

INCREASES IN WEALTH AMONG THE ELDERLY IN THE EARLY 1990s: HOW MUCH IS DUE TO SURVEY DESIGN?

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The Asset and Health Dynamics Among the Oldest Old (AHEAD) study shows a large increase in reported total wealth between 1993 and 1995. Such an increase is not found in other U.S. household surveys around that period. This paper examines one source of this difference. We find that in AHEAD 1993 ownership rates of stocks, CDs, bonds, and checking and saving accounts were under-reported, resulting in under-measurement of wealth in 1993 and a substantial increase in wealth from 1993 to 1995. The explanation for the under-reporting is a combination of question sequence and wording in the AHEAD survey instrument.

1. INTRODUCTION

The Asset and Health Dynamics Among the Oldest Old (AHEAD) is a panel study of households with at least one person who was 70 or over in 1993. Because of its large sample and broad coverage of subject domains, the AHEAD is widely used to study many aspects of elderly life in the U.S. by disciplines such as economics, sociology, psychology, and public health.

The AHEAD study collects detailed information on the economic status of households, but a simple descriptive analysis of its asset information shows a remarkable feature: average total wealth increased from about \$165,500 in 1993 to just under \$241,000 in 1995,¹ an increase of about \$76,000 or over 45 percent in just two years. Taken at face value, this large increase implies that AHEAD respondents had extraordinarily high rates of return between 1993 and 1995 because, with only an average household income of just \$26,000 in 1993, they could not possibly have saved the wealth increase out of income. Similarly, taken at face value, the large increase in wealth between waves would lead to a strong rejection of the basic life-cycle model because the model implies wealth will decline in old age. However, such conclusions are likely unwarranted because comparisons with subsequent

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¹The calculation of mean total wealth for 1995 excludes two extreme values that we excluded from the entire analysis in this paper. See Section 2 for details.

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waves of the AHEAD and other U.S. household surveys show that the dramatic increase is unique to the 1993 and 1995 AHEAD.

In this paper we investigate the large increase in wealth between the 1993 and 1995 AHEAD. Our analysis leads us to conclude that a large part of the increase was the result of an underestimation of the ownership of several financial asset categories in 1993 and that the underestimation was due to the design of the survey instrument. The redesigned 1995 survey and subsequent waves were not plagued by the same problem.

2. DATA

The Asset and Health Dynamics Among the Oldest Old (AHEAD) is a panel survey of individuals born in 1923 or earlier and their spouses.² At baseline in 1993 it surveyed 8,222 individuals in about 6,000 households from the community-based population, including oversamples of blacks, Hispanics, and Floridians. When weighted, the sample is representative of the national community-based population. Wave 2 was fielded in 1995, wave 3 was collected in 1998, and thereafter, households have been re-interviewed every two years. We present tabulations from waves 1 through 4.

The main goal of AHEAD is to provide panel data from the three broad domains, covering economic status, health and family structure. In wave 1 individuals and couples were asked for a complete inventory of assets and debts and about income sources. Through the use of unfolding brackets, non-response to asset values was reduced to levels much lower than would be found in a typical household survey such as the Survey of Income and Program Participation (SIPP).³ To reduce respondent burden and to improve data quality, couples were requested to designate the person most knowledgeable about financial matters to be the financial respondent. All questions about income and assets for the household were then put to the financial respondent.

From all the analyses below we excluded two household observations from AHEAD 1995 who reported very large stock holdings of \$18 and \$40 million, respectively. None of the adjacent waves has values of comparable magnitude, and these two outliers affect the means for 1995 substantially.

For comparison purposes, we will also present tabulations for the original cohort of the Health and Retirement Study (HRS). The HRS is a panel survey of individuals born in 1931 through 1941, collected biennially beginning in 1992. From 1998 forward, the AHEAD cohort and the HRS cohort were combined into one data collection effort with two additional cohorts; the collective panel study is also called the Health and Retirement Study. At baseline in 1992, the HRS cohort included 12,652 individuals in close to 7,600 households from the community-based population.

²See Soldo *et al.* (1997). For current information about AHEAD see <http://hrsonline.isr.umich.edu/>

³To handle non-response, we use the RAND-HRS imputation files, version D. See <http://www.rand.org/labor/aging/dataproduct/index.html> for further details on these files.

TABLE 1
TOTAL NOMINAL NET WEALTH IN AHEAD AND HRS (IN THOUSAND DOLLARS)

	1992	1993	1994	1995*	1996	1998	2000
<i>AHEAD cohort</i>							
<i>N</i>		6,047		5,220		4,551	3,924
Mean		165.5		240.9		255.4	285.9
Median		81.1		98.0		106.0	119.8
<i>HRS cohort</i>							
<i>N</i>	7,702		7,052		6,811	6,635	6,329
Mean	217.7		248.6		271.9	327.3	384.4
Median	97.0		115.5		120.2	128.0	150.0

Notes: Weighted cross-sections; unweighted N.

