Longitudinal changes in net worth by household income and demographic characteristics for the first three waves of the HRS

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Abstract

The purpose of this study is to provide an initial examination of the first three waves of the HRS in terms of non-housing net worth by gender, education, race, religion, income, and age. The longitudinal data that is available for a sample of those who are nearing retirement or in retirement allows a picture of their financial condition to be drawn. Statistical analysis indicates that there is a difference in non-housing net worth by demographic characteristics and marital status for each wave of the HRS and between the waves. © 2001 Published by Elsevier Science Inc.

1. Introduction

In the United States, the number of individuals 65 years and older has dramatically increased since the initial creation of the Social Security system in the 1930s. According to the annual Social Security Administration (2001) mailed to participants, their projection is that there will be 76 million baby boomers that will start to retire in 2010 and during the next 30 years the number of older Americans will almost double. Starting in 2015 the Social Security Administration will begin paying more in benefits than they collect in taxes and by 2037, the trust fund will be exhausted. These assertions are the basis for the call for reform of the Social Security system.

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In addition, Mitchell and Moore (1998) argue that the combination of new savings vehicles and a shift from defined benefit pension plans to defined contribution plans has transferred the planning and risk of retirement from employers to individual households. This raises two fundamental questions: (1) how well prepared are households to successfully assume this responsibility, and (2) what do we know about retirement asset accumulation and dispersion.

The National Institute on Aging (NIA) has sponsored a study called the Health and Retirement Study (HRS) in response to a perceived need by both government officials and social scientists for information on retirement planning and its actual occurrence. Specific goals for the study include a better understanding of the factors that influence the decision on the timing of the retirement decision and the effect of health and asset accumulation on this choice.

Juster and Suzman (1995) describe the development of the HRS. It started in 1991 with a cohort of households age 51–61 years old and is expected to be repeated every 2 years for at least a 10-year period. This study will provide a longitudinal analysis of a group of individuals who are close to retirement or retired and allow an examination of the factors in their decision to retire and their financial condition.

The first three waves (1992, 1994, and 1996) of the study have now been released by the University of Michigan which has overall responsibility for its implementation. While there are several published studies that use the first wave of data, very little has been done with the longitudinal data that is now available.

The purpose of this study is to provide an initial examination of these first three waves of the HRS in terms of non-housing net worth by gender, education, race, religion, income and age. A comparison can now be made of changes in the financial assets for participants for each wave and over time as the cohort moves from 51–61 years of age in 1991 to 56–66 years of age in 1996. The group has entered the prime years of retirement from 62 to 65 years of age.

The balance of this paper is organized into four sections. Section 2 discusses the relevant existing literature on retirement planning, retirement adequacy, asset allocation, gender differences, and age of retirement. This study's utilization of HRS data is described in Section 3 along with an explanation of the methodology employed. Section 4 discusses the results of the analysis and Section 5 provides conclusions on the cross-sectional and longitudinal findings.

2. Review of the literature

There are several strands of research on retirement planning and implementation in the finance literature as well as related work in such diverse disciplines as sociology, economics, and demography. Only a small selection of this work can be presented and the focus in this study will be on those articles published in *Financial Services Review* in the last 6 years.

2.1. Retirement planning

Does financial planning make a difference in the level of retirement satisfaction? Elder and Rudolph (1999) address this question by examining the responses to three questions on

the first wave of the HRS. First, respondents are asked if they had thought about retirement with the choices including a lot, some, a little, or hardly at all. Next, respondents are asked to answer yes or no to attending meetings about retirement planning. Lastly, they are asked if they are satisfied with their life in retirement by selecting very satisfied, moderately satisfied, or not at all satisfied.

They find that for the 1,781 individuals who are retired, if they have planned for retirement it has a significant positive impact on their satisfaction. While this result is not dependent on economic status or household characteristics, those households with higher incomes and larger net worth are more likely to be satisfied. Those who are forced to retire because of their employer's decision or ill health are less likely to be satisfied.

Using the same HRS data base, Elder and Rudolph (2000) seek to determine an answer to two questions: (1) do individuals use expected pension benefits in retirement as substitutes for accumulating savings?, and (2) do individuals have a realistic concept of their retirement standard of living based on their pension plan participation and savings? Their results indicate that individuals do treat expected pension benefits as substitutes for savings. However, accumulated savings are perceived to have an impact on the expected standard of living in retirement but not pension plan participation.

Greninger, Hampton, Kitt, and Jacquet (2000) report on a study of financial planners and educators suggests guidelines for retirement planning. They find a strong consensus that guidelines should include an assumption of a 4% inflation rate, 8.5% return on investments, and a replacement ratio of 70–89%. They do not find consensus on how long before retirement asset allocation changes should be made or the proportion of equities to be held in a retired individual's portfolio.

2.2. Retirement adequacy

Yuh, Hanna, and Montalto (1998) examine the retirement adequacy of a sample of households that are surveyed by the Federal Reserve Board in a triennial study conducted in 1995. The study is done in conjunction with the Department of the Treasury and is called the 1995 Survey of Consumer Finances (SCF) as reported by Kennickell, Starr-McCluer, and Sunden (1997).

The authors state that retirement adequacy is a function of the resources available in retirement that exceeds the desired consumption. They utilize mean lognormal portfolio projections and current contribution rates and find that 52% of households are adequately prepared for retirement. In determining the resources that are available they analyze the value of financial assets, non-financial assets that include home equity, and the present value of income from Social Security and other pension funds.

