ECONOMIC WELL-BEING AT OLDER AGES:
INCOME- AND CONSUMPTION-BASED POVERTY MEASURES IN THE HRS

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ABSTRACT

According to economic theory, well-being or utility depends on consumption. However, at the household
level, total consumption is rarely measured because its collection requires a great deal of survey time.
 As a result income has been widely used to assess economic well-being and poverty rates. Yet, because
households can use wealth to consume more than income, an income-based measure of well-being
could yield misleading results for many households, especially at older ages. We use data from the
Health and Retirement Study to find income-based poverty rates which we compare with poverty rates
as measured in the Current Population Survey. We use HRS consumption data to calculate a consumption-based
poverty rate and study the relationship between income-based and consumption-based poverty measures.
 We find that the poverty rate based on consumption is lower than the income-based poverty rate.
Particularly noteworthy is the much lower rate among the oldest single persons such as widows. The
explanation for the difference is the ability to consume out of wealth.

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1. Introduction

According to economic theory, well-being or utility depends on consumption and possibly other inputs such as leisure. However, at the household level total consumption is rarely measured because its collection requires a great deal of survey time. As a result income has been widely used to assess economic well-being and poverty rates. Because households can use wealth to consume more than income, or they may save and consume less than income, an income-based measure of well-being could yield misleading results for many households. As argued in a number of studies consumption is therefore a better measure than income for assessing material well-being and poverty status (Cutler and Katz, 1991; Jorgenson and Slesnick, 1987; Mayer and Jencks, 1993; Slesnick, 1993, 1994, 2001; Jorgenson, 1998; Garner and Short, 2001; Johnson, Smeeding, and Torrey, 2005; Meyer and Sullivan, 2003; Rogers and Gray, 1994; Zaidi and de Vos, 2001). For example, an elderly household with low income and substantial wealth can be expected to spend part of its wealth to finance greater consumption than its income, and so it would have a higher standard of living than would be indicated by its income. Furthermore, income does not capture flows of utility derived from owner-occupied housing and other durables that a household might own (Federman *et al.*, 1996; Garner and Short, 2001, 2005; Slesnick, 1994).

Even among households that are liquidity constrained and so could be presumed simply to consume their income, the difference can be important. For example, Meyer and Sullivan (2003) find that among welfare recipients income is a poor indicator of well-being due to transfers from outside the household and systematic underreporting of income. Furthermore, income is subject to transitory shocks which households are largely able to smooth so that consumption is more stable than income (Sabelhaus and Groen, 2000). The differences between income and consumption have important implications for policy because they affect assessments of poverty rates and the adequacy of economic resources.

The two primary data sources for previous studies of consumption-based measures in the United States are the Consumer Expenditure Survey (Cutler and Katz, 1991; Federman et al. 1996; Fernandez-Villaverde and Krueger, 2002; Garner and Short, 2001; Jorgensen 1998; Meyer and Sullivan, 2003; Rogers and Gray, 1994; Sabelhaus and Groen, 2000; Short *et al.*, 1998; Slesnick 1993 & 1994) and the Survey of Income and Program Participation (Bauman 1998, Bauman, 2003, and Short *et* al.,1998). Neither of these surveys has sufficient data to assess poverty as measured by income and by consumption: while the Consumer Expenditure Survey (CEX) has the most detailed and comprehensive measure of household spending, its income measure has known weaknesses and, as we report later in this paper, apparently under-states income substantially; the Survey of Income and Program Participation (SIPP) has only partial measures of spending.

Our contribution to this literature is an analysis of newly available data which contain high quality measures of income, wealth and consumption, as well as many other characteristics of the same households. We use data from the Health and Retirement Study (HRS), a biennial longitudinal survey of about 20,000 persons aged approximately 51 or older. In the core survey the income and wealth of the household are measured using innovative techniques that arguably yield better measures of economic resources than many other surveys. Of particular importance for this research is that a substantially complete measure of spending was assessed for a large random subset of the HRS. Thus we can study

consumption- and income-based measures of economic well-being and relate the difference to wealth for the same households. No other U.S. household survey permits such analyses.

In this paper we compare poverty rates based on income with poverty rates based on consumption. In that we want to relate the consumption-based poverty rates to official income-based poverty rates, we begin by a comparison of the income-based poverty measure in the HRS with the corresponding measure in the Current Population Survey (CPS). The CPS is the source for the official poverty measure in the U.S. and we want to establish whether any difference between our consumption-based measure and the official poverty rate is due to anomalies in the two surveys or due to the populations covered. Then we study the relationship between income-based and consumption-based poverty measures in the HRS, and relate the differences to a number of household characteristics. In particular we investigate whether there are important wealth differences that could explain why a household is in poverty according to income but not according to consumption. Our main emphasis is on poverty status among those of retirement age or older because of the concern about the high poverty rate among older single people, in particular older widows. Furthermore, the causes of poverty are different before and after retirement. Prior to retirement, poverty is mainly related to employment either because of very low wage rates or unemployment. After retirement poverty is due to inadequate saving, survival into advanced old age, and possibly unexpected health care expenditures, as well as inadequate income.

2. Income-Based Poverty Measure

In this section we discuss the official definition of poverty and how its measurement is accomplished in the CPS. Because the CPS statistics are used in government statistics to report on poverty rates, it is natural to choose the CPS as a benchmark. We note, however, that the CPS measure is based on survey data itself and as such is subject to reporting error on income just as any other survey. We have assessed the CPS and the HRS design and conclude that, for measuring poverty status in a reliable way, both have their strengths and weaknesses. That prompted us to move beyond simply comparing our derived poverty measure from the HRS to the CPS estimates; instead we summarize design issues for both surveys and highlight their most important sources of measurement error for estimating poverty status. For the HRS this is the lack of detail elicited for income of other household members that might be living with the HRS core respondents. With the HRS being the focus of our study, we present a detailed sensitivity analysis of the resulting poverty rate estimates with respect to this weakness.

2.1 Definition and Measurement

The official poverty measure classifies an individual as "in poverty" if the individual lives in a household whose total annual pre-tax money income is below the poverty threshold. Table 1 gives the schedule of the poverty thresholds for the year 2001. A notable feature is that the poverty threshold is lower for households in which the head (or the so-called "householder") is over 65, and that it differs according to the number of people in the household. Thus the poverty rate will depend on living arrangements. Poverty status does not depend on income-in-kind such as food stamps or Medicare, ownership of consumer durables especially housing, or wealth.

In the U.S. the poverty status of a sample of households is assessed in the Annual Social and Economic Supplement (ASEC) to the CPS which has historically been referred to as the March Supplement to the CPS.[1]

2.2. CPS: Basic features and measurement of income

One person, the "respondent," answers for all people in the household. The relationships among the household members are defined by their relationship to the "reference person," who is generally the owner or renter of the dwelling unit and so is known as the householder. The respondent and the reference person need not be the same.

The respondent is asked whether any person in the household has income from a list of income sources; who has the income (which is matched against a household roster); what is the most comfortable reporting period for the income item (week, month etc); and the amount of income that each household member has from that source. If, when annualized, the amount seems too large, the respondent is asked whether the amount seems about right, and is possibly re-asked.

Aside from income from assets, the CPS measures 17 components of income, some of which are aggregations of subcomponents.[2] The list is rather lengthy, the income items have to be recorded for each individual, and a reporting period is asked about each item. Thus, there is considerable opportunity for reporting errors and for item nonresponse. This is particularly true for asset income. Asset income is divided into three groups in the CPS: interest, dividends and rent. Each group can have subcomponents that are asked about separately; see Appendix 1. After finding whether anyone in the household has an asset, the respondent is asked about amounts of income and reporting period.

