 to 2018, distinguishing between those under age 65 and those 65 or older because of the very different health insurance environment these populations face. Second, we complement the HRS core data with evidence based on detailed household spending data collected on a subsample of the HRS in the Consumption and Activities Mail Survey (CAMS) to quantify how much of total household spending goes toward OOP medical expenditures and how this varies by age and over time. We further document how increases in OOP medical expenditures affect other types of spending. We use regression models to study whether households that incurred large OOP expenditures reduced budget shares on necessities or luxuries, controlling for wealth and other socioeconomic indicators. Ideally, one would like to obtain causal estimates of spending crowd-out between OOP health expenses and other types of spending. However, OOP expenses are often associated with changes in underlying health which may prompt changes in spending preferences beyond the crowd-out effect. Since these are difficult to disentangle, the analyses of spending and budget shares are mainly descriptive.

Third, in view of the high skewness and concentration of OOP spending identified in prior studies, we examined the extent to which OOP medical expenditures contribute to the experience of economic hardship among older households, as measured by food insecurity and skipping medications because of their costs.

We study whether households have accurate beliefs about the risks of large OOP spending. Perhaps individuals are unaware of the risk of high OOP and fail to engage adequately in buffer stock saving. This led us to consider possible informational

reasons for insecurity. If individuals underestimate the probability and magnitude of OOP expenses for health care, when such expenses do occur, buffer stock savings may be insufficient, forcing them to reduce spending on other categories of goods and services. To examine how well households understand the risk, we study how individuals' perceived risk of OOP medical expenditures compares to their actual risk for such expenditures.

Data

The core Health and Retirement Study

Our analysis is based on data from the Health and Retirement Study, a biennial, nationally representative, longitudinal survey of U.S. individuals 51 and older and their spouses regardless of age. The survey started in 1992. In this study, we use HRS waves from 1998 to 2018. We do not use the survey waves prior to 1998 because the HRS used a substantially different set of questions about OOP medical expenditures.

The HRS core data includes responses from approximately 20,000 individuals per wave, and "refresher" cohorts of 51 to 56 year olds are added to the sample every six years (in 1998, 2004, 2010, 2016, and 2022) to ensure continued representation of the U.S. population over age 50. For our analysis, we restrict the sample to HRS respondents at least 55 years of age because only in the wave where the sample is refreshed does the HRS sample represent the population ages 51 to 55.

The RAND HRS Longitudinal Data file is a publicly available, cleaned data set based on the most commonly used HRS variables. We use the RAND HRS variables whenever available.

The HRS covers a broad range of topics, such as health care, housing, assets, pensions, employment, and disability. Compared with other general-purpose surveys, the HRS stands out for the detailed questions on health-related topics, including OOP medical expenditures. Our measure of OOP health care expenses is the amount an individual or family spends on a person's health care, excluding spending for health insurance. As such, it includes OOP (nonreimbursed) expenses for

- doctor's visits;
- hospitalizations;
- dental care;
- nursing home stays;
- in-home formal care;
- drugs, including over-the-counter medications; and
- other OOP medical expenditures (HRS 2010 onward).

The HRS asks individuals about spending on these categories since the previous interview, which is about two years.[1] We annualized these reports using the number of months between the two interviews and then inflation-adjusted the reports to 2019 dollars. In some analyses, we use household-level OOP medical expenditures, defined as the sum of spending by individuals and their spouses. In some regression models, we use the natural logarithm of OOP spending. In those models, individuals with zero OOP spending were imputed to have $1 so that the log transformation is defined on their spending.

[1] In more recent survey waves, the HRS allows analyzing OOP spending on more detailed categories, but we use this level of detail to be consistent with the earlier waves.

We use a number of additional measures from the HRS core survey, such as demographics, socioeconomic status, and subjective expectations about OOP expenditures. We will discuss the details in the Results section.

The Consumption and Activities Mail Survey

Since 2001, the HRS has mailed paper-and-pencil surveys to a subset of randomly chosen households in years between core interviews to measure household spending. We use these data to analyze the effect of OOP medical expenditures on spending on other categories.

Between 2005 and 2019, 7,026 households provided 42,354 surveys. In this project, we omit the 2001 and 2003 waves due to significant differences in the details of spending elicitation between these and later waves. CAMS elicits household spending during the prior 12 months in 39 categories, including spending on health care. We compared CAMS measures to those of the Consumer Expenditure Survey (CEX). Among those 65 or older, the ratio of average spending in the CAMS waves 2003, 2005, and 2007 to the corresponding measure in the CEX was 1.1 (Hurd and Rohwedder 2015). In later CAMS waves, the ratio has been close to 1.0.

Results

Trends and the age profile of OOP medical expenditures

We first document trends in OOP medical expenditures from 1998 to 2018, separately for HRS respondents ages 55 to 64 and those 65 or older, because the two age groups face a very different health insurance landscape. We study both the 50th and the 95th percentiles of expenditures to assess the dispersion of such expenditures.

Figure 1 shows OOP health care expenditures across the two age groups, expressed in 2019 dollars. Spending by the two groups was similar at the median over the study period and exhibited similar trends, but the swings are larger among the older group, especially when considering the 95th percentile. Median OOP health care expenditures among those over age 65 increased by 60.7% from $698 in 1998 to $1,122 in 2004, then gradually decreased to $708 in 2018. The 95th percentile of such expenditures changed more sharply, increasing by 95.9% from $5,646 in 1998 to $11,061 in 2004 before decreasing to $6,452 in 2018. The large increase and subsequent decline in total OOP medical spending appear to be driven in large part by trends in OOP spending on prescription drugs: the 95th percentile of OOP drug expenditures increased by 72.6% from $3,764 in 1998 to $6,496 in 2004 before decreasing to $2,443 in 2018. At the peak in 2004, the 95th percentile of OOP drug expenditures was 58.7% of the 95th percentile of all OOP health care expenditures among those 65 and older. By 2018, the 95th percentile of OOP drug expenditures was only 37.9% of the 95th percentage of all OOP health care expenditures. According to a Congressional Budget Office report (CBO 2022) and references therein, the rapid increase in OOP spending on prescription drugs leading up to the peak in about 2004 was the result of increasingly widespread use of new drug treatments for common conditions (e.g., statins for high cholesterol, ACE inhibitors to treat high blood pressure). The ensuing decline was due to a combination of expiring patents on those widely used drugs and pharmacy benefit managers introducing incentives to switch to generic drugs via much higher copays for brand-name drugs. Medicare Part D, which provides insurance coverage for prescription drugs for those over age 65, was introduced around

the same time. It went into effect in 2006 and led to a large reduction in OOP spending among this age group. The program also embedded strong incentives for the use of generic drugs via benefit formulary design.

Overall, while there has been a good deal of variation in the 50th and 95th percentiles of OOP health care expenditures, as well as in the 95th percentile in OOP drug expenditures, such expenditures in 2018 were not much different from those in 1998.

Figure 2 shows annual OOP health care spending by age group among persons 55 or older across the period 1998 to 2018. Median expenditures slightly increase with age, being $671 for persons 55 to 59, increasing to $845 for persons 70 to 74, and further increasing to $995 for persons 80 or older. The 95th percentile changes more sharply, but primarily among the oldest respondents. It is below $7,000 for every age group younger than 80 but more than $13,000 for persons 80 or older. The elevated OOP medical expenditures captured by the 95th percentile tend to be related to the cost of treating chronic conditions, which are more prevalent near the end of life (French et al. 2017); hence the concentration in the oldest age group. Put another way, financial burden slowly increases with age, and the risk of extreme spending rapidly increases at advanced old age.

Figure 3 further breaks down the 95th percentile of OOP health care expenditures by age and type: hospitalization or nursing home (Hosp/NH), doctor visits, and prescription drugs. This figure points to three findings. First, spending on drugs strongly and monotonically increases with age. Second, OOP expenditures for hospitals and nursing homes as well as those for doctor visits appear to decrease once a respondent

reaches the Medicare eligibility age of 65. Third, the high 95th percentile level of general OOP health care expenditures for persons 80 or older appears to result from hospital and nursing home expenditures.