Yuh et al. (1998) raise several questions about the determination of retirement adequacy. First, what should the replacement rate (level of pre-retirement income needed in retirement) be? Estimates from Duncan, Mitchell, and Morgan (1984) range from 70% to 90% and Palmer (1989, 1994) uses 65–85%. Second, should home equity be included in retirement wealth? Third, in projecting future growth rates for assets, should all assets have the same growth rate? Fourth, should asset allocations for portfolios be different before and after retirement? Fifth, what is the necessary saving rate needed for a comfortable retirement?

Sixth, at what age will retirement occur? Lastly, should taxes be considered? Researchers arrive at different answers to the question of retirement adequacy based on their answers to these questions.

Mitchell and Moore (1998) base their study of retirement adequacy on the first wave of the HRS which is available at www.umich.edu/~hrswww Website. They find that the median American household has too little accumulated for a comfortable retirement with the married household having only $73,000 in net financial assets that exclude pension plan accruals. Their estimate is that this median household needs to save an additional 20% of income to achieve a replacement rate sufficient to retire at age 62 and 12% for retirement at age 65. For single males, an additional 29.3% of savings is needed for retirement at age 62 and 17.6% at 65. Single females need to save an additional 31.5% at 62 and 18.8% at 65. These two studies would appear to indicate that individual households do not have sufficient retirement wealth to provide a comfortable retirement with the situation being worse for singles than those households that are married.

2.3. Asset allocation

Reichenstein (1998) addresses two issues that impact retirement wealth: (1) what assets and liabilities should be included in the portfolio, and (2) should before-tax or after-tax values are used for portfolio valuation. He argues that after-tax values be used because that reflects the income that will be available to buy goods and services. To do so, he suggests multiplying pension assets by the factor one minus the individual household tax rate in retirement. The after-tax valuations would cause a much greater shortfall in retirement wealth projections and a difference in asset allocations. He examines the appropriate recognition of a home mortgage in terms of home ownership and the value of Social Security on an after-tax basis. This article considers several interesting factors in determining the appropriate asset mix and tax treatment of retirement wealth.

In determining the asset allocation for an individual who is retired, Vora and McGinnis (2000) find that the retiree is consistently able to consume more based on a portfolio invested in stocks rather than bonds. They recommend that retirees should continue to be invested in stocks rather than bonds.

Asset allocation in Individual Retirement Accounts (IRAs) is examined by Waggle and Englis (2000) in a study based on the Stanford Research Institute (SRI) survey database. Participants in the sample have an average annual income of $102,000, own their own home (92%), are married (81%), have completed college (71%), have a net worth of $725,000, which includes their home and an average age of 51. They divide asset allocations by four age categories starting with less than 45, 45–54, 55–64, and 65+ and three asset categories of cash, bonds, and equity. The authors find that over two-thirds of the investors put their funds into only cash, or only bonds, or only equity, providing no diversification at all in their IRAs. Further, 34% of all assets are in cash and 26% of participants have all of their funds in cash. This is contrasted with the fact that 34% have no equity in their IRAs and 36% are all equity.

Waggle and Englis (2000) contrast their results with a study by Bodie and Crane (1997) who examine average asset allocation decisions in retirement accounts by TIAA/CREF participants. Bodie and Crane find more than 40% of assets allocated to bonds that include

TIAA assets. Further the two studies find that older individuals hold less assets in equities, more equities if they have a college education, and more equities if they are higher net worth individuals. Further marriage does not appear to affect asset allocation decisions.

The first wave of the HRS is used by Hariharan, Chapman, and Domian (2000) to test two predictions of the Capital Asset Pricing Model (CAPM). First, those who have an increase in risk tolerance will reduce their propensity to purchase risk-free assets. Second, the portfolio of risky assets will not change because of higher risk tolerance. They find support for the predictions of the CAPM. Further, they find that those with more education allocate more of their wealth to risky assets as do Waggle and Englis (2000) and Bodie and Crane (1997). In addition, females are more likely to invest in risk-free securities than males.

Fraser, Jennings, and King (2000) examine the asset allocation decision in light of the effect of Social Security benefits on an individual's retirement portfolio. They argue that the present value of the Social Security benefits should be included in the wealth of the individual, with the calculations based on the real yield on Treasury Inflation Protection Securities (TIPS). Further, they argue that if the benefits are included the individual should include more stock in the portfolio.

2.4. Gender differences

The transfer of planning and risk management of retirement wealth from employers to individual households may lead to significantly lower pension benefits according to Bajtelsmit and Vanderhei (1997). The issue of possible gender differences in these decisions is raised by Bajtelsmit, Bernasek, and Jianakoplos (1999). They use data from the 1989 SCF to test for differences in contributions. Their results indicate that women allocate 27% of their wealth to defined contribution plans versus 35% for men. Women appear to have greater relative risk aversion than men, a result supported by later data in Hariharan et al. (2000). In terms of level of contributions to pensions, single men contribute more than married men, but single women contribute less than married women.

In a recent report by the U.S. Census Bureau, Smith and Tillipman (1999) provide relevant statistics for individuals who are 55 years or older. As the population gets older, women outnumber men, with there being 92 men for every 100 women in the age bracket 55–64. During the next 10 years from 65 to 74 years old, the ratio drops to 82 men, followed in the bracket 75 to 84 to 69 men, and finally for those 85 and over there are 49 men for every 100 women. Men 55 years old and over are more likely to be married and living with their spouse than women. For example, for those 55–64, 77% of men were married and living with their spouse versus 64% of women. There is no significant difference between men and women being a high school graduate, however, men are more likely to have a bachelor's degree. For the age group 55–64, 27% of men have a bachelor's degree and 19% of women.