*Asset values for 1995 exclude two observations with stock holdings of \$18 million and \$40 million. Neither one is imputed. If we were to include these, average total wealth in 1995 would amount to about \$256,000.

Source: Authors' calculations.

3. CHANGES IN WEALTH COMPONENTS

Table 1 shows mean and median wealth (nominal dollars) for the AHEAD and HRS cohorts. In AHEAD mean wealth increased by about 46 percent between 1993 and 1995 and the median by 21 percent. Such a large increase does not accord with the life-cycle model in which households of this age should be dissaving: although the exact age at which dissaving should begin depends on the interest rate and utility function parameters (Yaari, 1965), a reasonable estimate would be that singles should begin dissaving in their late 60s or early 70s and dissave at all greater ages. Previous empirical evidence largely corroborates this prediction.⁴ Furthermore there is no comparable change in wealth between 1995, 1998 and 2000, as would be suggested by a continuation of the behavior between 1993 and 1995.

For comparison purposes, we also present similar tabulations from the HRS in Table 1. Over the same period, wealth increased in a steady manner and continued to do so beyond 1996. Among the younger HRS cohort, the increase in mean wealth was 14 percent between 1992 and 1994 and 9 percent between 1994 and 1996. Thus, the accumulation rate for the HRS cohort is less than one third that observed for the AHEAD cohort, despite the HRS cohort being in a higher savings age range according to the life-cycle model.

Table 2 shows the components of wealth in AHEAD. Much of the increase in mean total wealth between 1993 and 1995 stems from a roughly \$53,000 increase in financial assets, representing an increase of 107 percent for this asset category. The increase is not restricted to just one particular financial asset: each component shows a substantial increase over the two years. The increases are particularly notable because financial assets rose only modestly in subsequent waves. The

⁴Sabelhaus and Pence (1999) find that the saving rate turns from positive to negative around age 60. For similar evidence from panel data, see Diamond and Hausmann (1984) for results from the NLS Mature Men, 1966–76; Hurd (1987) for estimates from the Retirement History Survey; Hurd (1991) for findings from the SIPP 1984/1985; and Mirer (1980) for evidence from the Survey of Financial Characteristics of Consumers and the Survey of Changes in Family Financing (Federal Reserve). Hurd (2003) presents an overview table of estimates from these studies for the annual rate of wealth change among elderly households.

TABLE 2
AVERAGE NET WEALTH IN AHEAD BY COMPONENTS (IN THOUSAND DOLLARS)

	1993	1995*	1998	2000
<i>N</i>	6,047	5,220	4,551	3,924
Financial assets	49.4	102.2	110.8	121.6
Stocks and mutual funds	19.6	45.9	58.6	62.7
Checking and saving accounts	16.4	28.6	22.9	25.7
CDs	8.9	18.0	19.9	23.4
Bonds	4.6	9.7	9.3	9.7
Other saving	2.7	5.2	5.9	6.1
Debt	0.9	0.7	0.5	0.7
IRA and Keogh acc.	7.8	15.4	15.4	18.6
Housing	68.9	68.1	75.7	82.8
Real estate	22.7	23.2	27.4	30.7
Business	8.0	21.4	14.0	19.9
Transportation	6.8	6.1	6.8	6.9
Total wealth	165.5	240.9	255.4	285.9

Notes: Weighted cross-sections; unweighted *N*.

*Two outliers with extreme stock holdings excluded.

Source: Authors' calculations.

remainder of the increase in total wealth was due to increases in IRA/KEOGH accounts, businesses, and other savings (a residual category). Other sources of wealth including debt, housing, real estate, and transportation were relatively constant across all years.⁵

Table 3 shows ownership rates in AHEAD for the seven assets that increased in value. We present pair-wise panels for waves 1 and 2, waves 2 and 3, and waves 3 and 4, excluding non-response within each asset component.⁶ In 1993, 21.5 percent of households owned stocks or mutual funds whereas by 1995 the ownership rate had increased to 30.3 percent. In the two subsequent waves, the ownership rate remained roughly stable. Ownership rates in the other components of financial wealth show similar strong increases between waves 1 and 2. Checking and saving accounts are widely held and the rate of ownership increased by 6.2 percentage points between waves 1 and 2, while the subsequent waves show, if anything, a slight decline in ownership. Similarly, between waves 1 and 2, CD ownership increased by 37 percent (23.0 to 31.4) and bond ownership increased by 50 percent (6.2 to 9.3).