Budget shares

A budget share is the fraction of total spending devoted to a particular category of spending; the budget shares over all categories are constrained to sum to 1.0. Previous research has found that budget shares vary systematically with age (Rohwedder, Hurd, and Hudomiet 2022; Hurd and Rohwedder, 2022). For example, as individuals age, they spend higher proportions of their budgets on health care, gifts, and donations, with smaller shares going to trips, vacations, and transportation (particularly for private automobiles). This can be seen in Table 1, which shows budget shares of household spending across 11 broad categories among 55 to 59 year olds and those 85 or older by marital status. The spending categories are ordered by size of budget share at ages 55 to 59, from largest to smallest. While health spending (including insurance premia) is the fifth largest budget share at ages 55 to 59, it rises to third place at advanced age (85+).

An increase in OOP health care expenditures is likely to be accompanied by a realignment of budget shares, although in principle, a household could increase spending on all categories in the same proportion, keeping all budget shares constant. The most likely case is that spending on all categories except health will remain the same or decrease; then, the budget share of OOP spending will increase, and all others will decrease. Households with adequate economic resources may cut back on spending on luxury goods. Households with few economic resources may be forced to

reduce spending on necessities; that is, OOP will crowd out spending on necessities. A second channel for realignment of spending may come from a modified desire to spend on some categories. We found in previous research that, as individuals age, they have less desire to engage in some types of activities (Rohwedder, Hurd, and Hudomiet 2022). For example, driving becomes more difficult for individuals as they age. Hence, individuals may choose to spend less on automobiles or other private transportation regardless of their OOP health care expenditures. Because of the adding-up constraint, the budget share for OOP will mechanically increase.

To investigate whether health care spending displaces other spending, we estimated regression models to analyze the effect of OOP health care expenditures on other budget categories. In addition to OOP health care expenditures, we included limitations in activities of daily living, age in categories, and age interacted with OOP spending. Spending on health care is a normal good and possibly a luxury good: well-to-do households may spend a greater fraction on health care and on other luxury goods, leading to the likely incorrect inference that health care and luxury goods are complements. To control for differences in economic resources across households, we estimated regression models of first differences in budget shares, for example, the change in the budget share of food on the change in the log of OOP spending. Because OOP spending is highly skewed we used the log form for OOP.

Figure 4 shows the results of the regressions of the changes in household budget shares by category resulting from a unit increase in the log of OOP health care expenditures. The top panel shows changes for single persons from three age groups, while the bottom panel shows changes for married persons. As shown in Table 1, for

both groups, the four largest categories of non-health care spending are transportation, utilities, housing, and food. For both single and married persons, the pattern is the same: Increases in the levels of OOP health care expenditures are associated with an increase in the fraction spent on OOP health and reductions in the fraction spent on transportation, housing, utilities, and possibly food. The reduction in spending on housing may be achieved either by moving to a smaller dwelling following a health shock or by reducing spending on home repairs and maintenance, a pattern highlighted and analyzed in Davidoff (2004).

OOP medical expenditures and economic distress

The statistics on the distribution of OOP medical expenditures, such as those on the 95th percentile, showed that some individuals incur very large expenses, which could cause financial strain. At the same time, Medicaid largely covers medical expenses for those 65 or older if the household cannot pay. To examine to what extent OOP expenditures contribute to economic distress, we examine two HRS measures: food and medication insecurity. We consider households to have food insecurity if the financial respondent of the household indicated that, since the previous interview (two years on average), the household did not always have enough money to buy the food they needed. We consider a person to have medication insecurity if they indicated that, at any time since the previous interview, they "ended up taking less medication than was prescribed for you because of the cost." A household had medication insecurity if either spouse reported medication insecurity. In what follows, we will speak about the food or medication insecurity of individuals, which means that they live in households where insecurity was experienced.

Figure 5 shows the prevalence of either insecurity for persons 55 to 64 years old and for persons 65 or older. The proportion reporting “any insecurity” is the proportion reporting one or both types of these insecurities. The patterns point to several findings. First, persons 55 to 64 — that is, those younger than the Medicare eligibility age of 65— are more likely to live in insecure households than those who have reached the Medicare eligibility age. Indeed, the proportion of those 55 to 64 reporting either insecurity is more than 50% higher than the proportion of those 65 or older. Second, the “Great Recession” appears to have caused insecurity to spike for persons 55 to 64 after 2008. Third, for both age groups, medication insecurity is more frequent than food insecurity. Fourth, medication insecurity is greater for respondents 55 to 64 than for respondents 65 or older. This is especially surprising, given that older persons take more medications than younger ones, and so have a greater chance of skipping their medication.

Next, we use the panel information from the HRS to analyze transitions into and out of food or medication insecurity between interview waves. The top row of Table 2 shows that, among persons who were secure in the first of two waves, those 55 to 64 years of age were more likely than those 65 or older to fall into food insecurity by the second wave two years later (4.9% versus 3.2%). Similarly, the second row shows that among persons who were insecure in the first wave, those 55 to 64 years of age were more likely to remain insecure by the time of the second wave than those 65 or older (49.3% versus 39.8%). Thus, the persistence of food insecurity is about 10 percentage points higher among those 55 to 64. Altogether, as the last row of the table shows, food insecurity among those 55 to 64 was about double that for persons 65 or older (9.0%

versus 5.0%).

The patterns are similar for medication insecurity. Table 3 shows transitions into and out of medication insecurity between waves that are about two years apart. Among persons who were secure in the first of two waves (top row), those 55 to 64 years of age were more likely to fall into medication insecurity by the second wave than those 65 or older (9.1% versus 5.5%). Similarly, among individuals who had medication insecurity in the first wave, 41.1% of those 65 or older remained insecure by the second wave, while this was the case for 49.0% of those 55 to 64. Altogether, as the last row shows, medication insecurity is nearly double among persons 55 to 64 than among persons 65 or older (15.8% versus 9.0%). The level of medication insecurity is also almost double that of food insecurity among both age groups.

Both tables imply that some persons may be in a permanent state of insecurity, whether for food or, particularly, for medication. To understand better who is in a state of insecurity and the predictors of insecurity, we estimated four types of linear probability models. The first “cross-sectional” model examines the association of OOP health care expenditures since the previous interview (about two years on average) but annualized, so variation in OOP across households is adjusted for varying time elapsed between interviews. The second “lagged” model uses both OOP health care expenditures and a lagged variable of OOP health care expenditures to model the persistent effects of such expenditures. Because HRS interviews are about two years apart, the lagged OOP variable reflects annualized OOP spending from two years prior. The third “secure to not secure" model examines wave-to-wave transition probabilities from food or medication security to insecurity as a function of OOP spending since the

previous interview. The fourth “not secure to not secure” model estimates the persistence of insecurity: the probability of insecurity in wave t+1 among those who already had food or medication insecurity in wave t. All regression models include control variables on respondent sex, age, education, household wealth quartile, race and Hispanic origin, and an indicator of any ADL limitations. To simplify the discussion, we speak of the “effects” of OOP, by which we mean the coefficient magnitudes in the regressions. In the discussion section, we review reasons to be cautious about a causal interpretation.

Table 4 presents the results of the four regression models of food insecurity among single individuals, and Table 5 shows the corresponding models among married individuals. We separate respondents by marital status because of the difference in resources and sharing of risks by respondents who have a spouse or partner and those who do not.

Among single individuals (Table 4), three out of four models find no association between OOP health care expenditures and food insecurity. The fourth model predicts that individuals with higher OOP spending are less likely to transition into food insecurity. The coefficient is small, however. A movement of 5.3 log points, or from the 10^{th} to the 90^{th} percentiles of OOP health care expenditures, would decrease the transition probability into food insecurity by less than 1 percentage point.

Among married individuals (Table 5), there is a modest and statistically significant negative relationship between OOP health care expenditures and food insecurity based on the cross-sectional, the lagged, and the “secure to not secure” models. These models imply that persons with higher OOP health care spending were

less likely to have or transition into food insecurity, but the effects are also small. In absolute value, the largest statistically significant coefficient is -0.00301 in the cross-sectional model. Based on this coefficient, a movement of 5.3 log points would decrease the probability of food insecurity by about 1.6 percentage points.[2]

Several estimates associated with the control variables are noteworthy. Among singles, we observe strongly decreasing food insecurity with age among older respondents. Among married respondents, the decrease with age was more modest. There is a stronger relationship between food insecurity and wealth quartiles among single respondents than among married ones. Black non-Hispanic and Hispanic persons have higher levels of food insecurity than white persons, even after controlling for wealth quartiles and education. Overall, OOP health care expenditures are not associated with an elevated risk of food insecurity.