Item response rates have been falling in the CPS between 1990 and 2000, according to Atrostic and Kalenkoski (2002). They report response rates on several income components for the 1990 and 2000 CPS data. For 2000 the response rates are highest on earnings (72.4 percent on earnings from the longest job, and 77.9 on other wage and salary earnings) and lowest on dividend income (49.6 percent) and interest income (48.4 percent).[3] Missing values are imputed using hotdeck with demographic and economic stratification. We note that this type of imputation will reproduce population averages, but it is not very good for imputation for the income items of a household that is in the tail of the distribution: covariates have limited power to put values in tails of distributions. An implication is that the CPS will underestimate poverty: if low-income elderly have interest-paying assets, their income will be imputed towards the mean of the population distribution which is likely to be an overestimate of income from that source.

2.3. HRS: Basic features and measurement of income

The HRS has arguably one of the best income measures collected in U.S. surveys thanks to several innovations that have been implemented over the years. The survey uses a "financial respondent," to report about income and asset items for the spouse and for others in

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[1] An additional small number of interviews for the ASEC are given in February and April.
[2] See Appendix Table 1 for the income components.
[3] Atrostic and Kalenkoski compute these response rates as the number of respondents for whom an amount is reported divided by the number of respondents for whom receipt of the income is either directly reported or imputed.

the household. The financial respondent is selected by the age-eligible respondent and spouse or partner (if applicable) in response to a question about who is most knowledgeable regarding the finances of the household. In the CPS the respondent is not chosen for financial knowledge. We know of no investigation about possible differences in income reporting this might make, but it could be substantial.

The HRS differs from the CPS in that the HRS is a person-based survey not a household survey. This difference can be important when assessing the poverty status of individuals who are living in multi-person households. For example, consider an elderly widow living with her daughter and son-in-law who are employed and who are the owners of the house. In the CPS the daughter or son-in-law would report on household income including the income of the widow. Because it is likely that the son-in-law and daughter have earnings that would put the household above the poverty line, a lack of knowledge about the widow's income would not be important in determining the household's poverty status. In the HRS the widow reports for herself. The daughter and son-in-law are other people in the household so the widow reports for them as well. To the extent that she under-reports their income (about which she may have little information), the household may be incorrectly classified into poverty. Thus, in this example, we would get better reports in the CPS format about total household income and poverty status, but worse information about the income of the widow.

When comparing CPS poverty rates with HRS poverty rates a complication is the "age" of the household. In the CPS, the age of the household is the age of the householder. The HRS does not define a householder. The age of the household is important for two reasons: the poverty line is different when the householder is 65 or over (see Table 1); and we would like to compare poverty rates by age which requires a classification by age of householder. For the HRS we will use the age of the male as an approximation, but we have no good way to assess any bias that may result from this.

An additional measurement problem is household income in composite households. HRS asks a large number of questions about the income of the core HRS household members (more details below), who are the age-eligible individual and the spouse of the age-eligible individual. However, poverty status also depends on the incomes of non-core HRS household members such as children or parents of the core HRS household members. The HRS asks about the earnings of each non-core household member with follow-up brackets. But the HRS has just one question about all other income of all non-core household members with a follow-up bracketing questions. There are four bracket boundaries, $2,000, $10,000, $20,000, $50,000, which define five bracket intervals. Even within one of the lower brackets, an imputation toward the upper end of an interval may be enough to lift the household out of poverty. We will show below to what extent the HRS poverty rate is sensitive to these imputations.

2.3.1. Innovations in survey methods in HRS particularly relevant to measuring income

In queries about income items there is very little item nonresponse about *whether* the household has income from some particular source. There is, however, considerable item nonresponse about the *amount* of income. The HRS uses unfolding brackets to reduce the harm from item nonresponse. In response to the answer of "don't know" or "refuse" about the amount, the HRS initiates an unfolding bracket sequence as follows: "Would it be less

than $2000, more than $2000 or what?" If the response is more than $2000, a follow-up query is: "Would it be less than $5000, more than $5000 or what?" In this way the income item is bracketed into one of several brackets.[4] For example, interest from checking, saving or money market accounts is placed into one of four brackets beginning at 0-$1000 and ending at $5,000 or more. Without brackets item nonresponse on dividend and interest income would be similar to that in the CPS. Taking into account the information obtained from the follow-up questions on the unfolding brackets, rates of item nonresponse are reduced substantially from values in the mid-forties down to the mid twenties.[5]

A major strength of brackets is that values can be imputed into the tails of the income distribution which is otherwise difficult because covariates have limited power to explain variation in income. This is an important issue for poverty measurement because incorrectly imputing income towards the middle of the distribution will often lift the household out of poverty.

A second innovation in the HRS was the integration of income and asset questions (Hurd, Juster and Smith, 2003). In HRS waves 1 and 2 (1992 and 1994) the HRS financial respondent was asked about asset values in an asset module. Then in a later separate module, he or she was asked about income, including income from assets. In HRS wave 3 (1996), these modules were combined into an income and asset module, which integrated the asset questions with questions about income from these assets. For example, with respect to stock ownership the financial respondent was asked about ownership of stocks and stock values, and then immediately about the income from stocks.

Linking income from assets to asset values substantially increased the measured income from assets between HRS wave 2 and HRS wave 3. For example, in Wave 2, 35 percent of owners had some interest or dividend income; in wave 3, 76 percent of owners had some interest or dividend income. Mean interest and dividends more than doubled. This experience suggests that under-reporting of interest and dividend income *receipt*, which is a separate problem from under-reporting of value conditional on receipt, may be an important source of under-measurement of asset income in the CPS. This conjecture is substantiated by the findings of Roemer (2000) who compared various components of CPS income to benchmark measures from the National Income and Product Accounts: Roemer found that interest income measured in the CPS accounted for 84 percent of the 1996 benchmark; and dividends only aggregated to 60 percent of the benchmark.[6]

Under-reporting of income from assets could affect reported income even of those with incomes near the poverty line such as elderly widows. They may have little income beyond Social Security but may own some assets: with under-reporting of asset income the income of the widow might be below the poverty threshold, but with accurate reporting her income may be above the poverty threshold.

In summary we believe that the HRS innovations in the measurement of income generate substantially higher quality income measures. Furthermore, the innovations would be anticipated to affect measured poverty status as compared with the CPS in at least two

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[4] The target amounts or bracket boundaries vary with income type.

[5] For comparability with the response rates reported in Atrostic and Kelenkoski (2002) we report response rates conditional on income receipt.

[6] Note that item response rates in the CPS have dropped substantially since the nineties, especially for income from interest and dividends. It is therefore unlikely that these statistics will have improved.

ways: Bracketing should increase measured poverty, but a better measure of income from assets should reduce measured poverty. The overall effect is an empirical matter, but it is likely to vary by age. For example, elderly widows may well have some assets so that an accurate measure of the income from those assets would cause them not to be classified into poverty.

2.3.2. Imputation of income of non-core HRS household members and the measurement of poverty.

Core HRS household members are the age-eligible respondent and spouse, who may also be age-eligible but is not necessarily age-eligible. The HRS spends considerable effort to measure their income and we will take their income measures to be of quality that is at least as good as in the CPS. We are concerned with the measurement of the income of other persons in the household such as children or parents, which lacks considerable detail in the HRS, and as such is the main weakness with respect to assessing poverty status in the HRS.

The financial respondent in the HRS is asked first about the earnings of each non-core household member with follow-up brackets for non-response as to value. Because of the brackets, the HRS procedure will likely give more accurate measures of household income than the CPS among households where earnings are the exclusive or predominant source of income. Following the questions about earnings, the financial respondent is asked just one question about all other income the non-core household members might have with follow-up unfolding brackets. We will use the brackets to bound the poverty rate. To that end we first assume that each bracketed income is at the lower boundary of its bracket. These income amounts are aggregated with non-bracketed reported amounts and with the core HRS respondent(s) income. Then we ask how whether the household would *not* be in poverty were income at that low level. Next, we assume that each bracketed income is at the maximum in its bracket and ask whether the household would still be in poverty were income at that high level. Thus the poverty rate is bounded. In a next step we impute income to non-core HRS household members who were bracketed using nearest neighbor conditional on a number of covariates.[7] Table 2 shows the classifications with and without imputations and the resulting poverty rates for the HRS households aged 55 or over as measured in HRS wave 6 in 2002. Among the 16,137 people aged 55 or over, 13,940 were either in households that only had core members (single person or couple) or in households where income of non-core members was completely reported. Of that group, 1,359 were in poverty for an unweighted poverty rate of about 9.7 percent. The HRS over-samples groups who have higher than average poverty rates, and so the weighted poverty rate is lower at 9.1 percent.