Family income changes over time with 73.8% of married couples having an income of $35,000 or more for the age group 55–64 years old. This drops to 51.4% in the 65–74 age group and 36.8% for those 75 years and over. In the 55–59 age group, 79.1% of men are working in the civilian labor force and 62.4% of women. As might be expected, these percentages dramatically drop for those 60–64 years old, with 56.1 of men working and

39.2% of women. Those who are 65 years and over have 16.2% of men working and 9.7% of women.

2.5. Age of retirement

At what age do individuals plan to retire? Is the planned age the same as the current retirement age suggested by Social Security of 62 and 65? Montalto, Yuh, and Hanna (2000) use data from the 1995 SCF to investigate the determinants of planned retirement age. They find that 51% of the sample plan to retire by age 62 and 89% by age 65, with the definition of retirement being when an individual stops working full-time (35 h a week or more). Those who plan to retire earlier have higher levels of financial assets, non-financial assets, and other private pension funds, with a defined benefit pension significantly decreasing the planned retirement age. Occupation does not appear to be a factor in planned retirement age, while being Black or Hispanic produces a lower retirement age by at least two years. Additionally, the older the individual, the older the planned retirement age. The longer the expected life, the older the planned retirement age.

Woerheide (2000) presents the decision of the age to retire at as an option, with the beginning of each year the worker deciding whether or not to work one more year. His focus is on the cash payouts of working one more year rather than other considerations that include survivor protection, medical benefits, inflation, Social Security offset, death benefits, increases in retirement wealth, and non-pecuniary considerations.

The results indicate that the longer one expects to live, the higher the net salary from working one more year. However, an increase in the salary for the following year has a minimal effect on the decision. There is a difference between types of pension funds, with an individual having a defined benefit plan more likely to retire if he has many years in the system. The decision for an individual with a defined contribution plan is more likely to be to work one more year.

The studies on retirement that are reviewed in this section focus on cross-sectional analysis of several data bases including the first wave of the HRS, several different years of the SCF, individual surveys, simulations, SRI surveys, TIAA/CREF data, and U.S. Census Bureau data. This study's contribution to an understanding of pre-retirement and retirement is that it uses both cross-sectional and longitudinal data to provide a picture of non-housing net worth, asset allocation, demographic differences and age of retirement. It also provides additional evidence on the relationship of gender, education, race, income, and age to non-housing net worth. A variable that has not been included in previous retirement research is religious preferences, which may influence decisions about asset allocations and accumulation of assets.

3. Data and methodology

3.1. HRS data

The data for the current study is obtained from the HRS database, which surveys more than 12,600 individuals in 7,600 households where at least one of the respondents is over the

age of 50. There is data for 7,607 households for the first wave, 7,227 for the second wave, and 6,816 for the third wave. The number of households decreases by about 10% between waves 1 and 3.

Criteria for selecting the final sample require that households be included only if they are present in all three waves and have the same person providing the financial data. Households are excluded if they display erratic changes in net worth between the waves, which is defined as an absolute change of more than one million dollars. The final sample contains 4,903 households. This sample is divided into two categories: married and single. The married group includes 3,636 households who have a partner of the same or opposite sex, and the single group includes the remaining 1,267 households.

The HRS data includes the non-housing net worth and income of the household and demographic information as reported by its primary financial respondent. The household net worth is measured for each wave and includes the following non-housing equity: vehicle(s), liquid assets such as checking/savings, money market funds, CDS, government bonds and T-bills, IRA and KEOGHs, stock and mutual funds, business equity, bonds, and other net assets. Housing equity is excluded because many studies indicate that individuals are usually unwilling or unable to consume housing equity because they would prefer to age in place by remaining in their homes.

The 1991 household income from the first wave is reported in 1992. The household income figure includes the income of both the respondent and partner (if there is any) from all sources. This potential income can include earnings, unemployment and workers' compensation, pensions and annuities, Social Security, welfare, capital income, disability income, and other income. Demographic information includes gender, years of education, race, religion, and age. All demographic information except age is as of the first wave in 1992.

3.2. Model used in analysis of the data

To analyze the non-housing net worth longitudinally and cross-sectionally, a one-way ANOVA is used. The ANOVA deals with differences between or among sample means without restrictions on the number of means. The ANOVA also allows two or more explanatory variables to be analyzed simultaneously and to examine the main effects of each variable and the interaction effects of two or more variables. Answers to the following questions are sought through a one-way ANOVA with the dependent variable being non-housing net worth:

1. Is there any difference in the non-housing net worth of households in each wave in terms of household income level and demographic characteristics?
2. Is there any difference in the non-housing net worth of households between waves in terms of household income level and demographic characteristics?
3. Is there any difference in results between those categorized as married or single households?

The explanatory variables for the ANOVA model include gender, years of education, race, religion, and age of the household's financial respondent, as well as household income level.

3.3. Description of explanatory variables

The six explanatory variables have each been divided into two or more groups as shown in Table 1. Gender as well as marital status may play a role in the non-housing net worth accumulation of those nearing retirement or in retirement as suggested by Bajtelsmit and Vanderhei (1997), Bajtelsmit et al. (1999), Mitchell and Moore (1998), and Smith and Tillipman (1999).

The education variable is divided into four groups to recognize the differences in educational achievement reported by Smith and Tillipman (1999). They state that education differs by gender, race, income, and age.

