

Health Shocks and Consumption Among Elderly U.S. Households

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Abstract

Do adverse health shocks make income more or less dear? When utility is a function of both consumption and health status, the sign of the mixed partial derivative is a critical parameter for intertemporal choice and financial planning. If the marginal utility of consumption were expected to increase (decrease) in poor health, then a forward-looking, rational agent would prefer more (less) consumption in future periods of poor health, all else equal. The sign of the mixed partial is an empirical question, but it is difficult to measure, and previous studies do not agree. In this paper, I review the literature, catalog the set of factors associated with health shocks that influence intertemporal choice, propose a testable theoretical model, and then explore the sign of the mixed partial among elderly households using a new panel dataset of consumption and health, the HRS-CAMS waves of 2001 and 2003, which can measure the changes in a broad array of consumption categories in response to health shocks. Results suggest XXX.

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1 Introduction

Health is a large and risky component of human well-being. Estimates of the value of life place it around \$6 million in 2000 dollars with individual life-years worth around \$200,000 (Viscusi and Aldy, 2003; Aldy and Viscusi, 2003). Other forms of wealth are typically valued at much lower levels. Costs of health shocks are typically measured in terms of quality adjustments to life years, and recent estimates suggest that serious but nonfatal health shocks reduce quality by about 20 percent on average (Cutler and Richardson, 1997), or perhaps \$40,000 for each remaining life year holding survivorship constant. On top of that, health shocks trigger the purchase of medical goods and services, although health insurance policies typically cover at least some of these expenditures. Compounding the problem is the fact that the timing of shocks to health are highly uncertain. One standard deviation in the age of death during adulthood is around 15 years in the United States (Edwards and Tuljapurkar, 2005), which is about one fifth of the average adult life span. Coile (2004) reports that over a two year period, older workers in the U.S. face a 5 percent chance of a serious health event such as a heart attack or stroke and a 10 percent chance of acquiring a new chronic illness. In 2002, the average working American approaching retirement reported a 30 percent chance of health-related work limitations sometime in the next 10 years, with a standard deviation of 45 percentage points.¹

How individuals plan for the likelihood of health shocks is naturally a vital component of economic behavior and the subject of much research. The saving literature identifies the risk of future health expenditures as an important trigger of precautionary saving (Hubbard, Skinner and Zeldes, 1994; Lillard and Weiss, 1997; Palumbo, 1999; Dynan, Skinner and Zeldes, 2004). Recent work in portfolio choice finds effects of current health status and expectations about future health events (Rosen and Wu, 2004; Edwards, 2005). Riskier health appears to prompt individuals to hold their financial wealth more safely. These issues of intertemporal choice depend on the distribution of future *marginal* utilities, rather than the full welfare effects of health shocks, which depend on total utility.² A key element for planning is thus the *mixed partial derivative* of utility with respect to health and consumption, or the dynamics of the marginal utility of consumption with respect to health. While it is evident that the first derivative of utility with respect to health should be positive, or at least nonnegative, the sign of the mixed partial is less intuitively clear.³

¹The 2002 wave of the Health and Retirement Study asked 18,000 respondents what the chances were of health limiting work activity over a 10-year horizon. Of these, 8,775 were aged 50 or over and were not retired.

²The latter are the subject of an extensive literature in health economics on the willingness to pay for risk reduction (Viscusi, 1993; Pratt and Zeckhauser, 1996) and on quality adjusted life years and cost-effectiveness analysis (Cutler and Richardson, 1997; Stewart, Woodward and Cutler, 2005).

³How individuals who experience health shocks come to regain some of their lost happiness, often ending up happier than they expected to be ex ante, or “adaptation,” is also an area of active research. But it is rare if not impossible to identify a situation in which a health shock has ever improved well-being even in the long run.