Even in households where there is some missing data on the income of non-core HRS household members, the income that is reported may be enough to lift the household out of poverty.[8] That was the case for 1,493 households. When assigning income of non-core household members to the lower boundary of the bracket, we found that an additional 152

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[7] We use nearest neighbor imputation within bracket separately for singles and for couples because singles tend to be elderly living with their middle aged children and couples tend to be younger living with their young children or their elderly parent. Covariates are: age, race, sex, number of household residents, any household resident less than age 18, income of the core HRS respondents, and self-rated health of the core HRS respondents.

[8] Recall that for non-core household members the HRS asks separately about the earnings of each one of them, followed by just one question about all other income of all non-core household members.

households would not be in poverty and that when assigning income of non-core household members to the upper boundary of the bracket 37 households would be in poverty. By these methods 15,622 households (97 percent) could be given a poverty status without imputing income of the non-core household members. Their unweighted poverty rate is 8.9 percent and their weighted poverty rate is 8.4 percent.

The remaining 515 households cannot be classified without imputation; but we can find the sensitivity of the poverty rate to the imputations by first assuming they are all in poverty and then by assuming that none is in poverty. These assumptions result in an unweighted poverty range of 8.7 percent to 11.8 percent and a weighted range of 8.2 percent to 10.8 percent. The last line of the table shows the poverty rate when we impute the missing income of non-core household members using bracket information. We note that even with bracket information the unweighted and weighted poverty rates based on imputations (when necessary) are within one percentage point of the minimum rate.

In 2002 the reference year for HRS income was 2001, so our comparisons with the CPS will be for 2001. Figure 1 shows by age band the HRS maximum poverty rate, the imputed poverty rate and the minimum poverty rate, and the CPS poverty rate. The HRS minimum and maximum bound the CPS rate. The imputed poverty rate has the same age pattern as the CPS rate, increasing from the first age band to the second, then decreasing, and reaching a maximum among those 75 or over. The most notable difference is that the HRS rate is lower than the CPS rate for the top three age bands, that is for those age 60 and above. These are ages when asset income is relatively more important than earnings. We have discussed why the HRS asset income measure is likely to be superior to the CPS asset income measure, and empirically it results in more asset income. The differences in the measured poverty rate in the CPS and in the HRS range between 0.5 and 1.4 percentage points.

Because of the difficulties of reporting income for other household members in complex households and of assigning the "age" of the household, the most direct comparison between the HRS and the CPS can be made by focusing on unrelated individuals living alone. These are all single persons both in the HRS and the CPS and they all report their own income. Table 3 shows poverty rates of such persons. With few exceptions the HRS rates are lower than the CPS rates, and in some cases substantially lower.[9] Of particular interest from a policy point of view is the poverty rate of older unrelated females because they exhibit above-average poverty rates in official statistics, and because they are quite numerous: for example, unrelated females 75 or over comprise 35% of the observations in Table 3. They are mostly widows and represent the especially long-lived survivors of a formerly couple household. According to the HRS, the poverty rate of females 65-74 years old is five percentage points lower than the rate according to the CPS, and about four percentage points lower among those aged 75 or over. The table also shows poverty rates of people who live in "married" households; that is, the reference person is married in the case of the CPS and the respondent is married in the case of the HRS. The differences are small, varying from 0.2 percentage points to one percentage point.[10]

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[9] The poverty rate among HRS 55-59 year olds is especially low. The number of observations in that cell is just 113 and the upper limit of the 95% confidence interval is 0.194, so the unusual value could be due to the small sample. In comparison there are 1362 females 75 or over in that table.

[10] The statistics for individuals living in couples do not impose the restriction of no other household members living with the couple.

3. Consumption-based poverty rates in the HRS

Consumption-based poverty rates differ from pre-tax income-based poverty rates because they take into account saving or dissaving, income-in-kind, the consumption of durables, and the consumption of housing services. They implicitly account for taxes because in the long-run people cannot consume more than their after-tax income. Even in the medium-run, consumption flows should be approximately equal to after-tax spending flows provided there is no substantial saving or dissaving.

The difference between income-based and consumption based poverty rates is likely to vary with age. Tax rates decline with age; there is dissaving at old age; consumption-in-kind is likely more important at older ages because of Medicare; older households may depreciate their durables more thoroughly so that they would still have a flow of consumption from the durables even though expenditures on them are nil; ownership of housing declines with age albeit slowly. Thus age-related welfare judgments are likely to differ according to whether poverty is measured by pre-tax income or by consumption.

3.1. Consumption and Activities Mail Survey

We will estimate consumption-based poverty measures in the HRS using data from the HRS core and from the Consumption and Activities Mail Survey (CAMS). In October, 2001, CAMS wave 1 was mailed to 5,000 households selected at random from households that participated in HRS 2000. In households with couples it was sent to one of the two spouses at random. The fact that the sample was drawn from the HRS 2000 population allows linking the spending data to the vast amount of information collected in prior waves in the core survey on the same individuals and households.

CAMS wave 1 consists of three parts. In Part A, the respondent is asked about the amount of time spent in each of 32 activities such as time spent watching TV or time spent preparing meals. Part B collects information on actual spending in each of 32 categories, as well as anticipated and recollected spending change at retirement (Hurd and Rohwedder, 2005). Part C asks about prescription drugs and current labor force status.

The instructions requested that for Part B the person most knowledgeable about spending be involved in answering the questions. The addressee answered Part B in 88 percent of households, possibly with the assistance of the spouse; 5 percent of the cases report explicitly that the spouse answered the questions; 2 percent had their children or children-in-law of the addressee help out in answering the questions, and the remaining 5 percent was a mix of miscellaneous responses including nonresponse.

Of course CAMS could not ask about spending in as many categories as the CEX, which in the recall component of the survey asks about approximately 260 categories. The design strategy adopted for CAMS was to choose spending categories starting from the aggregate categories that are produced in CEX publications, so as to have direct comparability with the CEX. However, to reduce the burden to respondents the categories had to be aggregated further. The final questionnaire collected information on 6 big-ticket items (automobile; refrigerator; washer or dryer; dishwasher; television; computer) and on 26 non-durable spending categories.

The reference period for the big-ticket items is "last 12 months," and for the non-durables it varied: the respondent could choose the reference period between "amount spent monthly" and "amount spent yearly" for regularly occurring expenditures like mortgage, rent, utilities, insurance, property taxes where there is little or no variation in amounts; and "amount spent last week," "amount spent last month," and "amount spent in last 12 months" for all other categories. For all non-durable categories there was a box to tick if "no money spent on this in last 12 months." The questionnaire had no explicit provision for "don't know" or "refuse" so as not to invite item nonresponse.

Of the 5,000 mailed-out questionnaires there were 3,866 returned questionnaires giving a unit response rate of 77.3 percent.

3.1.1. Unit non-response in CAMS

There were lower response rates among households with certain characteristics mainly age. For this paper the most important observation is that there was no pattern of significant unit nonresponse as a function of education, income or wealth. When calculating population averages, we will use weights that account for sample design and nonresponse in HRS itself, and for nonresponse to CAMS.