Race is divided into three traditional categories of Caucasian, African American, and all others. The largest grouping in the all others is Asian and Hispanic/Latino. The group is based on the distribution of the respondents by number in each group. Badu, Daniels, and Salandro (1999), Gutter, Fox, and Montalto (1999), and Plath and Stevenson (2000) examine

Table 1
Description of explanatory variables

Variables	Description
GEN	Gender
Male	1
Female	2
EDU	Education
Less than high school	1 if years of education < 12
High school	2 if years of education = 12
Do not finish college	3 if years of education > 12 and < 16
Finish college and more	4 if years of education > 16
RAC	Race
White or Caucasian	1
Black or African American	2
All others	3
REL	Religion
Protestant: Reformation Era and General	1
Protestant: Pietistic and Fundamentalist	2
Catholic, Eastern Orthodox, and Jewish	3
Non-Traditional Christian, and No Religion	4
Non-Judeo Christian	5
INC	Household income (1991 household income)
Lower 25 percentile	1 if income ≤ $24,258
Between 25 and 50 percentiles	2 if $24,258 < income ≤ $41,548
Between 50 and 75 percentiles	3 if $41,548 < income ≤ $64,600
Upper 25 percentile	4 if income > $64,600
AGE	Age as of 1992
Younger than average age	1 if age ≤ 55
Older than average age	2 if age > 55

differences in investment portfolios by race and conclude that African Americans have relatively few risky financial assets such as stocks and bonds compared to Caucasians. While they do not specifically focus on a retirement age group, their work indicates that there is a difference in non-housing net worth by race.

A religion variable is very difficult to divide into groups because there is no research available that suggests what influence, if any, exists. Five groups are formed for this variable based on categories in the HRS data and the numbers of respondents in each category. Group 1 is titled Protestant: Reformation and Protestant: General. Some of the specific religious entities included are Congregational, Episcopalian, Evangelical, Lutheran, Presbyterian, Reformed, and United Church of Christ. The second group is called Protestant: Pietistic and Protestant: Fundamentalist. Specific entities in this second Protestant category include AME Zion, Baptist, Disciples of Christ, Methodist, Mennonite, Church of the Brethren, Church of God, Fundamentalist Baptist, Pentecostal, Salvation Army, Seventh Day Adventist, Southern Baptist, and Missouri Synod Lutheran. The third group is titled Catholic, Eastern Orthodox, and Jewish. This group includes Roman Catholic, Greek Rite Catholic, Orthodox, and Jewish. Group 4 is called Non-Traditional Christian and No Religion. Specific entities include Christian Scientist, Jehovah's Witnesses, Mormons, Quakers, Spiritualists, Unitarian, and No Religion specified. Group 5 is titled Non-Judeo Christian. This group includes Islam, Muslim, Buddhist, Hindu, and Bahai.

Income is easily divided into the four quartiles by the available data in the first wave in 1992 and shown in Table 1. However, the more difficult task is to form an expectation for income and net worth. Gutter et al. (1999) suggest that net worth is positively related to income and that as income levels increase, investment risk tolerance increases.

Based on replacement ratios suggested in the work by Duncan et al. (1984), Palmer (1989, 1994), and Greninger et al. (2000), it would appear that a ratio between 75 and 90% of income would be appropriate in retirement. For the lowest quartile, that would suggest retirement income of between $18,193 and $21,832. For the highest quartile, that would be $48,450–$58,240. It is assumed that Social Security can provide more of the necessary incomes for the first two quartiles of income than the last two quartiles.

The last variable, age, is divided based on the median age into those 55 or less and those greater than 55 as of 1992. The advantage of this variable is the ability to over time track the changes in income and net worth given age information. In addition, Montalto et al. (2000) suggest that planned age of retirement changes as age increases.

4. Results

4.1. Descriptive statistics of net worth

Table 2 shows descriptive statistics for non-housing net worth of the three waves of HRS that are analyzed. The whole sample includes the non-housing net worth for the sample selected for each wave. Net worth is also shown for the married and single categories. The net worth increases from waves 1 to 2 and then decreases from waves 2 to 3 for both male and female respondents, whether married or single. Note that there are more male than

Table 2
Descriptive statistics of net worth from three HRS waves

Variable	Level	Description	No. of observation			Wave 1			Wave 2			Wave 3		
			Whole	Married	Single	Whole	Married	Single	Whole	Married	Single	Whole	Married	Single
GEN	1	Male	2629	2247	382	132912.4	140493.6	88318.6	158793.8	169109.9	98112.6	138845.7	147527.3	87778.7
	2	Female	2274	1389	885	93134.7	117881.1	54295.3	104007.6	128162.6	66096.7	83970.2	103951.2	52610.3
EDU	1	Less educated	1070	786	284	50582.5	57701.9	30878.8	48165.1	54819.4	29748.8	41717.3	49330.8	20646.1
	2		1728	1289	439	91666.2	108189.8	43149.3	109260.3	128231.9	53555.7	87357.2	101931.3	44564.5
	3		1022	747	275	136299.2	154047.3	88089.0	152673.1	171878.7	100503.7	128661.2	147118.1	78525.5
	4	More educated	1083	814	269	193347.0	220568.0	110975.8	237868.8	271788.0	135228.4	211349.1	240566.7	122935.9
RAC	1	White	4093	3152	941	127112.7	141931.5	77475.6	147349.2	164431.0	90131.6	126861.0	141833.7	76708.0
	2	Black	653	374	279	46858.0	62274.6	26192.1	52247.7	69127.4	29620.4	37268.7	48483.8	22234.8
	3	Others	157	110	47	65887.5	79703.2	33552.9	106779.4	126069.9	61631.3	78949.6	97174.8	36294.7
REL	1	Protestant I	967	741	226	150662.3	170036.3	87139.7	179572.8	201004.8	109302.3	156735.8	176920.1	90556.4
	2	Protestant II	2166	1576	590	90080.3	105045.1	50106.4	102577.1	119728.6	56762.4	86692.3	102193.9	45284.6
	3	Catholic	1387	1064	323	126079.6	144370.7	65826.6	144612.8	166587.1	72226.8	118656.1	135711.4	62473.8
	4	Non-Traditional Christian	359	236	123	122658.5	139147.8	91020.4	151859.2	170241.6	116588.9	134551.6	151395.9	102232.6
	5	Non-Judeo Christian	24	19	5	62662.5	75193.7	15043.8	127414.7	155008.7	22557.4	156441.7	189489.5	30860.0
INC	1	Lower	1225	629	596	48016.8	61158.6	34147.4	52158.1	66095.1	37449.5	38557.5	50609.8	25837.9
	2		1227	861	366	73816.4	78180.1	63551.0	87469.8	91360.6	78317.0	70002.7	74557.6	59287.5
	3		1224	1014	210	119563.3	125449.0	91144.0	137242.0	144257.1	103368.7	114921.4	120848.6	86301.6
	4	Higher	1227	1132	95	216362.1	217702.2	200393.1	256543.6	257505.1	245086.4	229978.4	227309.1	261785.8
AGE	1	Younger	2354	1745	609	97598.2	113824.6	51103.9	116040.9	135913.0	59100.3	102949.4	120719.5	52031.7
	2	Older	2549	1891	658	130038.8	148493.9	77001.3	149400.5	169666.6	91158.8	123040.7	140257.2	73562.8