If poor health decreases the enjoyment of additional consumption, the mixed partial is positive. For example, taking a vacation may not bring as much enjoyment when one is sick. But one could easily imagine the opposite being true with other types of consumption, specifically those that substitute market goods and services for home production. Taking a taxi is probably much more enjoyable when one is sick. Certainly the marginal utility of out-of-pocket health spending should increase when health declines; here we are primarily concerned with preferences for non-health spending, since those are what matters for optimal health insurance, but clearly total spending is important for the individual. So with a wide array of spending types, the effect of health on the marginal utility of all consumption should depend on the individual effects by type of spending and the shares of those types in total spending, which are fundamentally empirical in nature. To determine the sign of the mixed partial, we must examine how consumption actually changes or is expected to change with a health shock. Complicating matters is the fact that health affects several other arguments of intertemporal choice other than tastes for spending, which include remaining years of life, household size, labor supply, and bequests.

Good data on spending and health shocks over time at the individual level are rare, and as a result the empirical evidence on the sign of the mixed partial is limited and at odds. Studies focused on expectations have found the mixed partial to be positive or zero, while a study of dynamics in assets and health among elderly households revealed a negative mixed partial. In this paper, I revisit the sign of the mixed partial by examining how a wide array of consumption types respond to health shocks in a new panel dataset, the Consumption and Activities Mail Survey of the Health and Retirement Study (HRS-CAMS).

In the sections that follow, I first review the literature on intertemporal choice in the presence of health shocks and on the sign of the mixed partial in particular. I describe the HRS-CAMS data in greater detail and discuss my empirical strategy in Section 3. In Section 4, I present a theoretical model of intertemporal choice under uncertainty about health and propose a reduced-form model for identifying the effects of health shocks on consumption using panel data. Section 5 presents results, and Section 6 concludes.

2 Background

In a seminal contribution, Viscusi and Evans (1990) find that a cross section of chemical workers expect the mixed partial derivative to be positive, based on the willingness of chemical workers to be paid for a known adjustment in on-the-job risks. Evans and Viscusi (1991) perform a similar calculation using survey data on adults approaching middle age. The subjects were asked to state their willingness to pay to avoid temporary injury from household chemicals. Their responses suggested that the mixed partial was roughly zero; temporary health shocks were expected only to absorb wealth and leave utility alone. But on its face, a positive mixed partial seems to be at odds with certain aspects of the economics of aging, namely precautionary saving, the perceptions of the

elderly in regard to their health, and the theory and practice of life-cycle behavior. If spending needs actually fell in ill health, why do the elderly seem to fear health shocks and hedge against their financial effects by saving, when they already have limited health insurance in the form of Medicare, and a form of self-insurance in a positive mixed partial? If the marginal utility of consumption declines in poor health, the impact of out-of-pocket medical expenditures would be dampened by reduced spending needs. Less than full insurance of medical expenditures would in fact be optimal. The fact that we witness precautionary saving among elderly Medicare beneficiaries is thus somewhat at odds but not inconsistent with a positive mixed partial. Evidence of safer financial portfolios, also a form of self-insurance, among those who perceive risky health more directly suggests the mixed partial is negative (Edwards, 2005).

It is possible that Medicare and Medicaid, which pays for nursing home stays for the needy, might cover so few medical expenses for the elderly that precautionary saving remains necessary even if consumption needs fall in poor health due to a mixed partial. But out-of-pocket spending on health among elderly Americans appears to be moderate on average (Smith, 1999). Still, if the direct financial costs of health shocks tend to be fairly limited, elderly Americans still seem to fear them. Among respondents in the Study of Assets and Health Dynamics of the Oldest Old (AHEAD), the self-rated probability that medical expenses would use up all household savings in 5 years averaged 30 percent (Edwards, 2005). Catastrophic health costs can be large, but it is difficult to reconcile these fears of health events with the distribution of out-of-pocket health costs or the notion that a positive mixed partial helps self-insure against them.

Medicaid typically covers nursing home costs only after most other assets are spent down. If intended bequests were a key motivation for life-cycle saving, then the risk of institutionalization could rationalize excess saving at the end of life even if marginal utility were low. Precautionary saving could protect bequests by financing nursing home stays. But a prevailing view of bequests is that they are largely unintended (Hurd, 1989). Recent research describes them as unused precautionary saving (Dynan, Skinner and Zeldes, 2004).