Tables 6 and 7 show the regression models for medication insecurity among single and married individuals, respectively. The results are quite different from the models on food insecurity. Among both single and married persons, OOP health care expenditures are strongly and statistically significantly associated with medication insecurity. All eight models predict that more OOP spending leads to higher probabilities of medication insecurity. The absolute values of the coefficients are an order of magnitude larger than the ones for food insecurity. A change from the 10^{th} percentile of expenditures to the 90^{th} percentile, for example, would increase the probability of

[2] We investigated whether these findings were the result of functional form assumptions by re-estimating the relationship with locally estimated scatter plot smoothing (LOESS) which permits the functional form to be determined by the data. The results confirmed the relationship with OOP spending shown above.

medication insecurity by about 15 percentage points (0.02777*5.3=0.147), approximately doubling the risk of medication insecurity. The models including current and lagged OOP expenditures showed that the lagged expenditures had about half the effect that current expenditures did, indicating a cumulative association. The transition models show that OOP spending increases both the transitions into medication insecurity and its persistence.

The other control variables also showed statistically significant relationships with medication insecurity. Similar to what we found for food insecurity, medication insecurity strongly decreased with age and with wealth quartiles; it was elevated for Hispanic and Black non-Hispanic respondents, even after controlling for wealth quartiles.

Expected versus actual OOP medical expenditures

With adequate buffer stock saving, a health shock and the accompanying increase in OOP health care spending would not lead to a reduction or cessation in the consumption of medications and possibly a consequent worsening of health. Perhaps, however, individuals are not aware of the level and risk of OOP health care spending and hence do not undertake sufficient buffer stock saving. To address this issue, we analyzed expectations about OOP health care expenditures and compared these expectations to subsequent realizations.

In the core HRS, expectations are measured by the subjective probability that OOP spending will exceed a specified target. Specifically, on a 0 to 100 scale (absolutely no chance to absolutely certain), respondents are asked about the probability that their OOP spending would exceed $1,500 “for your own medical expenses over the next year, including expenses such as doctor and dentist expenses,

hospitals, nursing homes, prescription drugs and any others" or that a family member might spend on their behalf, excluding insurance premiums. Respondents were asked about additional targets of $3,000 or $8,000.

We linked the responses to the subjective probability questions and actual OOP as observed in the subsequent HRS wave.[3] Figure 6 shows, by age group, the average subjective probability that OOP health care expenditures will exceed $3,000 in the subsequent year, as well as the proportion for whom such health care expenditures did exceed this level. For example, among persons 55 to 64, the average subjective probability that OOP health care expenditures would exceed $3,000 in the subsequent year was 27.4 percent. If these subjective probabilities were accurate forecasts, then 27.4% of respondents in this age group should have had OOP health care expenditures exceeding $3,000 in the subsequent year. Instead, as the figure shows, only 14.3% had OOP expenditures exceeding that level. This is a relative error of 1.92 here, calculated by dividing 27.4 by 14.3.

There are similarly substantial errors among persons 65 to 74 and 75 to 84. Persons 85 or older did better at anticipating $3,000 in health care expenses, but even here, there was some overestimation. What might be the cause of such overestimations?

It is difficult to argue that the responses include insurance premia because such costs are explicitly excluded in the question. An alternative explanation may be that

[3] The time period for the subjective probability is spending over the next year; the time period for actual spending is since the previous interview which averages two years. We computed annualized spending by dividing the total observed since last interview by the number of months between interviews and then multiplying by 12 to obtain the annualized amount.

individuals overestimate the chances of a low-probability health event, especially at younger ages where bias in expectations is greatest. This is similar to estimates that persons may make of contracting the flu or dying from COVID-19. Still another possibility is that individuals overestimate what they would have to pay if they were to have an event requiring substantial OOP expenditures. As individuals age, they may become more accurate in their expectations given increasing exposure to the health care system and its costs, possibly facilitated by virtually universal coverage by the same health insurance, Medicare.

There is some support for a hypothesis that individuals overestimate the probability of rare events in the expectations about targets of $1,500, $3,000, and $8,000. For example, among respondents 55 to 64 years of age, the average subjective probability of incurring at least $1,500 in OOP health care expenditures is 1.56 times that of actually doing so (Table 8). The average subjective probability of incurring at least $3,000 is 27.4%, which is 1.92 times the actual probability, and the average subjective probability at $8,000 is 4.50 times the actual probability. As we would expect, the subjective probabilities decrease as thresholds increase from $1,500 to $3,000 to $8,000, but the relative overestimate increases as the actual events become rarer. Similar results are to be found for other age bands, with the exception of 85 or older.

To test further the sources of relative error in estimating costs, we considered such errors both by respondent age and by OOP health expenditures in the preceding two years. The classification by prior OOP is meant to show how the error is related to the experience of having interactions with the health care system, which might increase the accuracy of forecasts of future spending. Figure 7 shows for the target of $3,000 the

log of the relative forecast error, where the forecast error is the forecast probability that spending will exceed $3,000 divided by the probability that OOP spending actually did exceed $3,000. For example, among persons 55 to 64 years of age who reported no OOP health care expenditures in the preceding time period, the log relative error in estimating expenditures of at least $3,000 in the subsequent year was 1.6. By contrast, among those who spent at least $5,000 in the preceding time period, the log relative error in estimating expenditures of at least $3,000 in the subsequent year was only 0.1. We find similar patterns among older age groups (as shown on Figure 7) and for target expenditures of $1,500 and $8,000 (results not shown).

The overall effects show relative bias decreases with age and with previous OOP health care expenditures. These results are consistent with the hypothesis that individuals with greater exposure to health care costs are more accurate in their future estimates of such costs.

Discussion and conclusions

Because of our focus on risk, we defined OOP health care spending by a person to be what that person spent on health care services, excluding medical insurance. For the typical person, OOP health care expenditures are relatively modest. Among those 65 or older, we found that at the median (i.e., 50th percentile) such expenditures have not exceeded $1,200 annually in 2019 dollars between 1998 and 2018 and were lower in 2018 than in 1998. The decline is especially notable from 2004 to 2018, amounting to a decrease of about 37% over that time period. The declines are likely due to a shift of the payment channel from OOP to payments for insurance. The introduction of Medicare Part D is an example. At the same time, however, total household spending

on health care, including health insurance, has become greater than would be measured by OOP because of shifting of health insurance costs. Medicare Part B would be an example where, since the establishment in 2007 of income-related premia, high-income persons pay much greater premia than formerly.[4] The introduction of additional policy changes by the government, most notably the Affordable Care Act, has contributed to the decline in OOP.

The 95th percentile of OOP is much greater than the median by a factor of about 10, and it has been much more volatile than the median. For example, in the 65+ population it was $5,600 in 1998, $11,100 in 2004 and $6,500 in 2018. A good deal of this volatility comes from the OOP cost of prescription drugs and the introduction of Medicare Part D.

Household spending for OOP is greater than the individual-level spending just discussed, about 90% greater, because it captures spending of more than one person in multiple-person households. As measured in CAMS it shows the same pattern of decline in real terms over time. Between 2005, the first year of CAMS that we use, and 2019 real median OOP spending declined by 37%. Reflecting the decline in OOP spending, the budget share of OOP in CAMS declined from 2005 to 2019 by 17% for those ages 55 to 64 and by 35% for those 65 or older.

Because of the skewed distribution of OOP health care expenditures, we expected that OOP expenditures would cause damage to household budgets. Accordingly, we examined what effects OOP health care spending might have on

[4] The Medicare Modernization Act of 2003 instituted income-related Medicare Part B premiums, which took effect in 2007, requiring high-income beneficiaries to pay up to 80% of program cost compared to 25% among low-income beneficiaries.

medication insecurity and food insecurity. The levels of insecurity are much higher among those age 55 to 64 than among those 65+. Among the 65+ population, insecurity declines with age and, in some measures, very substantially. For example, among single persons 80 or older, medication insecurity was about 11 percentage points lower than at ages 65 to 69. This difference is consistent with other research showing greater economic security and higher economic status at advanced age in cross-section. The positive relationship between economic status and age is due in part to differential mortality, that is, more well-to-do individuals are more likely to survive to advanced old age.