Notes: The three columns under ''No. of observations'' include the number of observations in each level for given variable for the different samples. The last nine columns include the average net worth in dollars of each level for given variable for the different samples for each wave.

female respondents, with males accounting for 53.6%. The married to single ratio for males is roughly 7:1, while it is 2.6:1 for females.

The largest group in the education variable is those who have a high school diploma. They account for 35.2% of the population and those with a bachelor's degree or more account for 22.09%. Given the many studies that find a high correlation between education and income level, it should not be a surprise that the higher the education level the higher the net worth. Note that those with the least education, have a drop in net worth from waves 1 to 2 and then a further drop in wave 3. This finding may be explained by an earlier retirement. For the remaining three educational groups with a high school diploma or greater education, net worth increases from waves 1 to 2 and then decreases in wave 3 as more individuals retire.

When net worth is examined by race for the whole sample, Blacks have 36.86% of the net worth of Whites in wave 1, 35.5% in wave 2, and 29.4% in wave 3. This very large difference in non-housing net worth between Blacks and Whites supports results of studies by Badu et al. (1999), Gutter et al. (1999), and Plath and Stevenson (2000). It raises a very serious questions about retirement adequacy and a need to explain the reason for the results. The percentage comparison is higher for Black married couples than for Black singles. The primary races in the other group are Asians and Hispanics and this category has 51.8% of the White net worth in wave 1, 72.5% in wave 2, and then drops to 62.2% in wave 3.

There are differences in net worth when the variable is religion. In wave 1, those who indicate their religion as Protestant I have the largest net worth and those who indicate Non-Judeo Christian have the lowest. The Protestant I group continues to have the largest net worth in waves 2 and 3, but the lowest net worth changes to Protestant II in waves 2 and 3. While there is no previous research to suggest why there are differences by religious pre-Çference, it may have to do with attitudes toward the financial support of a specific religion or values and beliefs about charitable contributions that could reduce the savings of individuals.

The four groups for the income variable are evenly divided for the whole sample. However, the lowest two quartile have a much higher percentage of single individuals than the two higher quartile. In other words, those with the highest income, have the lowest percentage (7.8%) of single individuals and those with the lowest income have the highest percentage (48.7%) of singles. When the net worth of singles versus married is compared, singles have 55.83% of the net worth of married in wave one for the lowest income group and 92.05% in the highest income group. In wave 2, singles net worth increases to 56.66% in the lowest income group and then drops to 51.06% in wave 3. By contrast, singles in the highest income group increase to 95.18% of the net worth of married in wave 2 and then jump to 115.17% in wave 3. This result may reflect the loss of a spouse in the third wave.

In wave 1, those with the lowest income had 22.19% of the net worth of those in the highest income group, dropping to 20.33% in wave 2 and 16.77% in wave 3. Differences in income appear to be a major factor in the net worth when moving from waves 2 to 3.

The age variable shows that those that are 55 years or younger have a lower net worth in all three waves than those that are older than 55. For those that are younger, married individuals have more than twice the net worth of those that are single in wave 1 and this basically holds true for waves 2 and 3. The older group has married individuals with slightly less than twice the net worth of singles. This finding supports the results found by Mitchell and Moore (1998).

Based on the analysis of net worth by the groupings in the explanatory six variables, those individuals in wave 1 that are male, married respondent, with a college degree, White race, religious preference in the Protestant I group, in the highest income level, and older in age have the highest net worth. In wave 3, there are changes in the religion variable and the income variable in terms of net worth, with the highest net worth for those in the Non-Judeo Christian religion, single, and in the highest income level. The problem in drawing conclusions here is the relatively small number (24) in the Non-Judeo Christian religion variable and the single (95) variable. In wave 1, those with the lowest net worth are single, female respondents who do not have a high school diploma, Black race, religious preference in the Non-Judeo Christian group, in lowest income level, and younger in age. Further, it appears that net worth increases from waves 1 to 2 and then drops in wave 3 with the exception of the religion variable.

4.2. Cross-sectional analysis of non-housing net worth

The cross-sectional analysis shown in Table 3 examines main effects and interaction effects for significant differences in non-housing net worth *for each wave* of the data. Overall, the results are statistically significant at the 0.05 level or better in each wave. The percentage of the variability in the non-housing net worth that is explained is highest for singles in the third wave (34%) and lowest for married individuals in the first wave (13%).