We see a modest increase in the mean ownership rate of IRAs and KEOGHs from wave 1 to 2, but the difference is not statistically significant. The rate of business ownership increased by about 1.7 percentage points between wave 1 and

⁵Table 2 shows asset values for the entire population, including both owners and non-owners. Equivalent statistics restricted to the sample of owners of each asset (not shown) exhibit more erratic patterns and are difficult to interpret for a number of reasons: the sample of owners changes substantially between waves (see Table 3); asset prices, such as for stocks, bonds and CDs, changed over time; and some households shifted their portfolios and/or actively saved or dissaved. Finally, the sample of asset owners also changes due to attrition and mortality.

⁶Item non-response to ownership is low and stable: for example, for stock ownership it was 2.4 percent in 1993, 1.7 percent in 1995 and 2.7 percent in 1998.

TABLE 3
ASSET OWNERSHIP RATES (%) IN PAIR-WISE PANEL, AHEAD COHORT

	W1-W2		W2-W3		W3-W4	
	1993	1995	1995	1998	1998	2000
Financial assets						
Stocks/mutual funds	21.5	30.3	31.9	30.6	32.3	32.0
Checking/savings accts	78.3	84.5	85.6	84.4	85.4	83.2
CDs	23.0	31.4	32.6	31.2	33.1	33.2
Bonds	6.2	9.3	9.9	8.2	8.6	9.2
Other saving	11.3	9.4	9.5	9.5	10.3	9.8
IRAs, KEOGH accounts	18.4	19.5	21.1	20.2	22.5	21.3
Business	5.2	6.9	7.5	6.7	7.1	5.6
<i>Number of observations</i>	<i>4,849-4,955</i>		<i>3,908-4,030</i>		<i>3,361-3,464</i>	

Notes: Weighted panel. Number of observations varies from item to item due to item non-response about ownership. The reported ranges give the lowest and highest N among the considered categories for each two-year panel. Ownership status reported, not imputed.

Source: Authors' calculations.

TABLE 4
ASSET OWNERSHIP RATES (%) IN PAIR-WISE PANEL, HRS COHORT

	W1-W2		W2-W3		W3-W4		W4-W5	
	1992	1994	1994	1996	1996	1998	1998	2000
Financial assets								
Stocks/mutual funds	31.3	34.0	34.5	34.4	34.3	34.1	34.3	34.1
Checking/savings accts	82.9	83.6	84.4	86.1	85.6	84.8	85.2	87.3
CDs	27.4	23.8	23.9	22.6	22.3	22.6	23.2	24.4
Bonds	7.1	6.5	6.4	8.4	8.4	7.5	7.8	7.6
Other saving	17.2	24.6	25.0	20.1	20.2	17.0	17.1	17.5
IRAs, KEOGH accounts	43.0	45.5	45.9	45.3	45.1	45.2	45.8	46.1
Business	17.5	16.4	16.5	13.8	13.4	11.5	11.8	11.2
<i>Number of observations</i>	<i>6,666-6,830</i>		<i>6,136-6,222</i>		<i>5,853-5,955</i>		<i>5,732-5,838</i>	

Notes: Weighted panel. Number of observations varies from item to item due to item non-response about ownership. The reported ranges give the lowest and highest N among the considered categories for each two-year panel. Ownership status reported, not imputed.

Source: Authors' calculations.

2, while it decreased in subsequent waves. The increase is likely fully explained by the inclusion of farm ownership in the question wording for business assets beginning in wave 2.⁷

The increase in the ownership rates of financial assets is unparalleled in other surveys. Table 4 displays the ownership rates for the same asset categories in the HRS. Stock and mutual fund ownership increased by 2.7 percentage points between 1992 and 1994 and remained stable thereafter. The ownership rate of checking and savings increased slightly but the rates of ownership of CDs and bonds actually decreased between 1992 and 1994. Similarly, based on tabulations from the Survey of Consumer Finance for the individuals age 55 and above,

⁷The wording of the question about business ownership excluded farms in wave 1 but included them in wave 2.

Kennickell *et al.* (1997) find relatively constant ownership rates between 1992 and 1995 for CDs, savings bonds, bonds, stocks, and mutual funds (not shown). Therefore, we conclude that ownership of financial assets in the AHEAD increased sharply between waves 1 and 2, a pattern that is at odds with changes found in later waves of the AHEAD and with changes found in other surveys.