We could not detect a relationship between OOP spending and food insecurity, whether in cross-section or in the relationship between change in insecurity and OOP. We conclude that food insecurity results from low economic resources and has considerable persistence over time; it is not the result of either one-time large OOP or persistent OOP spending. For medication insecurity, there is good evidence of a relationship, some of which may be causal. Those with higher OOP are more likely to be medication insecure, and those with higher OOP are more likely to transition into medication insecurity or to remain in insecurity. But it is also clear that economic status matters, which clouds the quantification of a causal interpretation.

We found some evidence that OOP spending affects the budget shares of necessities (Figure 4) in that those households that experienced a large increase in OOP had increases in budget shares for OOP (as would be expected) but, importantly, reductions in budget shares for housing, transportation, utilities, and food.

A consistent finding is that measures of distress are lower in the population 65 or

older and the measures continue to decrease with advancing age. In the descriptive regression for food insecurity (Table 6), for example, the rate of insecurity among single persons 80+ is 17 percentage points (ppts) lower than among those 55 to 59. Among married persons, the age pattern is similar, although muted. Concerning medication insecurity, the age pattern is similarly strong, but now for both single and married persons. These patterns are consistent with recent research on the age variation in economic satisfaction (Rohwedder, Hurd, and Hudomiet 2022). That study found that people of advanced old age judge their financial situation to be better than people in their 50s and 60s, as reflected in statements about satisfaction with their financial situation and feeling economically constrained.

A second consistent finding is that even after controlling for age, education, and wealth, white non-Hispanic persons live in households that experience less insecurity than Hispanic, Black non-Hispanic, or other non-Hispanic persons.

Conclusion

Because of the skewed distribution of OOP for health care, we expected that it could trigger economic insecurity in some households. Because food is a fundamental need, food insecurity is of particular interest. While we found relatively high levels of food insecurity, we did not find it was related to OOP medical spending either in cross-sectional or longitudinal analyses. Rather it was related to economic status and, even when controlling for wealth and education, to race and ethnicity. We found a quantitatively significant relationship between OOP spending and medication insecurity.

By the measures we have considered, conditions are better for those 65 or older than those ages 55 to 64: OOP spending at the median and the 95th percentile are

lower, and food and medication insecurity are less frequent. An obvious explanation is public programs that begin coverage at age 65. Possibly more surprising is that improvement continues with age beyond age 65. Nevertheless, this is consistent with other research about the relatively favorable economic position of those at advanced old age. Differential mortality, that is, the tendency that those with higher economic resources disproportionately survive to advanced old age, very likely contributes to this observed pattern in an important way.

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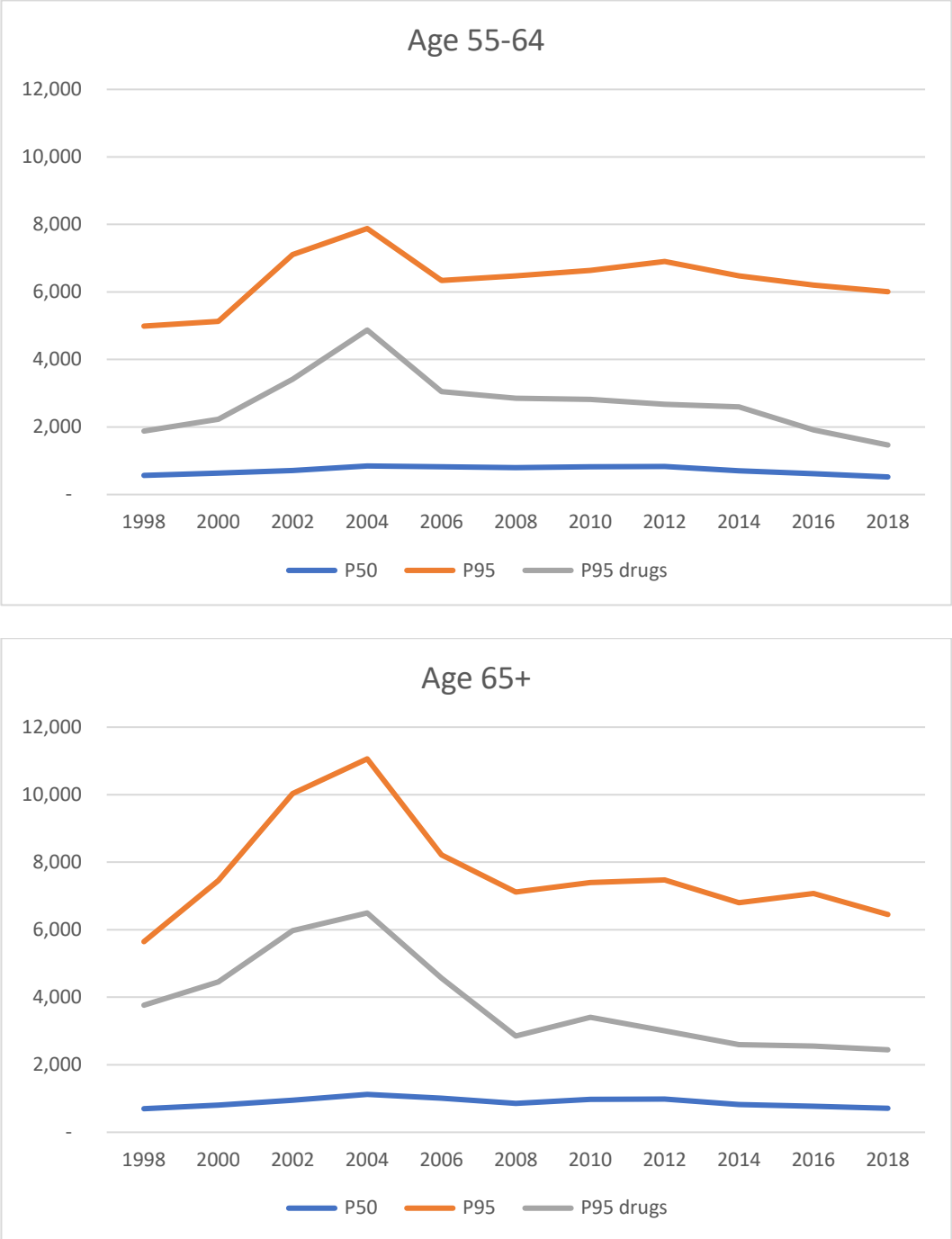
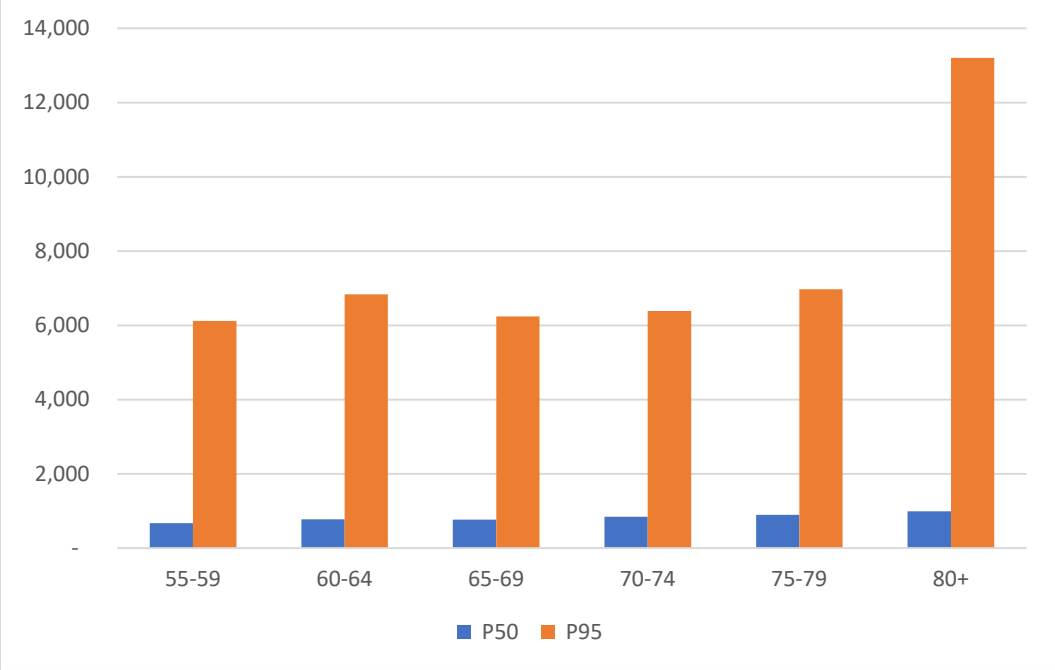
Figures

Figure 1: Trends in the median and the 95th percentile of annual OOP medical expenditures and drug spending by age.