The main effects for all six variables are significant with the exception of those who are single in the religion variable in waves 1 and 3. In wave 1, for the whole sample, the largest *F*-statistic occurs for the education variable in the main effects and this pattern continues in waves 2 and 3. The smallest *F*-statistic in wave 1 is for the religion variable. There is a difference in the level of *F*-statistics for main effects when the sample is divided into married and single individuals, with the highest *F*-statistic for education for married and income for single.

When the interaction effects are examined for wave 1 for the whole sample, there are four interactions that are statistically significant. For three out of the four interactions, the common variable is age. This same pattern holds for married, but is different for single where the common variable is income. Thus, for wave 1, age appears to be driving the results for the whole and married sample and income for the single sample.

In wave 2 for the whole sample, three out of the four interactions remain statistically significant with education replacing age as the common variable. In wave 3, two of the interactions change but education remains the common variable. The two interactions that are constant across all three waves are those between gender and education and between income and age. This result suggests that females with less education have lower levels of non-housing net worth as do those who have a lower income level and are younger in age. The implications for retirement adequacy analysis are that demographic factors should be considered when addressing the question of preparedness for retirement in terms of both income and non-housing net worth.

When the married sample is examined by wave, there are no interactions that are consistently significant across waves. For those that are single in wave 1, there are four interactions that are statistically significant and the common variable is income. In wave 2,

Table 3
Cross-sectional analysis of net worth from three HRS waves

Source	Wave 1			Wave 2			Wave 3		
	Whole	Married	Single	Whole	Married	Single	Whole	Married	Single
GEN	46.15***	8.80**	17.45***	84.19***	27.90***	14.14**	91.24***	33.39***	22.42***
EDU	92.19***	76.31***	22.56***	148.03***	122.95***	32.30***	130.08***	103.52***	36.91***
RAC	32.39***	16.01***	12.78***	35.67***	16.83***	14.81***	36.86***	19.50***	15.91***
REL	3.43**	3.20*	0.86	4.74***	4.13**	2.65*	4.13**	3.58**	1.92
INC	76.11***	36.90***	27.99***	97.52***	46.27***	40.25***	96.99***	44.06***	74.03***
AGE	44.24***	33.04***	16.40***	46.29***	29.66***	22.98***	20.29***	11.32***	15.90***
GEN × EDU	4.00**	3.13*	0.17	3.71*	1.92	0.76	3.01*	1.99	1.27
GEN × RAC	0.05	0.16	0.34	0.60	0.18	0.44	1.47	0.80	1.36
GEN × REL	1.01	1.37	1.55	0.55	0.52	1.20	0.42	0.47	1.27
GEN × INC	0.03	0.02	6.99***	0.12	0.16	3.15*	0.22	0.20	4.95**
GEN × AGE	0.07	0.08	0.02	1.82	1.10	0.15	0.06	0.25	0.33
EDU × RAC	1.07	0.85	0.49	2.02	1.33	1.16	2.24*	1.50	1.51
EDU × REL	1.60	1.65	1.64	2.14*	2.22*	1.22	1.46	1.74	0.90
EDU × INC	1.23	0.47	3.26***	1.59	0.69	2.69**	2.81**	0.97	5.33***
EDU × AGE	3.37*	3.29*	0.06	4.30**	2.80*	2.00	1.84	1.05	2.69*
RAC × REL	0.20	0.16	0.74	0.58	0.52	0.82	0.90	0.79	0.59
RAC × INC	1.28	0.48	2.30*	0.83	0.74	1.92	1.29	0.84	2.76*
RAC × AGE	1.46	0.77	2.23	2.14	0.75	3.99*	0.77	0.43	1.06
REL × INC	0.45	0.31	2.87**	0.85	0.82	2.94**	1.60	0.82	6.68***
REL × AGE	2.76*	2.67*	1.95	1.86	1.76	1.39	1.07	0.61	1.73
INC × AGE	4.75**	3.88**	2.42	3.85**	2.93*	3.50*	2.70*	1.48	6.41***
R^2	0.14	0.13	0.23	0.18	0.17	0.27	0.17	0.15	0.34
Model F	8.48***	5.67***	4.13***	11.76***	7.86***	4.99***	10.95***	6.88***	7.20***
Mean	114463.60	131855.30	64553.34	133384.10	153467.50	75749.47	113394.60	130880.60	63213.57

Notes: The numbers are F-statistics for testing whether main effects and interaction effects explain differences in the amount of net worth. The mean is the average net worth in dollars. The asterisks (∗∗∗), (∗∗), and (∗) indicate the significance at 0.1%, 1%, and 5% level, respectively.

there are five interactions that are significant. While income is again the most common variable, the strongest F-statistic occurs for the interaction of race and age. In wave 3, there are six interactions that are significant and income is the common variable for five of these interactions. This suggests that single individuals are significantly different in the level of non-housing net worth than those who are married.

To summarize the cross-sectional analysis, there is a difference between the whole sample, the married sample, and the single sample for both main effects and interactions. When the whole sample and the married sample are analyzed by main effects, education is the most important explanatory variable of non-housing net worth. For the single sample, the most important explanatory variable is income.

When interactions are analyzed for the whole sample, the most important explanatory variable for non-housing net worth is age in wave 1 and education in waves 2 and 3. For the married sample, there is no consistent explanatory variable. For the single sample, the most important explanatory variable is income. It would appear that income is the driving force in explaining the level of non-housing net worth, followed by education and then age. Further, being married produces a higher level of non-housing net worth.