4. EXPLAINING THE CHANGES IN OWNERSHIP BETWEEN AHEAD WAVES 1 AND 2

We believe that the ownership rates of stocks and mutual funds, checking and savings accounts, CDs, and bonds in AHEAD wave 1 were substantially under-reported and that the reason for this lies with the survey design. AHEAD wave 1 asks about income from assets in several broad categories and records the answers as income from “stocks or bonds/dividends” and “saving accounts/CDs/ interest.” See the Appendix for the exact question wording and response codes. In the section immediately following the income section of the survey, the ownership and value of various assets is queried to obtain a complete accounting of all asset holdings. Within the asset section, questions frequently begin with the phrase “Aside from anything you have already told me about, do you own . . .” This lead-in was intentionally included so that assets would not be reported twice.⁸ Our hypothesis is that some respondents who reported income from an asset interpreted the “Aside from” too broadly, and thus failed to report the ownership of the asset altogether, or they reported only on the subset of assets that were not income-producing.⁹ Wave 2 and all future waves of the AHEAD do not share this structure because the income and asset sections were combined into one section. In what follows we present several pieces of evidence that support our hypothesis.

4.1. *Common Question Structure: The Relationship Between Ownership Rates, Income Reporting and “Aside From” Language*

Table 5 categorizes assets according to whether income from the asset was queried in the income section (which preceded the asset section in wave 1) and whether the query about ownership used the language, “Aside from anything you have already told me about . . .” For example, the income section asked about income from IRAs, and the “Aside from” language was not used in the query about IRA values in the asset section. The table shows that the four financial assets with large increases in ownership between wave 1 to 2 share the structure that (a) income from the asset was queried and (b) “Aside from” language was used.¹⁰ This pattern would be expected according to our hypothesis.

⁸For example, at the beginning of the asset section the respondent had been queried about IRA ownership and value, so there was a risk that stocks held in IRAs would be counted both as part of the value of the IRA and in response to the question about stock ownership and value following immediately after the questions about IRAs.

⁹AHEAD wave 1 asked only about the most important (other) sources of income received so that households with only minor income from, say stocks and bonds, might not have reported it in the income section.

¹⁰As mentioned previously, the business asset question was changed after the 1993 wave to include farm assets as well. Therefore, although there was a large increase in business ownership between 1993 and 1995, the question changed in another material way.

TABLE 5
QUESTION WORDING ON ASSET OWNERSHIP AND ASSOCIATED INCREASE IN OWNERSHIP RATES

Asset Type	Income Question	“Aside From” Language	Increase in Ownership Rate Observed Between Waves 1 and 2
Housing			
Mortgage			
Other real estate			
Transportation			
Business			✓
IRA	X		
Stocks and mutual funds	X	X	✓
Checking/saving accounts	X	X	✓
CDs	X	X	✓
Bonds	X	X	✓
Other saving		X	
Debt		X	

Source: AHEAD questionnaire and authors' calculations.

4.2. *Inconsistent Reports: Asset Income Reported, Yet Ownership Denied*

A number of households reported having income from assets yet denied ownership of those assets. This is direct evidence of under-reporting of ownership. For example, in wave 1 of AHEAD, 924 households reported income from stocks or bonds or both, yet about 40 percent (359 households) denied ownership of both assets in the very next section of the survey. Because AHEAD wave 1 records income from stocks and bonds jointly, we can only identify a subset of the inconsistencies: those who deny ownership of both assets while reporting income from one or the other or both. The number of inconsistent cases (359 households) that we have identified is therefore a lower bound for the underreporting of actual ownership. Similarly, 219 households report income from “Saving account(s)/CDs/Interest” and yet report not owning CDs and savings accounts.

4.3. *Comparison of Characteristics: Inconsistent Responders Are More Like Owners Than Non-Owners*

Eight hundred and sixty of the 924 households with income from stocks and bonds in wave 1 were re-interviewed in AHEAD wave 2. Because households tend to maintain ownership of assets over a number of years, we would expect that owners in wave 1 would tend to be owners in wave 2. If the inconsistent responders were actually owners, then we should observe higher rates of asset ownership in wave 2 when compared to the non-owners who did not report income. Table 6 offers evidence that this is the case. It shows ownership rates for AHEAD wave 2 respondents who reported not owning an asset in AHEAD wave 1, stratified by the reporting of income from the asset in wave 1. Thus, among those who had no income from stocks or bonds, the transition rate to ownership of either or both was 9.7 percent, whereas the transition rate among inconsistent responders (those who reported income from stocks or bonds but denied ownership in wave 1) was 81.0 percent. For reference, we show the transition rates from not owning to owning in HRS waves 1 to 2 because we do not expect there to be the same classification

TABLE 6
WAVE 2 OWNERSHIP RATES (%) AMONG WAVE 1 REPORTED NON-OWNERS

	Ownership in Wave 2		
	Stocks and Bonds	CDs	Checking and Saving Account
AHEAD cohort			
Did not report income from asset in wave 1	9.7	11.6	44.3
Reported income from asset in wave 1	81.0	41.1	89.7
HRS cohort	12.2	8.1	34.5

Unweighted.