If out-of-pocket health spending is not large, and if desired bequests are not central, then it is difficult to reconcile empirical patterns of life-cycle saving with a positive mixed partial without additional assumptions. Individuals save considerably more, or they dissave less rapidly in old age, than is implied by the basic life-cycle hypothesis (Hurd, 1990; Attanasio and Hoynes, 2000). If the mixed partial were positive, individuals who rationally expect health shocks at the end of life should decrease their savings and consume more while young and healthy, in order to smooth marginal utilities. Thus a positive mixed partial seems inconsistent with slow dissaving.

Börsch-Supan and Stahl (1991) reconcile these observations by positing liquidity constraints that prevent households from consuming more while young. If young households expect to receive large pension annuities in old age that they would like to borrow against but cannot, they would postpone life-cycle dissaving. Further, if the mixed partial is positive, and in the extreme the

marginal utility of consumption becomes zero or negative in ill health, elderly households may never spend down their assets as the life-cycle model would predict. Overall, this is a less plausible scenario in the U.S. than in Germany, where public pensions have historically exhibited high replacement rates. Public pensions in the U.S. are not as generous; they are traditionally only one element of old-age support, along with private savings and private pensions. The latter two elements are typically not forced savings, and increasingly so with defined-contribution pensions replacing defined benefit schemes. Also, households in the U.S. that have accumulated lots of savings tend also to be those that save more (Dynan, Skinner and Zeldes, 2004). This suggests that those who continue to save in old age were not liquidity constrained when young.

So we are left with the puzzling juxtaposition of excess life-cycle saving and a prevailing belief that the enjoyment of consumption declines in poor health, which is also backed by some empirical evidence. Are catastrophic health expenditures higher than we think? Is there another factor at work that we have not recognized? Or is the mixed partial nonpositive?

The only previous effort to address this apparent dilemma head-on actually found that the mixed partial derivative of utility was *negative*.⁴ Lillard and Weiss (1997) examine the behavior of elderly households in the Retirement History Survey (RHS) using observations on assets and income, assumptions about medical expenditures, and dynamic programming techniques. They estimate that the marginal utility of consumption increases after a health shock. This suggests that healthy spouses transfer resources to sick spouses, and that elderly households save both in anticipation of out-of-pocket medical expenditure and of heightened consumption needs after a health shock.

Although vacations are not one of them, some types of consumption may become more rather than less dear following a health shock. Hiring a taxicab may become preferable to walking or taking public transit following a health shock. Many other kinds of services are clear substitutes for effort, either physical or mental. When exertion becomes more difficult, such as after a health shock, demand for market services may increase because home production no longer is practical. If leisure is a third argument of the utility function, then if health shocks diminish leisure, either through a reduction in quality or the inability to trade it for home or market goods, and if consumption is a substitute for leisure in enjoyment, increasing enjoyable consumption may be the rational response. Identifying how different types of consumption become more or less enjoyable after health shocks is likely to be an important parts of the puzzle, as may be understanding the role of home production.

Measuring consumption accurately is a key element of understanding life-

⁴Two other papers deserve mention. Picone, Uribe and Wilson (1998) examine the intertemporal behavior of elderly individuals in a model with health investment as well as saving. Their approach is solely theoretical and assumes that the mixed partial is positive. Palumbo (1999) explores how medical expenditure risk can explore saving patterns using the Panel Study of Income Dynamics. His model loosely specifies the mixed partial to be non-negative, but he finds that saving patterns are no better explained by a positive as opposed to a zero mixed partial.

cycle behavior and the mixed partial. Lillard and Weiss (1997) acknowledge that a major shortcoming of their study is that they had to impute consumption and out-of-pocket medical expenditures. If the latter were too low, their model may have systematically mismeasured the change in consumption following a health shock, which would confound estimates of the mixed partial. Luckily, the Health and Retirement Study (HRS), the successor to the RHS, has now conducted two waves of its Consumption and Activities Mail Survey (HRS-CAMS).