The statistical significance for both the main effects and the interactions leads to the conclusion that *there is a difference* in the non-housing net worth of households in each wave in terms of household income level and demographic characteristics. Further, it supports a conclusion that *there is a difference* in results between those categorized as married or single households.

4.3. Longitudinal analysis

The longitudinal analysis seeks to compare *differences in non-housing net worth between waves* for main and interactions effect. In Table 4, the three comparisons are the differences between waves 2 and 1, waves 3 and 2, and waves 3 and 1. The model is statistically significant with the exception of the difference between waves 3 and 2 for those in the married category. However, the results are much weaker than the results for the cross-sectional analysis.

Note that the average change in non-housing net worth is positive from waves 1 to 2, but is negative from waves 2 to 3 and wave 1 to 3. This would appear to indicate the effect of those who are retiring and starting to draw down their accumulated assets.

The main effects for difference in net worth between waves 2 and 1 that are significant for the whole sample are gender, education, race, and income, with the strongest F-statistic for education. In differences between waves 3 and 2, education and age are significant with age being the stronger results. Between waves 3 and 1, gender, education, religion, and age are significant, with gender being the strongest. The only common variable in all three comparisons is education. In the wave 3 comparison with waves 2 and 1, age is significant.

When the married category is analyzed, gender and education are significant in the comparison between waves 2 and 1. For the difference between waves 3 and 2, education and age are significant and for the comparison between waves 3 and 1, gender, education, religion, and age are significant. Education is the common variable for all three comparisons.

The comparisons for singles show education and income significant for the difference between waves 2 and 1 and only income significant for the other two comparisons. Income is

Table 4
Longitudinal analysis of net worth between three HRS waves

Source	Wave 2 − Wave 1			Wave 3 − Wave 2			Wave 3 − Wave 1		
	Whole	Married	Single	Whole	Married	Single	Whole	Married	Single
GEN	14.08***	12.83***	0.10	0.00	0.24	0.26	11.51***	13.46***	0.03
EDU	18.79***	15.80***	2.86*	4.26***	4.34**	1.12	6.04***	4.11**	2.44
RAC	3.21*	1.95	1.32	0.49	0.21	0.76	0.93	1.10	0.07
REL	0.95	0.58	1.22	1.74	1.95	0.40	2.95*	2.83*	0.40
INC	4.18**	1.69	3.36*	0.38	0.28	3.63*	1.88	0.62	10.10***
AGE	0.18	0.10	1.55	12.72***	9.94**	3.28	8.62**	10.41**	0.24
GEN × EDU	0.81	1.24	2.49	1.77	0.48	2.26	3.10*	2.66*	1.10
GEN × RAC	1.21	0.96	0.42	0.64	0.43	2.39	2.62	2.13	0.66
GEN × REL	0.75	1.05	0.89	0.44	0.35	0.58	0.76	0.50	1.65
GEN × INC	0.08	0.26	1.60	0.03	0.04	1.82	0.15	0.23	1.55
GEN × AGE	2.68	4.07*	0.48	5.22*	4.96*	0.03	0.42	0.08	0.60
EDU × RAC	2.90**	2.37*	1.00	0.26	0.46	0.13	2.06	1.39	1.17
EDU × REL	1.63	2.24*	0.99	0.88	0.81	0.77	1.00	0.90	1.10
EDU × INC	1.24	0.84	1.12	1.31	1.19	1.71	1.16	0.59	3.45***
EDU × AGE	1.69	1.00	2.84*	1.30	1.11	0.99	0.86	1.77	2.68*
RAC × REL	0.50	0.95	0.79	0.34	0.42	1.65	0.84	0.91	1.22
RAC × INC	1.29	1.47	1.30	0.24	0.16	0.81	0.66	0.71	0.92
RAC × AGE	1.37	0.94	1.07	0.80	0.12	2.58	0.68	0.77	0.43
REL × INC	2.44**	1.83*	4.77***	2.96***	2.05*	4.28***	2.80***	1.54	5.15***
REL × AGE	0.55	0.29	1.36	1.06	1.12	0.05	1.89	1.58	1.20
INC × AGE	0.34	0.52	0.47	1.28	0.89	0.37	2.20	2.02	1.04
R^2	0.04	0.05	0.11	0.03	0.03	0.10	0.04	0.04	0.13
Model F	2.22***	1.98***	1.68***	1.36*	1.14	1.51**	1.88***	1.54***	2.11***
Mean	18920.51	21612.15	11196.13	−19989.54	−22586.84	−12535.90	−1069.03	−974.69	−1339.77

Notes: The numbers are F-statistics for testing whether main effects and interaction effects explain the differences in changes of net wealth between two waves. The mean is the average change of net worth in dollars between two waves. The asterisks (***), (**), and (*) indicate the significance at 0.1%, 1%, and 5% level, respectively.

clearly the explanatory variable for non-housing net worth for singles, while education is for the whole sample and those that are categorized as married.

The only common interaction for the whole sample is between religion and income. For the married category there is no common interaction between waves, but for singles there is a common interaction of religion and income. Thus, for the longitudinal comparison, the interaction results appear to be driven by the single category with the combined effects of religion and income.

The statistical results for the longitudinal analysis supports the conclusion that there is a difference in the non-housing net worth of households between waves in terms of household income and demographic characteristics. For the whole sample and those that are married, a common significant variable is education and for those that are single the common variable is income. Both the cross-sectional and longitudinal analysis indicate support for the conclusion that there is a difference between those that are married or single.

4.4. Number of retired households

Table 5 shows the number of retired households between waves 1 and 3. In the initial wave, those who are not retired outnumber those who are by more than 4 to 1, with the average age for retired individuals being 59.9. Recall that the sample in wave 1 spans those age 51–61 in 1991. By the third wave, the age has increased to 56–66, with those who are not retired outnumber those who are by approximately 3 to 2 with the average age for retired individuals being 62.7 years.