3.1.2. Categories of spending and item response rates

Appendix Table 2 shows the spending categories and the rate of item nonresponse in CAMS. Nonresponse in CAMS is much lower than it is for typical financial variables such as the components of wealth or income. A consequence of the high response rates is that 54 percent of households in CAMS wave 1 were complete reporters over all 32 categories of spending. An additional 26 percent had just one or two nonresponse items. Ninety percent of the sample were complete reporters of 26 categories or more. Furthermore, in the spending categories with the highest rate of nonresponse, we have information from the HRS core that we can use for imputation. For example, rent has almost the highest rate of nonresponse. However, we have responses in the HRS about homeownership which we can use with considerable confidence to impute rent. Of the 512 who were nonrespondents to the rent query, 427 owned a home in HRS 2000. We believe we can confidently impute zero rent to these households. Similarly among nonrespondents to the question about homeowners insurance and who owned a home with mortgage in 2000, 66 percent reported that their insurance was included in their mortgage payment. Apparently they did not respond in CAMS because they had already included that amount in the mortgage report.

Using the HRS core data, we imputed spending (mostly zeros) in up to 18 spending categories. The number of imputed observations in a particular category ranged from just a few to 470. Based on these and similar imputations that use HRS core data to provide household-level information, 63.5 percent of CAMS respondents are complete reporters over all 32 categories of spending.

Because of the small amount of item nonresponse that remained we used simple imputation methods from the mean of the reported amount. See Hurd and Rohwedder (2005) for further details.

3.2. Validation of Consumption Data

　　We will use two methods to validate the CAMS data: We will compare levels of spending in CAMS with levels in the CEX, which collects the most detailed and comprehensive data on spending at the household level in the U.S.; we will also compare spending with after-tax income to find whether the relationship is consistent with the predictions of economic theory and with wealth change in panel.

3.2.1. CAMS-CEX comparison

　　The measurement of an aggregate that depends on summing many components is thought to vary with the number of components that are measured. The reasoning is that each component is composed of sub-components and that respondents will not remember all the sub-components when reporting the value of the component (Weinberg, *et al*., 1999). Thus, increasing the number of components that are queried will increase the aggregate of the components.[11] CAMS asks about 32 categories of spending; CEX asks about hundreds of categories. *A priori* we would expect spending to be under-estimated in CAMS compared with the CEX.

　　Table 4 has comparisons between spending in CAMS and spending in the CEX. In the lowest age band the spending levels are similar, but at older ages spending in CAMS is higher than in the CEX and, particularly at advanced old age, it is substantially higher. This difference in average spending at older ages is not due to the use of a reference person in the CEX. This is apparent when we compare income across surveys. The CPS, just as the CEX, also uses the concept of the reference person for classifying households by age. Even though this concept is not well-defined in the HRS average income is very close to the CPS statistics for all age bands.

　　We have included CEX income for reference purposes, but it is not really comparable. It is the average over "complete reporters" only; that is, households that had no item nonresponse to questions about income items. This will induce an obvious bias because of the high rate of item nonresponse to questions about asset income. Thus complete reporters tend to have no asset income and to be low income households, as is evident in the table.

　　We have no explanation for the similarity of spending in the age-band 55-64 and the divergence between HRS spending and CEX spending at advanced ages. However, we believe that the CEX spending levels are under-estimates for the actual older part of the CAMS sample.

　　We base this belief on comparisons between of CEX spending and CAMS after-tax income, which is shown in the last line of Table 4.[12] Although the CEX respondents and the CAMS respondents are different people, they represent the same population. If the level of CEX spending were appropriate for the CAMS sample, the implied amount of saving among those 75 or over would be $3.4 thousand per year (CAMS after-tax income minus CEX spending), implying a saving rate out of after-tax income of about 13%. This rate is very much greater than any estimate of household saving rates in the U.S. Furthermore, economic theory (the life-cycle model) predicts that saving should be negative at advanced old age, not strongly positive. A saving rate of 13% would lead to an increase in wealth in panel; yet we

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[11] See for example Hurd *et al.* (1998) where consumption is under-estimated by about 35% when based on a single question.

[12] The method of calculating taxes is discussed in the next section.

clearly find a decrease in wealth in panel. See the discussion in 3.2.3 below. In contrast, a comparison of CAMS spending with CAMS after-tax income shows dissaving of $3.4 thousand per year which is qualitative consistent with economic theory, and with observed wealth change in panel.

3.2.2. Taxes

We want to compare consumption with after-tax income. We used the NBER tax calculator (TAXSIM) to calculate Federal, state and Social Security taxes for each household in our sample.[13] A limitation is that we can only perform the calculation for the HRS singles and couples in a reliable way because we do not have the required details of the income of other household members. Furthermore, it is very likely that other members of the household would file separate tax forms. We, therefore, restrict our comparisons of after-tax income and consumption either to single persons living alone or to married couples living alone.

3.2.3. Life-cycle pattern of consumption and saving

Figure 2 shows pre-tax and after-tax income and spending of the CAMS sample.[14] Whereas pre-tax income declines sharply with age, after-tax income declines much more slowly. Spending declines still more slowly reflecting the fact that households in their 50s and early 60s save and households above about age 75 dissave: spending becomes greater than after-tax income in the age band 75-84.

Figure 3 shows saving rates out of after-tax income by marital status. Except for some noisy variation among singles the saving rates are consistent with the following observation: Although the rate of saving declines monotonically with age, couples always save until advanced old age; singles do not save at any age, and dissave substantially at advanced old age. Apparently couples preserve capital so that the surviving spouse will have resources to finance spending to advanced old age. The high rate of dissaving at advanced old age among singles is consistent with the life-cycle model.[15]

Another type of validation of spending levels is to compare saving as measured by the difference between after-tax income and spending with wealth change as measured in panel. Except for capital gains, over long periods of time the change in wealth should be equal to the inflow or outflow of resources into wealth accounts. Under the assumption that income and wealth are measured without bias in the HRS, a large discrepancy between wealth change and net saving or dissaving would be due to bias in measuring spending. However, because of capital gains we will not be able to make a quantitative comparison; rather we would like to see whether the age-pattern in saving rates is found in the wealth change and whether the pattern by marital status is also found. For this comparison we use panel wealth change between HRS waves 3 to 4, 4 to 5 and 5 to 6, which cover the years (approximately) 1996-

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[13] See Hurd and Rohwedder (2005) for a similar application of the NBER tax calculator to the HRS and CAMS data; see Feenberg, Richard and Coutts (1993) for a detailed description of the TAXSIM model.

[14] This figure and Figure 3 exclude composite households because of our inability to calculate taxes for all household members in the case of complex households.

[15] The lack of saving among singles in their fifties (no saving or dissaving) reflects largely a compositional effect: the group of singles at these ages is dominated by divorcees, while at older ages the mix shifts towards widows. When controlling for such compositional changes one would observe small, but positive saving among singles at those younger ages (see Figures 4 and 5).

1998, 1998-2000, and 2000-2002.[16] Our method is to calculate changes in median or mean wealth in each of the three pair-wise panels by age band and by marital status. To smooth the rather violent changes in the stock market over this period we average the three changes. These results are shown in Figures 4 (medians) and 5 (means). We see that as measured by changes in median wealth the broad pattern of saving by age which we have calculated from after-tax income and spending is found in changes in wealth: among couples prior to retirement median real wealth increased by about 5 percent every two years. At older ages there was little change until advanced old age. For singles in the youngest age band, median wealth increased by about 2 percent over two years. It was approximately constant at older ages until advanced old age. The means show a qualitatively similar pattern but with larger changes in the first age band reflecting the influence of large wealth holders. We view these wealth changes as providing additional validation for the measure of spending in CAMS.

3.3. From Spending to Consumption

CAMS collects information on spending on durables, but our measure of interest is consumption of services from durables. For five of our big ticket items (excluding automobile purchases) our general strategy is to estimate in CAMS the probability of a purchase and the expected value conditional on a purchase as functions of important covariates such as income, wealth, age and marital status. Then we impute an annual purchase amount which, in equilibrium, will be equal to the annual consumption with straight line depreciation. In particular we make the following assumptions and calculations. We assume straight-line depreciation and that average annual consumption is equal to average annual depreciation. We estimate logistic functions for the probability of annual purchase. Covariates are age, income, marital status, and number of household residents. We estimate spending conditional on purchase using the same covariates as for purchase. Then predicted average annual consumption on five big-ticket items is calculated as:

average annual consumption on five big-ticket items =

$$\sum_{i=1\dots5} (\text{probability of purchasing item } i) \times (\text{expected amount given purchase of item } i)$$

From these estimations we find mean consumption of the five big ticket items to be $271 per year with a range of $67 to $2,581.