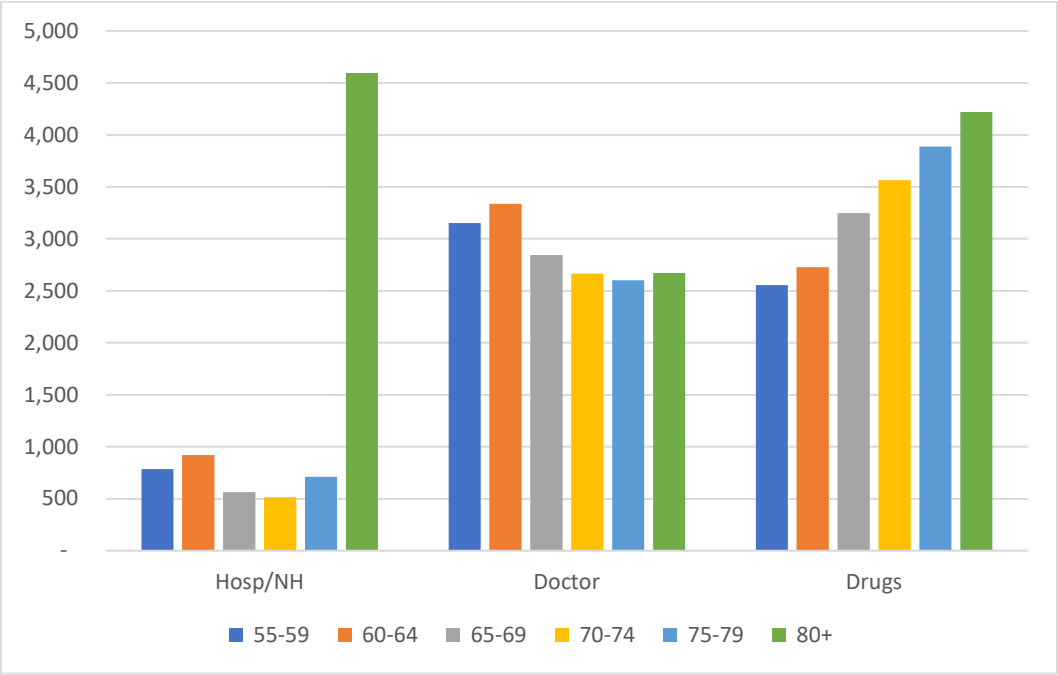
*In 2019 dollars. HRS, 1998 to 2018, N=180,818, weighted.

Figure 2: Median and 95th percentile annual OOP medical expenditures by age



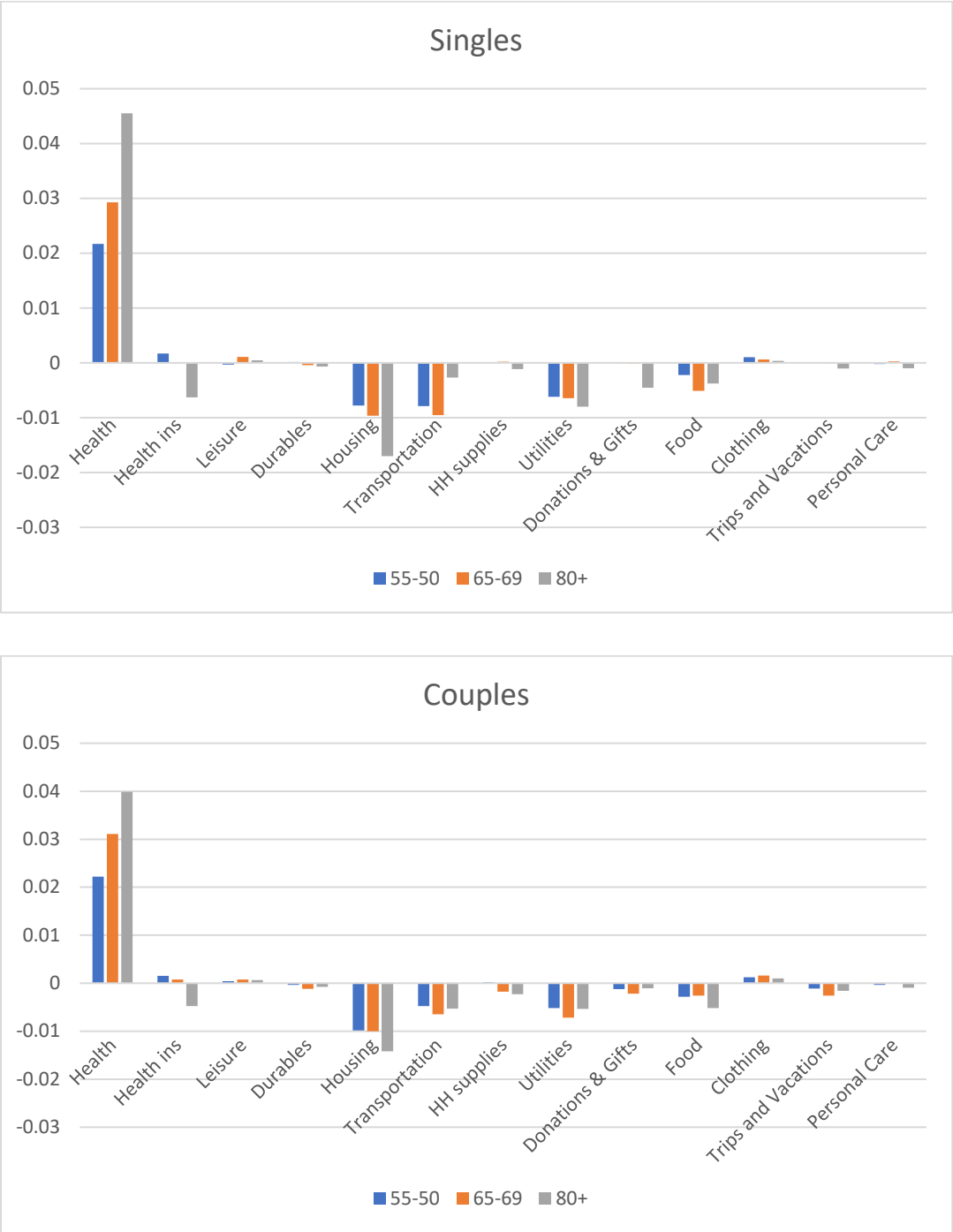
*In 2019 dollars. HRS, 1998 to 2018, N=180,818, weighted.