Source: Authors' calculations.

error. As the table shows, the HRS transition rates are similar to the transition rates in AHEAD among the consistent responders (those who did not report income from an asset source and then denied ownership).¹¹ We find qualitatively similar results of unusually high transition rates into ownership for CDs and for checking and savings accounts for households who reported income from these assets but denied ownership (also shown in Table 6).

Table 7 offers further evidence that the inconsistent responders about stocks or bonds ownership appear to be much more like owners than non-owners. The table shows household and personal characteristics by report of income receipt and ownership of stocks and bonds. We adopt a definition of "asset holding" that facilitates a comparison with the reporting of income from "stocks and bonds" in AHEAD wave 1: we consider a household "holding the asset" if it owns either stocks, or bonds, or both and "not holding the asset" if it owns neither one of the two. Thus, in our classification in Table 7, column (1) "income: no; asset: no" refers to those households that reported no income from either source and denied ownership of both stocks and bonds; column (2) "asset: yes" refers to households that affirmed holding stocks or bonds or both; and column (3) "income: yes, asset: no" refers to households that reported income from stocks or bonds or both but denied ownership of both.

Column 1 shows that 4,293 households reported receiving no income from either asset and not owning either asset; 1,181 households (column 2) reported owning one or both assets. The personal and household characteristics of the two groups are very different. For example about 34 percent of the non-owners are married whereas 55 percent of the owners are married. This is consistent with marital status being a strong predictor of wealth which is consistently found in other data. Just 16 percent of the owners have less education than high school compared with 55 percent of the non-owners. Owners are much more likely to own other assets: 85 percent own houses compared with 65 percent of non-owners, and asset values in those other assets are considerably higher. Total wealth in wave 2 among owners was \$490,800 compared with \$107,500 among non-owners. The subjective probability of leaving a bequest has been shown to be strongly corre-

¹¹Section N of the AHEAD wave 2 questionnaire asks about purchases and sales of assets between waves 1 and 2. We found these data to be sparse and uninformative possibly due to the skip patterns used in that section.

TABLE 7
PERSONAL AND HOUSEHOLD CHARACTERISTICS BY REPORTING STATUS ABOUT STOCK AND BOND HOLDINGS

	(1) Income: No Asset: No	(2) Asset: Yes	(3) Income: Yes Asset: No
<i>N</i>	4,293	1,181	359
Age	77.6	76.0	77.2
Couple (%)	33.6	55.3	48.7
Hispanic (%)	7.8	1.4	1.4
White/Caucasian (%)	77.9	96.5	95.8
Education (%)			
Less than HS	55.1	16.4	22.0
HS graduate or equivalent	28.4	38.6	30.1
Some college	10.7	23.2	26.2
College graduate	5.7	21.8	21.7
Asset ownership in wave 1 (%)			
Housing	64.5	84.8	82.7
Real estate	12.2	33.8	30.1
Business	2.4	8.6	7.0
Debt	15.7	9.4	9.5
Asset values in wave 1 (\$'000)			
Housing	45.4	106.9	126.0
Real estate	10.1	48.6	42.0
Business	4.0	15.3	9.9
Debt	0.7	0.9	1.8
Asset values in wave 2 (\$'000)			
Total wealth	107.5	490.8	498.2
Financial assets	36.5	241.6	263.2
Housing wealth	44.0	99.3	117.9
Stocks	7.7	130.1	154.0
Bonds	1.4	31.7	17.0
Probability of leaving bequest in wave 1 (%)			
Any size	40.7	73.6	73.1
\$10,000 or more	66.0	87.2	87.3
\$100,000 or more	30.1	58.1	63.9

Notes: In the case of a couple, the personal characteristic of the household is that of one spouse chosen at random. Because the probability of a bequest is reported by each spouse, data from both spouses are used, resulting in more observations.

Unweighted.

Source: Authors' calculations.

lated with total wealth (Smith, 1999). In the table the average probability of leaving a bequest of more than \$100,000 was 58 percent among owners and just 30 percent among non-owners.