Because we have the value of automobiles and other vehicles used for transportation in the HRS in 2000 and 2002, we calculate the flow of services from the actual values. This calculation will more accurately estimate the flow of services for low income households. We make these assumptions and calculations: The value of transportation (almost all automobiles) is measured in the HRS core; user cost is the sum of interest on the value, depreciation on a 12-year schedule, and observed maintenance costs from CAMS. We find that the mean flow of services is $2,803 per year with a range of $0 to $39,500.

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[16] AHEAD was fielded in late 1995 and again in 1998 and covered those 72 or over in 1995. We combine them with HRS cohorts who were interviewed beginning in March, 1996 and again in 1998 for the waves 3 to 4 calculation.

We follow a similar strategy to estimate the flow of consumption services from owner-occupied housing by estimating a rental equivalent: the amount the housing unit would rent for in a competitive market in equilibrium. In particular we make the following assumptions and calculations. (1) The interest cost is the value of housing multiplied by the prevailing interest rate. We use the observed house value from the HRS core and assume an interest rate of 7.16 percent, which was the average 30 year mortgage interest rate in 2001. (2) We estimate depreciation from maintenance costs which are observed in CAMS and from the observed house value: we assume depreciation of 2.14 percent per year which is equivalent to a depreciation period of 47 years. The flow of housing services is the sum of these items, amounting to $13.0 thousand dollars at the mean among home owners and $9.6 thousand dollars at the median.

One difference between spending and consumption is income-in-kind. For the older population by far the most important income-in-kind is Medicare. However, the valuation of Medicare or even out-of-pocket health care expenditures is controversial. The National Academy of Sciences panel on measuring poverty recommended excluding out-of-pocket spending from income when assessing poverty status, but the recommendation drew sharp dissent from one panel member (Citro and Michael, 1995). Furthermore, the panel's methods of treating health care spending results in large variation in poverty rates in the elderly population. For example, in 2003 the official poverty rate among the elderly was 10.2 percent (Delaker, 2005). But the poverty rate varied between 14.0 percent and 17.3 percent when various of the panel's recommended measures were used. Thus, the method of treating health care spending can have a large effect on measured poverty. Because of the lack of agreement among researchers, we follow the method of the official poverty rate calculation and do not place any value on Medicare or Medicaid, even though we recognize that those programs certainly have considerable value to the older population. Similarly we do not include health care consumption financed by others such as employers. We do include out-of-pocket spending for health care.

While the HRS core queries about gifts and money received from others outside the household, it does not distinguish between them, so we do not include any non-money gifts received from others.

Total consumption is the sum of the consumption of 26 nondurables, the consumption of services from five durables, the consumption of services from transportation (mainly automobiles), and the consumption of services from owner-occupied housing.

3.4. *Estimates of consumption-based poverty rates*

We compare household total consumption to the official poverty thresholds to find the household's poverty status based on consumption.

Figure 6 shows by age band the poverty rate as measured by pre-tax income and by consumption. Except for those 75 or over the poverty rate is considerably higher when measured by income rather than by consumption. Figure 7 shows poverty rates for unrelated individuals when measured by pre-tax income, after-tax income and by consumption.[17] We introduce poverty rates based on after-tax income because consumption is a post-tax measure and should therefore be compared to a post-tax income measure to eliminate any differences

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[17] We cannot show after-tax poverty rates for all households because we do not have sufficient information to calculate after-tax income of complex households.

driven by taxes. Among those 55-59 the poverty rate is about 2.5 percentage points higher when measured by after-tax income rather than by pre-tax income. Even low income families pay Social Security taxes out of earnings. At older ages the difference is minor and at advanced old age the poverty rate is slightly lower on an after-tax basis.[18] When measured by consumption the poverty rate is considerably lower, as much as 11.8 percentage points, than when measured by after-tax income. Among those 75 or over, which would mostly be widows, the consumption-based poverty rate is just 6.2 percent. These rates give a very different impression of the prevalence of poverty as measured by pre-tax income: for the same group that measure is 14.2 percent.[19]

Figure 8 shows poverty rates for couples who live alone. In this type of household we can calculate taxes, so the figure has pre-tax, after-tax and consumption based poverty rates. For couples younger than 75 we find again substantially lower consumption-based poverty rates compared to after-tax income-based poverty rates. For couples age 75 or more the measures are not much different. Compared with unrelated individuals, the poverty rates of couples are very low, and at advanced old age very close to zero.

4. Relationship between after-tax income and consumption-based definitions of poverty

To understand the characteristics of households that are classified into poverty on the basis of after-tax income but not on the basis of consumption we first present the correspondence between these measures in Table 5. Because we do not have a reliable way of estimating taxes in composite households we limit the sample to singles and couples who live alone.[20]

About 92.5 percent of these simple households are classified as not in poverty both according to income and to consumption. If, as we have argued, consumption is a better measure of economic well-being than income, the table shows that income overstates poverty status and therefore is not a good proxy for poverty in this population. Aside from the level differences in poverty rates (6.2 percent versus 2.9 percent) the table shows that the correspondence between the poverty measures is low: just 24 percent of households that are classified into poverty on an income basis are also classified into poverty on a consumption basis (1.5/6.2=24.2). About 52 percent of those classified into poverty on a consumption basis are also classified into poverty by income (1.5/2.9=51.7).

We ask whether there are differences in wealth that can explain the differences in these two measures of the poverty rate. To do that we consider only those households that are classified into poverty according to income. There are 226 such households. Then we classified those households into two groups according to their poverty status as determined by consumption. We ask: What are the wealth differences between these two groups? These wealth differences are shown in Table 6. To eliminate possible error in the measurement of

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[18] Due to low-income tax credits mostly at the state level.

[19] Slesnick (1993) compares poverty rates based on income with those based on consumption using the CEX. His measure of consumption is expenditures and finds about a five percentage point difference between the income-based measure and the consumption-based measure. Our results for unrelated individuals show a greater difference but for the entire sample a smaller difference.

[20] We use the poverty rates based on after-tax income for subsequent comparisons with consumption-based poverty rates because we do not want the differences between the two measures to be driven by differences in taxes. Consumption is mostly a post-tax measure and so we should compare it to post-tax income.

the income of non-core HRS household members, the sample is limited to the CAMS sample of singles and marrieds living alone.

Mean nonhousing wealth of those in poverty according to after-tax income and also according to consumption is essentially zero ($187) whereas mean wealth of those in poverty according to after-tax income but not in poverty according to consumption is about $158 thousand. Of course, mean wealth is heavily influenced by outliers, but at the 75th percentile the difference in non-housing wealth between the two groups is about $15,000.

Next we study a number of factors jointly: home ownership, non-housing wealth, age, education and marital status. We estimate a logistic model for poverty status of the household as measured by consumption over the sample that is in poverty as measured by after-tax income. The sample is the CAMS sample of singles and couples living alone.

In Table 7, being single increases the odds of being in poverty according to consumption by a factor of 3.2; that is, a single person is about three times more likely to be in poverty by a consumption definition relative to a married person.[21] This factor is almost offset by a decrease in the odds of being in poverty for females, so that an elderly widow is not substantially more likely than a married person to be in poverty.[22] Being a home owner decreases the odds of being in poverty according to the consumption definition with relative risk of 0.55. Those in the highest non-housing wealth quartile are one sixth as likely to be in poverty as those in the lowest quartile. There is little relation to age in the higher age bands, but a higher risk of being in poverty among those in their early 50s.