4.5. Changes in asset allocation

Traditionally, it has been assumed that as individuals near retirement they will reduce their asset allocation in equities to reduce the risk of losing part of their retirement assets. Table 6 shows for each group in the six independent variables the percentage of financial asset value to total non-housing net worth for waves 1 and 3. The columns marked cash, stock, and bond show the asset allocation for the portfolios for each asset group.

Table 5
The number of retired households between waves 1 and 3

	Wave 1		Wave 3	
	Responses	Age	Responses	Age
Retired	723 (17.1%)	59.9	1855 (41.8%)	62.7
Not retired at all	3517 (82.9%)	54.9	2579 (58.2%)	58.0
Total	4240 (100%)		4434 (100%)	

Notes: The numbers under "Responses" are the number of responses, and the numbers in the parentheses are the percentage of responses to total responses. The numbers under "Age" are average ages of the financial respondents. The group of "Retired" includes the households whose financial respondent answered either completely or partly retired at the time of survey. The group of "Not retired at all" includes the households whose financial respondent answered they are not retired at all at the time of survey. The number of total responses is different between waves 1 and 3 because the response rate is different for waves 1 and 3.

Table 6
Changes in composition of financial asset between waves 1 and 3

Variable	Level	Description	Financial Asset		Cash		Stock		Bond	
			Wave 1	Wave 3	Wave 1	Wave 3	Wave 1	Wave 3	Wave 1	Wave 3
GEN	1	Male	36.93	38.47	76.53	73.31	21.22	24.04	2.25	2.65
	2	Female	33.41	43.07	83.60	83.93	14.73	14.34	1.67	1.73
EDU	1	Less educated	34.95	41.19	92.88	92.41	6.79	6.96	0.33	0.63
	2		35.24	40.67	82.96	82.42	15.66	15.53	1.38	2.05
	3		34.62	38.01	76.46	74.43	21.73	23.67	1.81	1.91
	4	More educated	36.33	42.46	68.36	65.12	27.38	30.94	4.26	3.94
RAC	1	White	36.07	39.76	78.39	76.35	19.51	21.26	2.10	2.39
	2	Black	34.39	45.86	89.06	92.27	10.01	6.70	0.92	1.03
	3	Others	16.61	47.01	83.49	83.67	13.86	14.76	2.66	1.57
REL	1	Protestant I	34.72	40.76	74.65	70.85	22.63	25.83	2.72	3.32
	2	Protestant II	32.64	39.11	83.95	83.92	14.79	14.48	1.26	1.60
	3	Catholic	39.26	42.71	76.85	75.65	20.57	22.17	2.58	2.18
	4	Non-Traditional Christian	37.14	38.57	81.15	78.11	17.67	19.40	1.18	2.49
	5	Non-Judeo Christian	38.00	60.26	80.30	71.62	13.00	24.43	6.70	3.95
INC	1	Lower	39.94	46.36	89.23	91.41	9.98	7.88	0.79	0.71
	2		33.44	40.91	84.25	83.17	14.45	14.93	1.30	1.90
	3		33.75	38.61	78.69	76.60	19.54	20.82	1.77	2.58
	4	Higher	35.11	37.75	69.65	65.32	26.63	31.33	3.71	3.35
AGE	1	Younger	33.90	38.94	80.63	79.23	17.59	18.98	1.78	1.79
	2	Older	36.59	42.18	79.00	77.34	18.84	20.03	2.17	2.63

Notes: The two columns under "Financial asset" include the percentage of financial asset value in total non-housing equity for waves 1 and 3. The two columns under "Cash" include the percentage of liquid asset value in financial asset value for waves 1 and 3. The two columns under "Stock" include the percentage of stock asset value in financial asset value for waves 1 and 3. The two columns under "Bond" include the percentage of bond asset value in financial asset value for waves 1 and 3.

It appears that financial assets increase as a percentage of the total non-housing net worth for all groups in all of the six variables. The increase is allocated to a higher percentage for stocks for males, those with no high school diploma, those with some college and those with a college degree. Whites and others increase this percentage as do all religious groups except those in the Protestant II group. The decrease in stock holdings and the low percentage compared to the White and others comparison support the findings of Badu et al. (1999), Gutter et al. (1999), and Plath and Stevenson (2000), who conclude that African Americans have relatively few risky financial assets such as stocks and bonds compared to Caucasians.

All income groups except those in the lowest income group increase and those in both age groups increase their allocation to stocks. Waggle and Englis (2000) and Bodie and Crane (1997) find that older individuals hold less asset in equities, more if they have a college education, and more if they are higher net worth individuals.

There is an increase in stock allocations at the time when it is expected that they will decrease. A possible explanation could be the growth in stock prices during the period. However, it must be remembered that there is a decrease in non-housing net worth from waves 1 to 3 and this makes the increase in financial assets and stocks even more puzzling. Further this time period is prior to the real large increase in stocks prices during the late 1990s. Possible explanations may include a bias in respondent's financial data reporting over time and the fact that some of the data are estimated by HRS.

5. Conclusions

The purpose of this study is to provide an examination of non-housing net worth for the first three waves of the HRS by demographic characteristics and marital status. The statistical results indicate that there is a difference in the non-housing net worth of households in each of the three waves in terms of household income level and demographic characteristics. Further, there is a difference in the non-housing net worth of households between waves in terms of their income level and demographic characteristics. Lastly, there is a statistically significant difference between those categorized as married or single households.

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