Comparing the inconsistent responders in column (3), that is those who reported income but then denied ownership, with the remaining households in columns (1) and (2), shows that the inconsistent responders appear to be very similar to owners in terms of education levels, ownership of housing, and total wealth in wave 2. In fact, the inconsistent responders have *greater* total stock and bond wealth in wave 2 than the wave 1 owners (column 2). This is plausible because column (3) only contains asset holders who reported income from stocks and bonds as an "important source of income" which is an indicator for more sizeable holdings; column (2) contains a mixture of asset holders with and without

important income receipts from the asset. The average probability of leaving a bequest of more than \$100,000 is greater among inconsistent reporters, indicating that their true wealth levels were probably greater in wave 1 than the wealth of asset holders (column 2) even though their measured wealth levels were considerably less (due to the lack of measured ownership of stocks and bonds).

5. THE POTENTIAL FOR CORRECTING AHEAD WAVE 1 WEALTH DATA

Given the evidence that several financial asset holdings are under-measured in AHEAD wave 1, we consider the potential for correcting the problem in this section.

5.1. *The Magnitude of the Problem*

To gauge the aggregate importance of underreporting in AHEAD wave 1, we performed two illustrative calculations. For the first calculation, we assumed that ownership rates for the four financial assets (stocks/mutual funds, checking/saving accounts, CDs, and bonds) were the same in 1993 as in 1995 and that the holdings conditional on ownership were accurately recorded in 1993.¹² Based on these assumptions, our calculations imply that the asset holdings for wave 1 should have been about \$15,000 higher, or alternatively, the four affected financial assets were 31 percent higher than what was actually reported (\$64,500 versus \$49,400).

This first calculation is likely to be an underestimate of the problem because average asset holdings are likely to be higher for the inconsistent reporting households when compared to the accurately reporting households. The reason is that the income section question that inquires about various asset income sources only allows respondents to mention the three largest sources. Thus, households that misinterpreted the “aside from” language for the ownership question must have had sufficiently high asset income to be at risk of misinterpreting the question. Table 7 lends support to this claim in that inconsistent reporters in column (3) have higher total wealth and financial asset wealth in wave 2 than the asset holders in column (2).

For the second calculation, we began with the AHEAD wave 2 data which we believe to be more accurate and subtracted estimates of potential capital gains. We assumed that stockowners gained 32.4 percent between AHEAD wave 1 and AHEAD wave 2¹³ and that the three other financial assets grew by 6 percent. The result is the four financial assets should have been 78 percent higher in AHEAD wave 1 than what was actually measured (\$87,800 vs. \$49,400). This second calculation could underestimate or overestimate the mis-measurement depending on the extent to which individuals have moved other assets into or out of the four categories that we are considering.

¹²For example, we assumed that the actual ownership rate for AHEAD wave 1 stocks and mutual funds was 30.3 percent as reported in wave 2 rather than the 21.5 percent reported in wave 1 (see Table 3). We then multiplied the reported wave 1 stock and mutual fund holdings (\$19,608) by this assumed degree of under-reporting (30.3/21.5).

¹³This is the gain in the New York Stock Exchange Index between February 1994 and February 1996. Although wave 1 of AHEAD is said to occur in 1993, it actually was fielded in October 1993. February 1994 was about the mid-point of the data collection.

TABLE 8
 IMPUTED MEAN FINANCIAL ASSET HOLDINGS (IN THOUSAND DOLLARS)

	1993 Unadjusted	1993 Assumption-1	1993 Assumption-2	1995 Unadjusted
Total financial assets	51.5	61.0	75.5	100.9
Stocks/mutual funds	20.8	26.8	30.1	45.5
Bonds	4.8	6.6	10.6	9.9
CDs	9.2	9.8	16.8	17.4
Checking/savings accounts	16.6	17.7	18.0	28.1

Note: The calculations for this table are based on the 5,011 households that responded to AHEAD waves 1 and 2. Unadjusted levels are based on the RAND-HRS data. Assumption-1 and Assumption-2 impute asset holdings to those individuals who may have misreported assets based on alternative assumptions; see Section 5.2 for a description of these assumptions. All results are weighted.

Source: Authors' calculations.

5.2. Fixing the Problem

Apart from assessing the aggregate magnitude of the problem, it would be helpful to impute more accurate asset holdings for AHEAD wave 1 respondents. Such imputation could introduce considerably more measurement error than the typical imputations used for the AHEAD and HRS. The reason is that usually item non-response to ownership questions is low, just a few percent. Item non-response for value conditional on ownership is fairly high, but AHEAD makes extensive use of brackets to reduce imputation error. In the case we are considering, however, we potentially need to impute ownership to a much larger fraction of the population. For example, according to our tabulations in Table 3 imputations may be needed for about 9 percent of the population for stock ownership, 6 percent for checking, 8 percent for CDs, and 3 percent for bonds. After imputing ownership, we would then need to impute asset values without the benefit of bracket information. The higher rate of ownership imputation and the lack of bracket information could result in large errors in wealth at the individual level.