5. Conclusions

Our objective was to compare income-based poverty rates with consumption-based poverty rates in the HRS. But that comparison required as a first step the comparison of income-based poverty in the HRS with income-based poverty in the CPS; otherwise we would not have a good basis for comparing the HRS consumption-based poverty rates with the official poverty rates. In the general population, we found high correspondence between HRS and CPS poverty rates based on income. For example, among those 55 or over the HRS poverty rates that excluded imputations for other household members bracketed the CPS rates and differed by just one percentage point when using imputation. This close correspondence is important because the HRS is the only data set where income, wealth and consumption are available, and so permits the study of internally consistent relationships such as dissaving as measured by wealth change and dissaving as evidenced by income minus consumption. Furthermore, the HRS has many years of panel data on a very wide range of personal and household characteristics that can be used to understand poverty and poverty transitions.

Even though the HRS and CPS income-based poverty rates are in close agreement in the elderly population, we found an important difference between HRS and CPS income-based poverty rates for the subgroup of elderly single women, most of whom are widows. Among those 75 or older, the HRS poverty rate is 4.2 percentage points lower. We believe

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[21] The number of observations in Table 7 is slightly larger than the number in Table 6 because the latter only includes those age 55 or above, whereas in estimation we also include some younger households to gain sample size.

[22] Of course, this statement is the result of holding constant the other covariates. In the population couples are more likely to be home owners and to have more education.

this difference is likely due to the superior measure of income from assets in the HRS. We base this judgment on the following: first, apparently the CPS under-reports asset income by as much as 50 percent (Moore, Stinson and Welniak, 1997); second when HRS changed from a question format that had no direct link between asset value and income from assets, as is the case in the CPS, to a format that had a direct link, observed income from financial assets increased substantially across the entire asset distribution. The importance for poverty measurement is that some poor elderly widows have financial assets and a more accurate assessment of income from those assets may be enough to lift some of them out of measured poverty.

We found that our consumption-based poverty rates are considerably lower than income based poverty rates, especially for single people. The difference in poverty status when moving from an income-based measure to a consumption-based measure is not only due to home-ownership and the derived housing services: the ability of people to spend more than their income is also important. We conclude that the CPS likely overstates the poverty rate among single persons of advanced old age even when poverty is defined by income, and it does so by a considerable amount when poverty is defined by consumption.

Appendix

Appendix 1: Assessing income from assets in the CPS (somewhat paraphrased).

- *Interest income*
    "Did anyone in your household have money in savings accounts or money market funds?"
    "Did anyone have bonds, T-notes, IRAs or CDs?"
    "Did anyone have an interest-earning checking account or other investments that pay interest?"

    If "yes" to any of these queries, by household member and by the most comfortable reporting period the respondent is asked the amount of interest income in total from these sources. The total is annualized depending on the reporting period.

- *Dividends*
    "Did anyone own stocks or mutual funds?"

    If "yes," by household member and by the most comfortable reporting period the respondent is asked the amount of dividend income in total from these sources. The total is then annualized.

- *Rental income*
    "Does anyone own land rented out, apartments etc?"
    "Royalties, roomers?"
    "Estates or trusts?"

    If, "yes" to any of these queries, by household member the respondent is asked the amount of income from these sources in most comfortable reporting period. Then total is then annualized.

Appendix Table 1
Components of income in the CPS

Pre-tax earnings
Net earnings from business or farm
Unemployment compensation; strike benefits
Worker's Compensation (injury or illness)
Social Security benefits
Supplemental Security Income
Public assistance or welfare
Veterans' payments
Survivor benefits: regular payments from pension, estate, trust, annuity, life insurance
Other disability payments
Pension or retirement income
Reimbursement for educational expenses
Child support payments
Alimony
Regular financial assistance from friends, relatives outside the household
Hobbies, home businesses, farms, or business interests not already covered
Unemployment compensation, severance pay, welfare, foster children care or any
other money income not already covered.

Appendix Table 2
Unweighted item non-response rates (percent) in CAMS 2001

Big ticket item purchases	
Automobile or truck	
Refrigerator	3.6
Washing machine/dryer	3.5
Dishwasher	2.2
Television	2.3
Computer	2.8
Payments	2.6
Mortgage	
Homeowner's or renter's insurance	7.8
Property tax	11.3
Rent	11.2
Electricity	13.2
Water	7.6
Heating fuel for the home	10.4
Telephone, cable, internet	13.7
Vehicle finance charges	6.1
Vehicle insurance	13.8
Health insurance	8.0
Spending	8.9
Housekeeping, yard supplies	
Home repairs and maintenance	6.3
Food and beverages	6.1
Dining/drinking out	5.3
Clothing and apparel	5.3
Gasoline	5.9
Vehicle maintenance	6.6
(Non-)Prescription medications	6.8
Health care services	5.5
Medical Supplies	6.3
Trips and Vacations	8.0
Tickets to movies, events etc.	5.3
Hobbies	5.1
Contributions	5.8
Cash or gifts to family/friends	5.6

Source: Hurd and Rohwedder, 2005

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Figure 1

Poverty rates (%): CPS and HRS (weighted)

	55-59	60-64	65-74	75+	All 55+

max HRS □ imputed HRS ■ min HRS □ ■ CPS
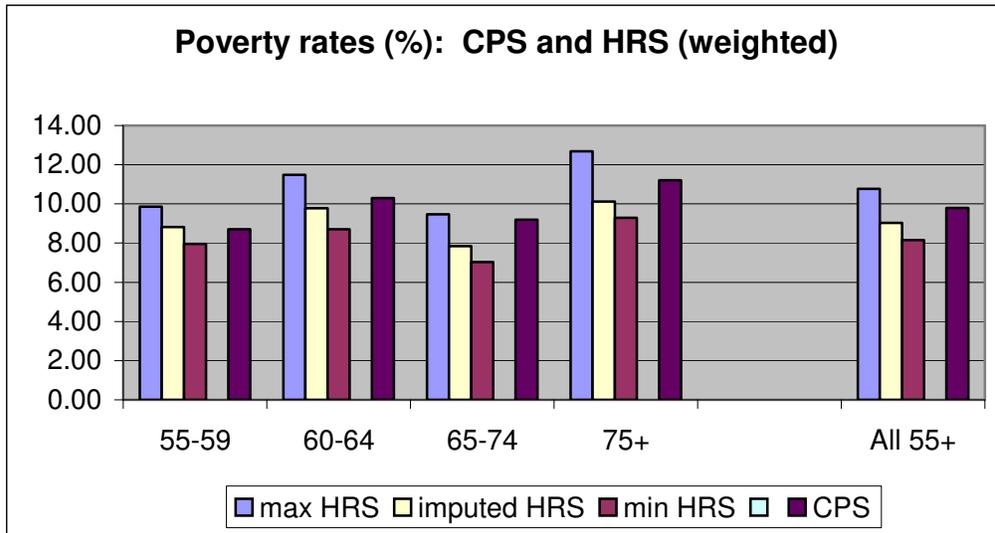
Source: Authors' calculations.

Figure 2

CAMS: Gross and after tax income, and spending
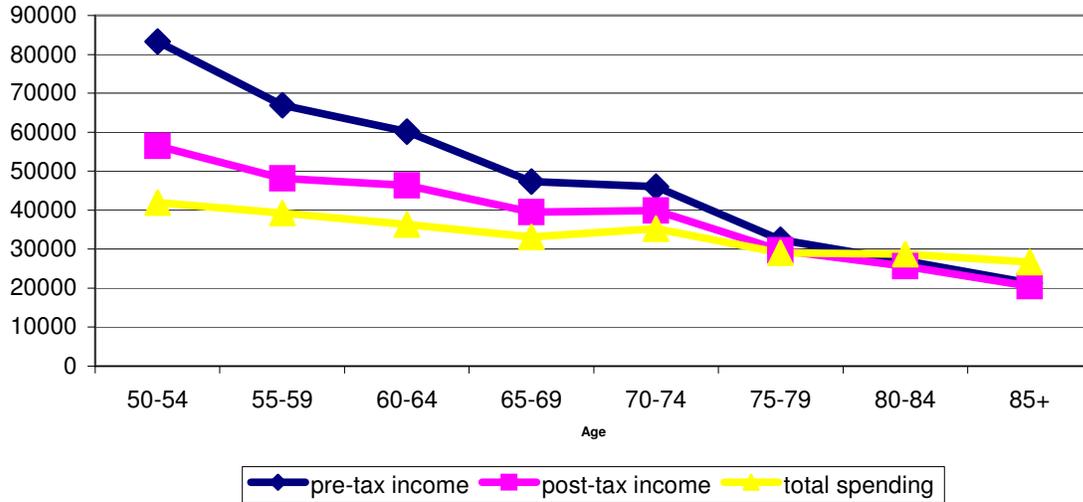
Source: Authors' calculations.