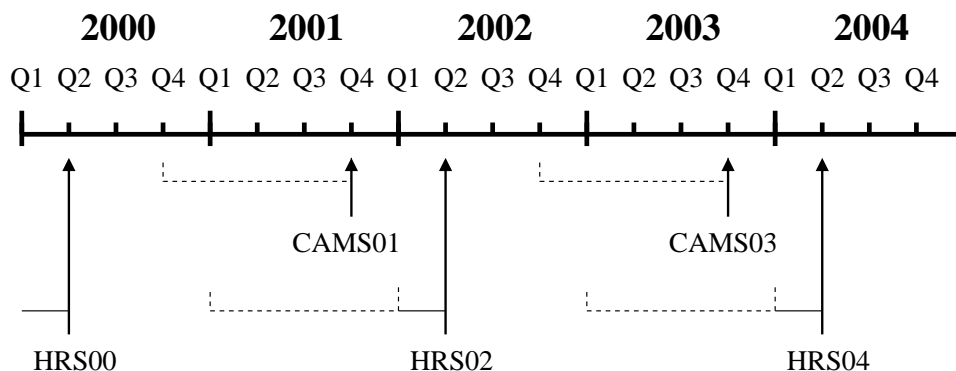
3 Data and empirical strategy

The Health and Retirement Study (HRS) is a nationally representative panel survey of health and economic well-being among about 20,000 Americans in households with a member over age 50.⁵ The HRS collects an extensive array of information on health, including self-perceived health status, functional limitations, and the onset of major conditions, as well as data on income, wealth, and work. Among its measures of individuals' expectations are self-perceived survivorship probabilities, which Hurd and McGarry (1995) show are reasonably behaved and quite powerful in describing current and future health events. The HRS also asks about intended bequests.

In the fall of 2001, a subset of 5,000 HRS households received the CAMS survey by mail, which requested that one individual within the household report his or her time usage and the household's expenditures during the past year. Two years later, in 2003, updated surveys were mailed to 4,156 of those same households. Just under 3,000 households returned surveys in both years. Figure 1 displays the timeline of HRS-CAMS data collection since 2000. The HRS 2002 core survey carried out in the second quarter of that year asked about the levels of certain stocks, such as health and wealth, at the time of the survey (the arrow), while it asked about flows, such as income or health shocks, that happened during the previous calendar year or since the last core survey (the dashed lines). Respondents filled out the CAMS questionnaires in the fourth quarter of 2001 (the arrow) and reported spending flows during the past year (the dashed lines). In terms of timing, data on income in the 2002 HRS roughly matches up with data on consumption in the 2001 CAMS. Health and wealth in the 2000 HRS predate consumption in the 2001 CAMS.

⁵Originally following members of the 1931–1941 birth cohort every 2 years starting in 1992, the HRS was designed to be a comprehensive survey of health, wealth, income, employment, and perceptions among Americans approaching retirement (Juster and Suzman, 1995). For the 1998 wave it was widened to incorporate its sister survey, the AHEAD, whose cohorts were born before 1924 and surveyed in 1993 and 1995, as well as new cohorts added to make the HRS nationally representative of the population aged 50 and over.

Figure 1: The Timeline of the HRS and CAMS Data Collection



3.1 The CAMS spending data

By design, the HRS-CAMS asks about spending among categories that are comparable to the those of the Consumer Expenditure Survey (CES).⁶ Unlike the CES or other surveys, the HRS-CAMS measures health events through linkages to the HRS core survey. And unlike the Retirement History Survey (RHS), the HRS-CAMS explicitly measures consumption along with health. Table 1 lists the 40 HRS-CAMS spending categories, where I have categorized them as durable or nondurable spending or transfers and arranged them into qualitatively similar groups. The CAMS questionnaire changed slightly between 2001 and 2003, which is shown by the checks in the last two columns. The primary update was to the group 2, which I label as optional home expenses, where a separate category for gardening was introduced in 2003, and supplies and services were asked about separately. Although these more finely detailed 2003 subgroups were perhaps implicitly covered by the more general 2001 questions, we suspect that their addition may increase group 2 spending overall. Group X, including personal care products, was introduced in 2003 and has no direct counterpart in the 2001 data, so I omit it.