Figure 3: 95th percentiles of OOP spending for hospital/nursing home, doctor visits, and prescription drugs by age



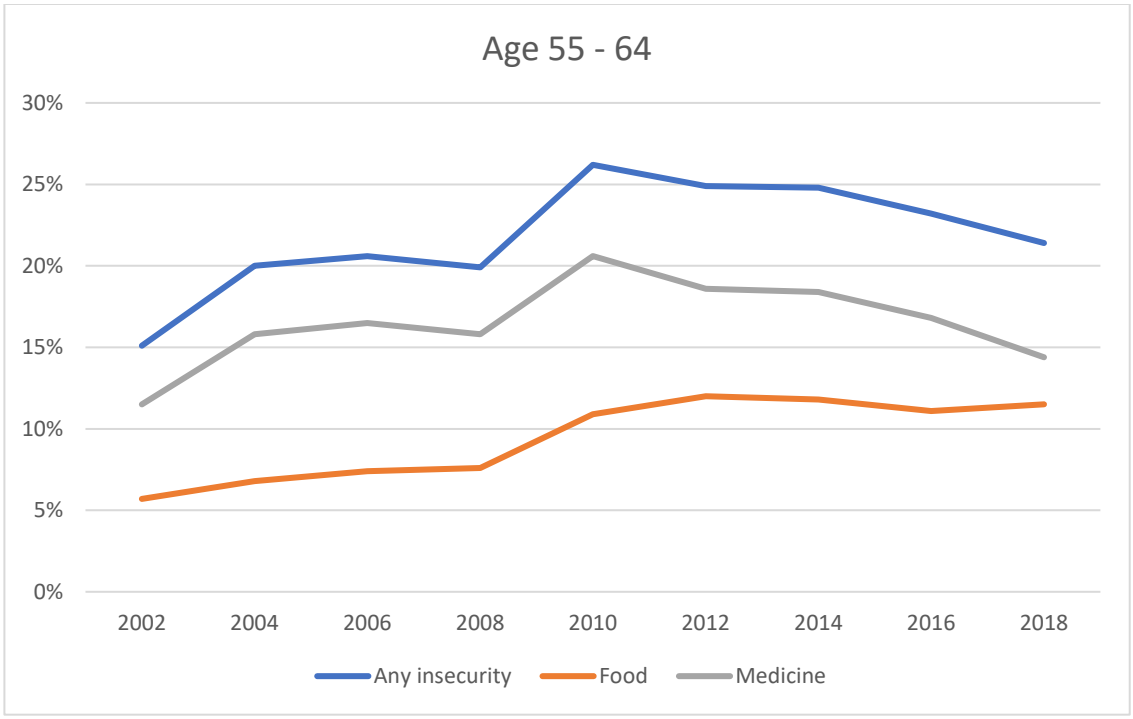
*In 2019 dollars. HRS, 1998 to 2018, N=180,818, weighted.

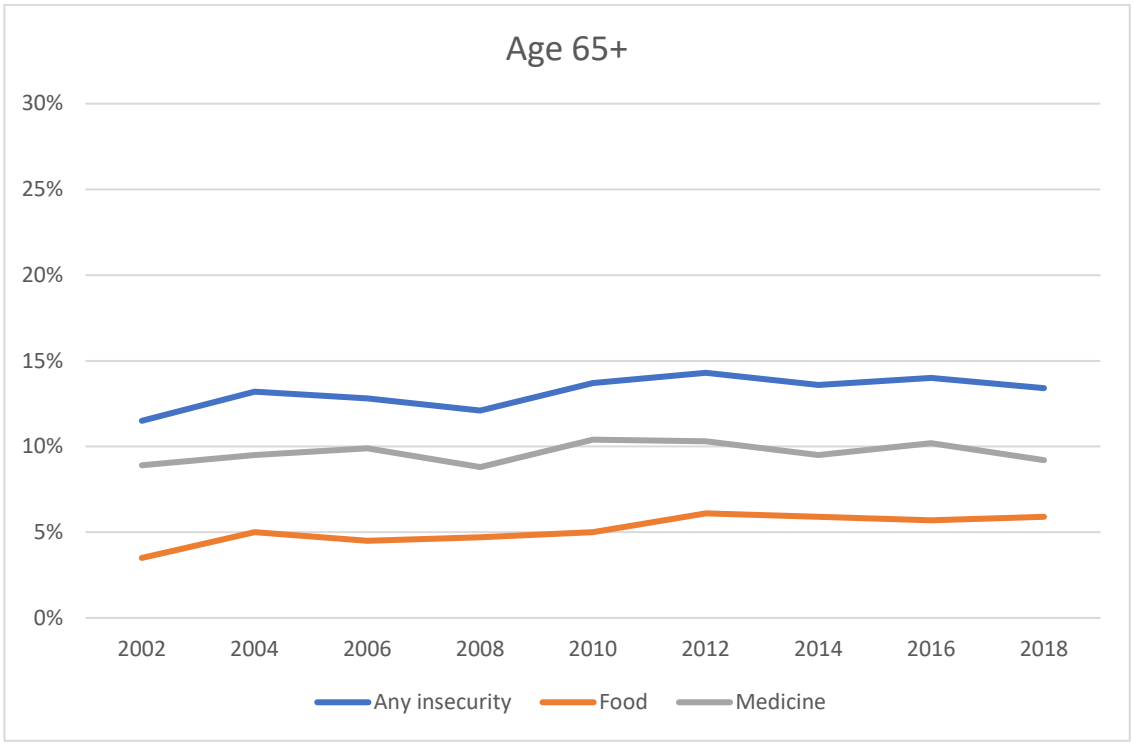
Figure 4: Change in budget shares for a one unit change in log OOP spending for three age groups



Note: HRS CAMS 2005 to 2019. "Health" = OOP medical expenditures, excluding health insurance premia. The graph shows estimated coefficients from the regression of the change in budget shares on the change in log OOP. Each of the 13 regressions included interactions between six age bands and the change in log OOP and controls for changes in ADL limitations.

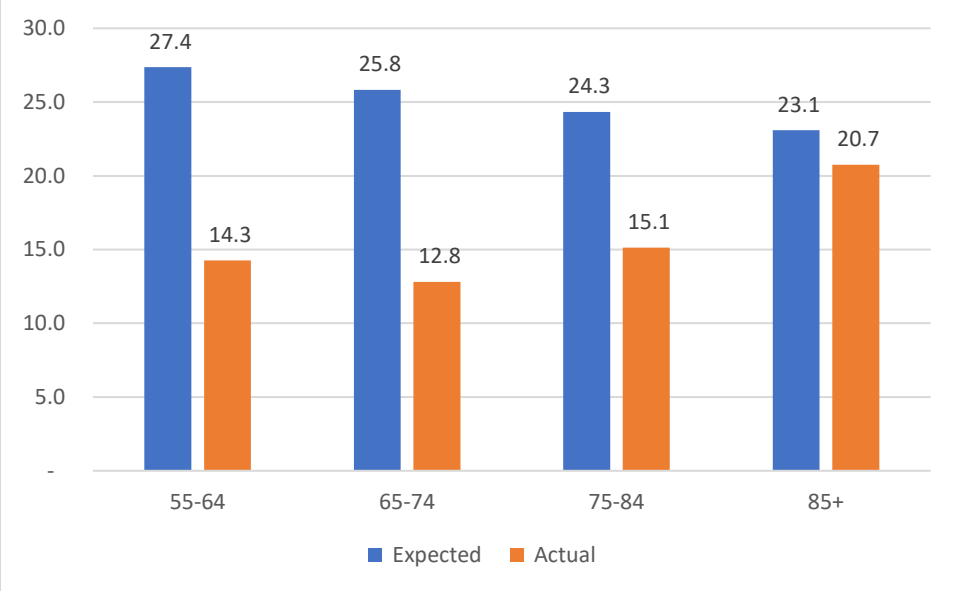
Figure 5: Trends in household food and medication insecurity





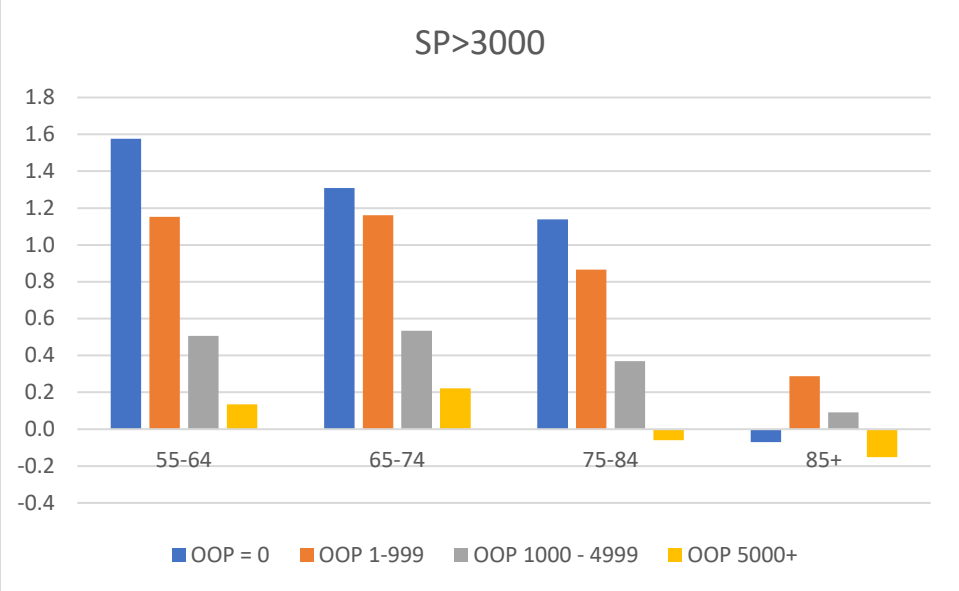
*HRS, 1998 to 2018, Ages 55 to 64: N=52,415; Ages 65+: N=93,208, weighted.