Figure 3

Saving rates (out of post-tax income)
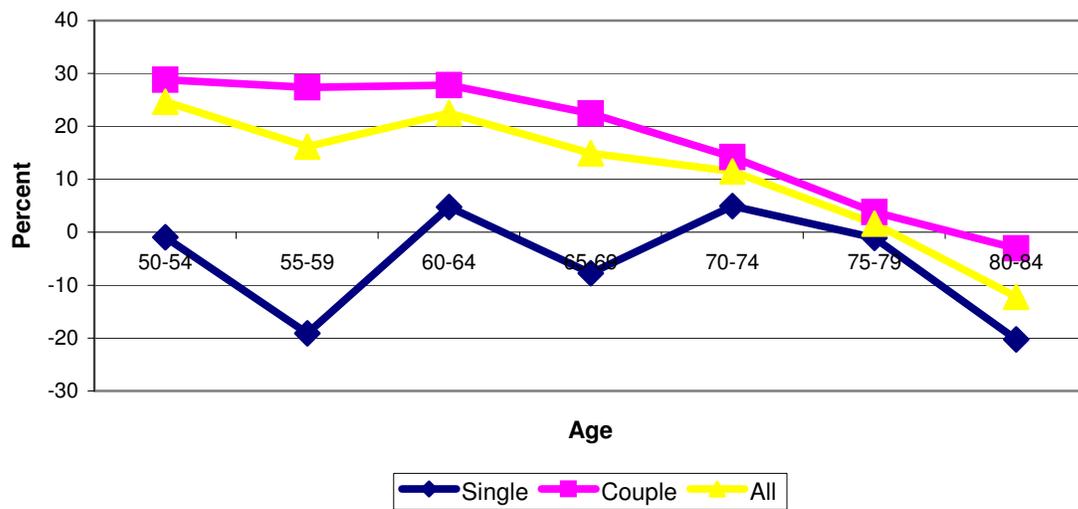
Source: Authors' calculations.

Figure 4
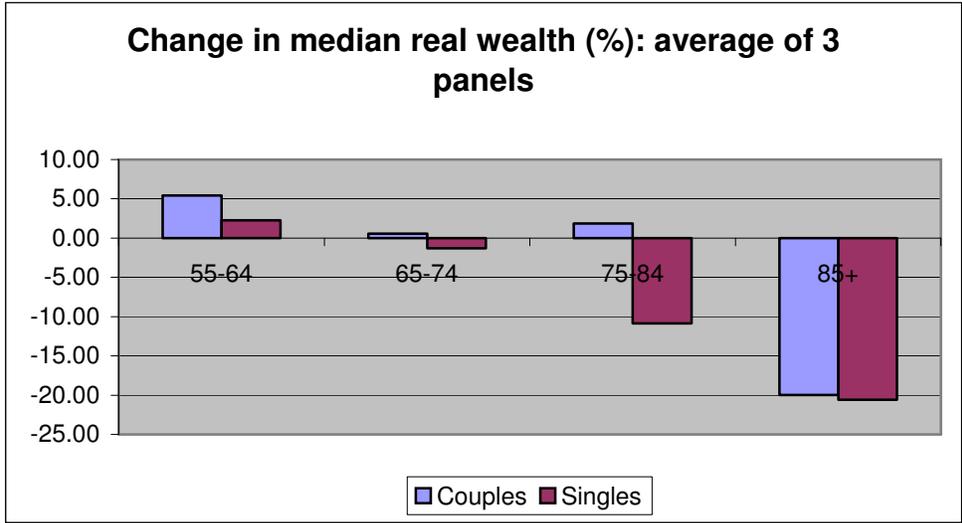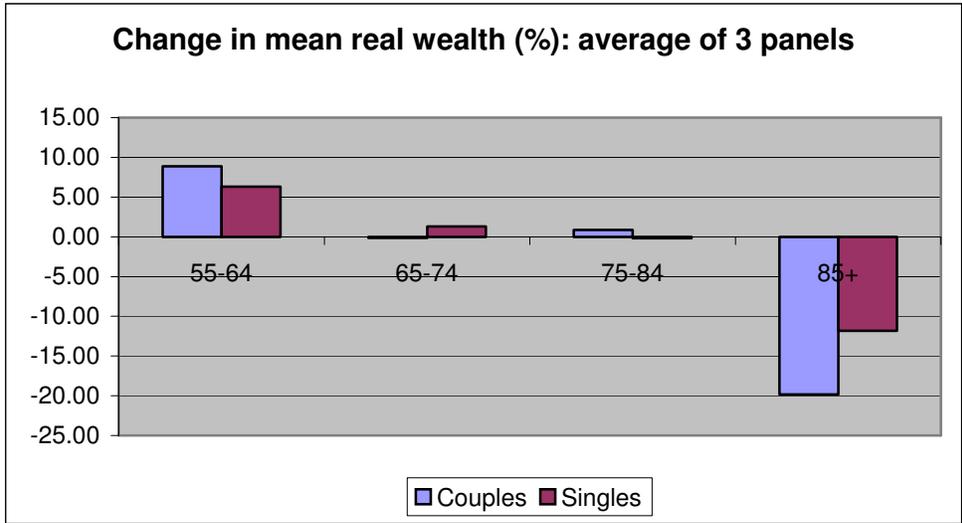
Change in median real wealth (%): average of 3 panels

Source: Authors' calculations.

Figure 5

Change in mean real wealth (%): average of 3 panels

Source: Authors' calculations.

Figure 6

Poverty rates (% weighted). CAMS. All

Source: Authors' calculations.

Figure 7

Poverty rates (% weighted). CAMS. Single persons living alone.

	55 to 59 years	60 to 64 years	65 to 74 years	75 years and over
Pre-tax income	18	16	14.5	14
Post-tax income	21.5	15.5	14.5	13
Consumption	9.8	6.3	6	6

Source: Authors' calculations.