Nonetheless we show in Table 8 the results of imputing asset holdings for the four asset categories that were likely affected by misreporting: stocks/mutual funds, bonds, CDs, and checking/savings accounts. For each asset category, we impute an asset value for respondents who may have misreported asset holdings using a predictive mean matching method.¹⁴ Specifically, we first make an assumption about which respondents may have misreported asset holdings and which did not. Then, for each potential misreporter, we find the respondent among the correct reporters who is most “similar” and assign the asset value from this similar correct reporter to the potential misreporter. Importantly, we include all individuals in our imputation procedure, including those who report not owning an asset. Thus, if the most “similar” person among the correct reporters has zero asset holdings, we could impute zero holdings to the potential misreporter.

We perform our imputations based on two assumptions regarding which respondents are misreporters. The first assumption is that all individuals who are

¹⁴Predictive mean matching is an extension of the hot-decking method to allow for continuous predictors. The HRS imputations and the RAND-HRS imputations use the same basic method. See Little (1988) for additional details.

inconsistent reporters (i.e. they reported incomes from stocks/bonds or CDs/savings accounts, respectively, but subsequently denied holding any of these assets, see column 3 of Table 7) may have incorrectly reported the holdings of a particular asset, but no others were affected. This assumption will likely result in too little additional wealth imputed to the AHEAD because it ignores misreporters that we cannot identify.¹⁵ Our second assumption is that all individuals who report income from an asset group (e.g. income from stocks and bonds) and reported zero holdings of one of the assets (e.g. stocks or bonds) while reporting positive asset holdings of the other asset may have incorrectly reported asset holdings. This second assumption could impute too much additional wealth or too little additional wealth. It could lead to too much imputed wealth to the extent that some individuals who claimed to have zero holdings actually did have zero holdings, and it could lead to too little additional wealth because it still ignores households who only failed to report part of their holdings. However, given that our method allows us to impute zero holdings to a potential misreporter, we suspect that our second assumption will also lead to too little wealth imputed to the AHEAD.

We match misreporters to correct reporters based on the following characteristics: (a) demographic and household characteristics such as age, household structure, race, and education level because of the strong relationship between demographic characteristics and wealth; (b) AHEAD wave 1 financial characteristics such as household income, housing value, and type of income because of the strong relationship between wealth levels and portfolio choice; and (c) AHEAD wave 2 value of the misreported asset because of the strong correlation in wealth holdings across time. We list the specific covariates in the Appendix.

Table 8 presents the results of the imputations. Based on assumption 1, our imputations increase financial wealth by about \$10,000 compared to the unadjusted data (\$51,500 versus \$61,000). The bulk of this increase comes from an increase in stock holdings (from \$20,800 to \$26,800). Based on assumption 2, our imputations increase financial wealth by \$24,000 (\$51,500 versus \$75,500). The difference between the imputations is largely due to an increase in the holdings of the other three asset categories. The reason for the difference rests with assumption 2 identifying far fewer additional respondents who may have misreported stocks as compared to the other three asset categories. Based on assumption 2, about half of the \$49,400 increase in financial wealth between waves 1 and 2 can be attributed to survey design.

6. CONCLUSIONS

We have offered evidence of systematic underreporting of financial asset ownership in AHEAD wave 1. The most likely explanation for the underreporting is that avoiding one problem (double-counting of asset holdings) inadvertently caused another problem. Specifically, respondents interpreted the “Aside from” language not to apply only within a survey section as intended by the designers, but rather, some respondents interpreted the language to apply across sections.

¹⁵As noted in Section 4.2, the asset income questions in 1993 ask about multiple income sources, e.g. “stocks/bonds” and “CD/saving/interest.” Among those households who report owning at least one of these assets we cannot distinguish *mis-reporters* from genuine reporters.

Because the income section came before the asset section, this alternative interpretation caused some respondents not to report asset holdings that had produced income. This problem only affects AHEAD wave 1 because the survey instrument was redesigned between waves 1 and 2. The effect of this underreporting is approximately \$15,000 to \$40,000 of financial wealth is missing from AHEAD wave 1 depending on the assumptions used, leading the data to exhibit improbable wealth increases between waves 1 and 2.

Our findings have several implications for future research. First, studies that examine wealth using the AHEAD should be careful about using wave 1 financial wealth information. Our estimates of missing financial assets for wave 1 are non-negligible, but the problem we identified should not affect later waves. Second, our findings have immediate implications for survey design. Many large-scale surveys use a sectional or modular approach to its design, as does the AHEAD. Our findings suggest that there can be important and unintended interactions across the sections or modules. Finally, we have considered several possible ways of fixing the identified problem. Although we describe and implement a particular method that appears to work well, the problem is difficult enough that studies should consider the potential effect and potential solutions on a case-by-case basis.