Figure 6: Expected versus actual probabilities of OOP >3,000.



Sample: Ages 50+ in 2010 to 2018 with nonmissing expectations. N= 53,466. Weighted.

Figure 7: Logarithm of relative forecast error as a function of preceding two-year actual OOP



Note: The relative forecast error is the mean subjective probability that spending will exceed $3,000 divided by the actual frequency. The log of that ratio is displayed.

Sample: Ages 55+ in 2010 to 2018 with nonmissing expectations. N= 53,465. Weighted.

Table 1: Budget shares (in percent) of household spending at ages 55 to 59 and 85+

	All		Singles		Couples	
Category	**55-59**	**85+**	**55-59**	**85+**	**55-59**	**85+**
Housing	25.1	25.8	27.4	26.9	23.4	20.1
Transportation	20.8	9.0	18.2	8.2	22.7	12.9
Food	16.0	15.5	16.6	15.2	15.6	16.8
Utilities	11.9	14.3	13.9	14.5	10.6	13.0
Health (OOP + insurance)	8.6	15.2	7.9	15.2	9.0	15.1
Trips & Vacations, Leisure	5.1	2.6	3.8	2.4	5.9	3.7
Gifts & donations	4.9	8.9	3.8	8.7	5.7	9.9
Household operations	3.1	4.5	3.5	4.6	2.8	4.2
Clothing	2.2	1.6	2.5	1.6	2.0	1.6
Personal care	1.4	1.9	1.5	1.9	1.2	2.0
Durables	1.0	0.8	0.9	0.8	1.0	0.7

Notes: CAMS 2005 to 2019, pooled; weighted. Budget shares ordered from largest to smallest at ages 55 to 59.

Table 2: Transition rates between food security and insecurity in consecutive waves

	Age 65 or older			Age 55 to 64		
	Wave t+1			Wave t+1		
Wave t	**Secure**	**Not Secure**	**Total**	**Secure**	**Not Secure**	**Total**
Secure	96.8	3.2	100.0	95.1	4.9	100.0
Not Secure	60.2	39.8	100.0	50.7	49.3	100.0
All	95.0	5.0	100.0	91.0	9.0	100.0

* HRS, ages 55+, 2002 to 2018. N=70,836 ages 65+; 41,606 ages 55 to 64, weighted.

Table 3: Transition rates between medication security and insecurity in consecutive waves

	Age 65 or older			Age 55 to 64		
	Wave t+1			Wave t+1		
Wave t	**Secure**	**Not Secure**	**Total**	**Secure**	**Not Secure**	**Total**
Secure	94.5	5.5	100.0	90.9	9.1	100.0
Not Secure	58.9	41.1	100.0	51.0	49.0	100.0
All	91.0	9.0	100.0	84.2	15.8	100.0

* HRS, ages 55+, 2002 to 2018. N=71,000 ages 65+; 41,711 ages 55 to 64, weighted.

Table 4: Linear probability regression models of food insecurity, single individuals

	Cross-sectional	Lagged	Secure to not secure	Not secure to not secure
	(1)	(2)	(3)	(4)
Log OOP medical	-0.00011	0.00001	-0.00157***	0.00241
	(0.001)	(0.001)	(0.001)	(0.003)
Lagged Log OOP		-0.00029		
		(0.001)		
Missing lag flag		0.00596		
		(0.007)		
Male	-0.03053***	-0.03074***	-0.01202***	-0.11147***
	(0.004)	(0.004)	(0.003)	(0.019)
Age 55-59	ref.	ref.	ref.	ref.
60-64	-0.04601***	-0.04505***	-0.02165***	-0.02487
	(0.006)	(0.006)	(0.006)	(0.020)
65-69	-0.09933***	-0.09815***	-0.04443***	-0.06831***
	(0.006)	(0.007)	(0.005)	(0.023)
70-74	-0.12281***	-0.12154***	-0.04897***	-0.12647***
	(0.006)	(0.007)	(0.005)	(0.026)
75-79	-0.14430***	-0.14298***	-0.05994***	-0.20880***
	(0.006)	(0.006)	(0.005)	(0.029)
80+	-0.18564***	-0.18435***	-0.07724***	-0.27775***
	(0.006)	(0.006)	(0.005)	(0.028)
< H.S.	-0.00033	-0.00042	0.01378***	-0.04789**
	(0.006)	(0.006)	(0.004)	(0.022)
High school	ref.	ref.	ref.	ref.
Some college	0.00089	0.00090	-0.00473	-0.01710
	(0.005)	(0.005)	(0.003)	(0.022)
College	-0.02356***	-0.02343***	-0.01344***	-0.04857
	(0.005)	(0.005)	(0.003)	(0.032)
Wealth quartile lowest	ref.	ref.	ref.	ref.
2nd	-0.07152***	-0.07131***	-0.02870***	-0.04918***
	(0.006)	(0.006)	(0.005)	(0.018)
3rd	-0.11717***	-0.11693***	-0.05179***	-0.10633***
	(0.006)	(0.006)	(0.005)	(0.023)
Wealth quartile highest	-0.14548***	-0.14522***	-0.06564***	-0.24785***
	(0.006)	(0.006)	(0.005)	(0.032)
White non-Hispanic	ref.	ref.	ref.	ref.
Black non-Hispanic	0.05461***	0.05437***	0.03525***	0.03508*
	(0.006)	(0.006)	(0.004)	(0.019)
Other non-Hispanic	0.03899***	0.03862***	0.01513	0.05398
	(0.014)	(0.014)	(0.010)	(0.043)

Hispanic	0.01491**	0.01451*	0.01326**	-0.00985
	(0.008)	(0.008)	(0.006)	(0.027)
Any ADL limitation	0.07962***	0.07966***	0.03065***	0.10793***
	(0.004)	(0.004)	(0.004)	(0.016)
Constant	0.28132***	0.28077***	0.14242***	0.60550***
	(0.009)	(0.009)	(0.007)	(0.027)
Observations	57,049	57,049	37,060	4,762
R-squared	0.114	0.114	0.043	0.076

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. HRS, ages 55+, 2002 to 2018, unweighted.

Table 5: Linear probability regression models of food insecurity, married individuals

	Cross-sectional	Lagged	Secure to not secure	Not secure to not secure
	(1)	(2)	(3)	(4)
Log OOP medical	-0.00301***	-0.00238***	-0.00209***	-0.00413
	(0.001)	(0.001)	(0.001)	(0.005)
Lagged Log OOP		-0.00136		
		(0.001)		
Missing lag flag		0.01377*		
		(0.008)		
male	0.00436***	0.00390***	0.00055	0.00709
	(0.001)	(0.001)	(0.001)	(0.010)
Age 55-59	ref.	ref.	ref.	ref.
60-64	-0.01483***	-0.01271***	-0.00757***	-0.04689**
	(0.003)	(0.003)	(0.003)	(0.022)
65-69	-0.03501***	-0.03222***	-0.01756***	-0.10207***
	(0.003)	(0.003)	(0.003)	(0.027)
70-74	-0.04036***	-0.03746***	-0.01824***	-0.11688***
	(0.004)	(0.004)	(0.003)	(0.029)
75-79	-0.05423***	-0.05118***	-0.02509***	-0.19043***
	(0.004)	(0.004)	(0.003)	(0.035)
80+	-0.05752***	-0.05439***	-0.02610***	-0.18561***
	(0.004)	(0.004)	(0.003)	(0.037)
< H.S.	0.02726***	0.02700***	0.01858***	0.06261**
	(0.005)	(0.005)	(0.003)	(0.025)
High school	ref.	ref.	ref.	ref.
Some college	-0.00653**	-0.00670**	-0.00463**	0.00416
	(0.003)	(0.003)	(0.002)	(0.025)
College	-0.00710***	-0.00710***	-0.00436**	-0.04372
	(0.002)	(0.002)	(0.002)	(0.030)
Wealth quartile lowest	ref.	ref.	ref.	ref.
2nd	-0.07824***	-0.07769***	-0.03972***	-0.11976***
	(0.005)	(0.005)	(0.004)	(0.029)
3rd	-0.08790***	-0.08737***	-0.04852***	-0.20924***
	(0.005)	(0.005)	(0.003)	(0.034)
Wealth quartile highest	-0.08693***	-0.08617***	-0.04799***	-0.33275***
	(0.005)	(0.005)	(0.003)	(0.032)
White non-Hispanic	ref.	ref.	ref.	ref.
Black non-Hispanic	0.03890***	0.03746***	0.02365***	0.07099**
	(0.006)	(0.006)	(0.004)	(0.031)
Other non-Hispanic	0.02338***	0.02165***	0.01278*	0.02804
	(0.008)	(0.008)	(0.007)	(0.058)
Hispanic	0.01899***	0.01773***	0.01793***	-0.05507*
	(0.006)	(0.006)	(0.004)	(0.031)
Any ADL	0.04999***	0.04997***	0.02995***	0.08383***