Of the 2,975 households who returned CAMS surveys in both 2001 and 2003, 1,674 of them were couples at the time of both the 2000 and 2002 core surveys, while 1,191 were singles in both years and the remainder transitioned between household composition. Since much household consumption can be shared, per-capita consumption looks quite different depending on household composition. The average age of single versus couple households tends to be quite different as well, of course. I explore cross-sectional spending patterns of couples in Table 2 and those of singles in Table 3.

⁶Like the CES, the CAMS covers purchases of durable goods but not the actual consumption of many other types of durables, such as housing and currently owned automobiles. These assets are measured in the HRS core and consumption of their services can be inferred separately.

Table 1: Spending in the HRS-CAMS by Type and Wave

Type	Group	Subgroup	2001	2003	
Nondurables	1. Home expenses: fixed	1 Mortgage payments	✓	✓	
		2 Rent	✓	✓	
		3 Electricity	✓	✓	
		4 Water	✓	✓	
		5 Heat	✓	✓	
		6 Telephone, cable, internet	✓	✓	
		7 Homeowner's or renter's insurance	✓	✓	
		8 Property taxes	✓	✓	
	2. Home expenses: optional	9 Housekeeping and yard supplies	✓		
		10 Housekeeping supplies		✓	
		11 Housekeeping services		✓	
		12 Gardening supplies		✓	
		13 Gardening services		✓	
		14 Home repairs and maintenance	✓		
		15 Home maintenance supplies		✓	
		16 Home maintenance services		✓	
		3. Food at home	17 Food and beverages (at home)	✓	✓
		4. Food away	18 Dining / drinking out	✓	✓
		5. Clothing	19 Clothing and apparel	✓	✓
	6. Transportation	20 Vehicle finance charges	✓	✓	
		21 Vehicle insurance	✓	✓	
		22 Gasoline	✓	✓	
		23 Vehicle maintenance	✓	✓	
7. Health out-of-pocket		24 Medications	✓	✓	
		25 Health care services	✓	✓	
		26 Medical supplies	✓	✓	
	27 Health insurance	✓	✓		
8. Recreation	28 Tickets to movies, events	✓	✓		
	29 Sports equipment		✓		
	30 Hobbies	✓	✓		
	31 Trips and vacations	✓	✓		
	X. Other	32 Personal care products		✓	
Durables	9. Autos	33 Auto purchase/lease	✓	✓	
	10. Household durables	34 Refrigerator	✓	✓	
		35 Washer/dryer	✓	✓	
		36 Dishwasher	✓	✓	
		37 Television	✓	✓	
		38 Computer	✓	✓	
Transfers	11. Transfers	39 Cash or gifts to family or friends	✓	✓	
		40 Contributions to organizations	✓	✓	

Notes: A check in the last two columns indicates whether that particular wave of the CAMS included that category.

Table 2: Income, Assets, and Spending Among HRS-CAMS Households of Couples

	mean	median	mean	median
	HRS 2000		HRS 2002	
Age of respondent	63	63	66	65
Household income	72,244	47,352	66,734	45,197
Total assets	453,834	218,363	464,951	240,000
Total non-housing assets	338,107	112,000	330,221	111,300
Share in fair/poor health:				
Respondents	0.188		0.199	
Spouses	0.210		0.222	
	CAMS 2001		CAMS 2003	
1. Home expenses: fixed	6,472	2,520	11,084	5,580
2. Home expenses: optional	1,996	0	2,666	360
3. Food at home	3,204	2,600	3,966	3,120
4. Food away	1,255	600	2,069	960
5. Clothing	935	0	912	0
6. Transportation	3,376	1,140	5,516	3,145
7. Health out-of-pocket	3,015	660	4,205	2,400
8. Recreation	1,479	0	2,359	1,000
9. Autos	5,294	0	4,560	0
10. Household durables	414	0	396	0
11. Transfers	1,387	0	2,252	0
Total	28,825	21,071	39,985	29,069
N	1,674		1,674	

Notes: The sources are the RAND HRS file (waves 5 and 6) for the age, income, and asset data, and the HRS-CAMS files for the consumption data. The universe is households of couples (in 2000 and 2002) who participated in the CAMS in both years. The HRS core respondent's age is listed. All financial data are in nominal dollars.