APPENDIX

A1. Details of the AHEAD Questionnaire

In AHEAD wave 1, the income section, which also queries about income from financial assets, is asked separately from the assets section and it is asked before the asset section. In AHEAD wave 2 the income and the asset sections are integrated; income from financial assets is only asked if the financial respondent states that the household holds the asset.

Figures A1–A3 present several questions from the AHEAD wave 1 questionnaire. Figure A1 shows the initial questions about the largest income sources. Respondents are looped through question J20 (and numerous subsequent questions) to inquire about the three largest sources. Question J40 then asks about other sources. We note that “Aside from” language is used here as well to avoid double-counting of different sources of income.

Figure A3 presents the stock holding question and includes the “Aside from” language. The questions about ownership of several other financial assets, including checking and savings accounts, CDs, and bonds, follow the same format as the one on stocks and mutual funds in K10. Other asset categories such as IRAs (question K7, not shown) do not include such introductory language.

J19. The next questions are about regular sources of income.

IF R MARRIED or LIVING WITH PARTNER:

I will start by asking about income that you yourself receive. Later I will ask you about income that your (husband/wife/partner) receives.

Do you yourself receive any (other) regular income payments; for example, from retirement pensions, Veterans Benefits, annuities, payments from an IRA account, or anything like that?

IF R DIVORCED/SEPARATED or WIDOWED or NEVER MARRIED:

Do you receive any (other) regular income payments; for example, from retirement pensions, Veterans Benefits, annuities, payments from an IRA account, or anything like that?

1. YES

5. NO
8. DK
9. RF

GO TO J27

J20-1. Please think about the largest (other) regular income you receive.

What type of income is that?

[IWER: PROBE WITH CATEGORIES ONLY IF R NEEDS HELP]

1. VETERANS BENEFITS
2. RETIREMENT OR OTHER PENSIONS
3. ANNUITY
4. IRA DISTRIBUTION
5. STOCKS AND BONDS
7. OTHER (SPECIFY) _____
8. DK
9. RF

6. JOB

GO TO J26-1

Figure A1. Excerpt 1 from the AHEAD Wave 1 Income Section

J40-1. (Aside from anything you have already told me about,) Do you (or your (husband/wife/partner)) receive any income from financial investments like savings accounts, CDs, stocks and bonds, rental property, or investment trusts?

1. YES
6 [VOL] ALREADY SAID

5. NO
8. DK
9. RF

GO TO J43

Figure A2. Excerpt 2 from the AHEAD Wave 1 Income Section

K10. (Aside from anything you have already told me about,) Do you (or your (husband/wife/partner)) have any shares of stock in publicly held corporations, or mutual funds?

1. YES	5. NO 8. DK 9. RF
--------	-------------------------

GO TO K12

K11. If you sold all that and then paid off anything you owed on it, how much would you have?

[IWER: DO NOT PROBE DK/RF]

AMOUNT: \$ _____

DK RF

GO TO K12

K11a. Would it amount to \$25,000 or more?	1. YES	5. NO	8. DK	9. RF
			GO TO K12	
			GO TO K11d	
K11b. \$100,000 or more?	1. YES	5. NO	8. DK	9. RF
			GO TO K12	
K11c. \$500,000 or more?	1. YES	5. NO	8. DK	9. RF
			GO TO K12	
K11d. \$5,000 or more?	1. YES	5. NO	8. DK	9. RF

Figure A3. Excerpt from AHEAD Wave 1 Asset Section

A2. Details of the Imputations

Our imputations begin with the RAND-HRS data file, version D, including all of RAND imputed income and asset values. We then select all households that are in waves 1 and 2; we exclude two households that report over \$18 million in stock wealth.

The regressions for the predictive mean matching include the following variables: dummy variables for marital status (married, divorced, and widowed, with single as the omitted category), dummy variables for educational attainment, a dummy variable for African American, a dummy variable for Hispanic, respondent birth year, dummy variables for missing bequest responses, the probability of leaving bequests of various levels (any, \$10,000 or more, and \$100,000 or more), a dummy variable for renting or owning ones home in wave 1, a quadratic in wave 2 total household income, a quadratic in wave 1 housing value, a quadratic in wave 1 capital income, a quadratic in wave 1 IRA income, an indicator for wave 1 income from the particular asset, and the particular asset level for wave 2. For all of the individual characteristics (age, race/ethnicity, and education), we select the characteristics of the husband or wife at random in the case of couples.

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