	(0.004)	(0.004)	(0.003)	(0.019)
Constant	0.15090***	0.15267***	0.08930***	0.50504***
	(0.009)	(0.010)	(0.007)	(0.043)
Observations	88,297	88,297	66,846	3,696
R-squared	0.069	0.069	0.033	0.103

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. HRS, ages 55+, 2002 to 2018, unweighted.

Table 6: Linear probability regression models of medication insecurity, single individuals

	Cross-sectional	Lagged	Secure to not secure	Not secure to not secure
	(1)	(2)	(3)	(4)
Log OOP medical	0.01860***	0.01601***	0.00515***	0.02579***
	(0.001)	(0.001)	(0.001)	(0.003)
Lagged Log OOP		0.00627***		
		(0.001)		
Missing lag flag		0.06099***		
		(0.006)		
Male	-0.02376***	-0.02320***	-0.01027***	-0.03482*
	(0.004)	(0.004)	(0.003)	(0.020)
Age 55-59	ref.	ref.	ref.	ref.
60-64	-0.03316***	-0.02980***	-0.01657***	-0.02365
	(0.006)	(0.006)	(0.006)	(0.021)
65-69	-0.08202***	-0.07881***	-0.03929***	-0.09813***
	(0.006)	(0.006)	(0.006)	(0.023)
70-74	-0.10152***	-0.09825***	-0.05334***	-0.10707***
	(0.006)	(0.006)	(0.006)	(0.025)
75-79	-0.13411***	-0.13153***	-0.06910***	-0.17596***
	(0.006)	(0.006)	(0.006)	(0.028)
80+	-0.18045***	-0.17783***	-0.08791***	-0.21747***
	(0.006)	(0.006)	(0.005)	(0.026)
< H.S.	0.00735	0.00895*	0.00833**	-0.04656**
	(0.005)	(0.005)	(0.004)	(0.020)
High school	ref.	ref.	ref.	ref.
Some college	-0.00185	-0.00255	0.00360	-0.05115**
	(0.005)	(0.005)	(0.004)	(0.021)
College	-0.01989***	-0.02152***	-0.01245***	-0.03101
	(0.005)	(0.005)	(0.004)	(0.026)
Wealth quartile lowest	ref.	ref.	ref.	ref.
2nd	-0.03423***	-0.03663***	-0.00506	-0.00896
	(0.005)	(0.005)	(0.005)	(0.019)
3rd	-0.06653***	-0.06996***	-0.02681***	-0.04492**
	(0.005)	(0.005)	(0.004)	(0.021)
Wealth quartile highest	-0.11735***	-0.12110***	-0.05012***	-0.12941***
	(0.005)	(0.005)	(0.005)	(0.028)
White non-Hispanic	ref.	ref.	ref.	ref.
Black non-Hispanic	0.02117***	0.02294***	0.01984***	-0.02477
	(0.005)	(0.005)	(0.004)	(0.019)
Other non-Hispanic	0.03027**	0.03225***	0.01144	0.01452
	(0.012)	(0.012)	(0.010)	(0.041)

Hispanic	0.01349**	0.01642**	0.01623***	-0.01934
	(0.007)	(0.007)	(0.006)	(0.026)
Any ADL limitation	0.06023***	0.05944***	0.02678***	0.05382***
	(0.004)	(0.004)	(0.004)	(0.016)
Constant	0.14394***	0.11938***	0.09961***	0.38210***
	(0.007)	(0.007)	(0.006)	(0.030)
Observations	57,243	57,243	37,163	4,880
R-squared	0.085	0.088	0.029	0.045

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. HRS, ages 55+, 2002 to 2018, unweighted.

Table 7: Linear probability regression models of medication insecurity, married individuals

	Cross-sectional	Lagged	Secure to not secure	Not secure to not secure
	(1)	(2)	(3)	(4)
Log OOP medical	0.02777***	0.02302***	0.00926***	0.03039***
	(0.001)	(0.001)	(0.001)	(0.004)
		0.01100***		
		(0.001)		
		0.10815***		
		(0.010)		
male	0.01260***	0.01243***	0.00687***	0.01712***
	(0.001)	(0.001)	(0.001)	(0.006)
Age 55-59	ref.	ref.	ref.	ref.
60-64	-0.03153***	-0.02911***	-0.01390***	-0.03706***
	(0.004)	(0.004)	(0.004)	(0.014)
65-69	-0.06775***	-0.06617***	-0.03240***	-0.05639***
	(0.005)	(0.005)	(0.004)	(0.017)
70-74	-0.08278***	-0.08119***	-0.04205***	-0.08102***
	(0.006)	(0.006)	(0.005)	(0.020)
75-79	-0.10907***	-0.10741***	-0.05637***	-0.12902***
	(0.006)	(0.006)	(0.005)	(0.023)
80+	-0.14890***	-0.14711***	-0.07357***	-0.23138***
	(0.006)	(0.006)	(0.005)	(0.028)
< H.S.	0.02984***	0.03108***	0.02587***	0.00700
	(0.006)	(0.006)	(0.005)	(0.016)
High school	ref.	ref.	ref.	ref.
Some college	-0.00698	-0.00764	-0.00611*	0.00504
	(0.005)	(0.005)	(0.003)	(0.017)
College	-0.03008***	-0.03090***	-0.01572***	-0.02263
	(0.005)	(0.005)	(0.003)	(0.021)
Wealth quartile lowest	ref.	ref.	ref.	ref.
2nd	-0.09619***	-0.09789***	-0.05094***	-0.03265*
	(0.006)	(0.006)	(0.006)	(0.017)
3rd	-0.14340***	-0.14511***	-0.06781***	-0.11202***
	(0.007)	(0.007)	(0.006)	(0.020)
Wealth quartile highest	-0.17795***	-0.17991***	-0.08898***	-0.13468***
	(0.007)	(0.007)	(0.005)	(0.027)
White non-Hispanic	ref.	ref.	ref.	ref.
Black non-Hispanic	0.05178***	0.05270***	0.03146***	0.01993
	(0.008)	(0.008)	(0.007)	(0.020)
Other non-Hispanic	0.05613***	0.05781***	0.02800***	0.07819**
	(0.013)	(0.013)	(0.010)	(0.032)
Hispanic	0.05133***	0.05454***	0.03638***	-0.01761
	(0.009)	(0.009)	(0.007)	(0.022)
Any ADL	0.08527***	0.08440***	0.04443***	0.10455***

	(0.005)	(0.005)	(0.004)	(0.012)
Constant	0.07572***	0.02765**	0.08296***	0.28759***
	(0.010)	(0.012)	(0.009)	(0.037)
Observations	88,232	88,232	60,371	10,150
R-squared	0.096	0.099	0.038	0.042

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. HRS, ages 55+, 2002 to 2018, unweighted.

Table 8: Average subjective probability and actual average of OOP expenditures by target level for persons 55 to 64 years old

	$1,500	**$3,000**	**$8,000**
Average subjective probability	46.3	27.4	12.6
Actual average	29.7	14.3	2.8
Relative error	1.56	1.92	4.50