Figure 8

Poverty rates (% weighted). CAMS sample. People in 2-person married households

	55 to 59 years	60 to 64 years	65 to 74 years	75 years and over
Pre-tax income	4.2	3	1.6	0.8
Post-tax income	4.5	3.1	1.5	1.3
Consumption	1.8	1.4	0.8	0.9
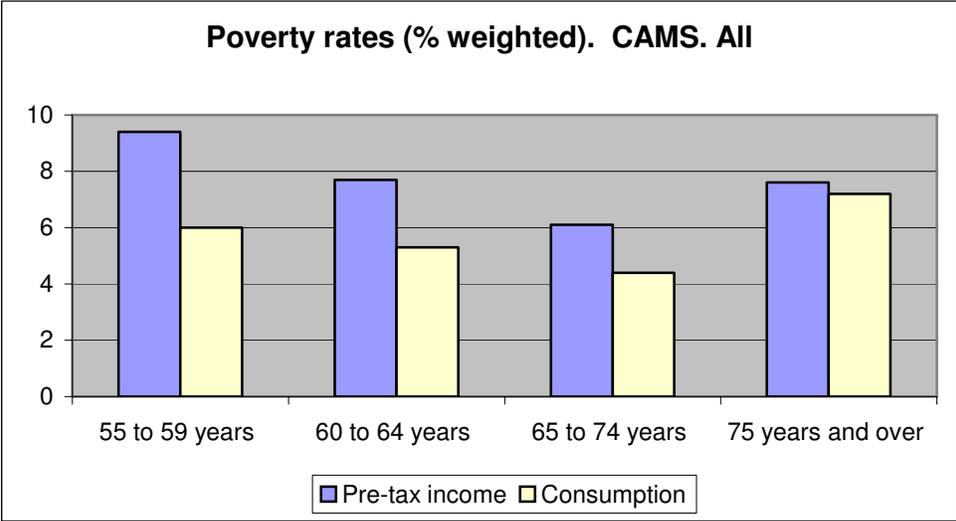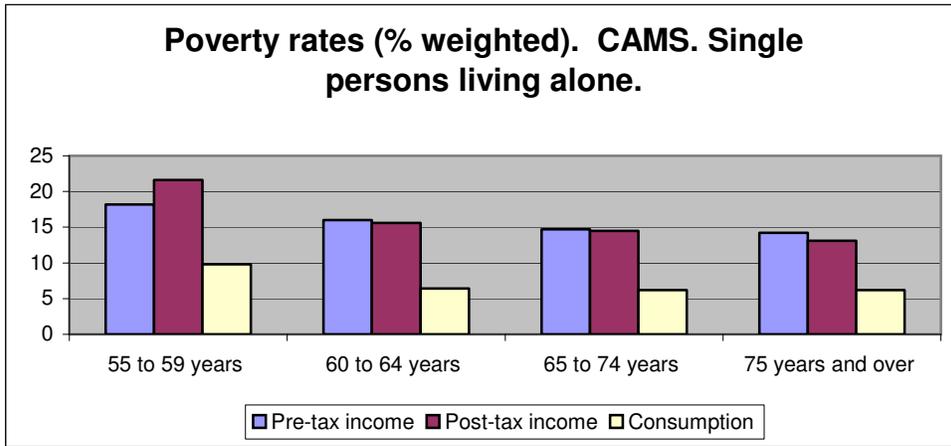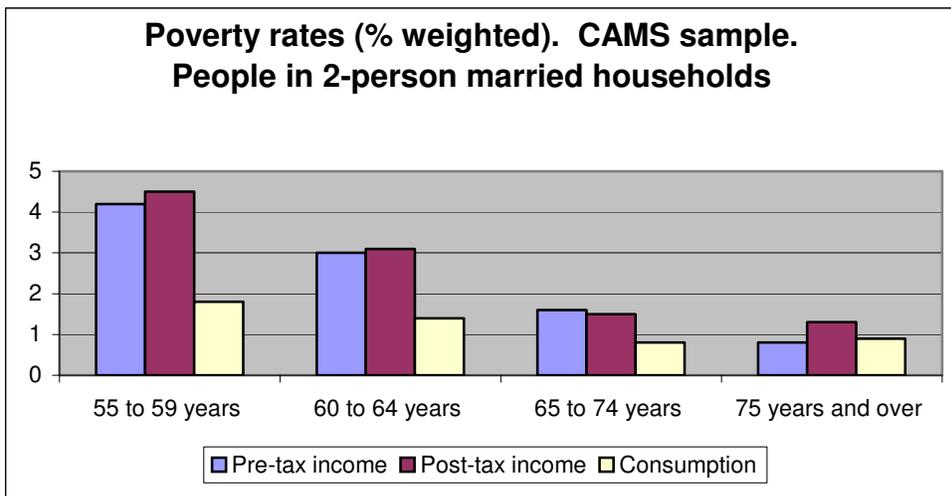
Source: Authors' calculations.

Table 1: Poverty Thresholds for 2001 by Size of Family and Number of Related Children Under 18 Years (Dollars)

Size of family unit	Weighted average thresholds	Related children under 18 years								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual)	9,039									
Under 65 years	9,214	9,214								
65 years and over	8,494	8,494								
Two persons	11,569									
Householder under 65 years	11,920	11,859	12,207							
Householder 65 years and over	10,715	10,705	12,161							
Three persons	14,128	13,853	14,255	14,269						
Four persons	18,104	18,267	18,566	17,960	18,022					
Five persons	21,405	22,029	22,349	21,665	21,135	20,812				
Six persons	24,195	25,337	25,438	24,914	24,411	23,664	23,221			
Seven persons	27,517	29,154	29,336	28,708	28,271	27,456	26,505	25,462		
Eight persons	30,627	32,606	32,894	32,302	31,783	31,047	30,112	29,140	28,893	
Nine persons or more	36,286	39,223	39,413	38,889	38,449	37,726	36,732	35,833	35,610	34,238

Source: U.S. Census Bureau (www.census.gov/hhes/poverty/threshld/thresh01.html).

Table 2

Poverty status of HRS sample

Effects of incomplete reports of income of non-core HRS household members

	N	In poverty	Not in poverty	Unweighted Poverty rate	Weighted poverty rate
Complete income reports	13940	1359	12581	9.7	9.1
Incomplete reports	2197	.	.		
Classification of poverty status by non-missing data	.	.	1493		
Classification on minimum in bracket	.	.	152		
Classification on maximum in bracket	.	37	.		
Total of above	15622	1396	14226	8.9	8.4
Cannot be classified	515	.	.		
Classified in poverty	16137	1911	14226	11.8	10.8
Classified not in poverty	16137	1396	14741	8.7	8.2
Missing income imputed	16137	1568	14569	9.7	9.0

Source: Authors' calculations

Table 3
Poverty rates 2001

	Single males living alone		Single females living alone		All couples	
	HRS	CPS	HRS	CPS	HRS	CPS
55 to 59 years	12.8	21.2	20.5	22.5	5.2	4.5
60 to 64 years	19.6	21.6	21.5	21.8	6.1	6.3
65 to 74 years	17.5	16.9	16.9	21.9	3.2	4.2
75 years or over	10.9	14.7	16.5	20.7	4.0	4.5

Source: HRS: Authors' calculations;
CPS: various tables found at http://pubdb3.census.gov/macro/032002/pov/new01_000.htm

Table 4
Comparison of CAMS and CEX spending and income comparisons (dollars in thousands)

	55-64	65-74	75 or over
Spending CAMS	39.6	35.5	29.6
Spending CEX	40.9	31.7	22.8
Pre-tax income HRS	60.1	43.3	27.1
Pre-tax income CPS	63.5	42.0	28.3
Pre-tax income CEX	52.0	32.4	22.3
After-tax income CAMS	47.3	39.8	26.2

Notes: CEX and CPS income for year 2001; CEX income full reporters only; HRS income for year 2001; spending for CAMS and CEX October, 2000-September, 2001.
Sources: CAMS: Authors' calculations; CEX: various tables found at
http://www.bls.gov/cex/home.htm#tables

Table 5
Percent distribution of poverty status of households (weighted)
N = 3,651

	Consumption-based definition		
After-tax income-based definition	No	Yes	All
No	92.47	1.37	93.84
Yes	4.68	1.48	6.16
All	97.15	2.85	100.00

Note: Singles and couples living alone.
Source: Authors' calculations

Table 6

Distribution of non-housing wealth among households in poverty according to after-tax income.

N = 226

Poverty status (cons. based)	Mean	Percentile				
		10	25	50	75	90
Yes	187	-1,850	0	46	1,500	4,038
No	158,202	0	0	1,600	16,500	105,000

Note: Singles and couples living alone.

Source: Authors' calculations

Table 7
Probability of being in poverty according to consumption: logit estimation
(N = 239 in poverty according to income; mean of dependent variable = 0.247)

	Odds ratio	P-value
Sex = female	0.50	0.11
Single	3.20	0.02
Home ownership	0.55	0.10
Less than high school	1.53	0.28
High school	--	--
some college	0.26	0.11
College	0.88	0.87
Non-housing wealth quartile lowest	--	--
2	1.10	0.83
3	0.63	0.28
4	0.14	0.00
Age < 55	3.49	0.13
55-59	2.24	0.14
60-64	1.01	0.98
65-74	--	--
75+	1.47	0.39

Note: Singles and couples living alone. The unit of observation is the household.
Source: Authors' calculations