Table 3: Income, Assets, and Spending Among HRS-CAMS Households of Singles

	mean	median	mean	median
	HRS 2000		HRS 2002	
Age of respondent	69	68	71	70
Household income	28,905	18,000	25,958	17,942
Total assets	181,378	75,000	189,482	86,000
Total non-housing assets	120,999	23,700	119,146	22,900
Share in fair/poor health: Respondents	0.246		0.284	
	CAMS 2001		CAMS 2003	
1. Home expenses: fixed	5,000	2,400	7,486	4,020
2. Home expenses: optional	2,104	0	1,779	240
3. Food at home	2,091	1,500	2,566	1,800
4. Food away	640	120	896	180
5. Clothing	662	0	506	0
6. Transportation	1,939	360	2,156	1,340
7. Health out-of-pocket	2,176	360	2,470	1,200
8. Recreation	669	0	854	200
9. Autos	2,035	0	1,744	0
10. Household durables	217	0	186	0
11. Transfers	1,601	0	1,220	0
Total	19,135	12,000	21,864	14,538
N	1,191		1,191	

Notes: The sources are the RAND HRS file (waves 5 and 6) for the age, income, and asset data, and the HRS-CAMS files for the consumption data. The universe is households of singles (in 2000 and 2002) who participated in the CAMS in both years. The HRS core respondent's age is listed. All financial data are in nominal dollars.

These tables present mean and median nominal spending by spending group in the 2001 and 2003 CAMS datasets, alongside summary statistics of those households' age, income, and assets in 2000 and 2002. The first pattern to notice is that mean and median spending differ greatly. Like income and wealth, consumption is lognormally distributed in the cross section. There also are many zeros in these data, which have not been imputed.⁷ Since health and wealth or consumption are correlated, those who experience a health shock will already have relatively low consumption and thus will change the level of their consumption very little. An empirical model should focus on log or median changes rather than average changes. Log changes are problematic when there are zeros in the data, however.

A second pattern is that among couples, measured spending increases dramatically between waves, by around \$10,000. Little of this seems to be concentrated in optional home expenses (group 2), even though the questionnaire was redesigned with greater detail in that group. Rather, the increases seem to be largest in fixed home expenses and otherwise fairly evenly distributed across groups. Whether this increase in consumption is real or reflects a process of learning how to answer the questionnaire is an open question. An increase this large among households around age 65 certainly seems out of place given other recent evidence suggesting large declines in consumption at retirement (Hurd and Rohwedder, 2003; Fisher et al., 2005). But what is interesting is that among singles, the increase in spending is not nearly as great, only about \$2,000, which is also smaller in percentage terms. This suggests that the observed increase in couples' spending may be more real than error due to learning or questionnaire redesign, since the latter two effects presumably would have affected singles also.

Stocks and flows appear to be roughly consistent with one another in these data. Couples' median income of \$45,000 in the 2002 HRS was earned in 2001, when median consumption according to the 2001 CAMS was \$21,000, generating net annual saving of \$24,000. Median total assets grew by about \$22,000 over the 2 years between HRS 2000 and HRS 2002, however, leaving a missing \$23,000 that was either unreported consumption, errors in asset reporting, or a 10% capital loss. Between 2000 and 2002, the Dow Jones Industrial Average fell about 14 percent, so this 10 percent is not an unreasonably high figure.

3.2 The HRS health measures

One of the simplest yet informative ways to measure health is through self-reports on a 5-point scale of excellent to poor (Mossey and Shapiro, 1982). Table 2 shows there is little change over time in the share of respondents or their spouses who report fair or poor health. Among the singles in Table 3, an increase over time is more apparent, no doubt due in part to their being about 5 years older.

⁷Although it is possible that these zeros for over half of all households are real, a more likely explanation is that respondents simply did not fill in anything for the category in question, perhaps because the amounts in question were too small to remember.

- 4 Models of health shocks and intertemporal choice
- 5 Results
- 6 Conclusion

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